

**WWRP**  
**WGNR Working Group Meeting**

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**Final**

**REPORT ON THE MEETING OF THE WGNR  
8-10 FEBRUARY 2011 IN GENEVA**

**Participants**

- Committee** Paul Joe (Chair); Tom Keenan, Jian Jie Wang, Alan Seed, Steve Goodman, Marianne Koenig, Thomas Haiden, Jim Wilson, Ping Wah Li, Jenny Sun, Augusto Pereira
- Experts** **WEBEX:** George Isaac (SNOW-V10), Beth Ebert (JWGVR), Brian Mills (SERA), Jenny Sun for Jeanette Onvlee (MWFR), Hoang Phuc Lam (Vietnam), Elena Saltikoff (FMI), Jianhua Dai (WENS)  
**In Person:** Dmitry Kiktev (Roshydromet, Sochi 2014), Peter Chen (SWFDP), Haleh Kootval (PWS/JONAS), Tom Butcher (WMA), CM Shum (CAEM President), Ian Lisk (CAEM, VP) Herbert Puempel (AeMP)
- WMO** Ted Nakazawa, Slobodan Nickovic, Nanette Lomarda

**Presentations** [http://www.wmo.int/pages/prog/arep/wwrp/new/Presentations\\_Nowcasting\\_2011.html](http://www.wmo.int/pages/prog/arep/wwrp/new/Presentations_Nowcasting_2011.html)

**1 Introduction**

The meeting was opened by the Paul at 9.00 am on 8 Feb 2011. Welcoming words and logistics information were provided by Ted, Slobodan, and Nanette. Ted welcomed Paul Joe to chair the working group. The objective of the meeting is to review the past and current projects and to lay out the plan for the future projects. Demonstration projects focused on the Olympic Games have significantly advanced the science of nowcasting. Considerations should be given to advancing and promoting nowcasting in developing countries as it would serve many WMO members.

Nicko provided an overview of the WMO structure and emphasized the cross-cutting relationships with agriculture, hydrology, aviation, disaster reduction, etc.

Nicko covers Mesoscale, Nowcasting and Thorpex. Nanette covers Tropical, Verification and SERA.

**2 Review of WGNR Mandates**

Ted, Slobodan and Paul thanked Tom for his tireless work in the past eight years and significant global progress has been made under his leadership. This is the first meeting of the WG since Sept 2009 and there were five new members. The purpose of the meeting was team-building and set the direction for the next 4 or 8 years.



**Figure 1: Tom Keenan receiving a certificate of appreciation from the WWRP Secretariat for his contributions to the the WGNR, WWRP and WMO. Slobodan Nickovic presented the certificate on behalf of the Secretariat.**



**Figure 2: Working Ground on Nowcasting Research Committee Members: Slobodan Nickovic, Tom Keenan, Steve Goodman, Alan Seed, Thomas Haiden, Jenny Sun, Ted Nakazawa, Marianne Koenig, Jian Jie Wang, Augusto Pereira, Peter Li, Paul Joe and Jim Wilson.**

Nowcasting addresses the 0-6 hour time frame and very short range covers the 0-12 time frame. A distinguishing feature of nowcasting is that it is precise in space, time and weather element and that it leads to a “call to action”. In order to improve nowcasting, there are three thrusts: (i) improve understanding, tools and extrapolation systems on the 0-2 hour time scale, (ii) improve the skill of high resolution models to facilitate the nowcasting-type decisions (call to action) in the 4-6 hour time scale and (iii) blending in-between.

As outlined in the WWRP Strategic Plan, the mandate of WG is to advise, promote, advance the science, publish scientific results, build capacity and transfer technology. Based on discussions with Tom and the Secretariat (with actions from Congress and the Executive Council), gaps in the WWRP Nowcasting program were identified:

- Better links to aviation
- Better links to hydrology
- Seamless nowcasting through better links with the WG on Mesoscale Forecast Research
- Development of a Developing Country FDP (e.g. Nigeria, Brazil, Lake Victoria, SE Asia) where development of a local research capacity within a region would be one of the goals. The concept of a DCFDP is defined in the WWRP Strategic Plan.
- Development of the Test Bed concept (not defined in SP though mentioned) would enable better statistics and engagement with end-users who may require longer projects to adapt and adjust to the new technology. What is test-bed? It relates to mainly a longer time demonstration project. Then, the main problem is manpower, cost and sustainability of supporting such a project. Since, it may lead to an operational implementation, engagement of and collaboration with CBS is necessary. In the definition of a DCFDP, a mentoring country is needed to sustain the long-term action.
- Forecast systems. Many countries are strategically discussing how to produce forecasts considering the recent technological advances including the improvement in NWP, nowcast systems and automated product generation but also due to the lack of radar networks in many countries. While this has been identified by Congress to move forward, little progress on this has been made due to resources.

