Attendees

WMO Secretariat: Estelle de Coning

Committee Members: Rita Roberts (co-chair), Peter Steinle (co-chair), Rachel Albrecht, Tabito Hara, Paola Salio, David Turner, Jian Jie Wang

Committee Members Not-present: Yu Hui, Ping Wah (Peter) Li, Valery Mason, Alan Seed, Yong Wang

Invited participants: Celeste Saulo (SMN), Claudia Campetella (SMN), Marcos Saucedo (SMN), and Steve Goodman (NASA)

Remote presenters: Yu Hui, Ping Wah (Peter) Li, Steve Goodman

Day 1

1 Welcome (Host)

Dra. Celeste Saulo, Director of the Servicio Meteorológico Nacional, and the host of our meetings, welcomed the committee members to SMN and wished us a productive meeting.

2 Welcome (Co-chairs)

The co-chairs welcomed new and existing committee members, received approval for the meeting agenda, and provided an overview of their goals for the meeting.

3 Reports from the secretariat

3.1/3.2 WWRP Update and Strategic Plan (Estelle)

The four main societal challenges of our times was presented, with commentary on how these challenges impact the WWRP and NMRWG. To address these challenges, WWRP has on three core topics: HiWeather Projects, Sub-seasonal to Seasonal (S2S) Prediction Project, and the Polar Prediction Project. The WWRP has two foci of particular interest: 1) Science to Service and 2) Bringing climate and weather research closer together through cross-cutting activities (through the Global Data-Processing and forecasting System (GDPFS)) and seamless prediction across all scales. A good example of cross cutting research (which also address the societal challenge or urbanization) is the GAW Urban Research Meteorology (GURME).
**Action 1:** NMRWG to increase its engagement with other WGs and projects on cross-cutting activities in order to align with the goals of the WWRP Implementation Plan.

**4 Introductions**

Introduction of new and existing committee members were made, with committee members providing a summary of their background and expertise.

**5 Review of Actions from Hong Kong meeting (Pete Steinle)**

The list of action items from the 2016 working group meeting in Hong Kong was discussed. Based on this discussion updates to specific actions are itemized below.

**Action 2:** Send the Hong Kong meeting summary, the WMO Implementation Plan and the most recent NMR Implementation Plan highlights to the new members of the NMRWG.

**Action 3:** Dave Turner will link up with a NOAA representative who is heavily involved in the Year of Polar Prediction. Dave’s understanding is that the Polar Prediction group may be moving forward to do an FDP. Dave can be a focal point from NMR WG to link with PPP.

**6 RDP/FDP/DC-FDP definitions (Rita Roberts)**

The definitions and guidelines for WMO RDP, FDP and Developing Country (DC) – FDPs were reviewed and discussed, particularly for the benefit of the new WG members. Some suggestions were made to be added to the RDP/FDP guidelines (this will need to be discussed with Paolo/Sarah):

- Add the four societal challenges and 18 Action Areas as Annex to the Guidelines
- Add contact point/person for data of the RDP
- Should data be available to non-direct participants, and with what time lag? (After a year?)
- After the end of the project, for how long should data still be made available?

**7 Status reports of current projects, RDPs and FDPs**

**7.1 Argentina:RELAMPAGO field campaign (Paola Salio)**

An overview of the RELAMPAGO-CACTI field campaign that will be held 1 Nov – 15 Dec 2018 was presented. Some of the objectives of this field campaign are to study the intense convective systems that develop in Argentina and produce substantial flooding and severe thunderstorms, and to improve severe storm hazard prediction. A large suite of instrumentation will be installed for the field campaign under funding from the NSF (US), NASA (US), DOE (US), SMN (AR) and INPE/FAPESP (Brazil). The primary scientific focal areas are 1) convective lifecycle, 2) microphysics and aerosol, 3) electrification, 4) several weather (winds, hail, tornadoes and flooding), 5) hydrometeorology/land surface and flooding, and 6) nowcasting, forecasting and societal impacts.
7.2 SURF (Jianjie Wang)

