NOWCASTING SYSTEMS FOR DEVELOPING COUNTRIES

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According to the WMO definition of nowcasting, it "comprises the detailed description of the current weather along with forecasts obtained by extrapolation for a period of 0 to 6 hours ahead." The latest radar, satellite and observational data are powerful tools in warning the public of hazardous, high-impact weather, thunderstorms and tornados, lightning strikes and destructive winds. Effective and accurate nowcasting contributes to reduction of fatalities and injuries, reduction of damage to property as well as improved efficiency for industry.

The strength of nowcasting lies in the fact that it provides location-specific forecasts of the initiation, growth, movement and dissipation of weather phenomenon. In an ideal world radar systems are the most important part of nowcasting, since it provides information on the size, shape, intensity, speed and direction of movement of individual storms on a continuous basis. The harsh reality, however, is that many developing countries (DC) and even more so Least Developing Countries (LDC) do not have operational radar systems at all, and the countries which are fortunate enough to have radar systems, are struggling to maintain and sustain these powerful data sources. If the focus is on nowcasting systems for *developing countries and/or least developing countries*, it implies that one would have to look beyond the use of only ground based radar systems. The emphasis should be on using what is available, without giving up on efforts to try, with international assistance when possible, to build upon, and improve the observational network of sensors (e.g. surface rain gauge stations, satellite-based radar data etc.).

At the WMO Nowcasting symposium held in Whistler, 2009, a session was devoted to the challenges surrounding the support of nowcasting efforts in developing countries. Some of the main issues which were mentioned include: observational data availability, IT infrastructure and maintenance, tools for processing and visualization, training of operational staff in nowcasting concepts, end-to-end product dissemination, building regional radar networks, access to satellite data and local/regional Numerical Weather Prediction (NWP) model output. Some of these issues can be addressed by WMO funded programmes and/or training options, but the question remains: 'What else can be done?' A list of possibilities to answer this question was compiled at the end of the Whistler meeting, summarized as follows:

1. Plan purchasing of expensive system in order to be sustainable
2. Plan the dissemination of datasets via the internet, GEONETCAST etc.
3. Start by getting access to satellite data…"it is an efficient poor man's nowcasting system".
4. Plan how to develop the expertise and technical support staff in your service necessary to keep these systems operational.
5. Develop and document a sustainable plan for incorporating very short term forecasting in the operational setting.
6. Provide and document end-to-end training taking into account end-user requirements and needs.
7. Regional cooperation is crucial.

To get the ideal recipe – including all the mentioned ingredients - for nowcasting systems in DC is clearly not an easy task and for LDC perhaps even impossible. One

1. The Flash Flood Guidance System (FFGS) is the intellectual property of the Hydrologic Research Center (HRC), a non-profit public-benefit corporation based in San Diego, USA. SARFFG was developed and implemented by HRC.

way of trying to accomplish this is through the WMO CBS Severe Weather Forecasting Demonstration Project (SWFDP).The SWFDPs aim specifically to improve severe weather forecasting in DC and LDC by providing access to their forecasters to current forecasting information that they do not have access to such as NWP and Ensemble Prediction Systems. Currently there are three active SWFDPs around the world - in Southern Africa, South Pacific, Eastern Africa, and two under development in Southeast Asia and Bay of Bengal (South Asia). Feedback from the participating NMHSs in the Southern African SWFDP was reported to have improved warning services in many countries and contributed to the improvement of relations between NMHSs and disaster management authorities. The SWFDP has thus contributed significantly to and end-to-end process of warning dissemination.

Although these SWFDP projects were initially designed to focus mainly on numerical weather prediction output and synoptic scale events, it is becoming clear that more than model output is needed. At the fourth meeting of the CBS-SWFDP Steering Group in Geneva, February 2012, it was recognized that one of the main challenges for the SWFDP (also identified by the participating NMHSs) was "the need for very short-range forecasting tools, to address especially the rapid onset of localized severe thunderstorms which can produce heavy precipitation and strong wind, given the absence of adequate real-time observational networks, especially weather radar coverage." The usefulness of EUMETSAT products, such as the Global Instability Index, for nowcasting purposes was recognized and it was also agreed that real time satellite rainfall estimates have proven particularly useful in regions where rain gauges and radar coverage is sparse. The WMO and other international programs, however, still need to find ways to facilitate or provide surface-based precipitation measurement systems to DC and LDC to accurately measure and monitor precipitation amounts on the ground, to be incorporated into hydrological runoff models as well as aide in validation of other (satellite and model based) methodologies.

The WMO is attempting to address operational prediction of flash floods in the 1-6 hour time-range by introducing Flash Flood Guidance System[1] (FFGS) projects in various developing regions of the world. The FFGS is a hydrometeorological modelling system that predicts the flash flood guidance value for each small river basin based on hydrological conditions that may lead to flooding in a specific basin. The Southern African Regional Flash Flood Guidance (SARFFG) project is one of the sub-regional projects of the WMO's global FFGS programme. Seven countries in Southern Africa namely Namibia, Botswana, Mozambique, Zimbabwe, Zambia, Malawi and South Africa will participate in the SARFFG. SARFFG involves a combination of regular hydrological modelling for small catchments over the entire domain with real time precipitation information from satellites to determine small catchments which had the potential to experience flash floods.

Similar to SWFDP, the SARFFG would allow forecasters in NMHSs to use the information received from the global and regional centers to issue nowcast information on potential flooding to the disaster management structures (end-users) in their countries. The importance of developing an excellent collaboration between weather forecasters and hydrologists, and between weather forecasters and disaster managers, in each country for the successful implementation of the SARFFG is of course fundamental. In this presentation, examples of satellite and model based products for nowcasting of convection will be shown. Examples of the SARFFG will also be used to show the usefulness for flash flood forecasting over southern Africa's DCs.

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