### 3 Nowcasting in Canada (Paul Joe)

Main challenge in Canada is to provide severe weather warnings over a large domain -  $10^6 \text{ km}^2$  (tens of radars) – with a single severe weather forecaster - so automation is a key issue to help the forecasters identify only those thunderstorms that require a warning.

The Radar Quality Control and Quantitative Precipitation Estimation Intercomparison Project began as a WWRP/WGNR initiative but has now been taken up with CIMO/ET on Upper Air and Remote Sensing Technologies. Paul is a member of that group and is leading that project. A project document will be tabled.

Canada has recently just completed the SNOW-V10 project. It focussed on winter complex terrain nowcasting. Arguably, the requirements for winter nowcasting have a greater spatial resolution requirement than in summer. Certainly, in terms of weather elements, there is greater variety of issues.

**Decision/Action:** Paul to send a copy of the latest RQQI plan to the group.

#### **4 Nowcasting with STEPS (Alan Seed)**

Alan provided a presentation about probabilistic ensemble blended precipitation nowcasting system called STEPS (Short Term Ensemble Precipitation System). Considerable discussion on this interesting presentation ensued. He indicated that CSI is a strong function of spatial scale and that one skill score-lead time diagram is therefore misleading.

#### **5 Nowcasting with VDRAS (Jenny Sun)**

Jenny provided an overview of the Variational Doppler Radar Analysis System. This is an analysis system that assimilates radar and other remote sensing data. At times, it works well and other times it does not when the solution does not converge. Recent progress has been made in complex terrain (Taiwan project) where removal of the mean values for perturbation fields must take elevation into consideration. Main challenge is to balance the small and the large scales. The large scale analysis captures the field but the cycled analysis was giving the wrong large scale. More frequent cycling is needed (at least hourly) when using radar data so that observations have a chance to kill the spurious developments.

Results show that with 3DVAR systems, radar data only improves the forecast in the 3 hours.

4DVAR maintains the skill for longer and using reflectivity and radial velocity is better than velocity only. It could be better to use ensemble with radar data assimilation so there is sensitivity to the microphysics.

#### **6 Nowcasting in Brazil (Augusto Pereira)**

Sao Paulo, Brazil suffers from about 20 urban floods per year. Recently, 1000 people died in a recent flood in January but does not get the attention it deserves. Brazil has a plan to upgrade their radar network but major problem in developing their radar network – lack of ability to develop and retain technicians, lack of coordination due to lack of national legislation and competitive rather than collaborative culture.

#### **7 Nowcasting and EUMETSAT (Marianne Koenig)**

Marianne described the nowcasting related activities in EUMETSAT (also see following web sites [www.nwcsaf.org](http://www.nwcsaf.org), [www.satreponline.org](http://www.satreponline.org), [convection.satreponline.org](http://convection.satreponline.org)). Of particular relevance is the Convection Working Group meeting held in Mallorca Oct 2011 (Prague in 2012). She presented some examples of the GII/Combined II, RDT and RGB products.

#### **8 Nowcasting in Austria (Thomas Haiden)**

Austria focuses on weather hazards in mountainous areas:

1. Flooding and flash flooding – partly in combination with stationary thunderstorms confined valleys and steep terrain,
2. windstorms - large scale storms with down slope winds;
3. lightning and hail, confined mainly to foothills but convection can dominate orographic effects in the mountains
4. Snow.

Radar data quality is very poor and it is difficult to maintain the radar. Radars in the valley are blocked and radars at elevated locations miss the low level precipitation. They combine the

radar with a reasonably dense gauge network to get the 15 min rainfall accumulations and have a way of adding the effect of orography on the surface rain rate. There is orographic triggering of convective rainfall that is very common in summer and the 2km model is not up to predicting new development. Other model fields (convergence, trigger temperature, satellite) are empirically used to create new storms.

## **9 Nowcasting at HKO (Peter Li)**

HKO focuses on service and user needs for their sustainability development strategy. They have been exploiting the Android mobile telephone operating system very effectively to get the products out to end users. Participation in various FDP's (B08, WENS, and Commonwealth Games) has led to benefits to their system. They have made improvements to their tracking algorithms by using optical flow at different scales. They are now focussing on probabilistic nowcasting.