SURF is an international research program being led by CMA/IUM and is designed to improve understanding of urban weather systems and high impact weather in the urban area, focusing on the interaction between the urban environment, terrain, convection and aerosols. The project is driven by haze and flood events that cause disasters in the Beijing urban area. Two years of preliminary studies have been done, one in the summer and one in the winter. A SURF-2016 Summer Experiment using numerous instrumented platforms was run primarily within the Beijing and Tianjin municipalities. Highlights from some of these observing systems (e.g. Doppler LiDAR) and urban model results were presented. The SURF project has resulted in 19 publications from scientific participants. A fifth workshop was held 21-23 June 2017 that included discussion of new science reports, panel discussions, and recommendations for future SURF projects, new observing platforms and research to operational strategies. Data sharing is confined within the project participants, but will be released to other groups at the end of the project (2018-19). Future efforts will be focused on data QC, installation of additional new equipment, and on new science, that includes among other things, interaction between urban and terrain processes (Phase II).

WGNMR encouraged SURF last year to make an application to GURME and WWRP to be a pilot RDP program. An application was sent to GURME under the High Impact Weather initiative, and distributed to the NMRWG during this past year for our input. Email exchanges have ironed out some concerns on scientific research plans and international collaboration. The NMRWG has given approval to SURF request for RDP status.

Action 4: Pete to send WG approval of RDP status to Estelle for endorsement by WWRP SSC. Pete, Jianjie to summarize here any additional action items.

7.3 ICE-POP 2018 Winter Olympics (Pete Steinle)

The International Collaboration Experiment for the Pyeongchnag Olympics and Paralympics, 2018 (ICE-POP 2018) has both RDP and FDP components. The RDP involves an intensive observation campaign from the coast, up into the mountains – a distance of about 20km from the centre of the mountain observing sites to the coast. In addition to KMA’s operational observing system will be:

- A research aircraft with various instruments for measuring cloud properties, and dropsondes. The dropsondes can only be released over the sea.
- A research ship to provide fluxes from the ocean
- 4 X-band radars where the scanning strategy is scheduled to give transects both perpendicular and along the coast, and synchronized with aircraft overpasses.
- There will also be a Dual Polarized, Dual Frequency, Doppler X-band radar in the mountains
- 2 mobile (land-based) sonde launchers
- A number of scanning lidars and vertical lidars will be installed
- An extensive network of instruments to measure particle distributions (size, velocity and sometimes shape) is also in place.
There have been intensive observing periods for Feb-Mar 2016 and 2017, although most of the international systems cannot arrive until mid-late 2017.

The FDP will involve a number of groups (KMA, CMA, Roshydromet, US-NCAR, US-NASA, Taiwan, ZAMG and Canada) running NWP and nowcast systems. Standard domains have been defined and land-surface data sets have been provided. Not all of the finest model resolutions have been finalized, as any real-time running depends on computing resources. An interesting aspect of the FDP is the aim to have 15min nowcast updates pushed to the public via mobile phones at the venues.

The two main issues are:

- A change of leadership with KMA. This was unavoidable as key people had to move positions for a variety of reasons. None the less there is still a core group present. Some of the previous leaders are also still involved, but in a different role.
- Verification remains a concern. This was not that well resourced, a point made by Pertti Nurmi and myself last year. The changes in the people involved has not helped this. [UPDATE: Recently Laurie Wilson has stepped in on behalf of JWGFVR]

The KMA forecasters will have training on some of the systems, but there may well be limited scope for forecasters to really get to grips with all of the systems available or to have rapid feedback on how different systems are performing.

There will be a major meeting for ICE-POP participants in September.

**Action5:** ICE-POP science steering committee to provide a more detailed plan for model and forecast verification and forecast training on the use of forecast and nowcast tools.

