

WORLD METEOROLOGICAL ORGANIZATION
COMMISSION FOR ATMOSPHERIC SCIENCES (CAS)

8th MEETING OF THE CAS MANAGEMENT GROUP
(Geneva, Switzerland, 23-25 May 2013)

MEETING REPORT



June 2013

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1. INTRODUCTION

Dr Deon Terblanche opened the meeting at 14h00 on 23 May 2013. On behalf of the Secretary-General of WMO, he welcomed the Management Group Members to Geneva and highlighted the importance of this meeting in light of the preparations for the 16th Session of the Commission for Atmospheric Sciences in November 2013.

The President of CAS, Dr Michel Béland, in his opening remarks, noted that this would be the last CAS MG meeting that he will Chair during his term as President of this Commission. He mentioned that the 65th Session of the Executive Council of WMO which was held prior to this meeting, concluded the importance of research in ensuring that Members of WMO are well prepared to address the changing needs of the society in a rapidly changing world. He thanked the CAS MG members for attending and for the work they have done in preparing for the meeting. Dr Terblanche provided the participants with the necessary logistical and practical arrangements during the meeting in light of the fact that the second and third days of the meeting will coincide with the WMO official holiday and a Saturday.

1.3 Adoption of the Agenda

The agenda was adopted with some minor changes related to the scheduling of the various sessions to accommodate external participants and the presence of the members.

2. REPORTING

2.1 Report by the President of CAS

Since the 7th meeting of the CAS Management Group held in September 2012, the President of CAS, informed the members of his contributions and input, on behalf of the Commission, towards the GFCS planning documents and sub-structure, the Meeting of the Presidents of Technical Commissions in January 2013 and the election process for the Vice-President of the Commission. The third ballot will be underway within a few days of this meeting, with the two highest-ranking candidates from the second ballot. It is hoped that a Vice-President will be elected before CAS-16.

He highlighted the emerging cooperation with the Commission for Hydrology (CHy) in working more closely together on flood and river flow forecasting techniques, particularly those making use of advanced mesoscale weather forecasting models, coupled to hydrological basins modelling systems. Dr Vincent Fortin, from the Environmental Prediction Research Group of the Canadian Meteorological Centre, will act as a link between CAS and the CHy relevant Advisory Working Group.

As co-chair, with Dr Alan Thorpe, of the International Organizing Committee (IOC) for the World Weather Open Science Conference planned for August 2014, Dr Béland described and indicated that more details will be provided during the meeting under the relevant agenda item.

Dr Béland noted his participation in the GAW-2013 Symposium and in the JSC OPAG EPAC meeting and expressed his appreciation of the high level of the scientific excellence demonstrated and the dedication of the hundreds of volunteers which were responsible for the success of these events.

He concluded by mentioning the progress being made in preparing for CAS-16 and its Technical Conference (TECO), and mentioned a number of CAS related highlights from EC-65, including the side event on polar prediction held earlier that week.

2.2 Report of the Chair of JSC OPAG EPAC

Dr Øystein Hov reported how the GAW-2013 Symposium provided the opportunity for the GAW Programme to review progress against the five strategic thrusts in the WMO Strategic Plan 2012-2015 and provided examples from GAW on each of these:

- Improving service quality and service delivery
- Advancing scientific research and applications, as well as development and implementation of technology
- Strengthening capacity-building
- Building and enhancing partnerships and cooperation
- Strengthening good governance

In summarizing the GAW-2013 Symposium he emphasized the need to account for the human impact on the atmosphere and the importance to establish scientific integrity before the results of new research is made into services.

He acknowledged the very important and significant contributions to GAW especially by the USA, Switzerland and Germany in strengthening the global observation systems on atmospheric composition and related measurements.

Dr Hov reminded the members of the GAW structures and their roles, including the important roles of World and Regional Calibration Centres, Central Calibration Laboratories and World Data Centres and ensuring the success of the Programme.

In conclusion, he reflected on the way forward and highlighted the emerging roles of GAW in relation to Megacities, the Global Framework for Climate Services (GFCS) and the WMO Integrated Global Observing System (WIGOS) and WMO Information System (WIS). He highlighted the need for a “One Chain” approach that includes research driven and operational observations, model development and application. However that this should not be done at the cost of the core GAW strength and activity, namely, “doing good observations, not only collecting those of others”.

2.3 Report of the Chair of the JSC OPAG-WWRP

Dr Gilbert Brunet, in his introduction, reminded members of the long-term objectives of the WWRP and its structure and continued to provide an overview of recent highlights of the Programme.

Nowcasting Research has been active on a number of fronts, including organizing the Third WMO International Symposium on Nowcasting and Very Short Range Forecasting (WSN12) held in 2012 in Rio de Janeiro (Brazil) in which 166 scientists from 21 countries participated. The development of a research project to study convection over Lake Victoria has also progressed well. It will take on the form of a RDP based on a satellite, lightning and NWP supported nowcasting system.

Dr Brunet provided a short overview of the progress on FDP INCA-CE, a European mesoscale research project focusing on road safety, civil protection and operational hydrology; RDP La Plata Basin Project, a project demonstrating the feasibility of dynamical prediction of local extreme weather using dense observation data and numerical models over a shared catchment in South America and RDP/FDP FROST 2014 aimed at the 2014 Winter Olympics in Sochi, Russian Federation.

Dr Brunet highlighted the activities of the Social and Economical Research and Application (SERA) Working Group including the Communicating Risk and Uncertainty Workshop, which was

held in Melbourne, Australia, from 26 to 30 July 2012 and the WMO Forum: Social and Economic Applications and Benefits of Weather, Climate and Weather Services (April 2013, Geneva). He mentioned that WMO and the World Bank have recently formed a Climate Services Partnership (CSP) to develop a guidance document. The Bank views this activity as necessary to support its evaluation of investments in the developing countries NMHSs. Brian Mills, Chair of SERA, is leading a chapter on broader social science.

He also mentioned that the Working Group on Forecast Verification Research has recently issued a Tropical Cyclone Forecast Verification guidance document, and will publish a special issue of Meteorological Applications on forecast verification in June 2013. The special issue will include a review paper on progress in and challenges for forecast verification, a series of papers describing verification methods for short/medium/seasonal forecasts and climate projections as well as on scores for severe weather and weather warnings.

Tropical Meteorology Research has several FDPs/RDPs in Tropical Meteorology Research, including:

- Southern China Monsoon Rainfall Experiment (SCMEX) RDP aimed at improving the observation of precipitation processes by the use of a new generation of in-situ and remote sensing systems operated from the ground, on aircraft, and aboard satellites in order to shed light on the internal structure of convective clouds and the environment in which they develop.
- The Typhoon Landfall FDP (TLFDP), focusing on post-season verification systems for typhoon forecast set up in 2011, training for SE Asia forecasters in 2012 and extension of the project to 2015 to include research on typhoon genesis.

Dr Brunet concluded his presentation by encouraging active participation in the THORPEX legacy projects and highlighted progress being made in preparing the scientific programme of the World Weather Open Science Conference by the Science Committee that he co-chairs with Dr Sarah Jones.

2.4 Report of the Chair ICSC THORPEX

Dr T. Nakazawa, on behalf of Dr Alan Dickinson, presented the report. He provided an overview of the large number of THORPEX related activities since the previous CAS MG meeting, including:

- DAOS WG meeting in Madison, USA, September 2012
- ICSC-10 in Geneva, October 2012
- Asian THORPEX Science Workshop and Asian THORPEX Regional Committee meeting in Kunming, China, November 2012
- Ensemble Method Workshop, Toulouse, France, November 2012
- PPP Steering Group meeting, Reading, UK, November 2012
- S2S Planning Group meeting, Exeter, UK, February 2013
- MJO Workshop, Hawaii, USA, March 2013
- High Impact Weather Workshop, Karlsruhe, Germany, March 2013

He proceeded to give a summary of the major action items resulting from the ICSC-10 in 2012. Of particular interest is the decision to arrange for the preparation of a comprehensive paper recording the scientific achievements of the full THORPEX programme and to prepare a summary paper for open publication and to engage a consultant to carry out the work. In addition, the linkages between the post THORPEX legacy projects and how they compliment each other should be clearly presented in a context of a cluster of projects.