## **10 Nowcasting – Status and Trends/Where should Nowcasting go? (Jim Wilson, WEBEX)**

Nowcasting is defined as description of the current state and prediction of changes in the next couple of hours (0-6h). It is mainly based on observations. The following comments are for convective storms only. Found out that you could not beat extrapolation unless you include and get the boundary layer right. Blending and verification was a focus of the B08 project. Blending did not improve the nowcast if the NWP did not assimilate radar data. Some evidence that assimilating radar can improve over extrapolation after 3 hours of lead time. Use of nowcasting has increased over the past years but there has not been much improvement in NWP on nowcasting timescale.

Improving extrapolation does not improve nowcasting since it is not the major source of error which is the decay and initiation of cells. NWP is the way to go in the 3-6h lead times. In the 0-2h, the best nowcast system includes a forecaster. This means that understanding, conceptual models and tools are needed. The forecaster must know the local environment and must develop conceptual models or rules for nowcasting.

What do we need to improve nowcasting? (a) Improved understanding of the physical processes, (b) Need high resolution observations in the boundary layers and (c) High Resolution models on the nowcast time scale. For the future, it requires a commitment of weather services to provide nowcasts. Then, forecasters will look at the observations which they have stopped doing at the longer forecasts. In summary, the best nowcast system in the 0-2h involves expert systems, conceptual models and the forecaster. In the 2-4h period, blending NWP with advection forecasting, and in 4-6h period, high resolution NWP with data assimilation is the way to go

## **11 Nowcasting at CMA (Jian Jie Wang)**

The average annual death in China due to meteorological events is around 4000 people. There are 158 radars and very dense gauge networks of automatic weather stations have been installed at 20-40 km gauge spacing. CMA has developed the SWAN nowcasting system and has put into operations. The Radar QC adjusts for ground clutter, anomalous propagation, beam blockage and VPR correction. Z-R relationships seem to vary across the country. Real-time nowcasting verification using CSI, POD, FAR scores is done for 1 hour accumulations and also reflectivity. Nowcasting capability includes TREC winds, TITAN cell tracking. BJANC exists since 2008 and is now expanded to include more radars and bigger spatial domain. There is a

work on QPF blending and probabilistic nowcasting with STEPS at the Shanghai Met Bureau. Future plans include more radar QC, blending and probability products based on a multisystem approach. There is a significant gap between research and operation in the use of SWAN in NW China where the climate is drier. Aviation has their own systems.

## **12 Verification WG (Beth Ebert, WEBEX)**

Verification has been very active since S2K and the WG was formed in 2002. The JWGFVR has had a long and fruitful relationship with WGNR. Experience in real-time practice is that using simple plots of forecast and observations in categories and displayed in a table is easy to understand for QPE/F. WMO published videos of the recent Helsinki workshop which is available on the WWRP web site but also in hard copy. Papers were published in QJRMS and review the state of art. Future work: verification is crossing the space-time scales (consistent scores) to address the seamless concept and will focus on ensemble prediction, extreme events, aviation, multivariate verification (more than one weather element), time-height verification. Real time verification depends on what the users need to know in real-time and on the sophistication of the user. There is need for additional product development: subjective verification, intuitiveness and visual products.

## **13 SWFDP (Peter Chen)**

Peter is the chief of the Global Data Processing and Forecast System Division of the Commission of Basic Systems. He has a mandate to promote the use of NWP for member countries. It does not include the 0-12 time scale. His SWFDP project has been to exploit and produce tailored NWP products at Regional Centres for improving Severe Weather Warnings in the day 0-5 day time scale. There is a gap in the 0-12 hour time scale. The SWFDP is a “low lying fruit” project that focuses on implementation with no research or development components. Peter conducted SWFDP in Southern Africa, South Pacific Islands, South-East Asia and Eastern Africa.

The Eastern African project is in implementation phase. Peter indicated the role in “understanding the dynamics of the lake” that WGNR can play. In discussion, another identified role was in the application of satellite and lightning products for warnings in the 0-6 hour time frame.

Some discussion on a sub-area of the East African project was on the Lake Victoria area. Peter indicated that Tanzania and Uganda had radars in the area but little is known about the status of later radar. Additional radar(s) will be deployed in Tanzania. Kenya does not have radars.

The Mobile Weather Alert project (see below) focuses on dissemination and service and not on warning content production. This highlights the gap in the “forecast system” (see discussion below). There are many other projects in East Africa.

**Decision/Action:** The SWFDP focuses on day 1+ prediction is in the implementation phase and so is well under way. The MWA project assumes the warning content can be provided by NHMS’ (though experience suggests that there may be a gap here) and focuses on dissemination and service. Executive Council approved WWRP to develop an “understanding dynamics of the basin” project. While the WWRP project could move independently of SWFDP and MWA, piggy backing on and following those projects may be advisable to address logistic and co-ordination issues. It is agreed that SWFDP will co-ordinate with WGNR in the

development of an “understanding” project for Lake Victoria. Participation by a WGNR Expert Team in a future SWFDP meeting would be appropriate.