### 7.4 SCMREX (Yu Hui)

The scientific goals of the Southern China Monsoon Rainfall Experiment (SCMREX) are to use new, integrated datasets collected during IOPs to improve understanding on the development of heavy rain producing storms in southern China during the pre-summer rainy season and to improve QPF skill. Field campaigns have been conducted every spring (1 May – mid June) from 2013-2017. A longer field campaign was held this year from mid-March to mid-June with an enhanced radiosonde observational period, numerous profiling, radar, and lightning observations, and three super sites collecting specialized datasets. A number of agencies and universities are involved in these field campaigns. An international workshop of SCMREX was held in Beijing in April 2017, attended by about 60 participants from the United States, UK, Japan, Indian, Malaysia, Hong Kong, PSA, and China. More than 10 papers have been published on this program during the period from 2014-2017. Highlights were presented on the following research activities:

1) optimization of the dual-pol radar(s) Hydrometeor Classification Algorithm,  
2) merging of Ka-Band, C-Band FM-CW radars with a ceilometer,  
3) statistical analysis of cloud-precipitation characteristics,  
4) analysis of lightning observations,  
5) modeling of urban extreme rainfall,  
6) impact of cloud microphysics on convection-permitting simulations of heavy rainfall,
7) impact of radial velocity DA on probabilistic forecasts, and
8) ensemble prediction sensitivity studies.

The WG on Tropical Meteorology Research has the lead on this program so there may already be some approval of a second phase. No action is required by WGNMR.

8 New and Proposed Projects

Session 8 presentations were moved to the morning of Day 2, in order to stay on schedule for the WebEX presentation and remaining sessions (9-11) of Day 1.

9 New Observations

9.1 GOES-16 (Steve Goodman, via WebEx)

Several examples and animations of GOES-16 satellite observations were presented under a variety of different weather scenarios, illustrating the very high spatial and temporal resolution of this instrument and its ability to observe detailed and more subtle cloud initiations, interactions, and evolution. The list of products from this satellite was described.

10 Presentation on SMN Forecast Office (Marcos Saucedo)

The presentation given by Marcos provided background information on SMN forecast office activities, forecast staff and forecast responsibilities for all of Argentina. The SMN forecast procedures were described along with their future plans for nowcasting-related efforts and integrated displays. Following the presentation, committee members were given a tour of the forecast office in the new SMN building. Members had a chance to talk with the forecasters and be briefed on the forecast duties.

11 SMN RELAMPAGO RDP/FDP (Celeste Saulo, SMN)

During this session, Celeste provided commentary on short and very short range forecasting periods and the challenges associated with improving these capabilities in South America. This included discussion on the need to capture/detection convection initiation which should help to improve forecast capability, that a better understanding the short range evolution of storms will help impact the forecasting capability, and doing inter-comparisons of short and very short range forecasts would also be beneficial. The remainder of the discussion touched on benefits and show-stoppers for proposing an RDP/FDP centered around the RELAMPAGO effort. SMN will be supporting RELAMPAGO and will be working to improve their nowcasting and forecasting capabilities, i.e., will be doing the majority of efforts commonly associated with RDPs. The concerns have been whether there is sufficient international participation from South American countries (e.g. Brazil) and what is to be gained by SMN, by making
the effort to submit a proposal to the WMO, as they will already be conducting these RDP-type activities.

**Action 6**: Paola Salio and Rachel Albrecht to come up with a plan for Argentina and Brazilian collaboration as part of a RDP proposal and present plan to Celeste for discussion.

**Action 6 status**: A telecon to discuss this topic occurred on 29 Sept. A visit to CPTEC/USP/INPE is being organized to formally invite a collaboration with Brazil in the project. This visit may occur in early December and SMN will present the RELAMPAGO RDP project to the CPTEC coordinator. Nowcasting training was also discussed on the telecon and Rachel has obtained agreement that Brazil will host the training in Sao Paulo. Rachel and Luiz Machado (INPE) will submit a proposal to Sao Paulo state funding agency (FAPESP) to cover the participation of up to 100 people. RELAMPAGO RDP will be presented at Conference on Predictability and Multi-Scale Prediction of High Impact Weather at Landshut _ Germany at October 10, 2017. Celeste’s goal is to present the RDP plans at the next SSC but not clear at this time if this deadline can be met, as the document will need to be sent to the WG and to WMO secretariats for review.

