Report of the Second Session of the CAS
Environmental Pollution and Atmospheric Chemistry
Scientific Steering Committee (EPAC SSC)

(Geneva, Switzerland, 18-20 February 2015)
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1. INTRODUCTION

The Second Session of the CAS Environmental Pollution and Atmospheric Chemistry Scientific Steering Committee (EPAC SSC) was held at the World Meteorological Organization (WMO) on the 18-20 February 2015 in Geneva, Switzerland. Gregory Carmichael, Chairperson of the EPAC SSC opened the meeting and welcomed the participants (see Annex 1). Three SSC members were present at the meeting (Melita Keywood, Karla Longo and Kobus Pienaar), while two other members participated via teleconference during parts of the meeting (Paul Monks and Xiao-Ye Zhang). The chairpersons of the Scientific Advisory Groups (SAGs) and Expert Teams (ETs) were present at the meeting, including John Ogren (outgoing Aerosol SAG Chairperson), Ed Dlugokencky (Greenhouse Gas SAG Chairperson), Alkis Bias (Ozone SAG Chairperson), Richard Artz (outgoing Precipitation Chemistry SAG Chairperson), Silvina Carou (incoming Precipitation Chemistry SAG Chairperson), Martin Schultz (Reactive Gases SAG Chairperson), Susana Diaz (UV Radiation SAG Chairperson) and Vincent-Henri Peuch (Chairperson of the Expert Team on Near-Real-Time Chemical Data Transfer(ET-NRT-CDT)). The GAW Urban Meteorology and Environment project (GURME) SAG Chairperson, Veronique Bouchet, took part in the meeting via teleconference. Jörg Klausen, Chairperson of the Expert Team on World Data Centres (ET-WDC) was not available for the meeting. Sandro Fuzzi, representative of the Commission for Atmospheric Sciences in the Intercommission Task Team on WMO Integrated Global Observing System (ICG-WIGOS), participated in the WIGOS part of the meeting.

Gregory Carmichael explained to the participants the scope of activities of the meeting and asked them to propose additional agenda items. No new items were proposed and the agenda was approved (see Annex 2).

Deon Terblanche, Co-director of the WMO Research Department also welcomed the participants. He stressed that the GAW Programme is to take on new challenges. He highlighted that the importance of atmospheric composition research is receiving more recognition among members. Orientation of the programme to products and services through research requires broader collaboration among parameter specific SAGs. It is also clear that services cannot be provided without proper support from observations; hence, sustainability of the services and the observing system are closely related. Deon Terblanche mentioned that the new WMO strategy takes into consideration post 2015 UN sustainable development goals and it is recommended that individual programmes within WMO take those goals on board while developing their implementation plans (See Annex 4).

Oksana Tarasova, Chief of Atmospheric Environment Research Division, briefed the participants on the preparation to the 17th WMO Congress, which takes place on 25 May-17 June 2015. The GAW document will be presented among the group of four documents of the Research Department (Overarching Research, the World Weather Research Programme, the GAW Programme and joint research activities). Oksana Tarasova referred to the web page with the Congress documents (http://cg-17.wmo.int/documents-english) and mentioned that documents are considered draft before being approved by the Members during the Congress. She also highlighted the priorities of WMO as presented in the draft of the WMO Strategic Plan for 2015-2019. These priorities include:

- Disaster risk reduction
- Global Framework for Climate Services
- WMO Integrated Global Observing System
- Aviation meteorological services
- Polar and high mountain regions
- Capacity Development
- WMO Governance
Oksana Tarasova stressed that the development of the GAW Implementation Plan for 2015-2019 should refer to these priorities where appropriate. More general development goals should also be kept in mind to bring GAW activities into the broader context.

Oksana Tarasova mentioned that during the upcoming Congress GAW will hold a side event on aerosols on the 8th June. The aim of this event is to highlight the broad spectrum of applications of aerosol observations from impacts on climate and human health to aeronautical security services. Gregory Carmichael reported on the success of the World Weather Open Science Conference (WWOSC), Montréal, Canada, 16-21 August 2014. He mentioned that several white papers came out of that conference including white papers on the development of concrete collaborations with the World Weather Research Programme (WWRP), Montréal, Canada, 16-21 August 2014. He mentioned that several white papers came out of that conference including the ones on urban-scale environmental prediction, integrated modelling and data assimilation. These white papers are made available on the website of WWOSC and WWRP (http://wwosc2014.org/whitepapers-e.shtml).

2. REPORT ON ACTION ITEMS OF THE PREVIOUS SSC MEETING

Greg Carmichael referred to GAW Report No. 215 (Report of the First Session of the CAS EPAC SSC, Geneva, Switzerland, 10-12 June 2014), that summarizes the discussions and action items of the previous SSC meeting (Action Items are also listed in Annex 5 for easy reference). The subsequent discussions that took place during the meeting and new actions related to these items are summarized later in the text in the sections identified for each task.

AI-1: this action item refers to support of WIGOS. Gregory Carmichael briefed the participants on the meeting of the Task Team on observational requirements and satellite observations (TT-ObsReq) that took place in November 2014. Report of the session will be published as a GAW Report in 2015. He highlighted the progress made by that group on the definition of application areas, variables required within those application areas and further steps needed to fill in the user requirements in the Observing Systems Capability Analysis and Review Tool (OSCAR) database (http://www.wmo-sat.info/oscar/observingrequirements) with contributions from the SAGs and ETs. AI-1 was further discussed during the meeting (See Section 11 for discussions and new actions).

AI-2: in relation to the development of concrete collaborations with the World Weather Research Programme (WWRP), Gregory Carmichael reported on the success of the World Weather Open Science Conference (WWOSC), Montréal, Canada, 16-21 August 2014. He mentioned that several white papers came out of that conference including the ones on urban-scale environmental prediction, integrated modelling and data assimilation. These white papers are made available on the website of WWOSC and WWRP (http://wwosc2014.org/whitepapers-e.shtml).

AI-3: discussions on the role and involvement of contributing networks are included in the agenda of the current meeting (See Section 9 for discussions and new actions).

AI-4: discussions on the data exchange and the role of data centres are included in the agenda of the current meeting (See Section 10 for discussions, decisions and new actions).

AI-5: local stations category was discussed with SAG Chairpersons at the teleconferences in November 2014 but no formal decision has been taken. Further discussion is planned at the current meeting. It is clear that there is a need to develop a strategy to support local stations but this category should remain manageable (See Section 8 for discussions, decisions and new actions).

AI-6: SSC approved several contributing networks and one Global station designation (this action item refers to the decisions taken during the previous SSC meeting)

AI-7: outreach and communications are discussed later in the agenda (See Section 13 for discussions and new actions).
AI-8: role of satellite observations was discussed at November 2014 meeting of TT-ObsReq.

AI-9: a contact has been established with the carbon community and some progress has been made towards the development of an implementation plan of the Integrated Global Greenhouse Gas Information System (IG³IS) (See Section 7 for discussions, decisions and new actions).

AI-10: role of the World Data Centres is discussed during the meeting (See Section 10 for discussions, decisions and new actions).

AI-11: a lot of progress has been made on the development of application areas. One major achievement is a proposal to substitute the existing "Atmospheric Chemistry" Application Area with three Application Areas, namely atmospheric composition forecasting, atmospheric composition monitoring and re-analysis, and urban air quality. The GAW Implementation Plan for the period 2015-2019 will be built around these general and more specific application areas (See Section 15 for discussions, decisions and new actions).

AI-12: aerosols were highlighted as a priority at the sixteenth session of the Commission of Atmospheric Sciences (CAS-16). Aerosol observations and analysis have numerous applications of cross-cutting nature (weather, climate, health applications). Some efforts are needed to move forward aerosol activities within GAW.

AI-13: this action item is related to the Task Team on Atmospheric Composition Vocabulary (TT-ACV). After endorsement at the last meeting the TT was established and several teleconferences were held. The report is presented at this meeting (See Section 4.3 for discussions and decision).

AI-14: drafting of the GAW Implementation Plan is a major objective of this meeting (See Section 15 for discussions, decisions and new actions).

AI-15: SAG membership and chairpersonship was communicated to the groups. SAGs supported the strategy and developed the transition plans. SSC has already approved a number of changes in the SAG composition and further elaborated on this point during the meeting. SAGs expressed a need for discussion of the role of ex officio members (See Section 5 for discussions, decisions and new actions).

AI-16: this action item refers to the setting up of this EPAC SSC meeting, now completed and closed.

AI-17: The meeting of the SSC at the International Global Atmospheric Chemistry (IGAC) Project conference was completed and this action item is closed. IGAC conference brochure was a great success. It can be found at the GAW web page under "Other publications" (www.wmo.int/gaw).

AI-18: SSC assignments and communication are on-going activities and relate to SSC work flow.

AI-19: The GAW Statement on the Health of the Atmosphere, which was proposed at the GAW 2013 Symposium is discussed later in the agenda (See Section 13 for discussions, decisions and new actions).

AI-20: A closer connection between air quality and climate community is to be addressed through the interaction with WIGOS and the Working Group on Numerical Experimentation (WGNE). Further planning was conducted at the Symposium on Coupled Chemistry-Meteorology/Climate Modelling organized in Geneva, Switzerland on 23-25 February 2015. Further discussion took place at the WGNE-30 meeting in March 2015. SSC Chairperson agreed to follow-up on this issue and to report to SSC (See Section 6.1 for discussions, decisions and new actions).
3. **REPORTS OF THE SAGs, ETs AND OTHER EXPERT GROUPS**

### 3.1 SAG Reactive Gases

Martin Schultz reported on the major achievements of the Reactive Gases (RG) Group. He mentioned that the Tropospheric Ozone Assessment Report (TOAR) project that addresses global trends of tropospheric ozone and involves GAW observational community is a good example of a user case. He considered the update of the CO reference scale and steps undertaken to reflect the scale change in the data, agreement with the Clean Air Status and Trends Network (CASTNET) (although some problems with metadata exchange are to be resolved) among achievements of the group.

Ed Dlugokencky commented that the update of the CO scale is a big achievement as a way was found to trace a drift in CO standards. Many GAW laboratories lack a sufficiently-advanced database management system making it difficult to propagate drifts in WMO standards to their measurements.

Martin Schultz noted that it is important to improve collaboration with the Convention on Long-Range Transboundary Air Pollution (LRTAP). He stressed that acceptance of the network supporting this convention through the European Monitoring and Evaluation Programme (EMEP) as a contributing network to GAW would be an important step, but it would require a review of the terms of reference and requirements for contributing networks. Among the problems he encountered was the strict requirement for compatibility within GAW that doesn’t allow the involvement of regional networks that utilize non-recommended measurement techniques. Other obstacles are the underuse of GAW data, lack of liability in the institutions working with GAW and the high cost of the primary standards.

Martin Schultz presented the results of SWOT (Strengths/Weaknesses/Opportunities/Threats) analysis for the group of Reactive Gases (RG). He stressed that lack of funding, the diminishing importance of RGs and the potential drawbacks of integration represent the major threats for the success of the RG group.

Martin Schultz mentioned that sulphur and nitrogen cycle observations and analysis are among potential cross-SAG activities.

### 3.2 SAG Greenhouse Gases

Ed Dlugokencky reported on the achievements of the Greenhouse Gas (GHG) community. He mentioned the success of the series of Greenhouse Gas Measurement Techniques (GGMT) meetings and their outcomes published as WMO recommendations on quality assurance practices. CO₂ measurement guidelines which are highly needed by the community are planned for publication in 2015. The Greenhouse Gas Bulletin continues to serve as a benchmark publication by the GAW community and the SAG prepares this publication jointly with the World Data Centre for Greenhouse Gases (WDCGG) and the WMO Secretariat.

Geir Braathen enquired why global averages calculated by the WDCGG are not used in Intergovernmental Panel on Climate Change (IPCC) assessments. Ed Dlugokencky commented that WDCGG does not apply scientifically sound methodology for spatial weighting of data used for global average calculation.

**New AI-1: SSC /Secretariat to discuss the methodology used by the WDCGG for global averaged mole fraction calculation (to ensure GAW global averages are used in IPCC process)**
Ed Dlugokencky indicated the following activities as priority for the GHG community:

- Reaching measurement compatibility through the network
- Better use of data management system (e.g. for metadata compilation, tracing the scale change and recording the updates on data submission)
- Expansion of the GHG network in climate sensitive regions including measurements of vertical profiles (e.g. better observations in the Arctic are needed to trace the changes in hydrate stability)
- Development of applications relevant to verification of emission treaties
- Evaluation/validation of satellite retrievals
- Support of improved transport models that can be verified by measurements of the transport relevant tracers (e.g. SF$_6$ or $^{222}$Rn)

Vincent-Henri Peuch noted that the task of emission verification is very ambitious, there is still a long way to go to improve modelling tools and observational network to be able to get meaningful small uncertainty in inverse model products that can be used to verify small effects of anthropogenic emissions change.