#### **14 WENS** (Jianhua Dai, WEBEX)

The WENS project focuses on the demonstration of the provision of high impact weather forecasts and services rather than systems. To enhance SMB's ability to deliver a nowcasting service to the public, six forecast systems were implemented. In the early morning service, end users received nowcasts via SMS, phone calls etc. Six governmental departments were included. WENS had impacts at the nowcasting system and also the end users and it could be demonstrated that WENS did add value. Impact of the nowcast must be done on a case by case basis. Understanding and the development of conceptual models for urban thunderstorms is a gap. Weather type forecasting may aid in nowcasting in order to identify which nowcast system or conceptual model is relevant.

Lessons learnt: Nowcasting needs to better support for decision making to understand the impact – accuracy, precision and timing. Nowcasting products were not always easy to understand. Information delay was a big factor. There was no clear winner. Data quality control and weather type based nowcasting methods are needed.

Issues of concern: focus on impact evaluation, how to evaluate nowcasting, how to deliver a nowcasting service that is tailored to the end user. Evaluation will be the focus for completion with a final meeting to organize in November 2011.

#### **15 Nowcasting in Vietnam** (Hoang Phuc Lam and Elena Saltikoff; WEBEX)

There is a desire to develop a FDP in SE Asia/Vietnam. There are plans to upgrade the radar network in Vietnam in the next 10 years. There are three main groups within Vietnam Hydro-Met Service. The NCHMF in Hanoi does the research and training for the regional centres. The Aero-Meteorological Observatory (AMO) does the radar network and works with the NHMFC. The International division deals with Regional and International programs. There is existing co-operation with other countries through bilateral arrangements.

Nowcasting status: the current radar network is a mix of technologies developed over many years with resulting data quality and data access issues. Thompson radars are conventional only, EEC radars have proprietary formats and Doppler radars are just being installed now and over the next 10 years. Procedures for providing warnings are cumbersome. Major weather events: tropical cyclones, thunderstorms in the evening. There is 100+ days of thunderstorms a year in Hanoi. Pilot nowcasting exercises were conducted in 2010 by the NCHMF. There was a realization that nowcasting tools to aid the forecaster are needed and hence, the proposal for a WGNR-lead FDP.

A SWFDP is in the formulation phase led by GDPFS, with Japan and Hong Kong Regional Centres playing significant roles. The participating countries include Cambodia, Laos, Thailand and Vietnam. Thailand has EEC radars. Laos has Mitsubishi radars with Sigmet processors. There is no information on Cambodia. Hanoi will accept the responsibility for being the focal point for the SWFDP with support from Japan (Yuki Honda) and Hong Kong (S.T. Lai). There is a gap 0-12h in the SWFDP and there are radars in this region, so adding a nowcasting component with WGNR could fill the gap.

Finnish Met Institute (FMI) has a bi-lateral agreement to support Vietnam in maintenance of their AWS, building a radar mosaic and human resource capacity building. Radar training is planned for 4-8 April 2011. Involvement of the WGNR group would provide the missing expertise in convective forecasting and thunderstorm warnings.

**Decision/Action:** The SWFDP is in formulation phase and so there is a ripe opportunity for WGNR will collaboratively explore the development of a nowcasting FDP utilizing the relationships developed by the SWFDP program. Due to many unknowns, an expert team visit should be scheduled. While it could be done independently, an opportunity may be available in the fall, in combination with the WENS workshop in November. It could also coincide with a SWFDP regional meeting. This may be appropriate for a DCFDP – goal of establishing a research capability with a mentoring country. There may be elements of service and dissemination that will involve CBS – PWS and GDPFS groups.

## **16 PWS program related to nowcasting (Haleh Kootval)**

The major nowcasting related activity was WENS. The major concerns in WENS were mainly impacts and service issues. Still to be done are post project survey, review meeting, publish guidelines, organizing a capacity building workshop.

Future of PWS and Nowcasting is in demonstration projects and how to apply WENS experience. PWS works with GDPFS on SWFDP where satellite is the main observation sensor for many countries. Haleh indicated that she sees research interacting with GDPFS then PWS addressing the “service” component of the process. The use of SAF/RDT, GII and Combined II and the hydro-estimator to provide the input to nowcasts and also to develop probability nowcasts should be pursued. Also, optical flow tracking to advect the images may be useful.

China may be willing to assist with the SE Asia region and play a leading role through SMB and HKO. There is already a lot of contact between HKO and the Vietnam service (training workshops). There were problems with implementing the training on a bi-lateral basis and working through WMO would be much easier.

