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COMMISSION FOR BASIC SYSTEMS

OPEN PROGRAMME AREA GROUP ON INTEGRATED OBSERVING SYSTEMS

EXPERT TEAM ON SATELLITE UTILIZATION AND PRODUCTS

SCOPE-Nowcasting Ad-hoc Steering Group

1st Session

GENEVA, SWITZERLAND

19-22 NOVEMBER 2013

FINAL REPORT

Regulation 42

Recommendations of working groups shall have no status within the Organization until they have been approved by the responsible constituent body. In the case of joint working groups the recommendations must be concurred with by the presidents of the constituent bodies concerned before being submitted to the designated constituent body.

Regulation 43

In the case of a recommendation made by a working group between sessions of the responsible constituent body, either in a session of a working group or by correspondence, the president of the body may, as an exceptional measure, approve the recommendation of behalf of the constituent body when the matter is, in his opinion, urgent and does not appear to imply new obligations for Members. He may then submit this recommendation for adoption by the Executive Council or to the President of the Organization for action in accordance with Regulation 9(5).

SCOPE-Nowcasting-1 Ad-hoc Steering Group

1st Meeting, 19-22 November 2013
WMO, Geneva, Switzerland

Final Report

1. Opening

1.1 Welcome and Introduction

C. Richter opened the meeting on behalf of the WMO Director of the Department for Observing and Information Systems (D/OBS) and Director of the Space Programme (D/SAT), Dr Wenjian Zhang, who regretted not being able to attend. Using the recent typhoon Haiyan as an example, she emphasized that to minimise impact life and property, an ability to understand and predict such extreme events is paramount. In this context, satellites are an important tool for deriving real-time information about such events, highlighting the importance of the SCOPE-Nowcasting initiative.

1.2 Adoption of the agenda

S. Bojinski introduced the agenda to participants, and it was subsequently adopted with no change.

1.3 Working arrangements

S. Bojinski informed the group on the working arrangements for the meeting and stressed the following:

- the meeting is designed as a workshop with clear objectives and outcomes;
- the meeting brings together a range of backgrounds and fields of expertise; and
- SCOPE-Nowcasting is a relatively new initiative and there is the opportunity to modify, and strengthen aspects of the concept, refine pilot projects, and drop components if they appear unrealistic or incoherent.

The ET-SUP Chair and workshop facilitator, A. Rea, stressed that this first face-to-face meeting affords a critical opportunity to move SCOPE-Nowcasting from concept to reality.

Participants introduced themselves in a tour-de-table. A. Rea emphasised that the initiative must be firmly based on user requirements, and that it considers the need to bridge the “last mile” - the delivery, uptake and visualisation of the data. A cross-section of users was represented at the workshop through NMSs (BoM, CMA, IMD, JMA, KMA), SWFDP and the WWRP Nowcasting Working Group. Satellite operators were also represented through CMA, ESA, EUMETSAT, JMA, KMA and NOAA.

Meeting documents and presentations are available for download at:
http://www.wmo.int/pages/prog/sat/meetings/SCOPE-Nowcasting-1.php

2. Conceptual Overview

A. Rea presented the SCOPE-Nowcasting concept and objectives which has undergone refinement since ET-SUP-7 (May 2013).

Benefits of sustained, coordinated generation of consistent nowcasting products are expected to be:

- improved access to satellite data by member states;
- improved confidence in products generated through SCOPE-Nowcasting;
- reduced operating costs associated with technological change and software upgrades;

- reduced training overheads; and
- improved cooperation between NMHSs through access to shared products.

To achieve this, the satellite products should:
a) have a long-term stable status, beyond individual satellite missions;
b) be generated operationally in a routine and repeatable manner; and
c) include provisions for smooth transition between different satellite sources, in order to minimize the impact on users' processing and forecasting systems, and reduce training needs (Source: Doc. 2.1)

He recalled the *SCOPE-Nowcasting 2012-2014 Project Plan* (Doc. 2.1, Annex III) and noted that the initiative was on track in terms of milestones. Rea outlined the criteria for SCOPE-Nowcasting pilot projects which were established and agreed at ET-SUP-7 (and provided in Doc. 2.2). Most importantly, to warrant international effort and inclusion as a SCOPE-Nowcasting Pilot, projects should be concerned with multi-satellite data and involve multiple agencies.

The meeting noted that that the *WMO CBS Statement of Guidance for Nowcasting* defines *nowcasting* as the zero to two-hour range, and *very short-range forecasting* as two to twelve hours. These definitions were adopted by the meeting.

3. Nowcasting: Users and Drivers

3.1 Severe Weather Forecasting Demonstration Project (SWFDP)

A. Soares briefed on objectives and current status of the WMO Severe Weather Forecasting Demonstration Project (SWFDP) which is a project carried out by WMO/CBS primarily to enhance the use of output from existing numerical weather prediction systems, including ensemble prediction (NWP). The SWFDP aims at capacity building in helping developing countries to access and improve their use of existing NWP products for improving warnings of hazardous weather conditions and weather-related hazards.

The SWFDP has dramatically improved the lead-time of alerting of severe weather in the medium-range, however, the issuing of warnings of imminent threat is part of forecasting in the first few hours of the forecast range, where a blend of nowcasting tools and high resolution NWP limited area models should be used.

While satellite data processing systems have proven as powerful tools for forecasting, the products could be more effectively used, and possibly further developed for operational forecasting. Especially in developing and least developed countries, where weather radars are few or non-existent, expertise and capacities need to be dramatically increased.

There is synergy between SWFDP and SCOPE-Nowcasting, by potentially tailoring SCOPE-Nowcasting Pilot Project(s) to SWFDP regions. Current Regional SWFDP Projects are:

- Southern Africa (ongoing; 16 countries; with Regional Specialized Meteorological Centre (RSMC) Pretoria and RSMC-Tropical Cyclones (TC) La Réunion)
- Southwest Pacific Islands (ongoing; 9 island states; with RSMC Wellington, RSMC-TC Fiji)
- Eastern Africa (ongoing; 6 countries; with RSMC Nairobi, Regional Forecasting Support Centre (RFSC) Dar)
- Southeast Asia (in development; 5 countries; with RFSC Hanoi)
- Bay of Bengal (in development; 6 countries; with RSMC-TC New Delhi)

In total, these projects involve 41 NMHSs in developing countries, 29 of which are least-developed countries and small-island developing states.

Projects have developed implementation plans, with some indication of satellite-related user requirements. These requirements would need refinement. Typical high-priority products include quantitative precipitation estimates (QPE), convection products, ocean surface winds, hail and lightning products, volcanic ash and dust.

3.2 Nowcasting Research

M. König gave an overview of the WMO World Weather Research Programme (WWRP) and its components. The WWRP mission statement is to *advance society's ability to cope with high impact weather through research focused on improving the accuracy, lead time and utilization of weather prediction*. WWRP maintains a *Working Group on Nowcasting Research*, which commissions Research Development Projects (e.g. observational field experiments) and Forecasting Demonstration Projects.