Dr Nakazawa then concluded with a short summary on recent progress related to the Sub-seasonal to Seasonal Prediction Research Project (S2S) and WWRP Polar Prediction Project (PPP).

2.5 Report of the Chairs of WGNE

Dr Andy Brown, Co-Chair of WGNE, reminded the members that WGNE is co-sponsored by CAS and the WCRP JSC, and has responsibility for fostering the development of atmospheric circulation models for use in weather prediction and climate studies on all time scales and diagnosing and resolving shortcomings. This is achieved by providing advice and liaison, promote coordinated experiments and arrange relevant workshops, publications, and meetings.

Dr Brown highlighted the ongoing work related to Transpose-AMIP aimed at testing of climate models in NWP mode to take advantage from the extra information that can be gained from assessing models across different timescales, and the Grey-zone project, a new effort examining the new issues encountered as models are run at scales where convection is partially resolved.

The work on verification remains a high priority and efforts are continuing on NWP model performance (traditional CBS-style measures and also tropical cyclone and precipitation forecasts) but now also extended to polar performance, the development of Climate metrics (with WGCM) and assessment of issues associated with verification against own analysis.

Dr Brown provided a short overview of the WGNE-28 meeting that was held in Toulouse, France in November 2012 and a number of new initiatives were discussed, including:

- A study to compare the surface drags in leading operational models.
- Building on the success of the MJO metric work (with the MJO task force, which it has been agreed will now report to WGNE), extra data will now be provided by the operational centres to allow monitoring of the quality of predictions of the boreal summer monsoon intra-seasonal variability.
- Discussions with GAW/GURME to consider common points of interest including the role of the representation aerosols on the quality of model performance across time and space scales.

Dr Brown concluded with a summary of recent and upcoming workshops and the unique WGNE value of looking of across space and time scales.

2.6 Report of the Director of ARE Branch

Dr Deon Terblanche, Director of the Atmospheric and Environment (ARE) Branch, shared his view why, in an era of rapid global change, it has become even more important to proactively identify the priority areas for research for the next decade or two and discuss the optimal approaches to tackle them. He indicated that the agenda for this CAS MG meeting was deliberately compiled, in cooperation with the CAS President, to stimulate this discussion. In addition to safeguarding lives and property, the proactive, integrated use of weather and related environmental information and predictions to optimize the use of energy, resources and services has great potential and economic value still not fully realized. Such applications of weather science and atmospheric chemistry can make substantial contributions toward sustainability and climate change mitigation actions.

He highlighted the progress made in context of the overall strategic direction of WMO which has amongst others, identified the Global Framework for Climate Services (GFCS) and WMO Integrated Global Observation System (WIGOS) as part of the five strategic priorities for the current financial period. These two initiatives have a direct bearing on CAS – WIGOS in terms of the observational component of the GAW Programme and GFCS in terms of both GAW and WWRP. The joint WWRP-WCRP S2S, the WWRP PPP which has a strong links with the WCRP

Polar Climate Predictability Project, and the development of the Integrated Greenhouse Gas Information System (IGIS) are included in the GFCS Implementation Plan as tangible CAS contributions to the Framework.

He mentioned that the CAS MG should consider the advice that it could give for the CAS members on the future of the Weather Modification advisory and guidance activities of the expert team under CAS. MG members will recall that it was decided in 2006 that, in future, these activities should be supported through the voluntary contributions by Members, especially those with activities in this field. Apart from an initial contribution by the UAE, other contributions have not been forthcoming.

Dr Terblanche informed the members that UNEP and WMO collaborated to perform a study on the SDS-WAS concept and future additional regional node over the West Asia region, including the Islamic Republic of Iran and Turkey. The overall implementation plan of the SDS-WAS will be further refined to specify more precisely the steps to translate research modelling activities to operational dust forecasting, propose a mechanism of international coordination of existing regional collaboration components and suggest establishing a trust fund to support the global coordination of SDS-WAS activities.

3. OVERVIEWS AND STRATEGIC ADVICE OF THE MANAGEMENT GROUP MEMBERS

3.1 Polar Research Activities

Dr Elena Astakhova provided an overview of CAS related polar activities and its optimal relation to EC-PORS and other polar activities and bodies, such as IASC, SCAR and the IPI. Dr Astakhova provided examples of the drastic and rapid changes in the Polar Regions due to global warming and indicated that these changes are irreversible and expected to intensify in future decades. Of particular relevance is that polar changes influence global processes. She highlighted the research challenges faced in Polar Region related to insufficient observations, incomplete understanding of physical processes and predominance of mesoscale phenomena and smaller-scale systems which often develop rapidly (polar lows, low-level fronts and jets, etc.).

Dr Astakhova provided an overview of the numerous organizations involved in polar activities, and provided an in-depth overview of the following activities:

- GIPPS (EC PORS): Global(ly) Integrated Polar Prediction System
- WCRP PCPI (WCRP): WCRP Polar Climate Predictability Initiative (a sub-initiative within the 'Cryosphere in a Changing Climate' WCRP Grand Challenge)
- WWRP-PPP (CAS, WWRP, THORPEX ICSC): WWRP Polar Prediction Project
- IPI (WMO, SCAR, IASC, ICSU,...), International Polar Initiative
- Antarctic Observing Network (AntON)
- Sustaining Arctic Observing Networks (SAON)

She concluded by showing the synergies between these various polar activities and pointing out that the following is needed to ensure the success of these activities:

- Effective integration and coordination between IPY legacy initiatives, observing systems and programmes.
- Good working relations with non-WMO bodies (SCAR, IASC, etc) and their scientific communities to avoid duplication of efforts or competition.
- Support education, training and development of next generation of polar researchers.
- Strengthen links between academy, research institutions and operational centres.
- The support of WMO Members.

3.2 Emerging issue in the next 20 years of relevance to WWRP and GAW

Dr Philippe Bougeault using Météo-France as an example, highlighted that the expectations from the Government and society revolve around improving the accuracy of short-range forecasts for security of people and property, health, transport, defence and the energy market; and to develop climate services, i.e. improve seasonal prediction and demonstrate decadal prediction.

Dr Bougeault then systematically highlighted the future trends in each of the following:

- *NWP Systems*

NWP systems are becoming more integrated (for efficiency), at ever increasing resolution, covering timescales from nowcasting to decadal in order to provide seamless ensemble forecasts of impacts that go beyond mere weather and climate predictions.

- *Model Dynamics*

The basic equations for non-hydrostatic dynamics are being revisited, more scalable dynamical cores devised, the data flux between processor are optimized and a move towards unstructured grids to better represents steep orography (like in ocean models).

- *Model Physics*

The trend is towards more conservative variables, more advanced microphysics and accounting for horizontal exchanges by turbulence and radiation for grids < 1km. Parameterization of convection remains a difficult problem for grids > 5km and more “grey zone” problems can be expected as the integrated forecasts systems will be used at various resolutions.

- *New coupling requirements (Earth system)*

Increasing importance of coupling with atmospheric composition where the MACC project is a forerunner, coupling with continental surfaces where there is also a need for more realistic representations of urban surfaces and boundary layers as well as coupling with the ocean and sea-ice which is becoming important even for short-range NWP.