Back to back workshops for WENS and then SWFDP meeting may be advantageous. A good outcome from the workshop would be a common view of the scope and definition of a satellite based nowcasting service.

**Decision/Action:** Members of WGNR will be invited to participate in the WENS Capacity Building workshop to fill gaps.

## **17 Mobile Weather Alert (Tom Butcher)**

The project employs weather stations mounted on mobile towers to enhance the data density and how to provide warnings to fisherman on Lake Victoria warnings using SMS on basic mobile phones. Five thousand people die on the lake per year. There is also an aspect of providing a service to the agriculture industry. Sustainability is a significant issue and there are intellectual property issues with the instruments, data and maintenance. This project is a pilot technology demonstration and is being developed with the World Bank and Ericsson. A significant focus is on lake surface temperature since it may aid forecast models predict the local environment and the environment for the development of local thunderstorms.



It is not clear what the warning issues are and why fisherman are dying on the lake – is it wind, waves or something else? This project is independent but is coordinating its work with the SWFDP proposed for East Africa. It is not clear what the warning requirements are (time, precision, weather elements) or how the content for the “call to action” type warning will be generated. Tom indicated that the process that is envisioned is as follows: (i) basic product generated, (ii) value is added by a local severe weather forecaster, (iii) decision is made, (iv) a service is provided, (v) the warning is disseminated and (vi) understood by the end-user. He also stated that a forecaster using satellite data to generate the content would be a good outcome. It is not clear whether the existing Eumetsat training, nor whether existing office infrastructure (a severe weather position) supports producing such content. On-site mentoring may be a useful activity.

It was stated that nowcasting can be viewed in the context of Climate Change Variability and since actions arise from nowcast, it can also be viewed as a Climate Adaptation activity which is an important activity in East Africa.

**Decision/Action:** WGNR will provide scientific support this activity. Tom will attempt to validate the death statistics and provide dates for cases of severe weather on the lake. Marianne will provide the satellite data so that Tom can use them to illustrate the service that is envisioned. There are many projects in East Africa and there is the potential for project overload. The SWFDP is mature and progressing into the implementation phase and WGNR will co-ordinate and follow the lead of the SWFDP. There are radars in the area in Uganda and Tanzania. Executive Council approved an “understanding the basin dynamics” project. More information is needed on the requirements, definition and goals of a potential project. An expert team visit is recommended.

## **18 SNOW-V10 (George Isaac)**

The Science of Nowcasting Olympic Weather – Vancouver 2010 was a very successful RDP-FDP. It advanced nowcasting into winter, complex terrain and multi-weather element science. These are all novel areas for nowcasting science. Decision and critical threshold tables by sport were generated for the first time. Observations were a critical in the development of the project and a substantial legacy of the project was the data set that was created that can be used for research on understanding the weather, validation and verification of NWP. Minutely (or better) observations of basic parameters but also visibility, precipitation and wind were collected. Remote sensing (ceilometer, valley radar, vertical profiling by radar, radiometer and wind profiler) was critical. High resolution modelling at 1km scale proved to be extremely important to capture the flow and physics in complex terrain. Several new multi-element nowcast systems (ABOM, INTW) blending observations and models were developed and proved to be skilful. There were also advances in understanding the weather in complex terrain.

Weather played a critical role in many of the activities with many activities re-scheduled due to the forecast. A most important decision was made before the Olympics began and involved a 14+ day forecast of total accumulated snow. The lack of sufficient snow triggered a \$50+M decision to begin to manually transport snow onto the Cypress Mountain view. Thirty-one papers have been identified for publication in a special issue of Pure and Applied Geophysics with a due date of 1 Oct 2011.

**Decision/Action:** George Isaac is to be congratulated for leading an ambitious and successful project. All the goals of the WGNR were addressed in a highly successful way. The WWRP

and WGNR look forward to the scientific publication of the results. A final seminar that presents the results may be more appropriate than a capacity building workshop.

## **19 SERA (Brian Mills)**

Brian provided an overview of SERA activities and how to implement this component in WGNR projects. The focus of SERA is on decision-making and not on behaviour. A critical issue is to define the data that is needed to answer and identify the impacts of decisions. Often surveys and interviews are conducted to create this data and responses are often subtle and nuanced and so language is a key aspect of generating data. To understand risk, one also needs to understand the threat, the impact of the threat and the exposure to the threat. Often a “before and after” survey or interview is conducted to create the data. Focussing on a specific and limited number of end-users (e.g., forecasters and then end-users such as fishermen, farmers) is often more effective than broad surveys (e.g., general public) where there are many confounding factors.