Such projects have helped build weather forecasting support to the Beijing 2008, the Vancouver 2010 and the Sochi 2014 Olympic Games. M. König described the Lake Victoria night-time convection phenomenon which is confirmed by satellite imagery statistics. In this example, which highlighted the value of satellites to nowcasting, rapidly developing convective systems can be captured and to some extent forecast using a “near-cast” system which shows moisture pools over the Lake.

3.3 QPE from Satellites and IPWG

D. Vila presented the objectives and activities of the WMO-CGMS International Precipitation Working Group (IPWG). He described the basics of satellite-based rainfall estimation methods, including their strengths and weaknesses: IR-based methods (empirical, higher repeat cycles) versus MW-based methods (physics-based, lower repeat cycles).

He noted that, given the multitude of satellite sensors and algorithms available, one key question is how to reconcile and blend different products, and how to validate these. IPWG and also SCOPE-Nowcasting could play an important role in this area. As examples, on the IPWG website, global precipitation datasets are listed with update frequency and latency; and IPWG has also developed a common validation protocol which is routinely applied to these datasets.

The group noted that no major improvements to these datasets are expected from new generation of geostationary imagers, since the IR-based retrievals rely on empirical techniques to estimate the rainfall rate based on cloud top temperatures.

3.4 Volcanic Ash Detection and Quantification

M. Pavolonis gave an overview describing three main types of volcanic ash clouds: ash-enriched clouds, ice-topped umbrella clouds (observed mostly during major eruptions, with high ash concentration), and SO_2 clouds. He noted that there was no single satellite sensor with all the attributes necessary to comprehensively detect and describe all types of volcanic ash clouds.

Possible attributes of advanced algorithmic approaches include mass determination and detection of rapidly evolving clouds. Some eruptions can still be missed if shrouded in clouds, by many hours (e.g., 2011 eruption in Eritrea which caused very high SO_2 concentrations, plus ash).

The group noted that standardisation and operational reliability of products in this area was difficult to achieve, and that validation was, inter alia, dependent on mineral composition. Validation is also difficult due to the existence of relatively few test cases.

3.5 Sand and Dust Monitoring

H. Kunimatsu provided an overview of sand and dust-related satellite products from different providers, including JMA. Some questions arose about availability of these products. Currently, quantitative information from these products is not sufficient to be used in data assimilation.

3.6 ESA Support to Aviation Control Service

C. Zehner introduced ESA projects in the areas of: volcanic ash detection, SO_2 detection and modelling. All VAACs are subscribed users of the ESA Support to Aviation Control Service (SACS) service, which is a detection and warning service based on polar-orbiting satellite data. Development of this service has been conducted in close collaboration with end users, whose requirements have been documented. Options are being explored how to put this service on a sustained footing.

3.7 EUMETSAT Nowcasting SAF

M. König explained the distributed EUMETSAT Satellite Application Facility concept, with the SAF Nowcasting as the first founded in 1996. EUMETSAT Members and cooperating states are considered as primary users; in addition, any organization can apply to become a user of NWC-SAF. NWC-SAF source code is distributed and can be modified (e.g., for research purposes), including the algorithm. Some users in less developed countries have experienced difficulties in locally installing and using the software.

NWP model fields are used as background (there is a default that can be modified, or be omitted). Geostationary and polar packages are maintained under different responsibility within the NWC-SAF consortium. She presented some examples for rapidly-developing thunderstorm and wind products.

3.8 KMA Experience with Nowcasting Software

E. J. Cha described most common severe weather events in the Republic of Korea. Typhoons account for the majority of loss of life and property. Heavy rainfall and snowfall events are also common. Satellite-based nowcasting is very important to provide forecasters with appropriate information about such events. She explained the typhoon monitoring and analysis system maintained by KMA.

KMA introduced the NWC SAF software package in 2009, and applied it to data from COMS. KMA have plans to generate standard RGB products for the next generation of geostationary imagers, along with advanced visualization systems.

3.9 New generation of geostationary satellites

S. Bojinski gave an overview of the next generation of geostationary satellites to be launched and operated over the next five years, including Himawari-8, Fengyun-4A, GEOKOMPSAT-2A and GOES-R.

4. Data Access and Visualization

4.1 Satellite data distribution and access mechanism

A. Rea outlined the range of global (satellite) data distribution systems. These include direct readout, DVB-S (GeoNetCast) systems, WMO GTS, Internet (ftp, website, ADDE and mapserver).

The strengths and weaknesses of each system were discussed as background information for the subsequent discussions.

4.2 Visualization tools

S. Bojinski provided an overview of common data visualization tools, some of which are specifically designed for satellite datasets. Such tools are necessary for processing and analysis of satellite imagery and products, including for nowcasting applications.

5. Pilot projects

S. Bojinski introduced doc. 5(1) which summarized the description of all pilot Projects and should be used as the working basis for the meeting. Its updated version includes forward action plans (see Annex I).

5.1 Basic nowcasting

A. Rea (BoM) summarized the key user requirements as (i) low latency, (ii) consistency in product representation and data format, and (iii) low-volume products for users with limited bandwidth. He recommended adoption of standards for selected RGB composites, and the tuning of products to account for differences in spectral response functions. BOM could offer to host products from other providers, as single point of access for the SW Pacific, as part of their WIS Global Information System Centre (GISC) responsibility.

X .Fang (CMA) described basic nowcasting products from FY-2 (4 imagery, 10 weather products). The SWAP software is used for nowcasting purposes. Dissemination is done via direct readout, CMACast, and the internet. He identified scope for harmonization in the areas of: data format, region connections, standard display (colour schemes). CMA commit to continuing the FY-4 programme.

H. Kunimatsu (JMA) introduced the JMA perspective and noted a possible commitment to provide RGB composites on the JMA/MSC website.

E. J. Cha (KMA) showed KMA-internal user requirements and highlighted the 52 products planned to be generated from GEOKOMPSAT-2A. KMA will maintain L/HRIT dissemination for GEOKOMPSAT-2A.

To launch the discussion, A. Rea focussed on the consistency of RGB composite products: assuming that RGB composites are within the range of possibilities of all providers, one would have to decide on which standards to adopt. As none of the Asia-Pacific providers currently generate RGBs there is an opportunity to begin with an agreed, consistent approach. WMO, in collaboration with EUMETSAT, have recommended standards for RGB composites[1]. Additional action may lie in harmonizing data formats.

M. König (EUMETSAT) remarked that the upcoming geostationary imagers all had similar channels and allow that consistent RGB composites be generated from them. Training would be necessary to convey the information content of these RGBs.

The participants noted that the break-out group should elaborate on (i) which RGBs to choose, (ii) whether regional or contextual tuning is necessary (e.g., in support of the SWFDP Regional Projects), and (iii) dissemination and visualisation mechanisms.

It was also noted that colour blindness may impact a proportion of users' ability to use these products and that in many cases quantitative information was needed in parallel.

[1] http://www.wmo.int/pages/prog/sat/documents/RGB-WS-2012_FinalReport.pdf

5.2 Advanced Nowcasting for Aviation (Volcanic Ash)

A. Rea (BOM) pointed out that CGMS had expressed an interest in consistently generating volcanic ash products. SCOPE-Nowcasting could play a role in endorsing and focussing on a baseline product, acknowledging that development of state-of-the-art products would continue. Volcanic ash products are accessed by a range of users including VAACs and also the airlines directly.