- *Data assimilation techniques*

The evolution in DA techniques is driven by progress in science and the constraints from massively parallel machine architectures. Increasingly hybrid methods (ensembles-variational) are being used and 4D-EN-VAR is now explored in several centres despite the fact that it requires more storage of data.

- *New Observations*

New contributions by high spectral resolution IR sounders on geostationary satellites (MTG in 2020), space wind lidar (Aeolus in 2015), the advanced usage of meteorological radar, surface wind lidar, Mode S aircraft data, as well as opportunity data from telecom networks will contribute to data assimilation in NWP.

- *Ensembles*

Work on improving description of model uncertainty continues including the link between deterministic and stochastic physics as well as the development of suitable verification techniques. The coupling of atmospheric ensemble with impact models related to hydrology (flood ensemble forecasts), ocean waves, air quality (MACC regional ensemble), accidental pollution, etc. is becoming increasingly important, also from a user perspective.

- *Verification Techniques*

The development and widespread use of ensembles requires more effort in ensemble verification techniques.

- *Upstream Research*

Research on observation techniques involving drones, integrated profiling systems, turbulence profiling from Doppler lidar and field campaigns such as those related to the Mediterranean (HYMEX, CHARMEX, etc.), Atlantic (T-Nawdex), Arctic campaigns and studies on urban surface energy budget and structure of the urban boundary layer will help shape future forecast systems.

3.3 The Balance between fundamental research and socio-economic applications

Dr Gilbert Brunet presented a talk on ways to quantify the goals of NMHSs, how to balance growth through the chain of innovation (Monitoring, Research, Development, Operation and Service), the value of push and pull to innovation, and growth at the Met Office: a Weather Science perspective.

Dr Brunet explained how the Met Office defines and uses performance metrics to track progress in the provision of service. He highlighted the considerable added value (in terms predictive skill and scientific progress) derived from the regional model application compared to the global model. He also highlights how the user reach is being extended through social media subscribers.

Dr Brunet highlighted that growth of a NMHS is not just about commercial revenue but also about providing greater socio-economic benefit and widening the reach of services. He also noted that innovation is best supported by a balance between factors that pull (better understanding of users and customers both new and old, better use of our capabilities, government requirements etc.) and those that push (new science, new capabilities, collaborations with others etc.).

He continued to describe how the pull by users and customers are important in aligning what customers want and what is justifiable scientifically while also promoting other benefits and understanding customer needs through Research Development Projects (RDPs) and Forecast Demonstration Projects (FDPs). The importance of partnerships was highlighted and also how SWOT analyses can provide unique insights into a specific NMHS's position in the landscape it finds itself. In this case it has permitted to identify important emerging opportunities linked to the incredible advance in high-resolution (i.e. convective scale) NWP in some NMHSs. It has long been understood that accurate prediction and warning of the impacts of most severe weather events, including flooding, drought, storm surge and pollution episodes, requires a more integrated approach to forecasting and would rely on highly accurate NWP systems coupled to ocean-chemistry hydrology models. As the societal impacts of hazardous weather and other environmental pressures grow, the need for more complete prediction of our complex and interdependent environment is greater than ever. The scientific collaborative development needed to achieve this vision is also closely linked to the effective collaboration between the NMHSs through initiatives like RDPs and FDPs.

3.4 Implementing an Integrated Greenhouse Gas Information System

Dr Jim Butler presented on the implementing an integrated, global greenhouse gas information system starting with a simple overview of the physics determining the global climate system. Since the start of the industrial age, there is now 30% more CO₂ and N₂O, and triple the amount CH₄ in the atmosphere. Dr Butler also highlighted how an increasing number of GAW station are reporting CO₂ concentrations exceeding the 400 ppm milestone. This first occurred in hourly, daily and weekly average values at some Arctic stations during the NH Spring maximum of 2012 but monthly average values exceeding 400 ppm have now been reported at all Arctic GAW

station in May 2013. Mauna Loa, in the tropics, has for the first time also reported a weekly average of 400.03 for week beginning May 26 2013.

Dr Butler pointed out that society is attempting to advance efforts to reduce CO₂ emissions and that such mitigation efforts will vary by nation, region and emission sector (energy, transport, industry, etc.), and will be diverse in their approach. Although the complexity and the variability of the carbon cycle, the scale of problem, and the number of GHGs are challenging, it is surmountable. Emission reduction approaches (e.g., international, national, local) all require independent, scientific monitoring to support verification and policy decisions. This is related to the fundamental fact that one cannot manage what is not being measured.

At present, the rather sparse network of observations allows a good understanding of the evolving background GHG concentrations and provides some insight into the annual continental fluxes of CO₂. Dr Butler argued that the future demands new and expanded approaches that should include increased observations, improved transport models and enhanced reanalysis. Such a new approach should include “*Bottom-up*” measurements which include emissions reporting, reported and “verified” offsets and site-specific measurements (Accounting = “checkbook”), “*Top-down*” measurements from comprehensive atmospheric observation system and ecosystem and ocean observations (Validation = “bank statement”), and *Reanalysis* using transport models, data assimilation and regional fluxes of both emission and uptake (comparing checkbook with bank statement). This process should include land- and ocean-based measurements of GHGs and data on the exchanges between the components of the earth system. It will also require multi-agency collaboration.

Dr Butler concluded by suggesting how such a system, which could be called an Integrated, Global Greenhouse Gas Information System (IG³IS) should be planned within CAS and GAW, starting with the WMO contribution, in the two years leading up to Cg-17 in 2015. He showed some components of such a system that is already in place but which should be enhanced and benefit from global coordination.

The members of the Management Committee supported the concept and encouraged Dr Butler to further develop the plans and consult with other potential role players.

3.5 A holistic review informing the post THORPEX legacy

Dr Brunet presented a thorough overview of THORPEX, its history, achievements and its relationship with WWRP (referring to the 2009-2017 WWRP Strategic Plan) and WMO in general (Cg-16 of 2011). He made special mention of the THORPEX structure, including its International Core Steering Committee and Regional Committees and the three dedicated working groups. Some of the lessons learnt and highlights are:

- *DAOS WG - Data Assimilation and Observing Systems*

The impact on day 1-3 forecasts due to targeted observation on tropical cyclones track forecasts are mostly beneficial and are small but positive on average in the mid-latitudes storms. It was also pointed out that as forecast skill is improving due to improved resolution, observations, DA, physics, the average marginal impact of an individual observing system is decreasing. Quantifying the overall cost-effectiveness of targeted observations remains an open question and these observations have not provided clear and strong benefits.

- *GIFS-TIGGE WG Global Interactive Forecasting System – THORPEX Interactive Grand Global Ensemble*

Following the successful establishment of the TIGGE dataset, the main focus of the GIFS-TIGGE working group has shifted towards research on ensemble forecasting. The dataset is a resource for a wide range of research projects with over 70 articles related to TIGGE published in

the scientific literature. It has also provided a strong link to operational applications through the SWFDP.

Dr Brunet shared some views on the future structure of the WWRP that will build on current initiatives and the legacy of THORPEX. The three new projects on Sub-seasonal to Seasonal prediction (S2S), the Polar Prediction Project (PPP) and High Impact Weather (HIW) will form the cornerstones of the project activities post THORPEX.

Since TIGGE has proved an invaluable resource for research during THORPEX, it is planned to continue TIGGE and build on its success to ensure that new research projects such as S2S, PPP and HIW can benefit for this resource.

Dr Brunet concluded by emphasizing that THORPEX has been a major contributor to the advancement of weather forecasting capability, especially global NWP. Its structures (e.g., TIGGE) are increasingly used in wider research. It is important for these elements continue & achieve further advances in the post-THORPEX era. However, some important areas were omitted from THORPEX, and other areas have gained in importance as a result of external change, motivating the establishment of new projects on Polar Prediction, Sub-seasonal to Seasonal Prediction and High-impact weather.