Gregory Carmichael noted that GAW should discuss emissions with cities as this is where the actions are taking place. In general emission updates/verification, evaluation of policies via trends in observed atmospheric composition should be a role for GAW and reflected in the new GAW Implementation Plan.

3.3 SAG Aerosols

John Ogren reported on the progress made by the aerosol community within GAW. He mentioned the establishment of several stations which were initiated by SAG members (Chacaltaya in Bolivia and the Swiss Global Climate Observing System (GCOS)/GAW programme stations). SAG published a peer-review paper on trend analysis of several aerosol characteristics measured in GAW and a paper on Black Carbon terminology (http://www.atmos-chem-phys.net/13/8365/2013/acp-13-8365-2013.html). The SAG continued working with contributing networks and communicates with Surface Radiation (SURFRAD) Network concerning their contribution to GAW. SAG started working on the update of measurement guidelines; it established a sub-group to assess user requirements for the Rolling Review of Requirement (RRR) process. SAG started evaluation of black carbon measurements by aethalometers. Initial steps were done on the establishment of a World Calibration Centre (WCC) for aerosol chemistry.

The vision of the aerosol SAG addresses:

- Expansion of the network in undersampled regions (as an example John Ogren contrasted the relatively dense network of GAW aerosol stations in Europe to the extremely sparse network in Africa)
- Integration of observations with models and model verification (through International Cooperative for Aerosol Prediction (ICAP), Aerosol Comparisons between Observations and Models (AeroCom) etc…) which allows for multiple data streams and integration of observations from different platforms
- Improvement of integration with air quality networks, considering local stations as a bridge between regulatory and GAW networks
- Improvement of the aerosol column measurements and their verification against vertical profiles through extension of the measurement programme at a number of super-site and using aircraft platforms
- Preservation of historical data (e.g. the data collected in campaigns)
- Better utilization of data journals and digital object identifiers (DOI).
John Ogren proposed to include user community in SAGs.

Martin Schultz objected to this proposal, and suggested that SAGs should have a better interface with a user community rather than its direct involvement.

### 3.4 SAG Precipitation Chemistry

Richard Artz reported on the major achievements of the precipitation chemistry (PC) community. Several sites were added to the network in remote places (South America). The manual for the GAW precipitation chemistry programme has had strong resonance throughout the global community and has played an important role in network improvements and harmonization. The SAG is working to update and produce an online version of the manual. Laboratory Intercomparison Studies continue to be conducted by the QA-SAC twice annually with approximately 80 participating laboratories. The PC SAG developed a ring-diagram to represent the quality of measured concentrations of major ions commonly found in precipitation based on statistical results of each chemical measure. The Global Assessment of precipitation chemistry and deposition published last year as a Special Issue of Atmospheric Environment was a great achievement with over 6,300 views so far. It provides a global and regional view of precipitation composition and deposition based on high quality measurements combined with global model estimates. This assessment has many potential applications, and will be particularly useful to the aquatic and terrestrial community for assessing ecosystem sensitivity. The assessment findings demonstrated that deposition should be studied as total deposition (including dry and wet deposition).

Richard Artz noted that there are still several challenges to address:

- GAW still needs to increase the set of parameters measured in the precipitation chemistry programme (e.g. there is a need for measurements of organic nitrogen, organic acids, base cations and phosphorous)
- Large areas of the globe remain unmonitored. There is a need to increase spatial coverage of long-term global deposition monitoring sites in key locations in under-represented regions.
- SAG PC should explore linkages and collaborate with the other SAGs (as the first step a workshop on sulphur was proposed by WMO to be held at the Acid Rain 2015 conference)
- There is a need for the development and application of model/measurements fusion techniques in order to produce global maps of total deposition.

Several key networks have already expressed their interest in contributing to GAW, though several key networks like EMEP and the Acid Deposition Monitoring Network in East Asia (EANET) have still not joined the programme.

PC SAG considers opportunities for collaboration with the other SAGs, such as the use of aerosols and reactive gas data to estimate dry deposition. Potential application areas for total deposition include the assessment of impacts on ecosystem services and perhaps agriculture. These applications need to have requirements for the observing network formulated. There is no clear driver for urban environment deposition.

Modelling capabilities for deposition remain a challenge and further developments are needed. Currently the problem that comes in model-measurement comparison is that not all models use the same emission inventory and they all have different resolution. In this respect, Karla Longo proposed that the guidelines for model development should be prepared. The modelling community should define where the discrepancies are and work towards model improvement.

SAG PC made a proposal to extend the scope of the group to cover total atmospheric deposition, rather than wet deposition only. This proposal is reflected in Section 4.1.
3.5 **SAG Ozone**

Alkis Bais reported on the major achievements of the ozone community. Those include the review of ozone cross-sections in the Absorption Cross-Sections of Ozone (ACSO) initiative, continuous comparison campaigns partially with support from the Earth System Science and Environmental Management COST Action ES1207 “A European Brewer Network” and EURAMET “Traceability for atmospheric total column ozone (ATMOZ)” research projects (which will improve retrievals) and modernization of the ozone data centre in Environment Canada.

The vision for this focal area includes improvement of retrieval algorithm for Umkehr measurements, quality control of ozone datasets, establishment of the methods to assess uncertainty in ozone profile measurements, further comparison of ozone profile measurements from ozonesondes and aircraft. A new approach is to use Brewer instruments to retrieve Aerosol Optical Depth (AOD) which needs further investigation. Alkis Bais noted a decline in submission of data on total ozone to the World Ozone and UV Radiation Data Centre (WOUDC).

SSC wondered about the potential use of this new AOD product. It was hoped that if the data are used, this may motivate data submission.

3.6 **SAG on UV Radiation**

Susana Diaz reported on the major achievements of the UV community. She mentioned the transformation of the UV Regional Calibration Centre (RCC) in Davos to the World Calibration Centre. She highlighted the treasure of data residing in the different UV data centres (which still needs harmonization) and publication of several reports.

In UV radiation research the focus has moved from the negative effects of UV radiation to positive effects. UV index was developed but it is not linked to GAW yet. There are several producers of UV index but their products are not harmonized and some efforts are needed to drive this harmonization.

In the future, the changes in UV will be driven by both climate change and stratospheric ozone. These changes will have geographical and seasonal differences that will cause changes in vitamin D production in humans. There is a need for standardization of UV index calculation and extension of UV index scale jointly with the World Health Organization (WHO). The UV SAG will further address a need for observation of parameters related to climate and impacting UV, e.g. cloud optical depth, clear and real sky observations and some others. The UV community can provide services for human health and ecosystem studies and for satellite retrievals verification. UV radiation observations can be used for verification of the chemical schemas in models.

3.7 **SAG GURME**

Veronique Bouchet presented achievements of the GURME project (via teleconference). She explained that GURME mostly focuses on the development of modelling tools for megacities. As there is a need for better description of the processes in the boundary layer, efforts will be made to improve the collaboration with the weather community (nowcasting) to improve processes representation at 1 km resolution. Veronique Bouchet was not sure about the relation of local and urban stations.

GURME has developed a strategic directions document (Annex 6). GURME priorities will be in advancing the research questions, development of forecasting tools for health purposes, pilot project for the Olympic Games in Tokyo in 2020. The group should take a more proactive approach and work on data assimilation in collaboration with the new SAG on NRT applications (see Section 4.2) and with the World Weather Research Programme.
3.8 Expert Team on Near-Real-Time Chemical Data Transfer

Vincent-Henri Peuch presented the status of the Expert Team on Near-Real-Time Chemical Data Transfer (ET-NRT-CDT) and proposal for the extension of the scope of this group.

The former objectives of the group included support of the WMO Information System (WIS) and participation in NRT data delivery initiative through several pilot projects which were concluded. Not much progress has been made within recent years and there is a strong need to review the terms of reference of this group. The proposal is discussed in Section 4.2.

3.9 Expert Team on World Data Centres

Jörg Klausen was unable to attend the meeting but had provided input to the SSC Chairperson prior to the meeting. The Expert Team on World Data Centres (ET-WDCs) was discussed in connection with GAW data and data policy.

SSC noted that the mandate of ET-WDCs needs to be revised. There is a need for the development of a strategy related to World Data Centres and GAW data management in general. The issue of data sharing is further discussed in Section 10.

Currently, this Expert Team consists of ex officio members including Vincent-Henri Peuch as Chairperson of ET-NRT-CDT, as well as Martin Schultz and Kjetil Torseth as invited experts. The Expert’s team website can be found at: https://sites.google.com/site/wmoetwdc/home.

4. UPDATE OF GAW GROUPS

4.1 SAG on Total Atmospheric Deposition

A proposal has been made by the SAG Precipitation Chemistry for the extension of the scope of this group to cover total atmospheric deposition (the scope and proposed tasks are summarized in Annex 7).

SSC discussed the proposal and was very positive about it. Extension of PC SAG scope opens the door for sulphur, nitrogen, and other chemical flux studies of interest. This group can be used as a focal group to address ecosystem services (for example, sulphur and nitrogen cycles). Gregory Carmichael noted that this group can serve as an integrator between SAGs. SSC recommended SAG TAD to consider collaboration with iLeaps (Integrated Land Ecosystem Atmosphere Processes Study) project.

D-1: Decision was taken to endorse the extension of the scope of the SAG Precipitation Chemistry to cover total atmospheric deposition. SSC endorsed the name change to the SAG Total Atmospheric Deposition.

4.2 SAG on Near-Real-Time Applications

SSC identified a strong need for further fostering atmospheric composition modelling component within GAW. SSC noted that near-real-time data delivery is critical for data assimilation in forecasting systems. Modelling activities within GAW should be coordinated and linked with the activities of WWRP and WGNE. This collaboration is critical for integration.

Considering the increasing role of modelling on the regional and global scale and the importance of atmospheric composition for weather and climate, the Chairperson of ET-NRT-CDT Vincent-Henri Peuch proposed to extend the scope of this ET (as outlined in Annex 8). The new group would address applications that use NRT data delivery on scales larger than urban. The particular
tasks would include the development of boundary conditions for local modelling, the improvement of models and the development of services related to dust, to volcanic ash and biomass burning plumes and to health applications. It is clear that to support these applications the whole data system should be reviewed to ensure the possibility of service delivery. To implement its tasks the composition of the group should change. More modelling centres must be involved in this group, including the National Oceanic and Atmospheric Administration (NOAA), Environment Canada, the European Centre for Medium-Range Weather Forecasts (ECMWF), Japan, Australian Bureau of Meteorology and the Commonwealth Scientific and Industrial Research Organisation (CSIRO).

SSC recognized the importance of the proposed transformation. It further noted that proposed group should avoid duplication of work and keep strong links with the thematic SAGs. As it addresses a broad scientific topic, it can become a Scientific Advisory Group.

The proposed expert group can address in some ways data submission in NRT from GAW stations for specific applications. SSC noted that this SAG cannot address all modelling activities related to atmospheric composition and should be limited in scope to address specific tasks. The priority should be given to the tasks that are linked to forecasting skills. Those tasks can evolve with time. SSC recommended that SAG performs its activities through a limited number of pilot projects similar to the way it is done by GURME.

Each thematic SAG should have a liaison with this modelling group (residing in the group as ex officio member). To ensure connection with WWRP this programme will be invited to nominate two experts in the group. Linkages to the World Climate Research Programme (WCRP) should also be perused.

D-2: SSC decided to endorse the extension of the scope of the ET-NRT-CDT to cover a limited number of tasks related to applications that require NRT delivery of atmospheric composition data. SSC agreed that the initial focus of the group should be on biomass burning, sand and dust storms, volcanic ash plume forecasting. SSC agreed that the group should focus on global and regional scale modelling and keep an intrinsic link to GURME.

D-3: SSC further decided to transform this group from Expert Team to SAG. It approved Vincent-Henri Peuch as continued Chairperson of the group and requested him to propose SSC new members of this SAG and a name of the group by 15 April.

New AI-2: Vincent-Henri Peuch working with Gregory Carmichael to propose SSC new name and membership of the SAG on atmospheric composition modelling by 15 April.

4.3 Task Team on Atmospheric Composition Vocabulary

Martin Schultz reported on the activities of the Task Team on Atmospheric Composition Vocabulary (TT-ACV). This group has held two teleconferences. They established a TT-ACV Wiki page. Initial discussions in the group focused on chemical constituent names. During mid- March a server will be established for exchange. This server will be used to identify inconsistencies between different ontologies. This group works with the WIGOS expert team on metadata. WIGOS has a list of variables, but this list does not contain definition of terms. TT-ACV will work on the definition of those terms.

SSC found the work of this TT useful and progressing very well.