M. König (EUMETSAT) described the volcanic ash product development by EUMETSAT, using the SEVIRI instrument. Simple brightness temperature differences have been applied to tracking the Eyjafjallajökull event; however, the relatively small number of available test cases means that it is uncertain whether the method would work for other source types. The SEVIRI product has ash effective radius, mass loading, and height (incl. quality) per pixel, and is distributed (in netCDF) to EUMETSAT Member States, and the London and Toulouse VAACs.

Most regions of the world have a policy that aircraft should avoid ash that is discernible by a skilled human observer (i.e. “zero tolerance”).

H. Kunimatsu (JMA) reported on the establishment of a volcanic ash retrieval algorithm testbed where the output from different algorithms can be compared. This will be done for EUMETSAT and NOAA algorithms, and in close collaboration with Tokyo VAAC. The testbed consists of a database of historical cases, incorporating validation data from CALIPSO, in-situ data and past VAAC advisories; this project still in the build-up phase and is open to comments.

M. Pavolonis gave the NOAA perspective; the VAACs in Washington and Anchorage have responsibility for large areas. NOAA also operates Met Watch Offices. Algorithm development at NOAA aims at exploiting all sensors in orbit, that is, for volcanic ash detection, both LEO and GEO-based instrumentation is being used based on an optimal estimation approach, including Bayesian classifiers and general cost function. In addition, a near-real time volcanic eruption alert system is in place, exploiting the presence of rapidly changing gradients in satellite imagery during an eruption.

M. Pavolonis indicated that, internationally, the biggest single weakness with VAACs was that major eruptions could occur and remain undetected for hours, especially in unexpected places.

5.3 Precipitation products

D. Vila (INPE) described the components of the global precipitation product developed under this pilot project. It includes accumulated rainfall from microwave instruments and geostationary rainfall estimates from the HydroEstimator. NASA makes the underlying datasets available on a quasi-operational, best-efforts basis.

The group agreed that blended products were overall more powerful than single-source techniques.

The group discussed the potential skill of the tool to capture high-impact extreme rainfall events and the strong need for this capability from users. Work is underway to reduce the latency of products, and to extrapolate nowcasts up to 2h ahead based on an observation forward tracking algorithm.

5.4 Real-time ocean wind product

S. Goyal (IMD) described the proposal to develop a web-based method for delivering mosaics of different scatterometer data sources, initially over the North Indian Ocean. The proposed platforms are ASCAT (on Metop-A and –B) with equator crossing time of LST 09:30, SCAT on HY-2A at LST 06:00, and OSCAT on Oceansat-2 at LST 12:00. The access details of scatterometer data from HY-2A, operated by CNSA/SOA, are still unclear and subject of a current Action at CGMS.

The group discussed a number of options for refining this project, including potentially extending to the SWFDP Region in the South-West Pacific. Visualization of the various scatterometry datasets was identified as a challenge for IMD.

M. König (EUMETSAT) also informed the group on scatterometer winds generated by EUMETSAT.

5.5 Dust Monitoring and Prediction Products

X. Fang (CMA) stressed the importance of dust products for China. He also recalled a ET-SUP-7 action committing CMA and JMA to investigate the use of the GOES-R dust algorithm to the upcoming Himawari-8 and Fengyun-4A missions.

The group reviewed user requirements for dust products and noted the products available from FY-2 and FY-3.

H. Kunimatsu recalled the ET-SUP-7 action and user requirements for sand and dust products. JMA are generating a MODIS-enhanced MTSAT product which has so far no cloud mask applied to it; surface observation data are necessary for validation.

The group discussed the potential exchange of ground-based validation data between CMA and JMA. It was also suggested that KMA participate in this pilot project, encouraging further cooperation and data inter-comparison.

6. Forward Action

The meeting broke into separate groups to discuss each of the pilot projects (see below). The aims of the breakout groups were to:

- review the pilot projects against the defined criteria;
- refine each pilot project concept, including scope and deliverables; and
- develop an action plan for each pilot for the next two years.

Project	Break-out Group Members
Pilot Project 1 – Basic Imagery	Eun Jeong Cha Daniel Vila Marianne König Suman Goyal
Pilot Project 2 – Advanced Products (Volcanic Ash)	Mike Pavolonis Claus Zehner Xiang Fang Hiroshi Kunimatsu
Pilot Project 3 – Advanced Products (Precipitation)	Daniel Vila Eun Jeong Cha Xiang Fang Mike Pavolonis
Pilot Project 4 - Ocean Products	Suman Goyal Marianne König Hiroshi Kunimatsu Claus Zehner
Pilot Project 5 – Atmospheric Composition (Sand and Dust)	Discussed in plenary

The summary of the breakout groups, including forward action plans, is given in Annex I to this document.

7. Joint session with WMO/IUGG Volcanic Ash Scientific Advisory Group

The 4th meeting of the WMO/IUGG Volcanic Ash Scientific Advisory Group (VASAG) was held on 21-22 November 2013 at WMO HQ, concurrently with the SCOPE-Nowcasting meeting. Co-chairs of VASAG are Andrew Tupper (BOM) and Larry Mastin (USGS). The two groups had a one-hour joint session for an exchange of views.

A. Rea gave an overview presentation, describing the SCOPE-Nowcasting concept and focusing on Pilot Project 2 (volcanic ash products).

M. Pavolonis explained the preliminary results of the discussion in the SCOPE-Nowcasting meeting related to volcanic ash. He focussed on concrete actions that could potentially be achieved in a short timeframe: provision of email alert services to VAACs. Secondly, that an intercomparison activity should aim at (i) define spread in value of user importance (mass loading, height, detection) and (ii) define basic validation standards.

From the point of view of VASAG, the joint session was warmly received. VASAG noted that, from the point of view of the States involved, this initiative to propose volcanic ash as a SCOPE-Nowcasting trial project, amongst other things, represents part of a proactive response to the Joint ICAO/WMO State Letter AN 10/18.3-13/53 of May this year (copy provided in Annex III, along with statement by VASAG co-chairs).

VASAG was also enthusiastic about the proposed intercomparison work, in support of continuous improvement of techniques and their implementation. Having better, efficiently implemented, and global volcanic cloud products (including ash and SO_2) would certainly support the joint aims of ICAO and WMO in this area and particularly support VAAC operations. It would help improve the quality of information available for aviation risk management.

VASAG indicated that they look forward to continued active dialogue in this regard, and proposed Michael Pavolonis as the key contact for the WMO-IUGG Volcanic Ash Science Advisory Group

8. Governance

S. Bojinski summarized the governance arrangements for SCOPE-Nowcasting, as per the agreed concept. In light of the discussion held at the meeting, the group agreed on the following:

<u>Action SNWC-1:</u>
ET-SUP Chair and WMO Secretariat to draft ToR for SCOPE-Nowcasting Steering Committee, by Apr 2014.