**Day 2**

**12 Aviation RDP (Peter Li, via WebEX)**

The Aviation RDP has been a joint 4 year effort between CAS and CAem to conduct research in nowcasting and mesoscale modeling at a number of international airports. A vision of this RDP is to support the next generation aviation initiative, the Aviation System Block Upgrade (ASBU) under the new ICAO Global Aviation Navigation Plan (GANP). This effort involves collaboration with ATMs to translate Meteorological (MET) information (nowcast and mesoscale modelling) into ATM impact products to demonstrate the benefits of MET information to the aviation community. Key concepts under the ASBU are the development of seamless Trajectory-Based-Operation (TBO, or “gate-to-gate”) and Meteorological Services to ATM (MSTA) near the airport terminal area.

Phase I and proposed Phase II activities and timeline were presented to the SSC at the 2nd AvRDPSSC meeting held on 23-24 July 2016 in Hong Kong. Several IOPs have been conducted in mid-2015 to mid-2017. Efforts are underway on nowcasting research and establishing the research on verification in collaboration with the Verification WG. From May 2015 to 2017, a few airports, both in the northern and southern hemispheres, focused on connective weather. These include Hong Kong, Johannesburg, and Shanghai airports. From Nov 2015 continuing through 2018, a few airports (Charles de Gaulle, Toronto) are focused on winter weather and low visibility. Feedback from the aviation stakeholders cite the ATM and airline need for 0-6 h nowcasting for decision-making in the terminal area, the need for precise, reliable, frequently updating, graphical MET information for uplink and downlink, and the inclusion of uncertainty estimation. Research highlights from selected airports were shown at the end of the presentation.

Phase II of the Project, which focuses on MET-ATM impact translation and validation, has already started at the Hong Kong International Airport, Shanghai Hongqiao Airport and Paris Charles de Gaulle Airport with Meteo-France working on SESAR. Johannesburg Airport has also begun contacting with local Air
Traffic Management and relevant sectors to start Phase II; aiming for March 2018. The Toronto airport still needs a way to connect NAVCAN. Hong Kong has been collecting airport capacity and traffic data; verification is needed. Investigation continues on the translation of MET information into ATM impacts (airport capacity, airspace capacity, arrival/departure delays, fuel consumption, aircraft de-icing, lightning impacts on ground operations) and evaluation of those impacts. Peter Li has initiated collaboration with the WMO JWGFVR to develop verification methods and metrics, uncertainty estimations, minimum forecast accuracy. Some prospects for extension of the RDP include the addition of Singapore, Japan, and Russia, who have indicated interest in participating in the project. A training workshop in Russia is being discussed.

Another Capacity Building and Training workshop focusing on MET-ATM impact translation is being planned for 2018, due to lack of funding in 2017. Preparations are ongoing for the AeroMetSci-2017 Conference that will be held 6-10 November 2017 in Toulouse France, with the over-arching theme “Aviation, weather and climate: Scientific research and development for future aeronautical meteorological services in a changing atmospheric environment”.

Action 7: The possibility to expand the AvRDP into an Intercommission Aviation Research Project (CAS/CAEM/CBS) is under consideration in WMO. Discussions and possible decision on this is expected to happen in late 2017. Peter to provide feedback to the WG on decisions from this meeting.

Action 8: Peter Li is working with the WMO to draw up a roadmap for the Inter-commission Aviation Research Project, taking into account Phase II of AvRDP. This will also include exploring funding options with WMO (e.g. trust funds or other). Similar to Phase I, Phase II is not core funded.

8 New and Proposed Projects\(^1\)

8.1 Lake Victoria Basin (Estelle de Coning)

The UK DFID Weather and climate Information SERvices for Africa (WISER) announced in late July that the WMO WWRP HIGHWAY (HIGH impact Weather iLakesYstem) proposal for the Lake Victoria Basin was awarded funding for a 2.5 year period spanning Oct 2017 – March 2020. The over-arching goal of the HIGHWAY project is to strengthen the regional meteorological Early Warning System (EWS) in the Lake Victoria Basin. The proposal must address the following: operational infrastructure, innovation, regional coordination, and social economic impacts. There are four specific outcomes for this project.