Impact studies are valuable in establishing the value of a service and to determine benefit and value compared to cost. It can be used to monitor the value of the decision (goes up) and nowcasting skill (goes up). Discussion indicated that at HKO, considerable time is spent justifying the intangible benefits of a project but the tangible benefits are simply stated in dollars derived from cost-benefit studies. Another benefit of SERA studies is that it can help identify the best ways to package information.

## **20 Nowcasting: Satellite and Lightning (Steve Goodman/Marianne Koenig)**

Steve and Marianne were tasked to lead a discussion on the use of satellite and lightning for nowcasting. The presentation showed many examples of how this could be achieved in a developed country like U.S. and Europe. Related efforts to transfer this knowledge has been done through “test beds” and “proving grounds” – where artificial boundaries are removed and operations provide feedback to the researchers and also in the recently user-organized EUMETSAT “convection working group”. Researchers live in the world of the forecaster and can therefore develop much better products. There is need to understand end user needs, involve end user in the entire process with site visits over a long period. Many of these countries also have advanced radar networks and so a quantified “satellite and lightning – only” end to end warning process has not been demonstrated. Total lightning is highly correlated with mass flux of ice above the freezing level and hence highly correlated with thunderstorm dynamics and microphysics. Improvements in the spatial accuracy of long range lightning detection networks (currently at 5-10 km) can be achieved in East Africa with additional stations located in the Indian Ocean. It remains to be demonstrated whether the spatial and detection accuracy of these networks can be effective at the nowcasting spatial scales.

**Decision/Action:** Substantial progress has been made in satellite products for nowcasting applications using proxy GOES-R products in the U.S. and from MSG in Europe. Publications of these results are highly encouraged and a demonstration project of this capability would benefit many WMO members.

## **21 INCA CE Improved weather forecasting for Central Europe (Thomas Haiden)**

NWP is modified using radar and detailed surface topography to generate nowcast. Considered parameters include temperature, humidity, wind and precipitation. The INCA CE project is a European Union funded project to implement INCA in Central Europe. There 16 project partners

in 8 countries. The nowcast issues include road safety, operational hydrology and civil protection. The project has very strong links to service provision and end-users. It is not clear how application support, local tuning, requirements management will be managed as it is still early days. Yong Wang (current project manager) inquired about whether INCA-CE would benefit being a WWRP FDP project. Collaboration under WMO may facilitate research funding, access to experts, reduce the need for complex bi-lateral agreements and other contractual issues and demonstrate impacts and quantitative results.

**Decision/Action:** Paul encourages an INCA-CE proposal for WWRP FDP. There are advantages to both partners. The project document is in the Strategic Plan and it is not an onerous process.

## **22 Sochi-2014 (Dmitry Kiktev)**

Dmitry Kiktev is developing a blended FDP/RDP project for the Sochi 2014 Winter Olympic Games. A kick off meeting is planned for 1-3 March 2011 in Sochi and several international groups have indicated their interest including: Australia, Austria, Canada, China, Finland, Germany, Italy and the United States. The WGMWFR listed several concerns for the project but they have all been met. A desired legacy of the project would be an enhanced mesoscale modelling capability in Roshydromet. The project seems to be in good shape and the challenges are exciting and a natural follow-on from SNOW-V10. This is an opportunity to develop mesoscale NWP to close the gap in the 4-6 hour nowcasting time scale. Mesoscale modelling and satellite groups are encouraged to start their modelling and analysis to begin to develop conceptual and statistical models of the situation. Visibility is a big issue that needs both observations and models.

With the deployment of dual-polarization radars, a data quality component could be added where particle classification schemes could be inter-compared with in-situ data. With the coastal and warm winter environment, it is expected that a wide variety of particle types will be encountered.

**Decision/Action:** Need to encourage participation by the Mesoscale Weather Forecast Research and SERA groups. The WWRP Secretariat will participate in the Sochi Kick-Off meeting to represent SERA interests.

**Decision/Action:** WWRP congratulates Roshydromet for getting the project to this stage, supports the kick-off meeting in Sochi. It seems that the project is well on track to address issues identified from SNOW-V10 but also new challenges.

**Decision/Action:** Paul to explore a RQOI inter-comparison project on hydrometeor classification.

## **23 MWG-NWG Meeting (Jenny Sun and Dale Barker)**

Jenny reported on the developments of a specialty meeting between the WGMWFR and WGNR to explore and advance the use of NWP for nowcasting. This was an action item from a previous WGNR meeting. Jenny and Dale were looking for additional member for the International Organizing Committee. WGNR added Paul Joe and Peter Li to the organizing committee and Jeanette Onvlee from the WGMWFR. The tentative dates at the end of June were too soon and new dates need to be found.

**Decision/Action:** The workshop is relevant and supported by the WWRP and WGNR. Paul will organize a telecon n to discuss content and agenda for the meeting.