<u>Action SNWC-2:</u>
WMO Secretariat to send letters to participating organizations, formalizing the Steering Committee membership, including ToR, report from first meeting, current ad-hoc members, by Feb 2014

<u>Action SNWC-3:</u>
WMO Secretariat to set up a web presence for SCOPE-Nowcasting on the WMO Space Programme webpage, by Feb 2014

<u>Action SNWC-4:</u>
M. König to investigate adaptation of the SCOPE-CM logo to SCOPE-Nowcasting, by Feb 2014.

These Actions will be part of a report on SCOPE-Nowcasting to the 8th session of ET-SUP in April 2014.

9. Summary and Conclusions

A. Rea and WMO Secretariat expressed their sincere thanks to all participants for their contribution to the meeting.

Once the new geostationary INSAT-3D is operational, a contribution of IMD to Pilot Projects 1 and 5 should be considered.

The group agreed to hold a teleconference in March 2014.

A. Rea closed the meeting at 15.30 on 22 November 2013.

ANNEX I: Updated Pilot Projects and Forward Action Plans

PILOT PROJECT 1: Basic Nowcasting

Overall comment by meeting participants:
The group discussion was only on RGB composites, but the proposed way forward can be equally applicable to product visualizations; the project needs to consider data dissemination and visualization.

Theme:	RGB composites and enhancements, visible and infrared imagery, precipitation potential products and cloud products
Lead:	Anthony Rea (BoM) and satellite operator representatives
Region of Coverage:	WMO Region II (Asia) and Region V (South-West Pacific) (area of coverage of MTSAT-2, FY-2) – and mainly for the future advanced imagers onboard FY-4 (CMA), GEO-KOMPSAT-2A (KMA) and Himawari-8/9 (JMA). A specific target region is Region V where full resolution Himawari-8/9 data may not be available to all users because of reception station constraints. Making RGBs available would expose these users at least to some extent to the multi-spectral richness of the data. SWFDP participating countries in RA II and V should be a focus.
Users/Clients:	NMSs in Region II and V ; Users in SWFDP Regions
User requirements	VIS/IR imagery, 10 min latency; RGB composites, 10 min latency; Cloud masks and products; RGB composites seen as main need
Current needs & gaps	• No standard products available for region; • Low volume products are inconsistent and limited.
Providers:	CMA, JMA, KMA
Current Products and Access Points	Current imagers are not suitable for the generation of RGBs as per recommended standards Other standard imagery is available from the internet, DVB-S dissemination systems and the GTS.
Products from future satellites and expected access Points	CMA (FY-4A Advanced Geostationary Radiation Imager (AGRI), 14 channels) - CMACast (full res), web-based solution (products) JMA (Himawari-8/9 Advanced Himawari Imager (AHI), 16 channels) - Basic imagery, cloud products - Internet (full res), HRIT/LRIT via CTS (TBD; subset), JPG (low res) KMA (Geo-KOMPSAT-2A Advanced Meteorological Imager (AMI), 16 channels) - TBD
Host:	- CMA, JMA, KMA , BoM Australia: A one-point stop for the RGB products can be a web server hosted and maintained by BoM, i.e. dissemination method would be the internet; an additional distribution method could be a DVB-S-based service such as CMACast - SWFDP Regional Project websites should also be used for disseminating products
Expected benefits:	• Uniform low-volume products available to NMHSs in Asia-Pacific Region • Consistency of products across different satellite coverages facilitates information sharing and cooperation • Implement recommendations from RGB Satellite Products Workshop Sep 2012
Technical	Standard RGBs should be provided, following the recommendations outlined in the

details of planned product/service	first WMO/EUMETSAT RGB workshop (http://www.wmo.int/pages/prog/sat/documents/RGB-1_Final-Report.pdf) • Product content & format: Graphics images, GeoTIFF, netCDF: Especially GeoTIFF is seen as useful as that would allow geo-referencing and would allow reprojection, overlays with other data, etc., e.g. using tools like McIDAS-V • Access and dissemination: http, ftp, Mapserver (ADDE, GIS); a risk is the potential non-availability of the internet in emergency / natural disaster situations • Quality control: Intercalibration and cross-validation: RGBs may not be completely consistent between different advanced imagers because of differences in the filter functions; this is not seen as critical as the images are of qualitative nature and the impact of slightly different colour shades is expected small • Provisions for integration and sustainability: Through use of simple, standard data formats • Visualization: existing tools like SATAID/SWAP (maintained by CMA/JMA/KMA) will offer the functionality to create the standard RGBs for users who have access to the full data Other basic nowcasting products should be provided to SWFDP projects as per their demand.
Facility for user feedback	To be maintained by the Data Providers; existing user feedback fora in RA II and V
Forward Action Plan	**Action SNWC-PP1-1**: Develop standard RGB factsheet for collecting prioritized user feedback Who: BOM By when: 31 Jan 2014 **Action SNWC-PP1-2**: Investigate with RA II and RA V Satellite Data Users on their requirements for RGBs (type, size, format, delivery mechanism, latency). Who: H. Kunimatsu (for RA II), A. Rea (for RA V) By when: 31 Jan 2014 **Action SNWC-PP1-3**: Investigate with SWFDP projects on their requirements for satellite products including RGBs, precipitation, scatterometry Who: A. Rea, D. Vila and WMO Space Programme office, in coordination with SWFDP project office (A. Soares) By when: 31 Jan 2014 **Action SNWC-PP1-4**: Determine distribution pathways, formats and volumes for RGBs; this should include provision of visualization software to users with access to the raw data Who: A. Rea (BOM), H. Kunimatsu (JMA), X. Fang (CMA), E. J. Cha (KMA) By when: 30 Apr 2014 **Action SNWC-PP1-5**: Communicate to VLab the importance of organizing training events on RGBs (event weeks etc.) in RA II and RA V Who: ET-SUP Chair and WMO Space Programme office By when: 31 Jan 2014 **Action SNWC-PP1-6**: Review utility of standard RGBs in RA II and RA V based on Himawari-8 and FY-4A imagery Who: SCOPE-Nowcasting ad-hoc steering group, based on user feedback collected at AOMSUC and regional user groups By when: 6 months after availability of first datasets
Last Update	22 Jan 2014

PILOT PROJECT 2: Advanced Nowcasting: "Aviation"