Output 1: Established, effective institutional framework for an Early Warning system for the East African Region.

Output 2: Improved access to all operational data sources to support the generation and maintenance of Early Warning Services for the East African Region.

Output 3: Strengthened integration between producers and users to develop innovative, accurate tailor-made EWS products through co-production for the East African region.

\(^1\) Session 8 presentations that were scheduled on the agenda for Day 1 were moved here, to Day 2.
Output 4: Improved methods and strengthened capacity for communication and promoting understanding and use of EWS products with relevant producers, technicians, forecaster, intermediaries and users in the East African region.

WG members, the UK Met Office and NCAR and NOAA scientists will be involved in activities associated with Outputs 2-4. In broad terms HIGHWAY will focus on operational systems, mostly using existing infrastructure, and be driven by user needs. A modest field campaign (lead by Rita Roberts) utilizing all available observations in the region will be conducted to improve scientific understanding of the severe and high impact weather that occurs over the Lake. Observations collected during the field campaign will be used to develop new nowcast tools and improve existing tools and to conduct verification of the UK Met Office NWP forecast model(s) that are being run and provided to the NMHS offices in the region. These latter efforts are being led by Caroline Bain of the UK Met office. The field campaign will make use of extra radiosonde launches, satellite, lightning, and surface observations, instrumented boat observations and data being collected by the Mwanza, Tanzania radar and other radars as they become available.

**Action 9:** Negotiations with the Principal Investigators of the outputs will commence in Sep/Oct to align with the accepted project plan, time line and budget.

8.2 LAFE (Dave Turner)

The Land-Atmosphere Feedback Experiment (LAFE) is being led by David Turner and Volker Wulfmeyer, and includes participants from DOE, NOAA/ESRL, U. of Hohenheim, U. of Wisconsin, NOAA/ARL, NCAR, NASA, Cleveland State Univ., and U. of Tennessee. LAFE is a large international field campaign to improve understanding of land-atmosphere interactions, both near the surface and how it impacts the entrainment zone, and to use improved understanding to improve the representation of these processes in NWP models. Data collection occurred during August 2017 at the ARM Southern Great Plains field site in northern Oklahoma. LAFE has four scientific objectives:

1. *Investigate new similarity relationships for profiles of turbulence and latent and sensible heat flux, especially in the CBL entrainment zone*
2. *Map surface momentum, sensible, and latent heat flux profiles using a synergy of scanning wind, temperature, and humidity lidar systems*
3. *Characterize the LA feedback and moisture budget by combining surface and CBL flux profile observations together with humidity advection obs as a function of different soil moisture regimes*
4. *Evaluate LES models ability to replicate these flux, turbulence, and entrainment rate profiles, and improve turbulence parameterizations in mesoscale models*

The field campaign is facilitating the use of state-of-the-art observations, including scanning (temperature, water vapor, Doppler) lidars, to observe the above relationships. Other instrumentation includes profiling systems, flux towers, aircraft in-situ measurements, and UAVs. There is interest to extend LAFE into an RDP. Dave and Volker need to come to a decision on whether to pursue this and submit a proposal.

**Action 10:** Dave Turner and Volker Wulfmeyer to decide on whether to submit a LAFE RDP proposal, and inform the WG of their decision.
**Action 11:** Dave to let Estelle know if LAFE wants a letter of recommendation instead.

### 8.3 Brazil: SOS-CHUVA (Rachel Albrecht)

The SOS-CHUVA project is a follow-on project to the CHUVA project that ran from 2010-2015 in Brazil. SOS refers to “SISTEMA DE OBSERVAÇÃO E PREVISÃO DE TEMPO SEVERO” and CHUVA stands for Cloud processes of the main precipitation systems in Brazil: A contribution to cloud resolution modeling and to the GPM (GlobAl Precipitation Measurement). SOS-CHUVA is running from 2016-2019 with the following objectives:

- Apply cloud microphysics knowledge learned in CHUVA Project
- Understand the evolution of cloud microphysics as they change to become extreme events
- Build conceptual models and predict these changes
- Develop a warning system of storm intensification
- Make this information useful and reachable to the society:
  - Information sent directly to the Civil Defense
  - Information sent directly to the general public

The base site for this field campaign is in Campinas, near Sao Paulo; an area that is known for severe weather. A suite of instrumentation is deployed and accessible in the area that includes radars, disdrometers, GPS measurements, rain gauges, lightning, satellite derived products, and hailpad measurements. Examples of severe weather events were presented, using observations from some of the above sensors. Research in nowcasting and in cloud physics are key focal areas. SOS-CHUVA scientists have been involved in developing nowcasting products and transferring products to forecasters in CPTEC/INPE. Training in regional centers with the GEONETCast-Americas and SigmaCast are an active part of the SOS-CHUVA campaign. Tools such as the SIGMACast software are used to display and animate data and products. Products are also distributed to the public via web pages and cell phones. Severe weather alerts (lightning and storm approximation) are expected to be implemented during the next month. Rachel has also been actively involved in translating COMET educational modules and satellite modules into Portuguese.

### 13 and 14 Open discussion about all projects and potential New Initiatives

**SURF (Jianjie Wang)**

Two new initiatives being considered for SURF area urban-terrain phase and a tie-in with the Winter Olympics that Beijing/Hubei will host in 2022. A capacity building plan on conducting some nowcasting and forecasting efforts for the 2022 Winter Olympics has been made by CMA, in which Beijing Meteorological Bureau (BMB) will play the main role on leading the meteorological services and issuing weather forecasts for Olympics and the National Meteorological Center will play a role in providing forecast guidance. CMA has a positive attitude towards a RDP/FDP for the Olympics and may consider having an RDP/FDP activity in association with the 2022 Winter Olympics.

**Japan Meteorological Administration (JMA) (Tabito Hara)**
JMA will be providing the forecasting and nowcasting support for the Japan Summer Olympics in 2020. JMA is not considering conducting an RDP or FDP in association with the Olympics.

**High Impact Weather (Pete Steinle)**

The expectation still continues that HIW will rely on existing and planned RDPs and FDPs for achieving their goals. HIW task teams have been set up to define the activities over the next 8 years and to avoid overlap with activities already ongoing or planned. The next HIW meeting will be in October in Landshut, as part of the German Waves to Weather Project.

**Action 12:** Pete sits on one of the HIW sub-committees and will forward to the WG the HIW newsletter that is sent out every 6 months.

**Observations for Operational Met Service (Dave Turner)**

Some discussion occurred on boundary layer profiling observations needed or desired for operational meteorological services.

**Action 13:** Dave Turner has agreed to write a 5 page white paper on recommendations for operational ground-based thermodynamic boundary layer profiling. Dave to interface with the DAOS group regarding observations for meteorological services.

**ZAMG and EUMETNET Nowcasting and Forecasting Activities (Yong Wang)**

The current nowcasting and forecasting efforts are as follows. The nowcasting focus is on the better use of observations, better integrated analysis by using different integration techniques, and use of ensembles for nowcasting purposes. The NWP focus is on hourly RUC, operational DA, and blending between DA and nowcasts. ZAMG is working to bridge the gap between nowcasting and NWP, using a spatial blending technique. Under the EUMETNET forecasting program, Yong is drafting a call for the project for phase 2019-2021. The foci of the project is 1) intercomparision of European operational nowcasting algorithms, and 2) guidelines for implementation of seamless prediction system, both deterministic and probabilistic on the 0-12 h timeframe.

**Task Team on Guidelines for Nowcasting (Yong Wong)**

The final draft of the Guidelines for Nowcasting (WMO-No. 1198), led by Yong Wong for CBS, was reviewed by the Editor and comments were sent in August to the Task Team Committee for their response and corrections.