D-4: SSC took a decision to support the continuation of TT-ACV until its task is accomplished with regular updates and review of the progress at the next SSC meeting.
5. **SAGs AND ETs MEMBERSHIP**

Gregory Carmichael reported that SSC communicated guidelines for the SAG size and membership duration to SAGs and ETs.

Martin Schultz stressed that currently SAGs play a double role. On one hand, they keep GAW abreast to the scientific developments in specific fields and provide advice on research priorities to be addressed by the GAW community. On the other hand, SAGs are tasked to coordinate observational systems supporting those research priorities. This brings a need for a substantial number of ex officio members representing key networks and GAW Central Facilities within SAGs.

Martin Schultz noted that the terms of reference of SAGs should be re-worked. New terms of reference should include mechanisms that allow SAGs to identify and include in their work more cross-SAG activities. Probably the names of the SAGs can also be reviewed.

Melita Keywood commented that there are advantages in keeping SAGs focused on parameters rather than on broader issues, though SAGs should undertake more cross-cutting (cross-SAG) initiatives.

Gregory Carmichael stressed that the SSC must play an active role in looking for appropriate candidates to be included in SAGs. He also noted that SAG membership should be considered strategically in a view of GAW priorities and more experts in modelling and data assimilation should be included.

SSC took a note of the SAGs Chairpersonship change approved by CAS: Paolo Laj was accepted as upcoming Chairperson of the SAG Aerosol and Silvina Carou was accepted as upcoming Chairperson of the SAG on Total Atmospheric Deposition. Upcoming chairpersons officially take on their role after the SSC meeting in February 2015.

D-5: **SSC approved the following new members:**

1) Dr Meehye Lee - new member of the SAG Reactive Gases
2) Dr Frank Flocke (as a substitution to Tom Ryerson) - new member of RG SAG
   from May 2015
3) Dr Corinne Galy-Lacaux - new member of TAD SAG
4) Dr Ariel Stein - new member of TAD SAG
5) Dr Fiona O’Connor - new member of TAD SAG

New AI-3: SSC requested SAG and ET chairpersons to provide the list of expertise of the current members by April 15.

SSC had a discussion on the total number of members in the SAGs and the role of ex officio members. SSC expressed a strong opinion about necessary rotation of members, on the other hand recognizing the dual role of SAGs it accepted a substantial number of ex officio members in the SAGs.

D-6: **SSC decided that the total number of SAG/ET members (including ex officio) must not exceed 19 members. The total number of ex officio members must not exceed the number of regular members (max 10 regular and 9 ex officio). The role of ex officio must be articulated to the SSC.**

New AI-4: **SAG Ozone membership must be considered and brought in agreement with decision made about total number of members.**
New AI-5: The UV SAG is small, but most members have served more than 8 years. The membership of the UV SAG should be revised gradually in order to comply with the 8 years rule.

SSC made the following recommendations concerning SAG activities (best practices):

- SAGs share their meeting notes
- SAGs share expertise of members (See action item AI-3)
- SAGs should raise profile of the programme through dedicated sessions or presentations at high profile meetings and publications
- SAGs should structure their meetings toward more scientific discussions and share science presentations
- Cross-cutting issues should be addressed through inter-SAGs demonstration/pilot projects

6. COLLABORATION WITH THE OTHER PROGRAMMES

6.1 Collaboration with WWRP

SSC took note of the document provided by Paolo Ruti, Chief of the World Weather Research Programme (WWRP) highlighting possible ways of collaboration between GAW and WWRP (Annex 9).

SSC noted that the High-Impact Weather (HIWeather) initiative of WWRP clearly engages atmospheric composition. This initiative contains components of urban air quality, sand and dust storms and biomass burning. GAW can play a more active role in HIWeather on the aspects of mentioned above applications. Sub-seasonal to Seasonal forecasting (S2S) initiative can also be linked to GAW activities, though this initiative is considered by the SSC as more relevant to agriculture.

SSC noted the third WWRP priority is the Polar Prediction Project (PPP). SSC acknowledged that observations in the Arctic are taking place as a part of the GAW Programme. Potentially these observations can be linked to the Polar Prediction Project. Another potential link could be through the Arctic Monitoring and Assessment Programme (AMAP). It is clear that biomass burning in mid-latitudes gets transported to the Arctic and impacts atmospheric composition and snow properties in the region. This could be a potential link between PPP and GAW.

SSC agreed with the view of Paolo Ruti that potential collaboration areas between GAW and WWRP can include:

1) Atmospheric composition forecasting with a focus on urban areas
2) Assimilation of atmospheric composition data in the Numerical Weather Prediction (NWP) with the purpose to improve the forecasting skills

SSC noted that the collaboration with the S2S project is outside of the major scope of GAW activities.

Another potential body where GAW can profit of collaboration is with the Working Group on Numerical Experimentation (WGNE). WGNE is developing numerical models and has a group on aerosols and a group on assimilation of atmospheric composition data to NWP models. GAW will benefit from collaboration with these groups. Gregory Carmichael accepted an invitation to participate in the WGNE meeting in March 2015 and he will follow up on the potential collaboration activities between WGNE and GAW.
New AI-6: Gregory Carmichael to take part in the WGNE meeting in March 2015 and investigate the possibility of collaboration between GAW and WGNE. The outcome of discussion should be reported back to the SSC.

SSC noted that ways of collaboration with the WCRP should be further investigated.

Alexander Baklanov reminded that potential collaboration ways between atmospheric composition community and weather and climate community were discussed at the WWOOSC and they are described in the white papers prepared after the meeting.

New AI-7: Alexander Baklanov is requested to share relevant white papers with the SSC.

New AI-8: Findings from the Symposium on Coupled Chemistry-Meteorology/Climate Modelling (MMCC) to be shared with the SSC and taken into consideration in the further development of the modelling activities within GAW and through collaborations with WWRP, WCRP and other partners.

6.2 GAW contribution to WIGOS

Sandro Fuzzi made a presentation on the contribution of GAW to WIGOS. He mentioned that WIGOS is working towards the integration of the existing observing systems. From WIGOS’s concept point of view Sandro Fuzzi indicated the following needs for GAW:

- As a substantial input to the programme comes from outside of the NMHSs there is a need to highlight the importance of long-term collaboration between NMHSs and the research community to ensure the continuity of the atmospheric composition observations.
- GAW has to improve its communication strategy as communication with Permanent Representatives is not enough in many cases to deliver the priorities and needed actions to the countries.
- There is a need for mutual recognition between the NMHSs and the research organizations directly involved in atmospheric composition observations to ensure positive GAW contribution to WIGOS (procedures needed).
- There is a need for a body within GAW that can cut across the SAGs and work on customized applications.

Involvement of GAW in WIGOS provides some opportunities for the programme:

- Improved visibility
- Potential network extension
- Harmonized with the other observational programmes approach to quality assurance system
- Promotion of data exchange between different programmes

SSC appreciated the feedback from Sandro Fuzzi. It also noticed that as WIGOS is one of WMO priorities, GAW’s contribution to WIGOS should be reflected in the GAW Implementation Plan. It is important to note that GAWSIS is a significant contribution to WIGOS. Also, Jörg Klausen’s activities as member of WIGOS expert team on metadata (CAS representative) and co-chairperson of ET-WMD is a significant contribution of CAS/GAW to WIGOS.
7. PROGRESS ON THE INTEGRATED GLOBAL GREENHOUSE GAS INFORMATION SYSTEM (IG\textsuperscript{3}IS)

Oksana Tarasova reported on the recent activities related to IG\textsuperscript{3}IS. She reported that IG\textsuperscript{3}IS was presented at one of the meetings organized by the United Nations Framework Convention on Climate Change (UNFCCC) related to the Intended Nationally Determined Contribution (INDC). The concept of IG\textsuperscript{3}IS is briefly described in Annex 10. The IG\textsuperscript{3}IS effort is aimed at improving the granularity of observations and analyses, in order to support the planning and management of INDC mitigation efforts by nations. IG\textsuperscript{3}IS is not designed to check compliance with regulations, but rather to provide information on policy- and management-relevant scales and ensure that the information provided is consistent with a global network of high quality observations. Not much progress has been done on the development of IG\textsuperscript{3}IS concept. SSC noted that the scope of the concept reflects the current major activities of SAG GHG.

Oksana Tarasova noted that the UNFCCC has some reservations about the concept of IG\textsuperscript{3}IS as a tool for independent emission verifications (or as a political tool), so the concept of IG\textsuperscript{3}IS should be reconsidered from the angle of science (as a mean of carbon cycle research). SSC responded that such a scope overlaps with the scope of the Global Carbon Project (GCP). The SSC also requested to clarify the role of Carbon Tracker and Copernicus Services in IG\textsuperscript{3}IS.

Oksana Tarasova explained that the details of the IG\textsuperscript{3}IS concept will be developed by the IG\textsuperscript{3}IS Implementation Plan writing team. The first draft list of proposed experts for the team was evaluated by the SSC.

New AI-9: SSC requested to include one of the SAG Greenhouse Gases members in the IG\textsuperscript{3}IS Implementation Plan writing team.

The writing team will be lead by Phil DeCola. Initially, the team will work offline and composition of the team may evolve with time depending on the contribution of individual team members and identified gaps in expertise. It is expected that the outline of the IG\textsuperscript{3}IS Implementation Plan will be prepared before the 17th WMO Congress. Depending on the outcome of the Congress decision the plan may or may not be developed further.

8. URBAN ACTIVITIES/LOCAL STATIONS

Alexander Baklanov reported on urban activities within WMO. He noted that GURME serves as a focal point for such activities within GAW. He noted that there is a need to integrate urban observations in GAW. A new category of local stations can play an important role in support of urban activities. These stations can be used in pairs with Regional GAW stations to define cities increment in atmospheric composition. He explained that urban activities are taking place in a form of demonstration and pilot projects. NRT data delivery is essential for urban applications, though data assimilation schemes on urban scale need further development. GURME is ensuring a link between research, applications and services. It will move to further integration between meteorology and atmospheric chemistry.

Gregory Carmichael mentioned that we need to bring the aspect of health in the GAW strategy. Working collaboration must be established with the World Health Organization and environmental agencies to address health related aspects of atmospheric composition change. He agreed that urban – rural pairs are useful for urban gradient detection.

Kobus Pienaar argued that GAW should play an integrating role in urban observations rather than initiating new actions.
Melita Keywood stressed that air quality observations are performed according to legislations. Groups that are performing regulatory observations do not select special spots. For GAW it would be important to include stations in the outflow from a city, but implement the same quality control as at the other GAW stations. This means that position of the local stations must be carefully selected.

Vincent-Henri Peuch stressed that urban studies should be upscaled. The emissions defined with outflow studies can be compared with emission inventories.

Gregory Carmichael expressed once again the role of atmospheric composition modelling and observations but GAW cannot be monitoring urban environments. GAW should enable urban networks to take part in atmospheric composition research. He noted one role of urban observations could be to serve as a transfer standard enabling other urban stations not following exactly GAW protocols to be used in certain applications. The notion of urban/rural pairs of stations to study urban gradient, and other studies was also discussed.

Richard Artz enquired the role of campaigns in GAW and if it is possible to take their results on board. Usually campaigns do not contribute to a long-term monitoring strategy, but those campaigns can be used to improve predictability (through better processes description).

Martin Schultz returned to the point of mandate issue. Observations in the cities are carried out at municipal level. Perhaps the forum for sharing best practices can be developed. Different countries take different approaches for city observations and harmonization can be useful. Experience from the countries and cities that reached success in monitoring can be used for motivation of those cities that are just building networks.

Gregory Carmichael stated that improvement of the urban observations can in one hand help extend the mandate of NMHSs and on the other hand will help NMHSs to deliver better on their primary mandate, namely improve urban forecasts (environmental predictions).

SSC stressed that members should learn from each other. For example, in WWRP the data from Research and Demonstration Projects (RDP) are described on the web. These data are checked and endorsed by WWRP SSC before being put in the Central Database. Sharing results of projects increases information exchange and contributes to the development of members’ capacity.

John Ogren stressed that aerosol parameters addressed in GAW are different from those measured in the urban environment. If local stations operate the same way as GAW they can provide a link between different environments and measurement techniques.

Local stations can be used to verify action taken by for example Climate and Clean Air Coalition (CCAC). It may be useful for GAW to link with that coalition and to motivate NMHSs to establish such stations especially in the countries that are participating in CCAC initiatives.

New AI-10: Xiao-Ye Zhang to check how station requirements are reflected in the Technical Regulations, reflect “local stations” category and develop recommendations for requirements, including how to classify stations in contributing networks that may fall into the local category (see discussion below in Section 10).

New AI-11: Secretariat to provide the SSC with additional information about CCAC initiatives and partners.
9. **CONTRIBUTING NETWORKS**

SSC recognized that contributing networks are important for GAW and some of their representatives are ex officio members of SAGs. Involvement of contributing networks in GAW is not clear at the moment. Terms of reference should be re-worked in consultation with those networks.