3.6 Gender Balance within CAS

In light of the fact that gender balance was highlighted on the agenda of the CAS-15, Dr Mariane Diop-Kane presented on the evolution of gender balance within the structures of CAS showing a slow increase in female experts to the current 12.7%. The regional figures range from about 7.5 % to just over 20% with RA-3 having the largest female presence. There has been a marginal increase in the number of female representatives between the 14th and 15th session of CAS but the percentages remain too low.

Dr Diop-Kane also presented the statistics per individual working structure of the committee (working Group, Science Advisory Committee, Expert Team, etc.). She concluded by stating that there has been an overall increase of women participation, varying from region to region and within CAS bodies with the biggest increase in RA-3. Her sentiments that the proportions are still low and this should be taken into account when reconstituting CAS working bodies were echoed by all the members.

3.7 Progress on CAS-15 Actions

Dr Alice Grimm reviewed the input she has organized and coordinated regarding the 23 action items resulting from CAS-15. In general, good progress has been made on these and explanations presented where the progress has not been as expected. The members accepted the report with appreciation and noted the progress made. The report containing the details is available on the web.

3.8 GAW response to a growing need for data and information

Dr Øystein Hov explained the structure of the products, services and delivery system as used by the Norwegian Meteorological Institute as background to the wider context that GAW will have to consider in the future. He used the examples of the Antarctic Ozone Bulletin, WMO GHG and (new) Aerosol Bulletins as examples of what GAW is already doing in terms of services based on the full value chain starting from high-quality observations. In addition, he pointed out that GAW provides a measure of the `health of the planet` while also being an anchor for satellite observations. He highlighted that we should care more for the 2M people that die from poor AQ every year (30k from extreme events), that climate mitigation should remain high on the agenda supported by thorough understanding of CO₂ trends and other gases and PM including their emissions/cycle components.

Dr Hov showed the linkages between GAW NRT and archived data and a large number of weather, climate and environmental phenomena and used MACC as an example of how some of these linkages can now be modelled and predicted. He highlighted the impacts of pollution on the Arctic and stressed the needs of megacities where air quality is often compromised.

He made a strong argument for the case that weather (and related environmental data) should remain in the public good domain to maximise the value to be derived.

Dr Hov mentioned the long-term objectives as contained in the 2008-2015 GAW Strategic Plan as follows:

- Develop GAW into a **three-dimensional network** through integration of all kind of observations from surface to space
- Start delivering **data in near real** time by using WMO GTS/WIS
- Merge all activities from the observation to the users application into coherent **data processing chains** related to a GAW quality management system
- Support assimilation of the essential climate variables in atmospheric transport and numerical weather prediction **models**

He highlighted some of the issues that should be considered for the GAW plans post 2015, including:

- **User driven products:** AQ, deposition, UV, dust incl. volcanic ash, climate, NWP including seasonal weather forecasts, marine input
- **Towards “one chain”:** Research driven and operational observations, model development and application, and services
- **Core GAW activity:** Doing Good Observations, not only collecting others’
- **Policy facilitation:** DRR, GIPPS, AQ, CLRTAP, GFCS, IPCC, new global/regional alliances, and FEWER PARALLEL PROCESSES in policies’ underpinning
- **Data stewardship:** WIS (WIGOS). User-data provider interaction. Interoperability. Free data policy.
- **Foster country contributions** to research, infrastructure, education, institutional building
- **Management structure;** community of practise.

Dr Hov concluded his presentation by showing the links between GAW and other high-profile initiatives including the GFCS, WIS and WIGOS as well as the Polar Prediction Initiatives of both WWRP and WCRP.

3.9 Megacities and large urban complexes: Challenges and Opportunities

Dr Yunfeng Luo stated that global urbanization has become an irreversible trend. He showed statistics over the past decades indicating the astonishing growth in both the global population and the number of megacities. For example, it is estimated that there will be 23 megacities in 2015 in the world, among which 18 are coastal cities, and most are located in the developing countries.

Dr Luo showed how urbanization alters the “Forcing” Factor such as roughness, albedo, permeability, emissivity, etc. and causes an atmospheric “response” (turbulence intensity, stability, mixing height, etc.) resulting in special urban phenomena such as the heat island, enhanced flooding risk, channelling of wind, etc. In addition, waste heat and particulate and gaseous emissions further alter the atmospheric state and composition, increase turbidity, decrease radiation and visibility, exacerbate air pollution and provide a wealth of condensation nuclei for the formation of clouds, fog and precipitation.

He explained that the urban socio-ecosystem is not only an urban local phenomena, it is also a driver and responder to regional and global climate change through the altered biogeochemical cycles, altered hydrosystems, GHGs, biodiversity, etc.

Dr Luo provided examples of the growing need in cities for:

- Weather and environmental services for better city operations
- Urban air quality forecast and environmental emergency response
- Weather and environment service for public health
- Mitigation and adaptation to climate change and sustainable development

In order to develop and provide these services, special attention will be required for new urban observation and boundary reanalysis, urban modelling and seamless prediction techniques as well as impact forecasts and impact assessment techniques of weather and environment factors. Dr Luo used examples from Shanghai to showcase the progress that has been made on many fronts in this regard.

He concluded his presentation with recommendations related to:

- The need to place special emphasis on the urban environment in the GFCS
- Encourage showcase projects and enhance the role of GURME
- Encourage integrated urban observation and model intercomparisons
- The need for coordination amongst the relevant WMO activities under the leadership of CAS and CBS
- Communication and education of users, decision makers and city dwellers in general

3.10 WGNE priorities for the next 5-10 years

Dr Andy Brown provided an overview of the WGNE coordinated projects and experiments and the progress in each (Transpose-AMIP, Cloudy-radiance, Grey-zone, Verification, Importance of aerosols for weather and climate, Quality of monsoon simulations for weather and climate, Comparison of model momentum budgets).

Dr Brown gave an overview of the recent GOV/WGNE Ocean coupling workshop and the 4th WGNE Workshop on Systematic Errors in Weather and Climate Models. The recommendations from the systematic errors workshop should prove useful in identifying and understanding common challenges across the weather-climate time scale.

He highlighted some issues that will form the focus of future WGNE activities:

- Short-range weather prediction
- Earth system prediction
- Traditional model evaluation development
- Continue to look cross-timescale – weather and climate (and air quality/chemistry) communities together
- Need to keep championing the importance of model development
- Maintain strong links to many other groups and projects e.g. WWRP, DAOS, GASS, polar, subseasonal-seasonal, WGCM, SPARC, WMAC, GODAE...etc

Dr Brown concluded with some open questions and challenges related to:

- Involvement in data assimilation in light of structural changes to the WWRP and the relation to mesoscale working group.
- Maintaining an active portfolio of projects and workshops/conferences with limited resources.

3.11 Cooperation between the academic and operational weather communities

Dr Hans Volkert presented on the long history of cooperation between WMO and IAMAS as well as the complimentary nature of the structures of the two organizations. Dr Volkert also invited CAS and its structures to make better use of the expertise within IAMAS to further strengthen the collaboration between the more operational community of WMO and the academic research community represented by IAMAS. Mention was made to the contribution that THORPEX has made in this partnership and that it is important to build on this in the new THORPEX legacy projects (S2S, PPP and HIW).

Further thoughts and comments on the preceding presentations

The CAS MG members commented positively on this series of talks and its value for robust debate. Some of the conclusions drawn include:

- The further refinement and preparation of some of the presentation as discussion papers for CAS-16 and eventually for the World Weather Open Science Conference.
- The importance to ensure that the post-THORPEX legacy projects do not just repeat THORPEX itself but address gaps not covered by THORPEX, e.g. that the HIW Project should have a clear focus on high-impact events in very-high resolution and at timescales covering Nowcasting and Very-Short Range Forecasting.
- In light of advances in new data streams, data assimilation and high-resolution modelling, the WWRP is encouraged to investigate how best its Nowcasting and Mesoscale working groups can focus their attention on these emerging opportunities.
- The ongoing focus required on gender balance within CAS and its structure.
- The value of the cooperation between CAS and the WCRP in advancing the science and services to humanity.