#### **24 B08FDP Training (Jian Jie Wang)**

The B08FDP/RDP were highly successful projects. Still to be completed are formal publication of the results and a capacity building workshop for WMO members. Lists of papers were created with lead authors identified at the final Science Steering Committee meeting held in Guangzhou in 2009. The capacity building workshop should be used to bring the results together and to write the papers. While there is a WENS workshop in Nov 2011, it is too ambitious to address both projects in a single workshop, too early to be able to gather the materials together or to create the workshop. The proposed date and location of the workshop would be in the first half of 2012 in Beijing.

**Decision/Action:** A request from WWRP to CMA to host a training workshop should be made before June 2011 to match the planning schedule of CMA. Details of the training workshop will be decided between WGNR and CMA, such as number of people, contents, location, and duration. It is better to make it more general and applicable to SE Asia. Considering their current training activities in China, Jim Wilson and Rita Roberts will be asked to lead this activity.

#### **25 Heuristic Nowcasting workshop (Alan Seed)**

A proposal was submitted by Alan Seed and Isztar Zawadzki to conduct the second heuristic nowcasting workshop in Montreal. This workshop gathers experts to review and discuss how to improve nowcasting in the 0-4 hour time frame, moving beyond extrapolation and into blending. This complements the MWG-NWG workshop with addresses the accuracy from the longer to the shorter time scales (in particular, the 4-6 hour time scale).

**Decision/Action:** WWRP supports this workshop and invites Alan Seed and Isztar Zawadzki to organize this in Montreal. The date (initially proposed for 2012) and agenda is to be decided considering the other WGNR activities.

#### **26 Forecast Systems Workshop and DAOS (Tom Keenan)**

Forecast systems refer to the end to end issues of a seamless forecast production system – from instruments, monitoring systems for global and nowcasting scales, to both automated and human forecast processes and to efficient production of services. With the advances in technology, cost issues and the desire to make advancements, the forecast system needs a high level framework to enable collaboration and trans-national systems to be developed and shared. Congress approved a workshop but little progress has been made.

**Decision/Action:** Re-affirmation and clarity on workshop goals by Congress is necessary to progress this project. WWRP secretariat will follow up with Tom Keenan on history of the file and to find justification and funding scenarios for the workshop in collaboration with CBS.

Observations on the nowcasting scale are a gap in the GOS requirements and also in Thorpex DAOS which deals only with global data assimilation.

**Decision/Action:** Paul to discuss with WWRP chair on how to proceed.

#### **27 Linkage to Aviation (Peter Li)**

HKO have strong nowcasting and aviation programs. Peter Li as asked for a presentation on how to make better linkages between the nowcasting and aviation communities. C.M. Shum, Ian Lisk and H. Puempel of CAEM attended. This is timely as CAEM will develop a strategic plan in about 2-3 years time. It is important to know realistic accuracy and precision of weather prediction in a 10 year time frame. Verification needs to be done on user terms – that is, impacts verification as MAE and RMS statistics do not translate well. Probabilistic forecasts need clarification and calibration on how they are used and their impact on decision making. Products with high glance value are needed to support limited bandwidths up to the cockpit but also for decision support.

**Decision/Action:** WSN05 had a strong aviation component to the meeting. Participation by CAEM in WSN12 would be timely. CAEM will be invited to join the IOC of WSN12.

## **28 WSN12 Symposium (Augusto Pereira)**

Augusto Pereira has offered to host the WSN12 Conference in Rio de Janiero – 20-24 August 2012. Themes of the symposium should include the gaps identified at this meeting. Augusto identified that training workshops will be conducted in the week prior to the Symposium and invites WGNR committee members to participate.

**Decision/Action:** The WWRP/WGNR supports this Symposium.

## **29 Regional Training Centre for Nowcasting (Augusto Pereira)**

An advanced WMO training centre on nowcasting (Regional Training Centre on Nowcasting) was proposed to be organized at the University of Sao Paolo during the summer months over the vacation time. The idea is to implement systems from S2K or B08 and to invite WGNR and other experts to provide training and mentoring. With the systems in place, students will have hands-on experience with nowcast systems and tools. There was a brief discussion on some of the issues including: duration of the training (2 weeks to 2 months), sustainability (multi-year), support (IT systems and for trainers), content and objectives of the workshop(s). This would be considered an advanced course within the WMO training centre structure. With a semi-permanent facility, this could evolve in a Nowcasting Test Bed that could operate over several years to better engage end-users (civil protection), to advance nowcasting in a high impact urban environment and to link with urban hydrological modelling. These were identified gaps.