Terms of reference for contributing networks must be clarified in the new GAW Implementation Plan. It is important to consult with regional and global networks regarding their contribution to GAW (obstacles and benefits should be clearly defined). To better involve networks a consultation workshop should be organized with already contributing (the Total Carbon Column Observing Network (TCCON), the National Atmospheric Deposition Programme (NADP), Atmospheric Chemistry Monitoring Network in Africa (IDAF), GAW aerosol lidar network (GALION), Interagency Monitoring of Protected Visual Environments (IMPROVE) network) and potential contributing (the Clean Air Status and Trends Network (CASTNET), the Canadian Air and Precipitation Monitoring Network (CAPMoN), Network for the Detection of Atmospheric Composition Change (NDACC), cooperative programme for monitoring and evaluation of the long-range transmission of air pollutants in Europe (EMEP), Acid Deposition Monitoring Network in East Asia (EANET), GCOS Reference Upper-Air Network (GRUAN), Latin American Nitrogen Programme) networks.

New AI-12: SSC to organize before the end of 2015 a workshop with the leaders of current and potential contributing networks with a strategic discussion on their involvement in the GAW Programme.

10. **GAW STATIONS AND DATA**

There are several issues related to GAW stations and data:

- Network issue (stations designation)
- Relationship with existing networks and data from contributing networks
- Stations in GAWSIS with no data records
- Data management and role of the data centres
- GAW parameters
- Geographical gaps in the network

Martin Schultz noted that current understanding of Global and Regional stations differs among the community. Inclusion of a new category of local stations will confuse the situation even more. Stations requirements (currently summarized in the GAW Strategic Plan: 2008-2015, see Annex 11) are written in the form of recommendations and must be reviewed for the new Implementation Plan. Global or Regional status could be considered as a station designation. Requirements for quality of observations should be the same for all categories of stations, though Data Quality Objectives (DQOs) for local stations can be relaxed and siting requirements can be formulated in a way that local stations should be able to sample pollution sources quite often. Procedures are needed to treat contributing networks if they have stations that satisfy both local and Regional station requirements. Currently we apply “regional” requirements to those networks. This is to be addressed in New Action item AI-10.

Requirements to local stations must be reflected in the updated WMO Technical Regulations.

Stations status in GAWSIS must reflect data submission.
D-7: SSC decided to endorse the policy proposed by ET-WDC Chairperson with some changes:

That policy is as follows:

The following station status is listed in the Addendum to the GAW Strategic Plan: 2008-2015 (GAW Report No. 197):

- ‘Active’: Station is submitting data to the World Data Centres in due time for at least one variable registered in GAWSIS.
- ‘Inactive’: Station has not submitted data for any variable registered in GAWSIS for the past 27 months.
- ‘Intermittent operation’: Stations operating long-term but on a campaign or opportunity basis can request this operating status.

Effective January 2012, information on stations registered in GAWSIS that have no measurement programme listed in GAWSIS and no record of any data submission to one of the recognized data centres will be archived but no longer be displayed in GAWSIS, after consultation with the GAW Country Contact.

This procedure will be implemented in the GAWSIS application as follows:

- Application checks monthly if data have been submitted during the past 27 months. Regional stations require submission of 1 variable, for Global stations 3 variables from 3 different categories are required.
- If these conditions are not met, application triggers an e-mail message to station contact and GAW Country Contact informing them about this 3 times during 3 months, then sets station status to “silent”. Station will be checked routinely and will be re-activated upon data submission.
- Country can report a station as “closed”, system will check and assign only status “reporting” or “silent” based on data submission. Status “intermittent” will disappear, also status “unknown”. All stations currently listed as “intermittent” will be set to “reporting”. Stations currently listed as “unknown” with a measurement programme will be set to “reporting”, otherwise to “silent”.

SSC proposed the following changes to this practice: “silent” should be “non-reporting”, this category applies to parameter.

D-8: SSC decided that stations are declared “closed” if no data was submitted within the last 5 years. Exceptions to this rule should be brought to the SSC. Stations that have no data record should be removed from GAWSIS after consultation with the country Permanent Representative with WMO (or 3 months after the letter from the Secretariat was sent and no response received).

New AI-13: Secretariat together with Jörg Klausen to prepare a letter to stations to remind data policy and its implementation in GAWSIS and to reflect station status in accord with the guidelines discussed above, and develop a plan to deal with (or avoid) situations regarding stations that may be active but not reporting.

An important role is played in GAW data policy by GAW Data Centres. It is important that WDC’s role is changing in the changing world. Martin Schultz noted that terms of reference of ET-WDC and the data centres themselves must be reviewed. ET-WDC should include other data centres outside of GAW as well as data users. SSC can also have one member in this ET.
Gregory Carmichael proposed that to ensure the sustainability of the services provided by WDCs, the agreements with them must be formalized with clearly defined terms of reference for WDCs. This agreement should state that the strategy for the data centres development and functionalities are proposed by ET-WDC in consultation with the SAGs and the SSC to be implemented by data centres.

D-9: SSC decided to review the terms of reference of the WMO/GAW Data Centres.

New AI-14: Secretariat to review agreements with the data centres in a view of the updated terms of reference.

Melita Keywood stressed that the inclusion of external experts to ET-WDC can help to understand why people do not use GAW Data Centres, why stations do not submit data or what is expected of WDCs.

WDCs should also work on the development of specialized data packages. There are also WMO approved application areas and it is expected that WDCs as an element of the WMO structure should support these applications. SSC will revisit procedures for WDCs and the way they can change their terms of reference.

New AI-15: ET-WDC Chairperson to organize a teleconference with the engagement of the SSC and others to discuss the strategic role of WDCs. Based on the outcome the SSC will take action on WDCs terms of reference and re-constitute the expert team.

11. ROLLING REVIEW OF REQUIREMENTS

The Rolling Review of Requirements (RRR) has been initiated in GAW several years ago. Different SAGs perceive the process differently. To assist the process the Task Team on user requirements and satellite observations (TT-ObsReq) was compiled. In its current form it does not include SAG members. TT met in November 2014 and looked at the atmospheric chemistry application and other application areas that use atmospheric composition measurements and came up with three applications:

1) Forecasting Atmospheric Composition (F) - Covers applications from global to regional scales (with horizontal resolutions similar to global NWP (~ 10 km and coarser) with stringent timeliness requirements (NRT) to support operations such as sand and dust storm and chemical weather forecasts.

2) Monitoring Atmospheric Composition (M) - Covers applications related to evaluating and analysing changes (temporally and spatially) in atmospheric composition regionally and globally to support treaty monitoring, climatologies and re-analyses, assessing trends in composition and emissions/fluxes, and to better understand processes, using data of controlled quality (and with less stringent time requirements (not needed in NRT)), and used in products such as Ozone and Greenhouse Gas Bulletins, and State/Health of the Atmosphere reports.

3) Providing Atmospheric Composition information to support services activities in urban and populated areas (U) - Covers applications that target limited areas (with horizontal resolution of a few km or smaller) and stringent timeliness requirements and to support services related to weather/climate/pollution, such as air quality forecasting.

RRR has to reflect the user requirements. There was some discussion about the role of the SAGs per se in the RRR as SAGs are not user groups, but rather are providers of data and they can reach the user community through the scientific community. Others differ in opinion and see that
the SAGs should be combining expertise from data providers and data users and be a bridge to feed such expertise via the SAG Chairperson to the SSC.

The TT-ObsReq will take the lead in the establishment of the RRR process in GAW. As the next step to fill in user requirement a two-day workshop should be organized between TT-ObsReq and SAGs. Each SAG should nominate a dedicated member to ensure the continuity of the process. The meeting discussed also a possibility to have a special group within GAW that takes care of this process. John Ogren proposed to have this TT-ObsReq as an expert team on a permanent basis. No decision concerning additional expert group was taken.

New AI-16: Chairperson of the TT-ObsReq to organize a working meeting, identify subgroup and make assignments.

12. WATER VAPOUR

SSC recalled that CAS-16 considered water among six priorities in the ten-year plan.

Geir Braathen made a presentation reflecting different aspects of water vapour in the Earth system.

Roger Atkinson (from Observation Department of WMO Secretariat) explained that traditionally water vapour is addressed by the Commission for Instruments and Methods of Observations (CIMO) as relative humidity. Measurements of relative humidity are described in the CIMO Guide. The chapter on relative humidity was developed in the 1960s and it is out of date. It uses some formulas that do not work very well at low pressure. CIMO would appreciate collaboration with GAW on water vapour. There are about 10,000 stations measuring relative humidity with large uncertainty, some of those stations convert mixing ratio to relative humidity. CIMO is discussing with the International Bureau of Weights and Measures (BIPM) the potential change of definition of relative humidity to address broader spectrum of tasks than just meteorology but this change is outside of the CIMO mandate.

Martin Schulz mentioned that water vapour in the stratosphere is one of the parameters addressed by Stratosphere-troposphere Processes And their Role in Climate (SPARC) project. He also stated that in atmospheric composition measurements water vapour is considered as an obstructing factor rather than as a measurement parameter. Ed Dlugokencky noted that the claims were made that models verified climate feedback with observations (with changing climate relative humidity stays constant while absolute amount of water vapour in the atmosphere increases). The IPCC Fifth Assessment Report (AR5) concludes that water vapour very likely increased since the 1970s at rates consistent with the Clausius-Claperyon equation, in other words, consistent with near constant relative humidity but absolute water vapour increasing consistent with increasing temperature.

Deon Terblanche reminded that if water vapour is accepted as a GAW parameter, it should come with requirements for observations. These requirements can be defined by the climate community (through WCRP).

Currently, observations of water vapour are done in the stratosphere and mesosphere by NDACC. GRUAN also addressed vertical profiles of water vapour. Research aircraft projects measure water vapour in the upper troposphere/low stratosphere. There is a strong link to GRUAN and colleagues at Payerne may be willing to assist.

New AI-17: SSC to establish a small task team on water vapour to make an inventory of where and how observations are done. SSC to propose water vapour as a GAW parameter to CAS and to discuss with CIMO how to share the responsibilities. The water vapour task team should also help
defining the observational requirements for water vapour as a chemical substance relevant for atmospheric chemistry as this entry in the OSCAR database so far is empty.

13. OUTREACH AND PUBLICATION STRATEGY

GAW communications include communications between Met Services, communications with the community outside of Met Services and communications with country Permanent Representatives (PRs). All these communications have value to GAW. Communication with countries should not be limited to communications with PRs.

The role of different bodies should be also clarified as SAGs, SSC and Secretariat can use different communication tools.

Communication with community at large and appreciation of their contribution should start from the acknowledgements of data submission. Acknowledgement of the data centres is not enough.

WIS department was invited to address data identification opportunities. WMO can provide unique file identifiers through WIS, but DOI is a commercial service and it is unlikely that WMO can provide DOI services.

ET-WDC has investigated the benefits and challenges of using DOIs to identify datasets. It is recognized that DOIs present an adequate means of identifying observational data with sufficient flexibility to assign them to defined periods of data (e.g. yearly sets) as well as collections. ET-WDC took note that DOIs can only be assigned retrospectively and that changes to the content of the data require a new DOI to be assigned. Based on the experiences made at the World Data Centre for Remote Sensing of the Atmosphere (WDC-RSAT) and other data archives, ET-WDC recommends that all WDCs and other archives hosting GAW data use DOIs to unambiguously identify observational data sets archived in their centres. ET-WDC however recognizes that a number of challenges need to be resolved before this recommendation can be put into operational practice. These challenges include:

1) The need to establish collaborative arrangements with institutions authorized to issue DOIs
2) The need to agree on clear data flows so as to avoid duplicate assignment of DOIs to the same dataset.

ET-WDC has established action items for its members to further investigate the practicalities and potential costs involved.

Ed Dlugokencky noted that NOAA is minting DOIs before posting data streams, e.g. CO₂ data from in situ analysers at NOAA observatories. He also did not agree that changes to the content of data streams require a new DOI. Each modification will have a time stamp and perhaps other information associated with it to uniquely identify it. He recommended that GAW should open a discussion within the GAW community to determine what approach suits data providers best.

Melita Keywood noted that while the DOI is a great way to ensure that credit is given to the collectors of datasets, there can be major issues in the implementation, particularly with datasets having several DOIs. Some groups may already be assigning DOI for datasets that are currently submitted to WDC. Options are for the WDC to have well designed protocols or for WDC not to specifically issue new DOIs but for that option to be left to the data submitters themselves. This topic requires further consideration.

New AI-18: SSC requested the Secretariat to have a look at the opportunity to issue DOI.
Vincent-Henri Peuch stressed that means of communication will depend on the target audience.