4. PARTNERSHIPS AND CROSS-CUTTING ISSUES

4.1 Global Framework for Climate Services (GFCS): Progress and Opportunities

Mr Filipe Lucio presented an overview of the status of the Global Framework for Climate Services highlighting its purpose, near-future priorities (water, health, agriculture and DRR) and the progress since the Extraordinary Congress held at the end of November 2012 where the draft Implementation Plan was approved and the Intergovernmental Board for Climate Services (IBCS) was established. Mr Lucio highlighted the GFCS implementation priorities related to Governance, leadership and management to take the Framework forward, capacity development, implementation of high-priority project, improve climate observation in data sparse areas and partnerships.

The five pillars of the GFCS (Observation and Monitoring; Research, Modelling and Prediction, Climate Services Information System; User Interface Platform and Capacity Development) were described with particular emphasis on the Research, Modelling and Prediction pillar.

Mr Lucio concluded his presentation on the next steps, which will include the dialog and 1st meeting of the IBCS, examples of early action in Asia, Africa and the Caribbean as well as progress towards resource mobilization to support the GFCS.

4.2 WCRP: Views on Joint Research Initiatives in Support of Seamless Services

Dr Ghassem Asrar presented on the WCRP progress and plans starting with the background that is shaping the plans and priorities of the WCRP for the next decade. The WCRP coordinates international climate research aimed at improving climate predictions and advancing

the understanding of human influence on climate. It shares the view with CAS that a seamless approach to this understanding and predictions from both a time scale and spatial scale is highly desirable.

In recent years, the independent review of the WCRP in 2008-2009, WMO planning for the GFCS, ICSU Visioning for Environmental Research Sustainability and Future Earth, the IOC/UNESCO integrated Framework for Sustained Ocean Observations and the WCRP JSC strategic planning and consultation have all contributing towards how the WCRP research contributions address user and stakeholder requirements related to:

- Actionable climate information
- Symbiotic relationship between providers and users of climate information
- Training and development of next generation of scientists and decision makers

Dr Asrar provided an overview of the WCRP Grand Challenges and how the various structure of the WCRP will contribute to the research in support of these:

- Regional Climate Information (CLIVAR, WGRC, SPARC)
- Regional Sea-Level Rise (CLIVAR)
- Cryosphere in a Changing Climate (CLIC)
- Clouds, Circulation and Climate Sensitivity (WGCM)
- Changes in Water Availability (GEWEX)
- Prediction and Attribution of Extreme Events (GEWEX)

In conclusion, Dr Asrar provided a summary of the well-received joint WCRP-CAS activities that were presented to EC-65 during the previous week. These included S2S, PPP and the WCRP Polar Climate Prediction Initiative and WGNE.

4.3 WIGOS: Progress and Opportunities

Dr Sandro Fuzzi joined the meeting from Italy via Webex to make a presentation on his role as CAS representative in the Inter-Commission Group (ICG) on WIGOS. He gave an overview of WIGOS, its implementation, the role and composition of the ICG-WIGOS followed by a short summary of GAW with specific reference to GAW SIS and the co-benefits between WIGOS and GAW, which include:

- Recognition that the GAW networks are not only managed by NMHSs but rely strongly on the contribution of other government agencies as well as academia.
- Both NMHSs and participating research institutes will mutually benefit from improving access to information concerning atmospheric chemistry, related physical parameters, and meteorological measurements.

Dr Fuzzi described the WIGOS Pilot Projects within GAW related to:

- Improvement of Interoperability of GAW World Data Centres with WIS and Establishment of Prototype Services to Facilitate User Access to GAW Data (WDC-PP).
- Improvement of Dissemination of Ozone (total column, profiles and surface) and Aerosol observations through the WIS (GAW-IDOA).

He also mentioned the satellite task team for atmospheric composition and the plan to make substantial progress on this matter by the end of 2013 as decided at the JSC OPAG EPAC. Dr Fuzzi, referring to the requirement as expressed by ICAO to the President of CAS, recommended that volcanic ash detection could be an appropriate demo project for WIGOS.

Dr Fuzzi stressed the importance of including institutions outside NMHSs and showing the benefits of WIGOS to these institutions. He concluded by summarizing the action to be undertaken:

- **CAS-GAW** to continue the implementation of interoperability of its data centres to insure a smooth transition to the future WIGOS system.
- **CAS** to establish contacts with CBS to set up a joint ad-hoc Task Team to review the needs for GAW regarding satellite measurements.
- **Region VI** to implement the volcanic ash programme requested by ICAO. GAW is ready to make available the existing facilities for this task.
- **WIGOS Chair** to report to EC the issue of involvement of WMO observing system Partners other than NMHSs, and the need of establishing institutional relationships with research Institutions and observational networks outside the current WMO domain.

Dr Wenjian Zhang presented on the WIGOS Vision and Congress decisions, WIGOS key activity areas and major progress and highlighted the specific collaboration with CAS/GAW. He emphasized that the emphasis of WIGOS is on integration and building on the synergies between observing systems. He also explained the role of the ICG-WIGOS and its Task Teams, the Technical Commissions and Regional Associations and the WIGOS Oversight Board within the secretariat and chaired by the Deputy Secretary-General.

Dr Zhang provided an overview of the WIGOS GAW link with specific reference to the concept of ensuring compatibility of components of GAW with WIGOS and WIS as they become operational. He also explained the rolling Review of Requirements (RRR) process and highlighted the importance of strengthening the space based observation of atmospheric composition and provided several examples of current applications, including to air pollution.

5. THORPEX LEGACY

5.1 Three Legacy Projects: Progress Report

Dr Tetsuo Nakazawa presented the status of the three legacy projects; Sub-seasonal to Seasonal Prediction Project (S2S), Polar Prediction Project (PPP), and High-Impact Weather Prediction (HIW) Project. The first two projects have been approved at the WMO 64th session of the Executive Council in 2012 and the International Coordination Office (ICO) for the S2S has been established in Jeju Island, Republic of Korea. The contributions to the trust funds for the two projects are, at this moment, very limited, but further contributions from Members are much appreciated.

For the PPP, the decision of the ICO has not come yet, but the important publications for the project; Science Plan and Implementation Plan, are about to be ready for printing. The implementation of the Year of Polar Prediction (YOPP) will be fully discussed at the coming ECMWF/WWRP Polar Prediction Workshop in June.

HIW Project was initiated at the THORPEX International Core Steering Committee (ICSC) meeting in 2012, to fill the gap among the THORPEX legacy projects. The ICSC recommended to establish a project on high-impact weather from hours to weeks and a task force to prepare the implementation plan, led by Chair of the task force and a WMO consultant. The extensive discussion on this project has been done during the HIW Workshop in Karlsruhe, Germany in March 2013. Now the membership of the task force is under final stage to prepare a draft implementation plan to the coming THORPEX ICSC meeting and WWRP JSC meeting in July 2013.