**15 Issues related to the WWRP Implementation Plan (Pete Steinle)**

The Implementation Plan is the key driver for WGNMR activities. The WWRP Science Steering Committee expects that quantifiable progress on a few key Action Areas are made each year, and there
are to be plans for the next two years. The two yearly plans are reviewed and updated each year. Of the 18 Action Areas, WGNMR can feasibly contribute to more Areas than any other Working Group – so the problem is more deciding which ones to highlight. This is accentuated by any FDP/RDP generally contributing to multiple Action Areas, and there being some overlap between some of the Action Areas. (The overlap is inevitable, as it is better to have overlap than obvious gaps).

A few areas that were highlighted at the last SSC meeting:

1. The importance of activities around bridging the gap between nowcasting and very short range forecasting. This is one of the primary terms of reference for WGMR and so it is essential that we report on progress on this, and do what we can to facilitate or assist progress in this area.

2. Links to WCRP- especially regarding downscaling of global climate models. This will be very challenging given the reduction in membership relative to the previous two working groups (Nowcasting Research and Mesoscale Research). In a related vein, there was a short discussion with the Sub-Seasonal to Seasonal (S2S) co-chair at the last SSC, who did not see that there was any evidence that downscaling added value to S2S forecasts, and so was not convinced of the potential value of collaborative projects.

3. Links to GURME need to be established or strengthened. Traditionally GURME has been focused on much smaller scales than most NWP systems, however that gap is closing, at least in research. SURF is one way of bridging that gap. [UPDATE: Sue Grimmond has asked for volunteers to provide input and/or review of the Integrated Weather, Environmental and Climate Services document being prepared by GURME]

4. The discussions with the Expert Teams on Sand and Dust Storms (SDS) and Weather Modification were more positive. Both groups are increasingly interested in convective scale (or higher resolution) modeling. However to come up with any concrete activities will probably require a joint meeting of some sort. Nonetheless this would be worth pursuing in the future.

[UPDATE: Activities that the Working Group can be considered to contribute to can be EITHER those where members are involved due to their position on the Working Group OR due to their positions within their own organizations. Membership of the Working Group is based on the work that people do, and so the latter is considered part of WGNMR contributions]

16 WSN-2020

Some discussion occurred on the location for the next WMO Nowcasting and Very Short Range Forecasting Symposium. We were informed by Estelle that we should consider hosting a symposium if there are specific topics and research that need to be brought to the fore in the near future. These topics may be aligned with topics being covered in other conferences or symposiums that are already in the planning or overlap with other initiatives, such as the High Impact Weather program. With the advent of the European Nowcasting Conference, it is also unclear how we should move forward with the WSN, but important to still continue to reach out to other regions of the world that could benefit from this type of conference.
Action 14: Further discussion and decisions need to be made regarding whether we will pursue a WSN 2020 and where.

17 Committee Management Activities

Two committee members are aging off the committee at the end of this year: Jian Jie Wang, and Alan Seed. Factors for consideration in nominating new committee members for approval by the SSC, include: scientific expertise, geographic location, gender, and ability to actively participate in nowcasting/NWP activities and projects. In addition to the annual WG meeting, it has been suggested that the committee engage in periodic teleconference calls to provide opportunities for more frequent updates and status on ongoing activities.

Action 15: Rita Roberts will email to the committee the list of expertise gaps in the committee, the list of potential candidates for membership, and solicit suggestions of additional candidates for consideration.

Action 15 Status: Email was sent to committee members on 17 August with the attached documents and requests for potential candidate names.

Action 16: Pete to canvas members to determine frequency for teleconference meetings, and then identify a methodology for conducting the telecons.

18 Summary of meeting outcomes, decisions, actions

Action 1: NMRWG to increase its engagement with other WGs and projects on cross-cutting activities.

Action 2: Send the Hong Kong meeting summary, the WMO Implementation Plan and the most recent NMR Implementation Plan highlights to the new members of the NMRWG.

Action 3: Dave Turner will link up with a NOAA representative who is heavily involved in the Year of Polar Prediction. Dave’s understanding is that the Polar Prediction group may be moving forward to do an FDP.

Action 4: Pete to send WG approval of RDP status to Estelle for the endorsement by WWRP SSC. Pete, Jianjie to summarize here any action items.