Theme:	Globally-consistent volcanic ash products
Lead:	Anthony Rea (BoM) and CMA, ESA, EUMETSAT, JMA, and NOAA representatives
Region of Coverage:	VAAC regions of responsibility
Users/Clients:	Volcanic Ash Advisory Centres
User requirements	Short-term: Timely satellite-based detection of volcanic clouds (clouds with ash and/or SO_2) Long-term: Quantitative volcanic ash detection, ash cloud height, ash mass loading, SO_2 loading, and SO_2 height.
Current needs & gaps	Products are inconsistent in a variety of important ways: 1). Differing retrieved geophysical parameters, 2). Poorly known error characterization, 3). Performance is closely tied to background conditions (e.g. number and location of cloud layers) An algorithm inter-comparison is needed to help resolve product inconsistencies.
Providers:	CMA, ESA, EUMETSAT, JMA, KMA, NOAA
Current Products and Access Points	**CMA** Experimental split-window products from FY3 **JMA** Products: MTSAT-based split window channel difference (10.8-12) for VA detection (Prata algorithm) Product description: http://mscweb.kishou.go.jp/product/image/volcano/index.htm Use in VAAC Tokyo Developing product evaluation Testbed(CGMS-41 Action2) **ESA** - Support to Aviation Control Service (SACS), http://sacs.aeronomie.be (SO_2 , Absorbing Aerosol Index AAI using OMI, GOME-2, IASI, AIRS), funded by ESA **EUMETSAT** Volcanic ash RGB based on data from a combination of the MSG SEVIRI IR8.7, IR10.8 and IR12.0 channels, including the split window channel difference (10.8-12) (Prata algorithm) RT imagery: http://oiswww.eumetsat.org/IPPS/html/MSG/RGB/ASH/ **NOAA** Volcanic ash imagery and products based on GOES-13/15 and MTSAT (see above): http://www.ospo.noaa.gov/Products/atmosphere/vaac/satellite_imagery.html Product description: http://www.ospo.noaa.gov/Products/atmosphere/vaac/ Experimental quantitative volcanic cloud products and RGB's produced from a variety of LEO and GEO satellites on a global basis are available at http://volcano.ssec.wisc.edu
Products	TBD

[2] Action CGMS-41.26: "JMA to establish an environment to implement multiple algorithms to retrieve quantitative ash cloud parameters from operational satellites. This will serve as a test bed for the intercomparison of retrievals on an operational basis in the framework of SCOPE-Nowcasting. JMA is invited to perform an intercomparison based on historical data and report on this to CGMS-42."

from future satellites and expected access points	
Host:	Satellite operators
Expected benefits:	• Improved confidence in products generated through SCOPE-Nowcasting; • Improved consistency and timeliness of warnings from adjoining VAACs and better failover arrangements
Facility for user feedback	To be maintained by the Data Providers
Forward Action Plan	**Action SNWC-PP2-1**: Make the NOAA alert service available to all VAACs - service based on GEO satellites Who: Mike Pavolonis (NOAA) By when: mid 2014 **Action SNWC-PP2-2**: Determine satellite-based volcanic cloud retrieval inter-comparison workshop organizing committee Who: Mike Pavolonis (NOAA), Claus Zehner (ESA), Marianne König (EUMETSAT), and WMO By when: January 2014 **Action SNWC-PP2-3**: Determine participants, dates, and location of satellite-based volcanic cloud retrieval inter-comparison workshop Who: WMO and workshop organizing committee By when: March 2014 **Action SNWC-PP2-4**: Define test cases for inter-comparison, identify available validation sources, and define key common algorithm inputs (e.g. index of refraction for volcanic ash) Who: Workshop organizing committee By when: May 2014 **Action SNWC-PP2-5**: Host satellite-based volcanic cloud retrieval inter-comparison workshop with the following goals: 1). Establish basic product validation protocol, 2). Quantify differences (and overall spread) in products for pre-selected cases and begin interpreting the differences with the goal of identifying some best practices for extracting information on volcanic cloud properties and conveying the results to end users (no “winners” or “losers” will be declared). 3). Standardize volcanic cloud geophysical parameters relevant to VAAC and MWO operations, including units and associated quality flags Who: Workshop organizing committee By when: October 2014 **Action SNWC-PP2-6**: Finalize workshop report Who: Workshop organizing committee and participants By when: December 2014 **Action SNWC-PP2-7**: Use workshop results to define steps required to make products that meet the agreed upon standards available to users at VAACs. One possibility is the development of community software packages (e.g. CSPP, EUMETSAT SAF) that generate volcanic cloud products. The software packages

	would ideally allow users to generate products using multiple algorithms. Who: SCOPE-Nowcasting members By when: March 2015 ICAO should be kept informed on progress in this area (product provision and intercomparison) as appropriate. Further, the Group recommended that the SACS notification service be continued since all VAACs are already subscribed users.
Last Update	22 Jan 2014

PILOT PROJECT 3: Advanced Nowcasting: "Precipitation / Severe Rainfall Risk Reduction"

Theme:	Blended satellite global and regional precipitation product (GEO+LEO)
Lead:	Luiz Machado, Daniel Vila (INPE CPTEC)
Region of Coverage:	Global coverage, SWFDP regions
Users/Clients:	Civil authorities, NMHSs, Flash flood guidance systems, general users, SWFDP managers
User requirements:	Real-time Precipitation Intensity (1 hour latency - 1 hour accumulation nowcasting of precipitation intensity (2 hours in advance with a possibility of 3 hours) using ForTrACC technique Cumulated precipitation at the rolling last 24, 48 and 72 hours (9 hours latency, every 3 hours) to take into account the previous stage. Retrospective validation activities (not in real time) should be implemented in different regions (including SWFDP) to define uncertainty of the different products. Rain gauge data from those regions for a given time frame should be collected during the implementation phase. WMO observation requirements for 24h Accumulated Precipitation: http://www.wmo-sat.info/oscar/variables/view/1
Current needs & gaps	Rapid, facilitated access to quantitative precipitation estimates globally or for a given predefined region (pop-up menu or different web page)
Providers:	NOAA, NASA, others in the future
Current Products and Access Points	**NASA** Product 3B42RT (v7): GEO DIS 3-hourly binary data: ftp://disc2.nascom.nasa.gov/data/TRMM/Gridded/3B42RT/. HR: 0.25x0.25°, 3-hourly, 50N-50S Product description: http://disc.sci.gsfc.nasa.gov/precipitation/documentation/TRMM_README/TRMM_3B42_readme.shtml **NOAA** - Global HydroEstimator Single channel (11um) rain rate algorithm Product: Instantaneous rain rate, 1 hour, 3 hour, 6 hour, 24 hour and also multi-day precipitation accumulation over both global land and ocean made available in GRIB, McIDAS and netCDF4 formats HR: 4km; 15 min (instantaneous); global, 65N-S Access: http://www.ospo.noaa.gov/Products/atmosphere/ghe OSPO Data Distribution Server (DDS) and McIDAS ADDE servers Product description: http://www.ospo.noaa.gov/Products/atmosphere/ghe/algo.html **Other** - INPE hosts the webGIS visualization tool SIGMA (GEarth-based) which displays the above-listed products: http://sigma.cptec.inpe.br/scope/