5.2 Post THORPEX Impact on WWRP Structures

Dr Tetsuo Nakazawa showed a provisional plan of the WWRP structure after the THORPEX, which will end in 2014. The plan includes:

- Three WGs (DAOS, PDP, and GIFS-TIGGE) in THORPEX will be disbanded.
- DAOS WG will move under the WWRP
- After merging the PDP and GIFS-TIGGE WGs into “Dynamics, Predictability and Ensemble Forecasting WG, the new WG will also move under the WWRP
- Decision to continue the Weather Modification activity in WWRP may come at the CAS session in Turkey, followed by the approval in EC-66 in 2014.
- Decision to establish a new trust fund for the SDS-WAS activity in GAW and WWRP may come at the CAS session in Turkey, followed by the approval in EC-66 in 2014.
- Discussion on going among Chairs of WGNR and WGMFR with Chair of WWRP/JSC for further strong collaboration or merging into one WG in future

6. CAS-16 AND OTHER UPCOMING EVENTS

6.1 The World Weather Open Science Conference

Dr Michel Béland, in his capacity as co-chair of the World Weather Open Science Conference, scheduled to be held from 16 to 21 August 2014 in Montreal Canada provided an overview of the progress to date. He showed the visual identity that will be associated with the conference and explained the organizing structure and the various roles of the conference consisting of International Organizing Committee (IOC), Science Programme Committee (SPC), User Programme Committee (UPC), Sponsorship and Communication Committees and WMO Secretariat.

6.2 CAS-16 Technical Conference

Drs Tetsuo Nakazawa and Liisa Jalkanen as the Chiefs for the two Programmes (GAW and WWRP) are responsible for the Technical Conference on "Responding to the Environmental Stressors of the 21st Century" to be held in Antalya, Turkey, on 18 and 19 November 2013 in connection with the sixteenth session of the Commission for Atmospheric Sciences (CAS-16) which will be held from 20-26 November 2013. At the kind invitation of the Government of Turkey, both events will be hosted by the Turkish State Meteorological Service. This technical conference will present an opportunity to review some of the primary scientific and research challenges the WMO Members are facing and will provide a vision of research focus areas of the CAS: the Global Atmosphere Watch (GAW) Programme and its GAW Urban Research Meteorology and Environment (GURME) project, the World Weather Research Programme (WWRP), including the post THORPEX legacy projects, and the overlap of these activities with the World Climate Research Programme (WCRP).

The conference will consist of keynote talks, oral presentations and a poster session. Topics to be covered will include:

- **High Impact Weather** and its socio-economic effects in the context of global change.
- **Water:** Modelling and predicting the water cycle for improved DRR and resource management.
- Integrated **GHG** Information System: Serving society and supporting policy.
- **Aerosols:** Impacts on air quality, weather and climate.
- **Urbanization:** Research and services for megacities and large urban complexes.
- **Evolving technologies:** Their impact on science and its use (satellite technology and other remote sensing, computing power, social media etc.) including, geoengineering.

The conference will be co-chaired by Dr Gilbert Brunet of the UK MetOffice and Prof. Øystein Hov of the Norwegian Meteorological Institute.

6.3 Sixteenth Session of CAS (CAS-16)

Dr Béland introduced the discussion on CAS-16 by presenting a number of issues of importance to the future of CAS. He highlighted among other things the following:

- Research is becoming even more important because of the acceleration of environmental changes, technological advances and potentially approaching limits to growth.
- Population growth, urbanization, changing atmospheric composition, climate change, unsatisfactory climate services, vulnerabilities, air and water pollution, biodiversity, food security, resources constraints, economic growth stagnation.
- New technologies transforming communications, impacting dissemination of weather information, as well as sharing of observations in real time.
- Next generation of Hexa flop+ supercomputers extremely costly to run (power hungry) and operate (new approaches for dynamical cores, etc...).
- Thus, a renewed focus on needs-driven environmental research is demonstrably best coordinated through global cooperation, and closely linked with operational services.
- WMO is particularly well positioned to continue to play a leading role.

Dr Béland also indicated that many processes related to the humans have showed exponential trends (population growth, atmospheric greenhouse gas concentrations, global GDP etc.) and that such tendencies and their negative environmental impacts cannot be sustainable in a finite world. He referred to the Club of Rome “Limits to Growth” study conducted in the early 1970s that raised the same concerns and which is now receiving renewed attention.

CAS has the responsibility to account for these stressors when planning its activities and this is the context in which agenda for CAS-16 was structured.

Dr Béland then gave an overview of the CAS-16 agenda as has been approved by the SG.

7. LEADERSHIP, MEMBERSHIP AND ToR FOR CAS STRUCTURES

The CAS MG discussed ways to better align the ToR and structure of the overall steering committees of the WWRP and GAW. The MG also supported that the name “Scientific Steering Committee (SSC)” would be more appropriate than the currently used “Joint Scientific Committee (JSC)”. To ensure robust scientific guidance and strengthen the peer-review elements it was recommended to change the JSC OPAG EPAC to a structure more similar to that of the current JSC WWRP in which a number of core dedicated experts make up the core of the JSC tasked with the review and providing guidance and chairs of WG/SAG are ex-officio members mainly reporting on their activities, challenges and successes.

Dr Terblanche highlighted that although OPAGs for both Programmes exists that these have not functioned optimally. There is real value (without additional resource requirements) if these OPAG members could be used as communication channels from and to CAS. He suggested that CAS-16 be used to clarify the role of OPAGs within CAS.

8. ACTION ITEMS: REVIEW OF PREVIOUS AND CONFIRMING PRESENT ITEMS

The action items from the 7th CAS MG meeting held on 5 September 2012 via teleconference were discussed as per the table below. The community accepted the progress report presented but Dr Grimm indicated that the Item 4 related to the MJO impacts over South America and the S2S project should be maintained, as this has not been addressed to her satisfaction.

	Action Item	Status/Comment
01	CAS MG agrees that more inputs are required on the post THORPEX follow-on programme from major operation centres and supported such requests by Dr Dickinson.	Done – T. Nakazawa and Chair ICSC THORPEX has widely consulted via WWRP JSC, THORPEX ICSC and THORPEX EC and with major operational centres (ECMWF, UK MetOffice etc.) on the THORPEX follow-on projects.
02	H. Volkert was invited to provide written input reflecting the IAMAS views on the post THORPEX follow-on to A. Dickinson.	Done – H. Volkert provided written comments to Dr Dickinson on 27 March 2012 covering: <ul style="list-style-type: none"> ▪ Interaction National Meteorological Services (NMS)/WMO Academia/IAMAS; ▪ THORPEX 2005-2014: A good example of close cooperation between NMS/WMO and academia; ▪ THORPEX follow-on: Keep the momentum! The letter from H. Volkert is attached (ANNEX I).
03	O. Hov and L. Jalkanen were requested to include a discussion at the OPAG EPAC meeting (April 2013) on how to optimise the linkages between GAW, IGBP, IGAC etc., in context of the ICSU Future Earth Initiative in the best interest of GAW.	Done - GAW-2013 symposium included an invited presentation on IGAC by Paul Monks: http://www.wmo.int/pages/prog/arep/gaw/documents/GAW-2013-Monks.pdf Links, mutual benefits, cooperation and funding sustainability of and between GAW and related initiatives were discussed at the JSC OPAG EPAC.
04	T. Nakazawa to ensure that a case study on MJO influences on the sub-seasonal to seasonal time scale be included in the S2S project for South America.	Done – MJO is included as an integral part of the S2S project plan.
05	CAS MG understands that the Polar Prediction Project will merge with WCRP Polar Climate Predictability Initiative in future and would like to know the plan to merge. WMO Secretariat will report the status on this in the next MG meeting.	Ongoing - WMO Secretariat promotes the cooperation between the two initiatives and facilitates and favours a bottom-up approach in which scientific community promotes and responds to the obvious advantages of a converging initiative.
06	J. Butler and L. Jalkanen to work towards a poster on the IGIS at the Extraordinary Congress on the GFCS and making handouts regarding this initiative available to Members.	Done – A poster was prepared and displayed during the Extraordinary Congress in end November 2012. The IGIS will be discussed further under item 3.4 during the 8 th Session of the CAS MG.