**Decision/Action:** In principle, the WWRP and the WGNR support the concept of this workshop. There are many details to be worked out such as roles and responsibilities (of WMO, of USP, of PR), qualifications for participation, certification, infrastructure, sustainability and support. Augusto was invited to prepare a proposal to WWRP/WGNR to advance the case for the RTC-N.

**Annex A: Working Group on Nowcasting Research Meeting**

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Dates: 8-10 Feb 2011

Location: WMO Headquarters, Geneva

**Meeting Objectives:**

1. Review purpose, mandate and strategic plan of WGNR
2. Committee Member Introductions
3. Review Status of Current Projects
4. Review of WMO processes and other related WMO projects
5. Discussion/Preparation of Future Projects

**Agenda**

<b>8 Feb 2011</b>		
9:00	Introductions	Ted Nakazawa, Slobodan Nickovic, Nanette Lomardo, Paul Joe
9:30	Agenda Review and Review of WGNR Mandates	Paul Joe
<b>Committee Member Presentations</b>		
10:00	Nowcasting in Canada and RQQI	Paul Joe
10:30	COFFEE	
11:00	STEPS and Nowcasting Activities at BOM	Alan Seed
11:30	VDRAS and NCAR / U.S. Activities	Jenny Sun
12:00	Nowcasting Activities at HKO – Test Beds and Open Labs	Peter Li
12:30-1:30	LUNCH	
1:30	Nowcasting in Brazil/South America	Augusto Pereira
2:00	EUMETSAT – Activities (SAF's, Training, African Activities, etc)	Marianne Koenig
2:30	Nowcasting in Mountainous Terrain	Thomas Haiden
3:00	COFFEE	
3:30	Nowcasting Activities – BMB, CMA and China	Jian Jie Wang
4:00	Satellites and lightning for Nowcasting	Steve Goodman

4:30 (830AM Boulder time)	Nowcasting Trends - Where should Nowcasting go? (WEBEX)	Jim Wilson
5:00-5:30	Legacy, Review of WGNR Activities	Tom Keenan
<b>END OF DAY</b>		
<b>Dinner – Hosted by WMO at local restaurant (details provided at meeting)</b>		
<b>9 Feb 2011</b>		
<b>Related WWRP and WMO Projects</b>		
9:00 (7pm Melbourne)	Verification WG (WEBEX)	Beth Ebert
9:45	SWFDP's in Africa and SE Asia	Peter Chen
10: 15 (5:15pm Shanghai)	WENS (WEBEX)	Jianhua Dai
11:00	COFFEE	
11:30 (5:30 pm Vietnam, 1230 pm Helsinki)	SE Asia (WEBEX)	Hoang Phuc Lam / Elena Saltikoff / Paul Joe
12:30-1:30	LUNCH	
1:30	PWS Programs Related to Nowcasting	Haleh Kootval
2:00	Mobile Weather Alert	Tom Butcher
2:30 (4:30pm Nairobi)	Lake Victoria Nowcasting (WEBEX)	Joe/Marigi
3:15	World Bank and Resourcing Projects	Mary Power
3:30	COFFEE	
3:45	MWG – mandate, objectives, activities and the MWG/NWG Workshop	Jenny Sun / (Jeanette Onvliee)
4:00 (9am Toronto)	WSN09/SNOW-V10 Report (WEBEX)	Geroge Isaac
5:00-6:00pm (10am Waterloo)	SERA WG – Mandates, Objectives and Activities (WEBEX)	Brian Mills
<b>Group Dinner – Old Town (TBD)</b>		
<b>END OF DAY</b>		
<b>10 Feb 2011</b>		
<b>New Initiatives</b>		
9:00	Sochi 2014	Dmitry Kiktev
10:00	COFFEE	
10:30	B08 FDP/RDP Training	Jian Jie Wang
11:00	Heuristic Nowcasting – workshop?	Alan Seed
11:30	Forecast Systems /Thorpex DAOS	Tom Keenan
12:00	LUNCH	
1:00	INCA CE – A New WWRP FDP project?	Thomas Haiden
1:30	Advancing	Steve Goodman and

	Satellite/Lightning Nowcasting - Discussion	Marianne Koenig
2:15	Linking with Aviation - Discusson	Peter Li
3:00	COFFEE	
3:15	WSN12/RIO16	Augusto Pereira
3:45	Regional Training Center for Nowcasting	Augusto Pereira
4:15	Web Site / Nowcasting Guide	Slobodan Nickovic / Paul Joe
4:30	Implementation/Action Summary/Next Meeting	Ted Nakazawa, Slobodan Nickovic, Nanette Lomardo, Paul Joe
5:00	<b>END of MEETING</b>	

\* Discussion via WEBEX (Internet)