	HR: 0.25x.25°, Global The inclusion of other dataset will depend on availability and latency for global coverage, and agencies commitments (see (http://www.isac.cnr.it/~ipwg/data/datasets1.html) . The regional implementation of simple IR-based algorithms (i.e. Hydroestimator) could be a natural way to reduce latency. INPE can provide support to other centers on this issue (fortracc software and SIGMA web-based visualization tool).
Products from future satellites and expected access points	**NASA/JAXA** IMERG Algorithm appears as the natural improvement of TMPA for GPM GPM-based products (DPR – Dual-frequency Precipitation Radar; GMI – GPM Microwave Imager) Contact with IPWG is necessary to get feedback from all members.
Host:	INPE CPTEC and/or other regional agencies for reducing latency for SWFDP regions
Expected benefits:	• Improved confidence in products generated through SCOPE-Nowcasting; • Reduced operating costs associated with technological change and software upgrades; • Fast delivery of severe rainfall information to decision-makers and disaster response authorities (2 or 3h extrapolation forecast and ex-post 24h/48h/72h QPEs)
Technical details of planned product/service	• Product content & format: Precipitation intensity (real-time and nowcasting), Cumulated precipitation • Access and dissemination: WebGIS -> png image format with metadata for geolocation • Include extra capabilities - create bulletins of accumulated precipitation based on pre-defined ROIs - create iterative temporal evolution tool • Quality control: Adherence to coding standards • Provisions for integration and sustainability: formal memorandum between NOAA and INPE for sustained provision of Hydroestimator. NASA does not have any formal commitment (it is not an operative service), however with GPM project going on the provision of this data is ensured. • Facility for user feedback: through SWFDP
Facility for user feedback	TBD
Forward Action Plan	**Action SNWC-PP3-1**: Implementation of Real Time Precipitation Intensity (1 hour latency - 1 hour accumulation) – Hydroestimator. Who: Daniel Vila By when: February 2014 **Action SNWC-PP3-2**: Implementation of nowcasting algorithm (2 hours in advance with a possibility of 3 hours) using ForTrACC technique. Who: Daniel Vila By when: April 2014 **Action SNWC-PP3-3**: Consult IPWG members for algorithms with *low latency* Who: Daniel Vila By when: February 2014 **Action SNWC-PP3-4**: Investigate possible implementation of simple IR-based

	algorithms (i.e. Hydroestimator) at regional level to reduce latency. Who: Daniel Vila, Anthony Rea, Suman Goyal, Marianne König, Eun Jeong Cha By when: April 2014 **Action SNWC-PP3-5**: Implement SIGMA visualization tool for SWFDP regions Who: Daniel Vila By when: April 2014 **Action SNWC-PP3-6:**: Investigate possible retrospective validation activities (not in real time) in different regions (including SWFDP) to define uncertainty of the different products. Who: Daniel Vila and IPWG members By when: 6 month after the system is up and running. **Action SNWC-PP3-7:** Implement new functionalities in SIGMA (layers, bulletins, etc.) Who: Daniel Vila By when: November 2014
Last Update	22 Jan 2014

PILOT PROJECT 4: Real-time ocean products

Scatterometer data are an important nowcasting tool for IMD. However, currently, scatterometer ocean winds are currently not fully exploited in the IMD forecasting process, and there is no consistent use of all available sensors. A variety of users in India and in neighbouring countries have expressed a requirement for ocean surface wind vector information. Forecasters at IMD and in other institutions in India are faced with many open browser windows which are not interoperable, and there is no standard, flexible visualization software available that would allow integrated analysis and blending of scatterometer wind datasets. In addition to Metop ASCAT and Oceansat-2 OSCAT, scatterometer data from the CNSA HY-2A satellite is also required, for better sampling. As per CGMS Action, CNSA will report to CGMS-42 in May 2014 on access arrangements to HY-2A data.

Metop ASCAT data are available in BUFR and netCDF formats, on the GTS and through EUMETCast. OSCAT data are in HDF-5 format, and available on ftp (TBC).

It is suggested that McIDAS-V or equivalent, open source visualization software be installed at IMD to meet their needs (SATAID and SWAP are other examples for such software). WMO and, as appropriate, EUMETSAT should provide assistance.

The meeting decided that this proposed pilot project does not meet the criteria defined for such projects under SCOPE-Nowcasting. However, the issues raised by IMD shall be addressed in the framework of ET-SUP (which has IMD membership), for example at its next session in April 2014. They reflect a broader issue of data visualization and analysis of heterogeneous data sources across the meteorological community.

References to McIDAS-V:

McIDAS-V webpage: http://www.ssec.wisc.edu/mcidas/software/v/
McIDAS documentation: http://www.ssec.wisc.edu/mcidas/software/v/documentation.html
McIDAS developer: Tom Rink, rink@ssec.wisc.edu

PILOT PROJECT 4 (formerly #5) : Real-time Atmospheric Composition Products: Sand and Dust Forecasting

Theme:	Dust Monitoring and Prediction Products
Lead:	Fang Xiang (CMA) and Hiroshi Kunimatsu (JMA), E. J. Cha (KMA TBC)
Region of Coverage:	WMO Region II (Asia) and V (South-West Pacific)
Users/Clients :	SDS-WAS, NMSs (to issue results and warnings) in RA II and RA V, environmental agency, traffic agency
User requirements:	Uncertainty; general format, Toolkit or Software, assimilation for NWP; Detection, optical thickness, particle radius, density and visibility; Frequency: every 30 or 60 minutes, Latency < 15 min.,
Current needs & gaps	Regional diversity of aerosol-related products that are mostly not harmonized, and not always sustained
Providers:	CMA, JMA, KMA
Current Products and Access Points	- Sand and dust monitoring imagery - Aerosol optical thickness, effective particle radius, and column density CMA: Product access (to Dust Storm Monitoring product): FY-3 (LEO) based: http://satellite.cma.gov.cn/PortalSite/Data/DataView.aspx?SatelliteType=0&DataCategoryCode=Atmosphere&DataTypeCode=DST FY-2 (GEO) based: http://satellite.cma.gov.cn/PortalSite/Data/DataView.aspx?SatelliteType=1&DataCategoryCode=Atmosphere&DataTypeCode=DST Product description: “The thresholds of dust in satellite image were investigated by the probability dense function (PDF) and cumulative distribution function (CDF). The sampled targets include clouds, clear sky over land, clear sky over ocean, dust. 11 thresholds were used in visible and infrared band. The optical thickness, particle radius, and density of dust can be retrieved from this algorithm. Aerosol physical parameters (complex refraction index and particle size distribution) were pre-selected for the dust retrieval in the algorithm. Radiances of 8.7 um, 11um and 12 um in IR window spectral bands are calculated with a radiative transfer model that includes Mie scattering and the Discrete Ordinates Radiative Transfer (DISORT). Aerosol microphysical parameters (complex refraction index and particle size distribution), surface temperature, and dust layer top temperature are a priori inputs. The background land surface temperature is derived from previous day clear sky 11 μm BT observation in the same area and the same UTC time. Only two layers (surface and dust) are assumed in the forward model. Therefore, temperature profile is not necessary, only surface temperature and effective dust layer temperature is required. Infrared window brightness temperatures (BT) at 11 μm show a quasi-linear relationship with dust optical thicknesses and the split window BT difference (BTD) between 11 and 12 μm shows a quasi-linear relationship with the particle radius. The 8.7 μm band is very useful to infer the dust property over desert. However, it is not used in retrieval yet because the variation and uncertainty of surface emissivity is large over desert. Look-up tables (LUT) have been generated with the radiative transfer model to create a relationship between the dust microphysical properties and BT as well as BTD. Retrieval uses two spectral bands to