The CAS MG agreed on the following action Items from the 8th CAS-MG meeting:

Action Item CAS MG8.1

In reference to an ICAO request to CAS for GAW to assist in establishing best practices related to the observation of volcanic ash using lidar, ceilometer and other sensors in an integrated manner, the President of CAS is tasked to formally write to the Chair of ICG-WIGOS proposing that WIGOS (including GAW and CIMO structures) give priority to this request and to use it as a practical showcase of the benefits of WIGOS in addressing user defined observational needs.

Action Item CAS MG8.2

CAS MG strongly encourages the Chair of the PPP Steering Group to make an early start in the planning of the Year of Polar Prediction (YOPP) scheduled in 2017-2018, including appropriate focus on atmospheric chemistry and composition, the contribution by space agencies and satellite operators, data and product exchange based on WIGOS and WIS, and establish a dedicated team for YOPP planning and execution.

Action Item CAS MG8.3

CAS MG members are requested to actively promote the three THORPEX legacy projects (Polar Prediction Research Project - PPP, Sub-seasonal to Seasonal Prediction Research Project – S2S, and High-Impact Weather Research Project - HIW) their value to society and encourage contributions, both in terms of expertise and financial resources.

Action Item CAS MG8.4

CAS MG requested Philippe Bougeault, Gilbert Brunet and Øystein Hov to develop three to four white papers, in cooperation with relevant experts from the CAS MG, based on their comprehensive presentations at the 8th CAS MG meeting in preparation for CAS-16 and then refine this further as input to the World Weather Open Science Conference in August 2014.

Action Item CAS MG8.5

CAS MG requested the President of CAS and D/ARE to promote and position the IG³IS as a unique science-based information system for climate services to support mitigation efforts, balancing the predominant adaptation agenda of the GFCS. At the same time, the best practices related to the building blocks of IG³IS as is being established in Europe, Asia, the USA and South America, should be used in designing a global system.

Action Item CAS MG8.6

The CAS MG requested the C/WWR to make available information on past, present and planned RDPs and FDPs (final report, plans etc) on the WWRP website as an information resource that would also assist in the sharing of knowledge and experience.

Action Item CAS MG8.7

In reference to a growing need globally to ingest weather radar data for NWP data assimilation, the President of CAS is tasked to formally write to the Chair of ICG-WIGOS proposing that WIGOS (including WWRP, CBS and CIMO structures) give priority to this request and to use it as a practical showcase of the benefits of WIGOS in addressing user defined observational needs.

Action Item CAS MG8.8

CAS MG encourages the THORPEX community to compile a database of publications and science contributions, which could be included in the THORPEX overview paper being planned under the leadership of David Parsons.

Action Item CAS MG8.9

CAS MG supports the proposed key goals of the HIW Project:

1. Improve our understanding of the factors that determine the predictability of high impact weather through observation and analysis of processes in the physical environment and through diagnosis of model errors;
2. Enhance the capability to forecast weather impacts through improved multi-scale data assimilation and prediction of the relevant variables;
3. Produce more relevant forecasts and warnings through assessment of the impact of the predicted hazard on individuals, communities and businesses, their vulnerability and hence the risk;

4. Grow trust in forecasts through evaluation of forecasts & warnings of hazards & their impacts;
5. Achieve more effective responses to forecasts through better communication of forecasts & warnings of hazards & their impacts.

CAS MG recommends to the JSC WWRP and ICSC THORPEX to ensure that the emphasis of the HIW Project is on high resolution (i.e. convective scale), short time scales and specifically addresses those aspects not covered by THORPEX. It is understood that the HIW Project can be extended to longer lead times (at most two weeks) if the seamless framework of high-impact weather forecast justify it. Two examples are: (i) in support of the research and development of new products for forecasting high-impact weather. The GIFS-TIGE WG was mandated to achieve this goal and it is suggested that the HIW Project take over that aspect; and (ii) the field campaign T-NAWDEX aims at understanding the origin, many days in advance, of diabatically generated Rossby wave trains in the N. Atlantic, their breaking characteristics over Europe, and the predictability of the resulting HIW, especially organized convection associated with residual PV filaments.

Action Item CAS MG8.10

The CAS MG requested CAS President to share the gender statistics of CAS as presented to the committee by Mariane Diop-Kane with the Chair of the EC Gender Mainstreaming Committee and the Presidents of Regional Associations and Technical Committees.

Action Item CAS MG8.11

The CAS MG requested D/ARE to work with WMO Communication Department to develop a communication strategy to ensure active participation of CAS members and to facilitate reaching quorum at CAS-16

Action Item CAS MG8.12

CAS MG members are requested to suggest organizing committee members as well as keynote speakers for the CAS-17 TECO scheduled for 18-19 November 2013 to assist the co-chairs Drs Hov and Brunet by 31 May 2013 aligned to the six themes:

- High-impact weather and its socio economic impacts
- Water and its importance in the Earth System
- Finding the balance between climate change mitigation and adaptation through improved information on Greenhouse gasses
- Aerosols and their consequences on humans and the weather and climate system
- Urbanization, megacities and large urban complexes
- Evolving technology (including computing power, social media, observations and satellite technology, geoengineering etc.)

Action Item CAS MG8.13

D/ARE was requested to make the list of CAS members as captured on the WMO database available to the CAS MG by 31 May 2013.

Action Item CAS MG8.14

The CAS MG recommended C/AER investigate whether Megacity-related projects or initiatives around the world, some under the sponsorship of other organizations, such as IGBP, UNEP, or perhaps within WMO (e.g. DRR) to find out if some form of global coordination under a

WMO led initiative could be put together so that lessons learnt, scientific expertise, capacity building or sharing, could be enhanced.

Action Item CAS MG8.15

The CAS MG requested D/ARE to ensure that all the presentations made at the CAS MG are available on the web by 31 May 2013 and inform the CAS MG members of the link.

Action Item CAS MG8.16

The CAS MG requested the Chair of S2S Project Team to consider as part of their research a specific case study focusing on South America demonstrating possible prediction value of the MJO over that region.

Action Item CAS MG8.17

The CAS MG requested the secretariat (D/ARE, C/AER and C/WWR) to review all ToR related to CAS substructures so that these can be considered for approval at CAS-16 in November 2013.

9. CLOSURE OF THE MEETING

Dr Béland thanked all the members for what was a highly productive meeting that significantly contributed to the thinking required to prepare for CAS-16 and lay the foundation for the future work of the Commission. He in particular thanked the members for the thorough thought they have given in preparing the series of talks at the meeting. He wished all well on the return journeys.

The meeting was adjourned at 12:00 on Saturday 25 May 2013.

INTERNATIONAL ASSOCIATION OF METEOROLOGY AND ATMOSPHERIC SCIENCES (IAMAS)

within the International Union of Geodesy and Geophysics (IUGG)



Secretary-General

Dr. Alan DICKINSON
UK Met Office
Exeter, U K

27 March 2013

IAMAS view about THORPEX follow-on; ref. CASMG07/ACTION 2

Dear Dr. Dickinson,

in preparation of the coming meeting of the WMO Commission for Atmospheric Sciences Management Group meeting (CASMG08) I would like to provide you with a three-part IAMAS view regarding the THORPEX follow-on initiative.

Interaction National Meteorological Services (NMS)/WMO ↔ Academia/IAMAS

In the atmospheric part of the geophysical sciences the NMS have been developing a very strong position through their operational duties of running observational networks, suites of numerical weather prediction (NWP) models and increasingly also by providing climate services. WMO fosters the global cooperation as inter-governmental organization between the NMS of its 185 member states. IAMAS, on the other hand, acts as semi-autonomous non-governmental organization under the umbrella of IUGG making use of the personal network of researchers (mostly from university institutes and research laboratories; some also from research departments of NMS) as members of its 10 international commissions (cf. list at right side). It was repeatedly demonstrated that a close cooperation between both 'camps' is especially conducive to progress (cf. e.g. the historical accounts within the Radiation and Ozone Commissions of IAMAS [www.iamas.org/Reports] or editorial and some articles in the latest newsletter of ECMWF where the links between research and operations tend to be especially tight [www.ecmwf.int/publications/newsletters/pdf/134.pdf]).

