Nowcasting and Very Short-Range Forecasting Statement of Guidance for the EUCOS region

Contact point: Jacqueline Sugier (EUMETNET Observations at Met Office, UK) – jacqueline.sugier@metoffice.gov.uk

In 2018, WMO completed a rolling requirement review (RRR) process for Nowcasting and Very short-range Forecasting application area (Nowcasting and VSRF) which delivered: 1) an updated record of user requirements listed in the WMO's Observing Systems Capability Analysis and Review database (OSCAR database); 2) a critical analysis to assess the gaps by comparing capabilities versus requirements, 3) and finally an analysis (led by Alexander Kann, ZAMG) to produce a gap analysis and a Statements of Guidance (SoG) for WMO for the Nowcasting and VSRF Application Area. This SoG was developed to guide the evolution of networks (both ground-based and space-based) on a global scale and therefore does not necessarily represent the priorities for EUMETNET members for the EUCOS region. Following on from this WMO RRR process, the EUMETNET Observations Programme led a similar process in collaboration with the EUMETNET Heads of Forecasting community to develop a SoG for Nowcasting and VSRF for the EUCOS region.

The SoG captures the most important observation gaps that users wish to be addressed in order to help tackle some high priority challenges in NMHS's service delivery. The SoG does not provide a record of all user requirements; these are documented in the WMO OSCAR database which has been used to inform the SoG. The consensus view from the EUMETNET Nowcasting and VSRF community is that the EUCOS and NMHS observing networks are not currently fulfilling their requirements, with some significant key weaknesses. The starting assumption for this SoG is that existing networks should be maintained, forming the basis on which enhanced capabilities are introduced in an optimal manner to enhance the overall performance of composite network over the EUCOS region.

Nowcasting and VSRF application area encompasses the delivery of forecast services up to 2 hrs ahead (Nowcasting) and from 2 to 12 hrs ahead (VSRF). These services are delivered 24/7 by operational meteorologists and include general weather forecast along with forecast of the impact of the weather e.g. on businesses, on commercial or national facilities, on public safety and on their livelihood. Observations serve several purposes for the Nowcasting and VSRF application area: they are used as initial steps in Nowcasting, to generate Post-Processing products, and to carry out post-event verification. They are also used in real-time by operational meteorologists as diagnostic tools to provide some level of confidence on the model products, and to monitor rapidly evolving high impact event. These real-time applications are particularly crucial to support decisions made whilst issuing Impact Oriented Warnings (IOW).

The EUMETNET Heads of Forecasting community identified the prevailing Nowcasting and VSRF challenges within the EUCOS region relating in part to gaps in EUCOS networks; these currently include (in order or priorities) the forecasting and real-time monitoring of:

- Convection and associated hazards (thunderstorm, sting jet, strong wind/wind gust, tornadoes, high rainfall rate, hail storms).
- Winter and polar region weather (e.g. polar low, freezing precipitation, snowfall, snow depth, ice, avalanche forecast in mountainous areas)
- Precipitation types in the boundary layer (e.g. freezing precipitation, hail, snow) as well as the amount reaching the surface for hydrological applications and transport services.
- Low visibility, low cloud and fog formation, depth and dispersion (particularly important for the transport industry).
- Weather events in complex terrain including locally forced precipitation and high impact winds.

Based on these Nowcasting and VSRF challenges, the EUMETNET Heads of forecasting community selected and prioritised the following statements to guide the evolution of the EUCOS networks; Nowcasting and VSRF centres would benefit from increased:

- temperature, humidity and wind, both at the surface and as profile observations, at the spatial and temporal resolution required to improved model forecast of convective scenarios. These observations are critical to forecast and monitor the evolution of convective events and issue appropriate IOW. For that reason, the Head of Forecasting community strongly recommend to press ahead with the expansion of the MODE-S network to provide frequent wind profiles at all major airports. Furthermore, the potential contributions of emerging technologies to bridge these gaps (e.g. Raman Lidar, DIAL lidar, radar refractivity, microwave radiometers) should be investigated. This should involve taking part in field campaigns and other instrumentation trials, as well as conducting impact studies in collaboration with 1 or more Limited Area Model (LAM) consortia and 1 or more Nowcasting systems (e.g. INCA – Integrated Nowcasting Comprehensive Analysis).
- understanding the optimum requirement of additional observations to support improvement of services delivered during fog events, low cloud/low visibility events, during winter weather or in polar regions, and over complex terrain. This should involve taking part in field campaigns and other instrumentation trials, as well as conducting impact studies, and providing recommendations.
- exchange of observations between nations as well as nationally between organisations. There is a vast amount of surface observations collected by NMHS or partner organisations that are currently not exchanged on the GTS or not exchange at their full observing frequency. In some occasion, this is due to the lack of WMO numbers and this should be resolved once members move onto using the new WIGOS identifiers. However, for many partner organisations, the processes for exchanging observations is felt to be onerous and should be simplified. It is often perceived as a significant barrier to fruitful exchange of information. These blockers should be identified and, as far as possible, removed in a first attempt to get access to a higher volume of high-quality surface observations (e.g. basic variables as well as wind gusts, precipitation, snow, visibility).
- frequency and timeliness of all observations, particularly during rapidly developing, potentially significant weather situations (e.g. convective activities, fog/low visibility). The requirements captured in the WMO OSCAR database reflect the needs for model applications but don't fully reflect the requirement for real-time Observations as used by operational meteorologists to assess the performance of the model and guide their decision to issue warnings. These observations do not require to be necessarily of high quality, but will be essential to use in real-time to assess the performance of the models. These may include the development of central processing algorithm to extract information from web camera (e.g. visibility along motorway), social media (e.g. snow, hail, tornadoes damages), citizen observations (e.g. basic meteorological parameters as

well as snow coverage and depth, wind gust). Most importantly, these observations should be readily accessible via one central gateway.

- the quality of precipitation observations products including 4D-distribution as well as type and intensity. Furthermore, the radar coverage should be improved particularly over the ocean e.g. offshore around Iceland, over the Atlantic Ocean near the coast of Portugal but also including the Azores, and generally over the Mediterranean Sea i.e. off the coast of Africa, including also in these domains observations of ocean wind, waves and currents (e.g. with high frequency coastal radars for waves and currents).

List of Participants
Mr Jaime Rey, AEMET
Mr Janez Markosek, ARSO
Mr Marjan Sandev, CHMI
Mr Jan Sramek, CHMI
Mr Lovro Kalin, DHMZ
Mr Thomas Kratzsch, DWD
Mr Ole Kristensen, DMI
Mr Eric Petermann, EUMETNET
Mr Dick Blaauboer, EUMETNET/KNMI
Dr Jacqueline Sugier, EUMETNET/MetOffice
Mr Bruce Truscott, EUMETNET/MetOffice
Mr Anssi Vähämäki Anssi, FMI
Mr. Mateusz Barczyk, IMGW
Mrs. Julianna Drożdżyńska, IMGW
Mrs Elín Björk Jónasdóttir, IMO
Mr Nuno Moreira, IPMA
Mr Alessio Canessa, ItAF/ReMet
Mr Jan Rozema, KNMI
Mr Andris Viksna, LVGMC
Ms Evelyn Cusack, Met'Eireann
Dr Philippe Arbogast, MétéoFrance
Dr Christoph Schmutz, MeteoSwiss
Mrs Justyna Wodziczko, MetNorway
Dr Lang Will, MetOffice
Mr Fredrik Linde, SMHI
Mr Andreas Schaffhauser, ZAMG