	derive two parameters (optical thickness and particle radius). The dust density is derived from the two parameters." **JMA** MTSAT-2 split window (10.8-12) used for qualitative information on dust extent Product description: "JMA has produced Aerosol Optical Thickness (AOT) in the vicinity of Japan over cloud-free sea in daytime using visible channel data of MTSAT since December 2002 for internal use. AOT is defined at 500 nm wavelength and retrieved using visible channel referring to Look Up Tables generated by radiative transfer calculations at fixed Ångström exponents. AOT is calculated in 0.25 degree(longitude) x 0.20 degree(latitude) grid seven times a day, from 00 UTC to 06 UTC, hourly. JMA also retrieves AOT and Ångström exponent by a similar method from visible and near infrared data of NOAA/AVHRR 1-3 times a day. Figure A-II-9 (a) shows calculation example; Yellow Sand Dust in the vicinity of Japan was detected, and Figure A-II-9 (b) shows the comparison of AOT between ground observations and the nearest grid values of satellite products (see SCOPE-Nowcasting Concept paper for Figures: http://www.wmo.int/pages/prog/sat/meetings/documents/SCOPE-Nowcasting-1_Doc_02-01_Concept.pdf). In addition, JMA uses difference between MTSAT infrared 11 micron and 12 micron data as qualitative information for monitoring the spread of dust events at cloud free pixels even over the land and in the night time (Figure A-II-10). JMA uses these results to early grasp and monitor the distribution and the density of dust (Yellow sand) in Japan, and to issue dust information." **KMA** VIS/IR/WV/SWIR NRT imagery : http://web.kma.go.kr/eng/weather/images/satellite.jsp Products : Asian dust NMSC/KMA has produced Aerosol Index(AI) over the Korean Peninsula since 2011. NMC/KMA uses these results to monitor and produce warning of Asain Dust Storm in Korea.
Future Products and Access Points	CMA: FY-4A AGRI based aerosol detection and AOD products planned FY-3C will add optical depth, effective particle radius and dust loading products in Feb 2014 JMA: Himawari-8/9 AHI based dust monitoring products (density, height) to be generated using GOES-R ABI algorithm:
Host:	CMA, JMA, KMA
Expected benefits:	• More consistent products across satellite platforms and providers, e.g. through shared use of validation data and techniques • Product providers can create synergies and sustain their activities while avoiding duplication of effort through sharing information on product development and validation • Better dialogue between users and providers • Improved confidence in products generated through SCOPE-Nowcasting; • Improved cooperation between NMHSs through access to shared products
Technical details of planned product/service	Scope for harmonization • Product content & format: Aerosol optical thickness, effective particle radius, column density, over land and ocean • Sharing of validation data and techniques

Facility for user feedback	To be maintained by the Data Providers
Forward Action Plan	**Action SNWC-PP4-1**: Investigate with RA II Satellite Data Users on their requirements for dust products (type, size, format, delivery mechanism, latency). Who: H. Kunimatsu (for RA II) By when: 31 Jan 2014 **Action SNWC-PP4-2**: CMA, JMA, and KMA to share quantitative surface observation data for validation of satellite-based products for selected case studies. Who: X. Fang (CMA), H. Kunimatsu (JMA), E. J. Cha (KMA TBC) By when: February 2014 **Action SNWC-PP4-3**: Test and validate present products and next-generation dust algorithms (using MODIS data as proxy (ET-SUP Action 7.11)) against a number of case studies Who: X. Fang (CMA), H. Kunimatsu (JMA), E. J. Cha (KMA TBC) By when: May 2014 **Action SNWC-PP4-4**: Report on inter-comparison activities to CGMS and AOMSUC Who: X. Fang (CMA), H. Kunimatsu (JMA), E. J. Cha (KMA TBC) By when: May 2014 (CGMS), Oct 2014 (AOMSUC).
Last Update	22 Jan 2014

ANNEX II: Meeting agenda

TUESDAY, 19 NOVEMBER 2013		
		Approx.Time incl. Discussion
8:30	Registration (Salle 8 JURA)	
9:00	**1. OPENING**	20’
	1.1 Welcome and Introduction (*WMO*)	
	1.2 Adoption of the agenda	
	1.3 Working arrangements for the session	
9:20	**2. SCOPE-NOWCASTING CONCEPTUAL OVERVIEW** (*Rea*)	40’
	2.1 Overall concept	
	2.2 Implementation criteria	
10:00	**3. NOWCASTING: USERS AND DRIVERS**	
	3.1 Severe Weather Forecasting Demonstration Project(SWFDP) (*Soares*)	20’
	3.2 Nowcasting Research (*König*)	20’
10:40	*Break*	20’
11:00	3.3 Quantitative Precipitation Estimates from Satellites – IPWG (*Vila*)	20’
	3.4 Volcanic Ash Detection and Quantification (*Pavolonis*)	20’
	3.5 Sand and Dust Monitoring (*Kunimatsu*)	20’
	3.6 ESA Support to Aviation Control Service (*Zehner*)	20’
12:20	*Lunch Break*	70’
13:30	3.7 EUMETSAT Nowcasting Satellite Application Facility (*König*)	20’
	3.8 KMA Experience with Nowcasting Software (*Cha*)	20’
	3.9 New Generation of Geostationary Satellites (*WMO*)	10’
14:10	**4. DATA ACCESS AND VISUALIZATION**	
	4.1 Overview of satellite data distribution and access mechanisms (*Rea*)	10’
	4.2 Overview of data visualization tools (*WMO*)	10’
14:30	**5. PILOT PROJECTS – UPDATES AND DISCUSSION**	
	NB: USE PPT TEMPLATE TO STRUCTURE YOUR PRESENTATION ALONG: (I) USER REQUIREMENTS, (II) GAPS, (III) PRODUCTION AND DISTRIBUTION OF YOUR PRODUCT(S), (IV) SCOPE FOR HARMONIZATION WITH OTHER PROVIDERS, (V) INSTITUTIONAL COMMITMENTS TO GENERATE PRODUCT(S) ON SUSTAINED BASIS	
	5.1 **Pilot Project 1: Basic Nowcasting (Imagery, RGB composites, …)**	75’
	5.1.1 BoM (*Rea*)	(15’)
	5.1.2 CMA (*Fang*)	(15’)
	5.1.3 JMA (*Kunimatsu*)	(15’)
	5.1.4 KMA (*Cha*)	(15’)
	Discussion	(15’)
15:45	5.2 **Pilot Project 2: Advanced Nowcasting for Aviation (Volcanic ash)**	75’
	5.2.1 BoM (*Rea*)	(15’)