THORPEX 2005-2014: A good example of close cooperation between NMS/WMO and academia

About a decade ago the initiative for what was to become THORPEX came from the research community outside of the NMS. Alan Thorpe (then university of Reading, UK) and Melvyn Shapiro (NOAA and NCAR, USA) took the lead within a larger grouping in academia. Experiences from previous initiatives as the *First GARP Global Experiment* (FGGE, 1979) and the *Fronts and Atlantic Storm-Track Experiment* (FASTEX 1997), which had clear links between academia and NMS/WMO, were taken into account. The broad range of results will be made visible at the *World Weather Open Science Conference* in August 2014. Already now these facets appear noteworthy:

- integration of THORPEX into WWRP of WMO including national contributions to a trust fund,
- a series of large regional campaigns in different parts of the globe,
- national research initiatives towards THORPEX aims (e.g. in Canada, Germany, Japan, Korea, Norway, Switzerland, UK, USA),
- joint human resources projects between NMS and universities (e.g. Hans Ertel Centres [HERZ] in Germany)
- IAMAS involvement mainly through ICDM.

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Secretary-General

THORPEX follow-on: Keep the momentum!

IAMAS is aware that various initiatives were started to transform the momentum generated by THORPEX into a newly focused programme from 2015 onwards. The recent townhall-meeting at the AMS annual meeting (cf. www.pandowae.de/files/TH-HIW/townhall_summary_v3.pdf) as well as a series of combined international workshops in Germany plans for a T-NAWDEX field campaign in 2016 (cf. www.pandowae.de/en/newsevents) and future combined aircraft campaigns using the Gulfstream 500 crafts from NCAR and DLR are examples.

Within IAMAS work will be once more concentrated within ICDM. Additionally contributions will be sought from ICACGP concerning air-chemistry issues, as well as from ICCP for diabatic processes in clouds, IOC for stratospheric ozone issues and ICPM for an envisaged focus on polar regions.

In the light of the previous sections it appears decisive that a sufficient number of NMS realize and underscore the potential of a thorough integration into the THORPEX follow-on initiative of the next generation of active researchers who at present reside mainly in academic environments.

* * *

I hope that my - at this stage rather general - remarks will be useful for the planning process towards OSC-2014 and beyond.

With kind regards

Yours sincerely

Secretary-General, IAMAS

comprising the

International Commission on Atmospheric Chemistry and Global Pollution

International Commission on Atmospheric Electricity

International Commission on Climate

International Commission on Clouds and Precipitation
Committee on Nucleation & Atmospheric Aerosols

International Commission on Dynamical Meteorology

International Commission on the Middle Atmosphere

International Ozone Commission

International Commission on Planetary Atmospheres and their Evolution

International Commission on Polar Meteorology

International Radiation Commission

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8th MEETING OF THE WMO/CAS MANAGEMENT GROUP
Geneva, Switzerland, 23-25 May 2013

List of Participants

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8th MEETING OF THE WMO/CAS MANAGEMENT GROUP**Geneva, Switzerland, 23-25 May 2013****PROGRAMME****THURSDAY, 23 May 2013****1 - ORGANIZATION OF THE SESSION**

14:00 – 14:10	Welcome	WMO Secretary-General or representative
14:10 – 14:15	Opening Remarks by the president of CAS	Michel Béland
14:15 – 14:20	Opening Remarks by the Director of the Atmospheric Research and Environment Branch	Deon Terblanche
14:20 – 14:30	Adoption of the Agenda	Michel Béland / Deon Terblanche

2 - REPORTING

14:30 – 14:45	Report of the CAS President	Michel Béland
14:45 - 15:00	Report of the Chair of JSC OPAG-EPAC	Øystein Hov
15:00 - 15:15	Report of the Chair of JSC OPAG-WWRP	Gilbert Brunet
15:15 – 15:30	Report of the Chair ICSC THORPEX	Tetsuo Nakazawa (on behalf of A. Dickinson)
15:30 – 15:45	Report of the Chairs of WGNE	Andy Brown
15:45 – 16:00	Report of the Director of the AREB	Deon Terblanche

4 - PARTNERSHIP AND CROSS CUTTING ISSUES

16:00 – 16:30	Global Framework for Climate Services (GFCS):	Filipe Lucio
16:30 – 17:00	WCRP: Views on Joint Research Initiatives in Support of Seamless Services	Ghassem Asrar
17:00 – 17:30	WIGOS: Progress and Opportunities	Sandro Fuzzi (<i>via teleconference</i>) / W. Zhang
17:30 – 18:00	Discussion	

FRIDAY, 24 May**3 - OVERVIEWS AND STRATEGIC ADVICE OF THE MANAGEMENT GROUP MEMBERS**

09:00 – 09:30	Polar Research Activities	Elena Astakhova
09:30 – 10:00	Emerging Issues in the next 20 years of Relevance to WWRP and GAW	Philippe Bougeault
10:00 – 10:30	The balance between fundamental research and socio-economic applications	Gilbert Brunet
10:30 – 10:45	Coffee break	

10:45 – 11:15	Implementing an Integrated Greenhouse Gas Information System	James Butler
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3 - OVERVIEWS AND STRATEGIC ADVICE OF THE MANAGEMENT GROUP MEMBERS *(cont'd..)*

11:15 – 11:45	A holistic review informing the THORPEX legacy	Gilbert Brunet
11:45 – 12:15	Gender balance within CAS	Mariane Diop-Kane
12:15 – 14:00	Lunch break	
14:00 – 14:30	Progress on CAS-15 Actions	Alice Grimm / Bhawoodien Parker
14:30 – 15:00	GAW response to a growing needs for data	Øystein Hov
15:00 – 15:30	Megacities and large urban complexes:	Yunfeng Luo
15:30 – 15:45	Coffee break	
15:45 - 16:15	WGNE priorities for the next 5-10 years	Andy Brown
16:15 – 16:45	Cooperation between the academic and I operational weather communities	Hans Volkert

5 - THORPEX LEGACY

16:45 – 17:15	Three Legacy Projects: Progress Report	Tetsuo Nakazawa
17:15 – 17:45	Post THORPEX Impact on WWRP Structures	Tetsuo Nakazawa
17:45 – 18:00	Discussion	

SATURDAY, 25 May

6 - CAS-16 AND OTHER UPCOMING EVENTS

09:00 – 09:30	The World Weather Open Science Conference (Montreal, 16-21 August 2014)	Michel Béland
09:30 – 10:00	CAS Technical Conference “Responding to the Environmental Stressors of the 21 st Century” (Antalya, Turkey, 18-19 November 2013)	Tetsuo Nakazawa / Liisa Jalkanen
10:00 – 10:30	CAS 16 th session (Antalya, Turkey, 20-26 November 2013)	Michel Béland / Deon Terblanche
10:30 – 10:45	Coffee break	

7 - LEADERSHIP, MEMBERSHIP AND TERMS OF REFERENCE (ToR) FOR CAS STRUCTURE

10:45 - 11:15	Leadership, membership & ToR CAS structure	Michel Béland
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8 - ACTIONS ITEMS: REVIEW OF PREVIOUS AND CONFIRMING PRESENT ITEMS

11:15 – 11:45	Progress regarding Actions Items of the 7 th Meeting CAS Management Group (5 Sept 2012) and new Action Items of the 8 th Meeting	Deon Terblanche
11:45 – 12:00	Closing remarks	Michel Béland / Deon Terblanche
12:00	Adjournment	