Action 5: ICE-POP science steering committee to provide a more detailed plan for model and forecast verification and forecast training on the use of forecast and nowcast tools. [UPDATE: This was discussed in more detail at the September ICE-POP meeting. The modeling plans are well in place – subject to final approval from a few groups for highest resolution systems. All groups have at least convective (km) scale systems. ECCC will probably be running models in delayed mode, more for the FDP, to assess the cloud microphysics. JWGFR , quite appropriately preferred that they maintain oversight of the verification activities – Laurie Wilson to liaise closely with KMA]

Action 6: Paola Salio and Rachel Albrecht to come up with a plan for Argentina and Brazilian collaboration as part of a RDP proposal and present plan to Celeste for discussion.

Action 6 status: A telecon to discuss this topic occurred on 29 Sept. A visit to CPTEC/USP/INPE is being organized to formally invite a collaboration with Brazil in the project. This visit may occur in early
December and SMN will present the RELAMPAGO Argentina-Brazil RDP project to the CPTEC coordinator. Meanwhile, Luiz Machado is working the specifics for CPTEC's high resolution (not guaranteed) model to also cover Northern Argentina. Nowcasting training was also discussed on the telecon and Rachel has obtained agreement that Brazil will host the training in Sao Paulo, and will submit a proposal to Sao Paulo state funding agency (FAPESP) to cover the participation of up to 100 people. Celeste’s goal is to present the RDP plans at the next SSC but not clear at this time if this deadline can be met, as the document will need to be sent to Luiz, Rachel and Daniel for their approval, and then to the WG and to WMO secretariats for review.

**Action 7:** WMO is exploring whether to expand the AvRDP into an Intercommission Aviation Research Project (CAS/CAEM/CBS). Discussions and possible decision on this is expected to happen in late 2017. Peter to provide feedback to the WG on decisions from this meeting.

**Action 8:** Peter Li is working with the WMO to draw up a roadmap for the Inter-commission Aviation Research Project, taking into account Phase II of AvRDP. This will also include exploring funding options with WMO (e.g. trust funds or other). Similar to Phase I, Phase II is not core funded.

**Action 9:** Estelle will provide DFID with a budget plan and timeline for the HIGHWAY project, using input provided by Rita Roberts and Caroline Bain.

**Action 10:** Dave Turner and Volker Wulfmeyer to decide on whether to submit a LAFE RDP proposal, and inform the WG of their decision.

**Action 10 status:** Volker will submit a RDP proposal in the coming month or so. This addresses Action 10 and Action 11 below.

**Action 11:** Dave to let Estelle know if LAFE wants a letter of recommendation instead.

**Action 12:** Pete sits on one of the HIW sub-committees and will forward to the WG the HIW newsletter that is sent out every 6 months.

**Action 13:** Dave Turner has agreed to write a 5 page white paper on recommendations for operational ground-based thermodynamic boundary layer profiling. Dave to interface with the DAOS group regarding observations for meteorological services.

**Action 14:** Further discussion and decisions need to be made regarding whether we will pursue a WSN 2020 and where.

**Action 15:** Rita Roberts will email to the committee the list of expertise gaps in the committee, the list of potential candidates for membership, and solicit suggestions of additional candidates for consideration.

**Action 15 Status:** Email was sent to committee members on 17 August with the attached documents and requests for potential candidate names.

**Action 16:** Pete to canvas members to determine frequency for teleconference meetings, and then identify a methodology for conducting the telecons.
**Miscellaneous Actions:**

A. Preparations are ongoing for the AeroMetSci-2017 Conference being chaired by Peter Li, that will be held 6-10 November 2017 in Toulouse France.

B. Rita Roberts will attend and represent the NMRWG at the WMO Science Summit Meeting 20-22 October in Bali. **Updated Status:** Meetings will now be held in Geneva, Switzerland.

C. Paola Salio submitted a joint proposal on behalf of Argentina and Brazil, to the American Meteorological Society to host the 2018 International Conference on Radar Meteorology. **Updated Status:** the Argentina/Brazil proposal to host the conference was not selected.