**New AI-19:** SSC and SAGs should use scientific meetings to communicate GAW through dedicated sessions and presentations.

Geir Braathen reminded the meeting that WMO produces the WMO Bulletin and the MeteoWorld Newsletter to communicate with members.

**New AI-20:** SSC and SAG members are encouraged to submit short papers on scientific issues to WMO Bulletin.

**Other steps needed to improve communication:**

**New AI-21:** Secretariat should compile a communication mailing list with input from SAGs and the SSC.

There was an idea to prepare a one hour lecture on why atmospheric composition matters. This lecture can be used for training and promotion of GAW.

GAW web page is also a communication tool, but it is currently difficult to navigate and input from SAGs and the SSC to those pages is limited.

**New AI-22:** SSC and SAGs provide news items for the GAW web on current, actual events, such as volcanic eruptions etc. We should name 3-4 experts who can prepare a short article on current events and episodes. This request should be brought up at SAG meetings.

As GAW is recognized as a respected voice on atmospheric composition, it would be useful for SAGs to produce statements on extreme events. The list of expertise within SAGs will help to react on such events quickly.

Vincent-Henri Peuch reminded that when we speak of communication we should think in the sequence “audience -> message -> tool”.

Karla Longo requested that the modelling community be organized in similar way as the observational community (community of modellers).

Gregory Carmichael reminded that at the last SSC meeting a decision has been taken to produce a publication on the state of the atmosphere (“atmospheric composition matters”). This publication should reflect scientific achievements (what we are learning). This publication can be on themes.

**New AI-23:** The Publication “State of the Atmosphere” should be produced in 2016. After that it could be published approximately every two years.

Kobus Pienaar noted that people’s awareness of air pollution is growing and they started moving away from cities due to pollution.

Gregory Carmichael noted that we need to bring forward volcanic ash, SDS and biomass burning activities. This will add value to the programme as applications will better utilize GAW data.

Current perception of GAW is that it is about global background rather than about the real global picture.

Gregory Carmichael suggested that a communication topic “atmospheric composition matters” could be a theme to build a communications strategy around. This could include a lecture for use in many settings, a 1 pager for Congress, a regular GAW publication (every 1-2 years) with a
different sub-theme that would highlight the activities and applications i.e. atmospheric composition matters: for health; weather prediction; to agriculture etc.

These ideas will be further developed in the GAW Implementation Plan.

New AI-24: SSC working with the Secretariat develop a detailed communications strategy, to be drafted by summer 2015.

14. **GAW APPLICATIONS**

SSC brainstormed the ideas on the potential applications. The following were mentioned: sustainability, terrestrial impacts, climate, economic impacts, food security, and emission verification. Potential partners would include WHO, UNEP, IGAC, iLeaps, SPARC.

There is an understanding that SPARC works on climate applications, and GAW can play a complimentary role by addressing NRT applications.

Cross-cutting applications between SAGs can be established through a set of pilot projects. Improvements of the prediction of climate and weather without considering atmospheric compositions are becoming more and more limited, hence much broader collaboration with atmospheric weather and climate community is required. For NMHSs it is important that forecasting skills can be improved. It is important to show that GAW enables things to happen and these actions can lead to sustainability.

15. **GAW IMPLEMENTATION PLAN**

SSC and SAG members collected input during the meeting on the parts of the Implementation Plan they were assigned responsible for. The group broke out and worked on the drafting and follow up on Thursday afternoon.

New AI-25: responsible for different sections to send their Implementation Plan contributions to Gregory Carmichael by email before 26 February 2015.

Wiki page was established by Martin Schultz to exchange documentation related to the Implementation Plan.

Martin Schultz proposed that a SWOT (strengths, weaknesses, opportunities and threats) analysis be performed for the whole GAW Programme. This will allow us to improve the attractiveness of GAW to partners. NMHSs would expect higher appreciation within the countries for putting up environmental services. **SSC decided to consider SWOT analysis at the next teleconference.**

16. **TRAINING ACTIVITIES IN GAW**

GAW currently supports a number of training activities. One of the most significant contributions GAW has made in the past 25 years with respect to training labs in developing countries is to make high-quality observations through twinning and other arrangements.

Another major training activity is GAWTEC (GAW Training and Education Centre) training with two training session per year. Members always request more training and capacity development, but GAW is a research programme and cannot dedicate substantial time and budget to training. For
some SAGs (e.g. GURME) training represents a substantial burden that prevents them from focusing on primary GAW objectives.

SSC **recommends** that GAW does not increase the current level of training. It is important that training brings expected results (e.g. improvement of the measurement quality at the station or data submission). SSC **recommended** that GAWTEC sessions include one-day training on data formatting and submission.

*New AI-26:* SSC to develop guidance on GAWTEC training, including:
  - Criteria for evaluation and selection of trainees
  - Follow up questionnaire (lead Melita Keywood)
  - Potential training on modelling, data processing and submission, and data analysis (including satellite data) within GAWTEC and with the other programmes (lead Karla Longo)

17. **SSC WORK ORGANIZATION**

SSC discussed the next steps of its work.

*New AI-27:* SSC consider inclusion of new members in the group in 2015
*New AI-28:* SSC Chairperson to organize a teleconference in March to approve meeting report
*New AI-29:* Secretariat jointly with TT-ObsReq plan to organize a TT meeting in late August or early September.

18. **CLOSURE OF THE MEETING**

The Chairperson closed the meeting at 3 p.m. on the 20th February 2015.
ANNEX 1

Report of the Second Session of the CAS Environmental Pollution and Atmospheric Chemistry Scientific Steering Committee (EPAC SSC)

(Geneva, Switzerland, 18-20 February 2015)

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ANNEX 2

Report of the Second Session of the CAS Environmental Pollution and Atmospheric Chemistry Scientific Steering Committee (EPAC SSC)

(Geneva, Switzerland, 18-20 February 2015)

Meeting agenda

Wednesday 18 February 2015

Morning session - SSC meeting

(A-x refers to Action items from June SSC meeting, GAW Report 215)

9:00-9:15 Welcome from Secretariat and Introduction (preparation to Congress)
9:15-9:35 SSC update & brief review of SSC Action Items
9:35-10:05 GAW expert groups:
  - SAG memberships (A-15) - updates, issues for group discussion
  - New/Modified GAW groups;
  - Vocabulary Atm. Chemistry (A-13)
10:05-10:20 WGNE, WWRP, WCRP
10:20-10:30 Update on IG3IS (A-9)
10:30-11:00 Coffee break
11:00-11:15 Water vapour (in collaboration with CIMO)
11:15-11:30 SIP (A-14) (update review of outline status, timeline, planning for Thursday…..)
11:30-12:30 Follow up on several action points:
  - Observations including satellites and RRR (A-1)
  - Data flow + policies (A-3 &4)
  - Data centres (overall role, strengthening structure to provide better services) (A-10 + new request from JMA/NILU) - brief, discussed again on WED afternoon
  - Urban activities
  - Cross-cutting/priority activities (WWRP (A-2), aerosols (A-12), synthesis, closer connection between Atmos. Comp & Climate change (A-20) and health)
12:30-13:30 Lunch break
Afternoon session – joint SSC and SAG/ET Chairpersons meeting

Includes reporting from SAG (on major achievements (5 min) and VISION/PROPOSALS for future developments of GAW (10 min))

13:30-14:00  Concept of the GAW Implementation plan in a view of CAS and WMO priorities/
             How we make GAW relevant/assignments
14:00-14:15  SAG Reactive Gases
14:15-14:30  SAG Aerosols
14:30-14:45  SAG Greenhouse Gases
14:45-15:00  SAG Precipitation Chemistry/Total Atmospheric Deposition
15:00-15:30  Coffee break with informal discussions
15:30-15:45  SAG Ozone
15:45-16:00  SAG UV
16:00-16:15  SAG GURME
16:15-16:30  ET WDCs
16:30-16:45  ET NRT-CDT/ Integrated Atmospheric Composition Products
16:45-17:00  GAW and WIGOS
17:00-17:15  TT on vocabulary
17:15-17:30  TT on RRR
17:30-18:00  General objectives of GAW (or how do we stay relevant) and potential application
             areas, Thursday assignments

Thursday 19 February 2015

All discussion topics on THURSDAY are direct input to new GAW Implementation Plan

9:00-9:15    GAW Goals and Objectives
9:15-9:30    GAW Partners: WWRP, WCRP, GCOS, agricultural and aeronautical meteorology
9:30-10:30   GAW Observations:
             - GAW parameters (water vapour, responsibility)
             - Contributing networks
             - Local stations (A-5)
             - Mobile platforms
             - Collaboration with other media (ocean observations, flux measurements)
             - Procedures to accept stations
10:30-11:00  Coffee break
11:00-11:30  GAW observations data (A-3 &4):
- General - relation with other networks/activities/filling gaps, data flow, use, link to sat. …)
- Data centres (including new request from JMA/NILU)
- Data policy
- Harmonized data portal

11:30-12:00  Application Areas (A-11) /Integration, products and services/ Role of satellites observations in GAW

12:00-12:30  Cross-cutting activities

12:30-13:30  Lunch break

**Afternoon session – work on the Implementation Plan**

13:30-14:00  General discussion on GAW outreach and communication strategy (A-7)

Small writing team on individual chapters, write up of discussion (chapters lead assigned)

14:00-15:30  Break out groups to focus on writing Chapters 2 & 3 of IP. Group members are according to note taking assignments.

15:30-15:45  Convene to assess progress and decide on what areas require more discussion and/or new assignments

15:45-16:15  Coffee break

16:15-17:15  Continue writing

17:15-18:00  Report outs, next steps and time-line, wrap-up

**Friday 20 February 2015**

**SSC meeting (9:00-12:00)**

1. Review of SAG/ET discussions
2. Final decisions and follow up on action items
3. Identification of new action items
4. IP planning
5. Next meeting
6. SSC assignments
Decisions and Recommendations made during the meeting

D-1: Decision was taken to endorse the extension of the scope of the SAG Precipitation Chemistry to cover total atmospheric deposition. SSC endorsed the name change to the SAG Total Atmospheric Deposition.

SSC recommended SAG TAD to consider collaboration with iLeaps (Integrated Land Ecosystem Atmosphere Processes Study) project.

D-2: SSC decided to endorse the extension of the scope of the ET-NRT-CDT to cover a limited number of tasks related to applications that require NRT delivery of atmospheric composition data. SSC agreed that the initial focus of the group should be on biomass burning, sand and dust storms, volcanic ash plume forecasting. SSC agreed that the group should focus on global and regional scale modelling and keep an intrinsic link to GURME.

D-3: SSC further decided to transform this group from Expert Team to SAG. It approved Vincent-Henri Peuch as continued Chairperson of the group and requested him to propose SSC new members of this SAG and a name of the group by 15 April.

SSC recommended that SAG on NRT applications performs its activities through a limited number of pilot projects similar to the way it is done by GURME.

D-4: SSC took a decision to support the continuation of TT-ACV until its task is accomplished with regular updates and review of the progress at the next SSC meeting.

D-5: SSC approved the following new members:

1) Dr Meehye Lee - new member of the SAG Reactive Gases
2) Dr Frank Flocke (as a substitution to Tom Ryerson) - new member of RG SAG from May 2015
3) Dr Corinne Galy-Lacaux - new member of TAD SAG
4) Dr Ariel Stein - new member of TAD SAG
5) Dr Fiona O’Connor - new member of TAD SAG

D-6: SSC decided that the total number of SAG/ET members (including ex officio) must not exceed 19 members. The total number of ex officio members must not exceed the number of regular members (max 10 regular and 9 ex officio). The role of ex officio must be articulated to the SSC.

SSC made the following recommendations concerning SAG activities (best practices):

- SAGs share their meeting notes
- SAGs share expertise of members (See action item AI-3)
- SAGs should raise profile of the programme through dedicated sessions or presentations at high profile meetings and publications
- SAGs should structure their meetings toward more scientific discussions and share science presentations
- Cross-cutting issues should be addressed through inter-SAGs demonstration/pilot projects

D-7: SSC decided to endorse the policy proposed by ET-WDC Chairperson with some changes.
D-8: SSC decided that stations are declared “closed” if no data was submitted within the last 5 years. Exceptions to this rule should be brought to the SSC. Stations that have no data record should be removed from GAWSIS after consultation with the country Permanent Representative with WMO (or 3 months after the letter from the Secretariat was sent and no response received).

D-9: SSC decided to review the terms of reference of the WMO/GAW Data Centres.

The SSC decided to consider SWOT analysis at the next teleconference.

SSC recommends that GAW does not increase the current level of training.

SSC recommended that GAWTEC sessions include one-day training on data formatting and submission.
UN Post 2015 sustainable development goals

Sustainable development goals

Goal 1. End poverty in all its forms everywhere.

Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture.

Goal 3. Ensure healthy lives and promote well-being for all at all ages.

Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Goal 5. Achieve gender equality and empower all women and girls.

Goal 6. Ensure availability and sustainable management of water and sanitation for all.

Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all.

Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Goal 10. Reduce inequality within and among countries.

Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable.

Goal 12. Ensure sustainable consumption and production patterns.

Goal 13. Take urgent action to combat climate change and its impacts*.

Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development.

Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.

Goal 17. Strengthen the means of implementation and revitalize the global partnership for sustainable development.

*Acknowledging that the United Nations Framework Convention on Climate Change is the primary international, intergovernmental forum for negotiating the global response to climate change.
Summary of Action Items of the first SSC meeting

AI-1. WIGOS
i. Follow-up review of technical regulations (DONE).
ii. Satellite meeting will be held fall 2014 for further discussions of atmospheric composition community needs for satellite observations. The group is expected to provide a contribution to RRR process as well.
iii. Need to identify application areas for WIGOS that drives the RRR by the end of this year (in consultation with SAG chairpersons).


AI-3. Expand efforts to utilize national/regional networks and to get them to associate/contribute to GAW. Work with the SAGs to develop statement of win/win value proposition for interacting with GAW, and to identify what are the barriers limiting interactions with GAW.

AI-4. Ask SAGs & data centres regarding how they see the problems of data flow - missing data and suggested solutions. If we increase the use of the data, the submissions will likely increase.

AI-5. Develop recommendations and action plan for “local” station designation in consultation with SAGs/CAS MG.

AI-6. Discussed and later approved request for new NAPD as a GAW contributing network, and Puy de Dome station, as a new GAW Global station.

AI-7. Develop outreach strategy for GAW, communications plan, (SSC+SAGs+Secretariat - draft by time of the next SSC+SAG meeting February 2015) including:
   • Develop communication strategy with respect to GAW for the PRs and funding sources to highlight the importance of GAW activities and who are participating (outside of the Met. Services….)
   • Common wording to acknowledge the use of GAW data in publications.

AI-8. Develop a plan for the role of satellites within GAW (to be discussed at the upcoming ad hoc group meeting fall 2014)

AI-9. Set up a meeting of experts from carbon community to move this forward. A lot is done within GEO Carbon.

AI-10. Set up a task team or extend the current ET-WDC with independent members and organize a meeting to review the data centres and their role in GAW moving forward.

AI-11. Identify application areas - reduce into overarching themes in the GAW Implementation Plan. For WIGOS keep in mind current GAW key words, CAS future direction and IGACO strategy, etc. This item is tightly coupled to GAW Implementation Plan development and contribution to WIGOS. SSC will develop a draft set to be shared with SAGs.
AI-12. Work with the SAGs addresses this CAS action item. This will be a topic of priority for discussion at the next SSC joint meeting with the SAG chairpersons in February 2015.

AI-13. SSC considered Vocabulary Atmospheric Composition (VAC) task team establishment as a positive initiative, though the work of this task team will be reviewed in one year. The group should be aware that any updates would be appreciated at the February 15, 2015 joint meeting. Inform CAS through the minutes of the SSC and informally let Oystein Hov know. Communicate that membership may be appended over time as needs arise from SSC/Secretariat.

AI-14. Draft implementation plan should be developed for presentation at Congress 2015, then more detailed implementation plan with tasks should be develop and finalized by December 2015.

AI-15. Implement the SSC proposal for the SAGs. Main points are:

• In addition to complying with CAS (eight-year rule) the normal term as SAG Chairperson is four years. Regardless of leadership role the eight-year max term will hold for SAG members.

• SAG membership size is typically (6-10), with maximum size not to exceed ten, with size determined by SSC in consultation with SAG Chairperson and Secretariat. Adding new members done by SSC should address the new strategic vision and should help fulfil the GAW and CAS programme needs.

• Make wider use of ex officio members, with data centre representatives and network contacts typically ex officio.

• Make wider use of experts and perhaps ad hoc sub groups to do specific short-term tasks.

• Ex officio and experts may be invited to SAG meetings as needed (in consultation with Secretariat with respect to any budget consideration)

• Implementation will proceed immediately with transitions taking place at the next joint SSC-SAG chairpersons meeting in February 2015; exceptions being GHG because of convention needs, and UV because of recently named Chairperson and number of SAG members needing to leave because of eight-year rule.

AI-16. Set up next SSC meeting with SAG and ET chairpersons (16-20 February 2015).

AI-17. Meet with SSC members at IGAC meeting (September 2014).

AI-18. Determine SSC assignments, communications, and set up regular conference calls.

AI-19. Develop plan to produce state (health) of the atmosphere assessments/statements using GAW data and SAGs. Target first product for 2015.

AI-20. Develop closer connections between Air Quality and Climate Change throughout GAW.
Preamble

The GAW Urban Research Meteorology and Environment (GURME) project is held as an example within the GAW Programme for providing the means to a service and the services themselves through its partners and projects. GURME has been successful in bringing the concepts of real-time prediction to the international community and build a capacity in different part of the world that is adapted to their means. The level of complexity varies from forecasting the transport of CO as an indicator for other pollutants to full-scale 3D in-line chemical/transport models integrated within advanced dissemination systems. In doing so, GURME has encouraged where feasible research projects to further advance the field, such as the data assimilation project with the China Meteorological Administration (CMA), building on China’s rapidly advancing satellite capacity.

In the next strategic plan for the World Meteorological Organization (WMO), GURME is called upon to be a major player in the development of urban services. To rise to the challenge, GURME will need to refocus its activities. Building on its strengths in predictions, forecasting and assimilation, GURME is well placed to coordinate reviews in the current state of science in urban-scale forecasting and associated monitoring and establish activities where gaps exist. Given the integrative nature of modelling, the on-going scientific trend towards seamless predictions and the evolution of technology, GURME also has an opportunity to leverage and actively engage other WMO advisory and working groups within the World Weather Research Programme (WWRP), Global Atmosphere Watch (GAW) and the rest of its organization, to address this complex and multidisciplinary challenge.

Vision & main thrusts

GURME is evolving to be a major coordinator and facilitator of integrated forecasting projects for the urban environment, building on its experience and strengths in air quality and health. It will centre its activities on those research questions/issues that transcend disciplines and require leveraging a broader community to develop improved forecasting concepts and tools to resolve complex urban environments at increasing scales; through this process, it expects to support the implementation of derived services.

While megacities will continue to receive particular attention, GURME pledges to orient its research to cover the full array of urban environments that are key to the broader scientific question of urban-scale modelling.

Recognizing that the dynamic, physical and chemical processes governing the urban environment are highly interconnected, GURME will contribute actively to numerical modelling and data assimilation efforts focuses on integrated/coupled models and the seamless representation of processes, harnessing research that occurs outside the conventional forecasting time-scale.

GURME will continue to nurture its engagement with the health community as the main partner in assessing the needs, evaluating the benefits and communicating resulting services to society within these urban environments.

Finally GURME will seek to build capacity through its research projects, identifying those environments that constitute gaps in the overall directions of the GURME programme.
Research enabling services

GURME activities result largely in the establishment of air quality numerical prediction systems which serve as the basis for health-related prediction services. There are both growing needs and growing potential to cover other environmental conditions (such as heat stress, pollen conditions, disease potential indices at some latitudes…). In the urban environment where complexities grow rapidly with the size of the city, there is a strong potential through prediction capacity to contribute to the management of emergency situations (caused for example by smoke plumes from forest, industrial or accidental fires).

Numerical systems are also becoming the tools of choice to integrate data from multiple and diverse sources and produce consistent and continuous (in all three dimensions) information in real-time on the state of the atmosphere or more broadly the biosphere. It opens many new approaches for research and applications from exposure research to smart monitoring systems to real-time pollution or health management.

GURME’s research will be targeted at paving the way for existing services to improve in coverage and accuracy and for new ones to emerge where demand is expressed or societal gains foreseen; linkages will be established and consolidated with partners within WMO and elsewhere to deliver the predictive capacity and build the derived suite of services.

1. Application areas

It is foreseen that GURME activities will deliver capacity in the following areas of applications:

- Forecasting of atmospheric composition for health services
- Forecasting of related atmospheric conditions for health services, in particular in the urban environment
- Real-time integrated monitoring of atmospheric composition (analyses)

In doing so, GURME will contribute to the understanding and capacity to represent the physical characteristics of the lowest layers of the atmosphere. These advancements will be contributed to WWRP working groups through collaborations.

The three application areas align well with the two of the areas of applications defined for GAW observations, namely:

- **Forecasting Atmospheric Composition (F)** - Covers applications from global to regional scales (with horizontal resolutions similar to global NWP (~10 km and coarser) with stringent timeliness requirements (NRT) to support operations such as sand and dust storm and chemical weather forecasts.
- **Providing Atmospheric Composition information to support services in urban and populated areas (U)** - Covers applications that target limited areas (with horizontal resolution of a few km or smaller and stringent timeliness requirements to support services related to weather/climate/pollution, such as air quality forecasting.
  
  Note: The GURME SAG has been tasked to review all related entries to the later (U) area.

GURME will benefit from access and advancements in the GAW network in the two areas highlighted above. It will also play an instrumental role in collaborating with the observation leads to further the concepts of real-time analyses and derived products.
2. Products/services

While addressing the research barriers to advance the predictive capacity at increasing resolutions, and in the urban context in particular, GURME will endeavour to encourage in its projects the development and testing of derived services. The products themselves would take the form of forecasts, alerts and warnings and/or real-time/NRT maps or databases.

Embedding such products in dissemination systems in a form that is well suited for large or targeted audiences is key; the linkages benefit from being created early on as the predictive capacity emerges. For GURME this means forging stronger collaboration with the Commission for Basic Systems (CBS) within WMO and facilitating the inclusion of individuals with responsibilities similar to CBS in the home institutions piloting the projects.

Modelling research in support of above

Numerical models are the basis of GURME’s strategy. It is therefore critical for GURME to foster the research initiatives and collaborations that advance its goals. In the context of the urban environment, this means, amongst other, facilitating the convergence of interests in improving the modelling of the planetary boundary layer and the micro and local scale meteorology community, fostering the emerging joint research in micro-physics and radiation, supporting the cross-discipline initiatives to represent surface characteristics, and continuing to contribute to the development of coupled meteorology/chemistry modelling systems and understanding the role and importance of interactions at different temporal and spatial scales.

GURME will seek the appropriate expertise and engagement with the WWRP working group as well as the broader community internationally. As capacity grows, GURME will consider exploring opportunities for model intercomparisons under pilot and demonstration projects and/or under WGNE.

Implementation

1. Major new initiatives
   a. Development of joint initiative(s) with Joint Mesoscale/Nowcasting WWRP working group to advance urban scale modelling for weather and environmental prediction
      i. Assessment of observation needs to advance urban research and predictions, including:
         1. State of knowledge and lessons learned from the last 20 years of research with a comprehensive look across meteorology and air quality
         2. What is missing to develop and evaluate prediction systems for the urban environment and deriving a set of recommendations
   b. Establishing a community of practice that builds on existing efforts in weather/air quality/climate targeting the urban environment
      i. Facilitate the sharing of urban scale geophysical information
   c. Foster an urban scale integrated pilot (Tokyo 2020?) with WWRP to advance integrated high-resolution modelling in urban environment.

2. Overarching/cross cutting strategies
   a. Participation in integrated modelling initiatives and intercomparisons (Coupled Chemistry-Meteorology/Climate Modelling (CCMM) symposium, Working Group on Numerical Experimentation (WGNE) aerosol project, International Workshop on Air Quality Forecasting Research (IWAQFR)....)
   b. Establish/consolidate dialogue with health community with engagement of appropriate GAW SAGs and TF).
3. Enabling elements
   a. Data management
      i. Infrastructure for data management will need to be organized for to facilitate the
         projects significantly.
   b. Central facilities
      In the context of linking/exchanging databases, for major projects, or for training,
      GURME may want to consider whether there should be some central functions
      distributed across a number of centres where it facilitate efficiency.
   c. Outreach/communication/reports
      A list of results and needs reports will be generated at a later date. Publication needs
      are not expected to start before 2016.
   d. GURME trust fund
      i. The trust fund was created but has not been active. How is it feasible to change
         that?

Transitioning from previous activities/tasks

GURME has been very successful in its pilot projects. A number of them (list to come) are still
on-going while requests for GURME endorsement have been received for additional ones.