16:00	*Break*	20’
16:20	5.2.2 EUMETSAT (*König*)	(15’)
	5.2.3 JMA (*Kunimatsu*)	(15’)
	5.2.4 NOAA (*Pavolonis*)	(15’)
	Discussion	(15’)
17:20	*Adjourn for Day 1*	
WEDNESDAY, 20 NOVEMBER 2013		
		Approx.Time incl. Discussion
9:00	5.3 **Pilot Project 3: Advanced Nowcasting (Precipitation/Severe Rainfall Risk Reduction)**	45’
	5.3.1 INPE (*Vila*)	(30’)
	Discussion	(15’)
9:45	5.4 **Pilot Project 4: Real-time ocean products (Ocean winds)**	60’
	5.4.1 IMD (*Goyal*)	(20’)
	5.4.2 EUMETSAT (*König*)	(20’)
	Discussion	(20’)
10:45	*Break*	15’
11:00	5.5 **Pilot Project 5: Dust Monitoring and Prediction Products**	60’
	5.5.1 CMA (*Fang*)	(20’)
	5.5.2 JMA (*Kunimatsu*)	(20’)
	Discussion	(20’)
12:00	**6. FORWARD ACTION**	30’
	6.1 Development of Product Specification and Validation Plans	
	6.2 Development of Data Distribution Plans	
	6.1 AND 6.2 ARE DEVELOPED IN A SERIES OF PLENARY AND BREAK-OUT SESSIONS	
12:30	*Lunch Break*	75’
13:45	BREAK-OUT ROOMS: 6 JURA, OFFICES 7C46, 7L34	180’
16:45	**Initial reports from Pilot Projects back to Plenary**	45’
17:30	*Adjourn for Day 2*	
19:30	*Group Dinner; Café du Soleil, Place du Petit-Saconnex 6, 1209 Genève*	
THURSDAY, 21 NOVEMBER 2013		
		Approx.Time incl. Discussion
9:00	**6. FORWARD ACTION (CONTINUED) – MEETING IN PLENARY**	180’
	6.1 AND 6.2 ARE DEVELOPED IN A SERIES OF PLENARY AND BREAK-OUT SESSIONS BREAK-OUT ROOMS: 6 JURA, OFFICES 7C46, 7L34	
12:30	*Lunch Break*	75’

14:00	**Draft reports from Pilot Projects back to Plenary**	90’
15:30	**7. JOINT SESSION WITH WMO/IUGG VOLCANIC ASH SCIENTIFIC ADVISORY GROUP**	90’
17:30	*Adjourn for Day 3*	
FRIDAY, 22 NOVEMBER 2013		
		Approx.Time incl. Discussion
9:00	**6. FORWARD ACTION (CONTINUED) – MEETING IN PLENARY**	180’
	6.1 Finalization of Product Specification and Validation Plans	
	6.2 Finalization of Data Distribution Plans	
12:30	*Lunch Break*	60’
13:30	**8. GOVERNANCE**	30’
14:00	**9. SUMMARY AND CONCLUSIONS**	60’
15:00	*Adjourn Meeting*	

ANNEX III: List of Participants

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ANNEX IV: Statement by WMO-IUGG VASAG Co-Chairs and Joint ICAO/WMO State Letter AN 10/18.3-13/53

To: Dr Anthony Rea,

Chair, SCOPE-Nowcasting group

Dear Anthony,

Many thanks for today's joint session, which from our side was warmly received. In our discussion following the session, we noted that, from the point of view of the States involved, this initiative to propose volcanic ash as a SCOPE-nowcasting trial project, amongst other things, represents part of a proactive response to the Joint ICAO/WMO State Letter AN 10/18.3-13/53 of May this year (copy attached). We are also enthusiastic about the proposed intercomparison work, in support of continuous improvement of techniques and their implementation. Having better, efficiently implemented, and global volcanic cloud products (including ash and SO2) would certainly support the joint aims of ICAO and WMO in this area and particularly support VAAC operation, and therefore support the quality of information available for ash risk management for aviation.

We look forward to continued active dialogue in this regard, and we propose Dr Michael Pavolonis as the key contact for the WMO-IUGG Volcanic Ash Science Advisory Group

Kind regards,

Dr Larry Mastin & Dr Andrew Tupper

Co-chairs, WMO-IUGG Volcanic Ash Science Advisory Group

22 November 2013

International Civil Aviation Organization
Organisation de l'aviation civile internationale
Organización de Aviación Civil Internacional
Международная организация гражданской авиации
منظمة الطيران المدني الدولي
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Ref.: ICAO AN 10/18.3-13/53
WMO WDS/AN/VA

31 May 2013

Subject: Detection of volcanic ash in the atmosphere

Action required: Support activities to improve the availability of, and access to, satellite-based, ground-based and airborne volcanic ash detection data

Sir/Madam,

1. We have the honour to inform you that the International Volcanic Ash Task Force (IVATF), which was established by the International Civil Aviation Organization (ICAO) in close coordination with the World Meteorological Organization (WMO), has completed its work in respect of the response to the disruption caused to civil aviation by the eruption of the Eyjafjallajökull volcano in Iceland in April 2010.

2. One of the most important considerations of the IVATF was flight planning to avoid volcanic ash in the atmosphere that poses a significant hazard to flight safety and efficiency. During a volcanic eruption, flights will be planned on the basis of forecasts, prepared to internationally agreed standards, of the location and extent of volcanic ash clouds.

3. To ensure that data on the location and extent of volcanic ash clouds are made available to States that maintain volcanic ash advisory centres and/or meteorological watch office(s) within the framework of the ICAO international airways volcano watch, we kindly urge you to encourage and support necessary activities within your State to improve the availability of, and access to, satellite-based, ground-based and airborne volcanic ash detection data, taking into account where there is a need to establish a bilateral agreement as described in the attachment.

Accept, Sir/Madam, the assurances of our highest consideration.

Raymond Benjamin
Secretary General
ICAO

Michel Jarraud
Secretary-General
WMO

Enclosure:
Background on detection of volcanic ash in the atmosphere

ATTACHMENT to State letter AN 10/18.3-13/53

BACKGROUND ON DETECTION OF VOLCANIC ASH IN THE ATMOSPHERE

1. One of the most important considerations of the International Volcanic Ash Task Force (IVATF) was flight planning to avoid volcanic ash in the atmosphere that poses a significant hazard to flight safety and efficiency. During a volcanic eruption, flights will be planned on the basis of forecasts, prepared to internationally agreed Standards, of the location and extent of volcanic ash clouds. These are issued by volcanic ash advisory centres (VAACs) and/or meteorological watch offices (MWOs) within the framework of the international airways volcano watch (IAVW). Improved availability and access to volcanic ash observational data, including eruption source parameters, by the VAACs and the MWOs from satellite-based, ground-based and airborne detection systems, will lead to enhanced knowledge about the presence of volcanic ash in the atmosphere. The result of this will be increased observational capability and forecast accuracy, which in turn will lead not only to economic benefits for civil aviation through more efficient flight profiles, but also safety benefits through increased common situational awareness and user confidence.

2. Detection of volcanic ash in the atmosphere is currently possible through satellite-based remote-sensing technologies and ground-based and airborne detection systems. However, Eyjafjallajökull and similar eruptions, before and since, have demonstrated that observational data from such systems available at the VAACs and MWOs was often insufficient to enable these meteorological service providers to issue forecasts with a high level of confidence to the users. The issuance of forecasts uncorroborated by observations may have resulted in cancellations or deviations of scheduled flights which might otherwise have been conducted safely had better information been available.

3. Occasionally, observing networks used for the detection of volcanic ash in the atmosphere are maintained by a State only for non-operational, research-oriented purposes rather than for 24/7 operational decision-support purposes. Nevertheless, collaboration between non-operational and operational communities can often prove mutually beneficial. Where research-oriented resources are made available to assist the operational response, a bilateral agreement between the parties concerned may be necessary to ensure that requirements for the level of services and any associated costs are clearly specified.

— END —