A mechanism needs to be put in place to transition and align towards the objectives highlighted
above. This will necessitate:

- Review of existing projects and timeline
- Assessment of scientific opportunity within project for GURME’s objectives
- Mentoring/support towards renewed objectives where applicable

For new projects, a definition phase will be added to seek a convergence of interest between
GURME’s objectives and the local needs.
Scientific Advisory Group on Total Atmospheric Deposition

Terms of Reference

The Global Assessment on Precipitation Chemistry and Deposition (Vet et al. 2014, Atmospheric Environment 93), clearly establishes that total (wet plus dry) atmospheric deposition characterizes the exchange process between the atmosphere and the underlying surface, while precipitation chemistry and wet deposition capture only part of this exchange. This scientific focus has traditionally been coordinated in the Global Atmosphere Watch (GAW) by the Scientific Advisory Group (SAG) on Precipitation Chemistry. In order to be able to better address environmental relevant issues, it was proposed that the scope of the SAG should expand from precipitation chemistry and wet deposition to include dry and total atmospheric deposition. The goal is to provide a more comprehensive understanding and quantification of atmospheric deposition, which is of critical importance for satisfying the needs of the GAW Programme and for understanding contemporary and emerging environmental issues. The change in scope is reflected in the change of the SAG name to SAG on Total Atmospheric Deposition (SAG TAD).

Role

The role and responsibilities of the SAG TAD (with the support of the WMO Secretariat) will focus on three key areas: Operation, Organization, and Research.

Operation

1. Archival of global precipitation chemistry and deposition data including on-line access to these data via the World Data Centre for Precipitation Chemistry (http://www.wdcpc.org/).
2. Harmonization of precipitation chemistry and deposition measurement data and deposition calculation methods obtained by national and regional programmes via the:
   a. Establishment and update of guidelines, data quality objectives and standard operating procedures for the measurement and analysis of all chemical compounds of interest
   b. Ongoing evaluation of and improvement of laboratory performance via the GAW Interlaboratory Comparison Studies and other related activities of the Quality Assurance/SAC.
3. Assistance to regional programmes with the implementation of new sites and field, laboratory and data management operations.

Organization

1. Establishment of links with other scientific topics, issues, communities, international programmes and SAGs.
2. Coordination with other major environmental science activities including ambient aerosol and gas monitoring, atmospheric modelling, ecosystem effects research, climate research, etc.
3. Outreach to other scientific and non-scientific communities regarding the state of science related to atmospheric deposition of major ions and other chemicals, as well as proper understanding and use of measurement data.
4. Training and capacity/succession development.
5. Acquisition of funding for SAG activities.
Research

1. Quantification of patterns and trends of the composition of precipitation and total deposition on global and regional scales.
2. Provision of data sets for use by client communities, including ecosystem effects and atmospheric modelling communities.
3. Development, improvement and application of inferential methods to estimate dry deposition.
4. Research of measurement-model fusion methodologies to obtain total deposition estimates; and
5. Improvement of understanding of atmospheric deposition of chemical species of existing or emerging interest (e.g. organic acids, black carbon, metals, phosphorus, mercury, nitrogen).

Reporting

The Chairperson of the SAG TAD shall report annually on progress to the Environmental Pollution and Atmospheric Chemistry Scientific Steering Committee (EPAC SSC) and regularly communicate with the WMO Secretariat.

The SAG TAD shall develop an implementation strategy every 8 years as part of the GAW Implementation Plan (GAW IP).

Composition

The Chairperson or co-chairpersons of the SAG shall represent the areas of expertise relevant to the delivery of the GAW IP. The Chairperson or co-chairpersons shall be selected following the process accepted within the Commission for Atmospheric Sciences (CAS).

Members of the SAG TAD shall be appointed to represent: (a) major national and regional networks that monitor precipitation chemistry/wet deposition and/or ambient concentrations/dry deposition of chemical compounds of interest, (b) major international science programmes related to deposition, (c) sparsely-measured areas of the world that require deposition monitoring and (d) areas of expertise relevant to the delivery of the SAG’s goals and implementation strategy.

Members shall be selected following the process accepted within CAS.
Proposal for ET-NRT-CDT re-organization

This document presents some ideas for the re-organization of the Expert Team on Near-Real-Time Chemical Data Transfer (ET-NRT-CDT).

Findings

- Current focus of ET-NRT-CDT only on data exchange is very limited in scope and does not provide incentives for Members to implement such data exchange. NRT data delivery being detached from specific applications generally speaking is not required in GAW. Due to this limited scope, attendance at the ET meetings organized on an opportunity basis was pretty low. Involvement of GAW stations in NRT mostly took place through their collaboration with MACC (Monitoring of Atmospheric Composition and Climate) project and through contribution to some pilot projects (together with GAW Urban Research Meteorology and Environment (GURME). There is a strong need to provide science sound requirements for NRT data exchange.
- Most actors are convinced of the importance of exchanging chemical data worldwide, but there is a lack of resources to make it work. There are some other (e.g. political) obstacle that prevent NRT data exchange for several GAW sites (and beyond air quality measurement networks in and around cities worldwide).
- Purely on data, there is a not-so-well defined interface with ET-WDC and the Task Team working on vocabulary (TT-ACV).

Proposal

- Revise the scope of the ET to focus more on applications rather than purely of data exchange.
- Rename the ET into “Expert Team on Near-Real-Time Applications”
- Review membership of the ET to have a more global representation and expertise in the applications area.
- Main objective: “To demonstrate usefulness of exchanging chemical observational data in NRT in support of forecasting applications”.
- ET must relate to the WIS/ WMO Integrated Global Observing System (WIGOS).
- Terms of reference could outline a number of tasks with a task leader for each. Initial proposal:
  - Task 1: Improving NWP by considering atmospheric composition (liaison with WGNE, conclusions from WWOSC Montreal 2014, outcome of workshop February 2015…). Focus not only on cases but aim at improving overall skill scores. => Demonstrate that representation of composition (aerosol…) matters.
  - Task 2: Boundary conditions for regional to local Air Quality (AQ) application (liaison with the GAW Urban Research Meteorology and Environment (GURME) project. Facilitate global uptake of “realistic” boundary conditions (based on data assimilation) for AQ applications worldwide => Demonstrate that realistic boundary conditions make a quantitative difference when implementing local air quality forecasting applications.
  - Task 3: Large-scale transport of dust, fire and volcanic emissions (liaison with the Sand and Dust Storm Warning Advisory and Assessment System (SDS-WAS), the International Global Atmospheric Chemistry project, (IGAC) & the Global Emissions Initiative (GEIA), Volcanic Ash Advisory Centers (VAACs) …) based on data assimilation. => Demonstrate the impact of assimilating observations to better monitor and predict plumes and their impacts.
Task 4: Status of connection of health and air quality (including pollen) with involvement of the other actors: hospital admissions, anticipation of medication? Liaison and collaboration with the World Health Organization (WHO), EAN, etc.
Collaboration between the World Weather Research Programme (WWRP)

and the Global Atmosphere Watch (GAW) Programme

The WWRP background

Three main legacy projects pursue and extend The Observing system Research and Predictability EXperiment (THORPEX) scientific objectives and promote the development of a Seamless Prediction of the Earth System from minutes to months, namely: i) the High-Impact Weather (HIWeather) Project; ii) the Sub-seasonal to Seasonal Prediction Project (S2S), a joint initiative between the World Weather Research Programme (WWRP) and the World Climate Research Programme (WCRP); iii) the Polar Prediction Project (PPP), developed in collaboration with the WCRP. The WMO Executive Council at its 66th session, expressed its satisfaction with the recent progress of three THORPEX legacy projects aligned to meet the requirements of Members and the Global Framework for Climate Services (GFCS) namely.

The three projects address societal relevant topics and needs:

• HIWeather aims to promote cooperative international research to achieve a dramatic increase in resilience to high-impact weather, worldwide, through improving forecasts for timescales of minutes to two weeks and enhancing their communication and utility in social, economic and environmental applications. The scope of the project is defined by the needs of users for better forecast and warning information to enhance the resilience of communities and countries in responding to a carefully selected set of hazards. The research will focus on five hazard areas (urban floods, wildfires, localized extreme winds, disruptive winter weather, urban heat waves and air pollution), which cover a wide range of impacts so that advances in building resilience to them may be expected to have more general relevance.

• S2S (http://s2sprediction.net/) aims to improve forecast skill and understanding on the sub-seasonal to seasonal timescale through producing a multi-model ensemble system database and assessing their skill in high-impact case studies, and to promote its uptake by operational centres and exploitation by the applications community. From the end-user perspective, the sub-seasonal to seasonal time range is critical to many management decisions in agriculture and food security, water, disaster risk management and health issues. Improved weather-to-climate forecasts promise to be of significant social and economic value.

• PPP aims to “Promote cooperative international research enabling development of improved weather and environmental prediction services for the polar regions, on time scales from hourly to seasonal” (http://polarprediction.net/). This project constitutes the hourly to seasonal research component of the WMO Global Integrated Polar Prediction System (GIPPS). It is emphasized that the expected benefits go beyond the time scales (hourly to seasonal) and regions (Arctic and Antarctic). Anticipated improvements in the representation of polar key processes in (coupled) models such as stable boundary layers and sea ice dynamics are expected to reduce systematic errors in climate models and, hence, help narrowing uncertainties of regional climate projections. The Year of Polar Prediction will complement the GIPPS observational effort with a targeted field campaign with special observing periods between 2017 and 2019.
We are entering a new era in technological innovation and in use and integration of different sources of information for wellbeing and ability to cope with multi-hazards. New predictive tools in order to detail weather conditions to neighbourhood and street level, to provide early warnings a month ahead, and to forecast from rainfall to energy consumption will be the main outcome of the next 10 years research activities in weather science. A better understanding of small-scale processes and their inherent predictability should go together with a better comprehension of how weather related information influence decisional processes and with a better communication strategy.

**Key common scientific objectives**

The technical commission for atmospheric science (CAS) identified key long-term goals:

2. Water: Modelling and predicting the water cycle for improved disaster risk reduction (DRR) and resource management.
4. Aerosols: Impacts on air quality, weather and climate.
5. Urbanization: Research and services for megacities and large urban complexes.

Based on this long-term view, in the near future (2-3 years) WWRP and GAW can share three **main scientific objectives**:

1. The development and improvement of atmospheric composition forecasting systems with a focus on urban areas.
2. The development of new assimilation methods for chemistry compounds within the context of earth system modelling framework.
3. The advancement of underpinning research for services delivery, considering as a priority the link between sub-seasonal to seasonal forecast and chemistry compounds.

**Future activities**

WWRP and GAW should prioritize their collaboration through these tasks:

1. The establishment of a systematic collaboration among GAW, WWRP and the Working Group on Numerical Experimentation (WGNE) in order to promote new collaborative numerical experimentations within the context of the atmospheric composition forecasting.
2. The participation of GAW experts to HIW meetings with a target on air quality and related applications.
3. Exchanging information and developing new initiatives between the Working Group on Data Assimilation and Observing Systems (DAOS) and the new Expert Team on Integrated Atmospheric Composition products.
4. The organization of joint initiatives with S2S programme.
ANNEX 10

Brief introduction to an Integrated Global Greenhouse Gas Information System (IG³IS)

Preamble

Over the next few years, governments will likely become more involved in efforts to limit atmospheric concentrations of greenhouse gases. Initiatives in different regions will include various combinations of emissions reductions, energy-infrastructure development, land-use management, efficiency improvement, and cap-and-trade systems. It is virtually certain that strategies will vary by nation, region, and economic sector; many nations are already pursuing such activities and some are coordinating in these efforts. Regardless of the strategies and mechanisms applied, the ability to implement policies that limit greenhouse gas (GHG) concentrations in the atmosphere would be greatly enhanced by an Integrated Global Greenhouse Gas Information System (IG³IS). Such a system would combine ground-based and space-based observations, carbon-cycle modelling, fossil fuel-use and land-use data, meta-analysis, and an extensive distribution system to provide information about sources and sinks of greenhouse gases at policy-relevant temporal and spatial scales. These scales, of necessity, must reside at sub-continental levels. Modelling and observing capabilities will determine the granularity and value of the information.

IG³IS statement

IG³IS is envisioned as an independent, observationally based information system for determining trends and distributions of GHGs in the atmosphere and the ways in which they are consistent or not with efforts to reduce greenhouse gas emissions. This is being done already on a global scale through existing networks, but currently provides only a modicum of useful information at the spatial scale of nations and regions managing emissions and offsets. The IG³IS effort is aimed at improving the granularity of observations and analyses, in order to support the planning and management of Intended Nationally Determined Contribution (INDC) mitigation efforts by nations. IG³IS is not designed to check compliance with regulations, but rather to provide information on policy- and management-relevant scales and ensure that the information provided is consistent with a global network of high quality observations.

WMOs role (in a nutshell)

WMO’s role regarding greenhouse gases in the atmosphere stems from its capabilities in ensuring the high quality, consistency, and continuity of greenhouse gas and other observations of atmospheric composition, developing high quality atmospheric transport and data inversion models, and ensuring a solid basis from which to make weather and climate-relevant predictions. WMO has proven to be a viable and successful coordinating programme for atmospheric measurements and model improvements around the world, for leveraging capabilities across nations, and building capacity in developing nations.

IG³IS approach

Extend the international WMO Global Atmosphere Watch (GAW) network of in situ sampling stations to fill in underrepresented regions globally, thereby improving national sampling of regional greenhouse gas emissions. Expanding the network to increase collection of vertical profiles of greenhouse gases would constrain atmospheric transport and facilitate interpretation of satellite data. The vertical expansion could be done with the cooperation of commercial aircraft and with balloons flown to higher altitudes. Ideally, all major emitting nations and groups of neighbouring smaller nations would participate in the cooperative network. The latter may require financial assistance and capacity building to aid the poorest nations that dominate the most under sampled regions.
Essential characteristics of a GAW Regional or contributing station

(GAW Strategic Plan 2008-2015, Box 9)

1. The station location is chosen such that, for the variables measured, it is regionally representative and is normally free of the influence of significant local pollution sources.

2. There are adequate power, air conditioning, communication and building facilities to sustain long-term observations with greater than 90% data capture (i.e. <10% missing data).

3. The technical support provided is trained in the operation of the equipment.

4. There is a commitment by the responsible agency to long-term observations of at least one of the GAW variables in the GAW focal areas (ozone, aerosols, greenhouse gases, reactive gases, UV radiation, precipitation chemistry).

5. The GAW observation made is of known quality and linked to the GAW Primary Standard.

6. The data and associated metadata are submitted to one of the GAW World Data Centres no later than one year after the observation is made. Changes of metadata including instrumentation, traceability, observation procedures, are reported to the responsible WDC in a timely manner.

7. If required, data are submitted to a designated data distribution system in near-real-time.

8. Standard meteorological in situ observations, necessary for the accurate determination and interpretation of the GAW variables, are made with known accuracy and precision.

9. The station characteristics and observational programme are updated in the GAW Station Information System (GAWSIS) on a regular basis.

10. A station logbook (i.e. record of observations made and activities that may affect observations) is maintained and is used in the data validation process.

Additional essential characteristics needed for a GAW Global station (Box 10)

In addition to the characteristics of Regional or contributing stations, a GAW Global station should fulfil the following additional requirements, namely:

11. Measure variables in at least three of the six GAW focal areas (see item 4 above).

12. Have a strong scientific supporting programme with appropriate data analysis and interpretation within the country and, if possible, the support of more than one agency.

13. Make measurements of other atmospheric variables important to weather and climate including upper air radio sondes at the site or in the region.

14. Provide a facility at which intensive campaign research can augment the long-term routine GAW observations and where testing and development of new GAW methods can be undertaken.
### Annex 12

#### List of the action items of the second SSC meeting and their relation to the action items of the first meeting

<table>
<thead>
<tr>
<th>New Action Item number (AI-XX.2)</th>
<th>Content</th>
<th>Responsible</th>
<th>Deadline (if any)</th>
<th>Relation to the action item of the first SSC meeting (AI-XX.1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI-1.2</td>
<td>SSC /Secretariat to discuss the methodology used by the WDCGG for global averaged mole fraction calculation (to ensure GAW global averages are used in IPCC process)</td>
<td>SSC Chairman, Secretariat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI-2.2</td>
<td>Vincent-Henri Peuch working with Gregory Carmichael to propose SSC new name and membership of the SAG on atmospheric composition modelling by 15 April</td>
<td>Vincent-Henri Peuch, Gregory Carmichael</td>
<td>15 April 2015</td>
<td></td>
</tr>
<tr>
<td>AI-3.2</td>
<td>SSC requested SAG and ET chairpersons to provide the list of expertise of the current members by April 15</td>
<td>SAG and ET chairpersons</td>
<td>15 April 2015</td>
<td></td>
</tr>
<tr>
<td>AI-4.2</td>
<td>SAG Ozone membership must be considered and brought in agreement with decision made about total number of members</td>
<td>Alkis Bias</td>
<td></td>
<td>Follow up on AI-15.1</td>
</tr>
<tr>
<td>AI-5.2</td>
<td>The UV SAG is small, but most members have served more than 8 years. The membership of the UV SAG should be revised gradually in order to comply with the 8 years rule</td>
<td>Susana Diaz</td>
<td></td>
<td>Follow up on AI-15.1</td>
</tr>
<tr>
<td>AI-6.2</td>
<td>Gregory Carmichael to take part in the WGNE meeting in March 2015 and investigate the possibility of collaboration between GAW and WGNE. The outcome of discussion should be reported back to the SSC</td>
<td>Gregory Carmichael</td>
<td>1 April 2015</td>
<td>Follow up on AI-20.1 and AI-2.1</td>
</tr>
<tr>
<td>AI-7.2</td>
<td>Alexander Baklanov is requested to share relevant white papers with the SSC</td>
<td>Alexander Baklanov</td>
<td></td>
<td>Follow up on AI-2.1</td>
</tr>
<tr>
<td>AI-8.2</td>
<td>Findings from the Symposium on Coupled Chemistry-Meteorology/Climate Modeling (MMCC) to be shared with the SSC and taken into consideration in the further development of the modelling activities within GAW and through collaborations with WWRP, WCRP and other partners</td>
<td>Alexander Baklanov, Gregory Carmichael</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI-9.2</td>
<td>SSC requested to include one of the SAG Greenhouse Gases members in the IGIS Implementation Plan writing team</td>
<td>Oksana Tarasova</td>
<td>1 May 2015</td>
<td>Follow up on AI-9.1</td>
</tr>
<tr>
<td>AI-10.2</td>
<td>Xiao-Ye Zhang to check how station requirements are reflected in the Technical Regulations, reflect “local stations” category and develop recommendations for requirements, including how to classify stations in contributing networks that may fall into the local category</td>
<td>Xiao-Ye Zhang</td>
<td>Before 25 May 2015</td>
<td>Follow up on AI-5.1</td>
</tr>
<tr>
<td>AI-11.2</td>
<td>Secretariat to provide the SSC with additional information about CCAC initiatives and partners</td>
<td>Oksana Tarasova</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI-12.2</td>
<td>SSC to organize before the end of 2015 a workshop with the leaders of current and potential contributing networks with a strategic discussion on their involvement in the GAW Programme</td>
<td>SSC members</td>
<td>31 December 2015</td>
<td>Follow up on AI-3.1</td>
</tr>
<tr>
<td>AI-13.2</td>
<td>Secretariat together with Jörg Klausen to prepare a letter to stations to remind data policy and its implementation in GAWSIS and to reflect station status in accord with the guidelines discussed above, and develop a plan to deal with (or avoid) situations regarding stations that may be active but not reporting</td>
<td>Geir Braathen, Jörg Kalusen</td>
<td></td>
<td>Follow up on AI-4.1</td>
</tr>
<tr>
<td>AI-14.2</td>
<td>Secretariat to review agreements with the data centres in a view of the updated terms of reference</td>
<td>Oksana Tarasova</td>
<td></td>
<td>Follow up on AI-4.1</td>
</tr>
<tr>
<td>AI-15.2</td>
<td>ET-WDC Chairperson to organize a teleconference with engagement of the SSC and others to discuss the strategic role of WDCs. Based on the outcome the SSC will take action on WDCs terms of reference and re-constitute the expert team</td>
<td>Jörg Klausen, SSC members</td>
<td></td>
<td>Follow up on AI-10.1</td>
</tr>
<tr>
<td>AI-16.2</td>
<td>Chairperson of the TT-ObsReq to organize a working meeting, identify subgroup and make assignments</td>
<td>Gregory Carmichael</td>
<td></td>
<td>Follow up on AI-1.1</td>
</tr>
<tr>
<td>AI-17.2</td>
<td>SSC to establish a small task team on water vapour to make an inventory of where and how observations are done. SSC to propose water vapour as a GAW parameter to CAS and to discuss with CIMO how to share the responsibilities. The water vapour task team should also help defining the observational requirements for water vapour as a chemical substance relevant for atmospheric chemistry as this entry in the OSCAR database so far is empty.</td>
<td>Gregory Carmichael, SSC members, Geir Braathen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI-18.2</td>
<td>SSC requested the Secretariat to have a look at the opportunity to issue DOI</td>
<td>Oksana Tarasova</td>
<td></td>
<td>Related to AI-4.1</td>
</tr>
<tr>
<td>AI-19.2</td>
<td>SSC and SAGs should use scientific meetings to communicate GAW through dedicated sessions and presentations</td>
<td>SSC and SAG members</td>
<td>On-going</td>
<td>Related to AI-7.1</td>
</tr>
<tr>
<td>AI-20.2</td>
<td>SSC and SAG members are encouraged to submit short papers on scientific issues to WMO Bulletin</td>
<td>SSC and SAG members</td>
<td>On-going</td>
<td>Related to AI-7.1</td>
</tr>
<tr>
<td>AI-21.2</td>
<td>Secretariat should compile a communication mailing list with input from SAGs and the SSC</td>
<td>Oksana Tarasova, SSC members and SAG chairpersons</td>
<td></td>
<td>Related to AI-7.1</td>
</tr>
<tr>
<td>AI-22.2</td>
<td>SSC and SAGs provide news items for the GAW web on current, actual events, such as volcanic eruptions etc. We should name 3-4 experts who can prepare a short article on current events and episodes. This request should be brought up at SAG meetings</td>
<td>SSC and SAG members</td>
<td>On-going</td>
<td>Related to AI-7.1</td>
</tr>
<tr>
<td>AI-23.2</td>
<td>The Publication “State of the Atmosphere” should be produced in 2016. After that it could be published approximately every two years.</td>
<td>SSC members</td>
<td>2016</td>
<td>Follow up on AI-19.1</td>
</tr>
<tr>
<td>AI-24.2</td>
<td>SSC working with the Secretariat develop a detailed communications strategy, to be drafted by summer 2015.</td>
<td>SSC members, Oksana Tarasova</td>
<td>1 June 2015</td>
<td>Follow up on AI-7.1</td>
</tr>
<tr>
<td>AI-25.2</td>
<td>Responsible for different sections to send their Implementation Plan contributions to Gregory Carmichael by email before 26 February 2015</td>
<td>Sections drafting leaders</td>
<td>26 February 2015</td>
<td>Follow up on AI-14.1</td>
</tr>
<tr>
<td>AI-26.2</td>
<td>SSC to develop guidance on GAWTEC training, including: - Criteria for evaluation and selection of trainees - Follow up questionnaire (lead Melita Keywood) - Potential training on modelling, data processing and submission, and data analysis (including satellite data) within GAWTEC and with the other programmes (lead Karla Longo)</td>
<td>Melita Keywood, Karla Longo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI-27.2</td>
<td>SSC consider inclusion of new members in the group in 2015.</td>
<td>SSC members</td>
<td>31 December 2015</td>
<td>Related to AI-18.1</td>
</tr>
<tr>
<td>AI-28.2</td>
<td>SSC Chairperson to organize a teleconference in March to approve meeting report.</td>
<td>Gregory Carmichael</td>
<td>31 March 2015</td>
<td>Related to AI-18.1</td>
</tr>
<tr>
<td>AI-29.2</td>
<td>Secretariat jointly with TT-ObsReq plan to organize a TT meeting in late August or early September.</td>
<td>Geir Braathen, Gregory Carmichael</td>
<td>30 September 2015</td>
<td>Follow up on AI-1.1</td>
</tr>
</tbody>
</table>
LIST OF RECENT GLOBAL ATMOSPHERE WATCH REPORTS*

149. Comparison of Total Ozone Measurements of Dobson and Brewer Spectrophotometers and Recommended Transfer Functions (prepared by J. Staehelin, J. Kerr, R. Evans and K. Vanicek) (WMO TD No. 1147).

150. Updated Guidelines for Atmospheric Trace Gas Data Management (Prepared by Ken Maserie and Pieter Tans (WMO TD No. 1149).


154. WMO/IMEP-15 Trace Elements in Water Laboratory Intercomparison. (WMO TD No. 1195).


* (A full list is available at http://www.wmo.int/pages/prog/arep/gaw/gaw-reports.html)


170. WMO/GAW Expert Workshop on the Quality and Applications of European GAW Measurements (Tutzing, Germany, 2-5 November 2004) (WMO TD No. 1367).


176. The Tenth Biennial WMO Consultation on Brewer Ozone and UV Spectrophotometer Operation, Calibration and Data Reporting (Northwich, United Kingdom, 4-8 June 2007) (WMO TD No. 1420), 61 pp, March 2008.


182. IGACO-Ozone and UV Radiation Implementation Plan (WMO TD No. 1465), 49 pp, April 2009.


193. Guidelines for Reporting Total Ozone Data in Near Real Time (WMO TD No. 1552), 19 pp, April 2011 (electronic version only).


208. WMO GURME Workshop on Urban Meteorological Observation Design, (Shanghai, China, 11-14 December 2011).


