A NOWCASTING SYSTEM USING SATELLITE AND RADAR DATA: THE CHUVA PROJECT EXPERIENCE.

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ABSTRACT

This study describes the new results and implementations in the ForTraCC (Forecasting and Tracking the Evolution of Cloud Clusters) and the use combined with a Geographical Information System (GIS) during the CHUVA Project. New features was developed or included in the ForTraCC, we will describe news developments in the rain cells propagation, penetrative cloud tops, the merge with ground lightning data and the tracking of VIL structures. All these developments were included in a GIS and combined with CHUVA Project data allowing with free WEB access in real time for the population and decision makers.

1- Introduction

ForTraCC is a nowcasting system originally developed to use satellite data to track and forecast Mesoscale Convective System (MCS) (Vila et al, 2008). Machado et al. (2008) present a methodology using water vapor and window GOES channels to describe penetrative clouds and correlated it with the probability to have lighting. This feature was included in the nowcasting system adding additional information about the MCS life cycle evolution of the number of Cloud-Ground electrical discharge and the probability to have CG-lighting. Negri et al. (2010) used MSG channel differences to describe the inner cloud top structures and upper level wind divergence, this information will be included, in near future, in the ForTraCC system. Mattos and Machado (2011) found out several relationship between lightning activity and MCS size, area expansion, minimum brightness temperature, ice water patch and equivalent particles radius. This relationship are been included in the ForTraCC system. Recent new results show a potential procedure to extrapolate rain cells displacements. The ForTraCC system was adapted to run using radar and ancillary data to provide an integrated nowcasting tools running over a GIS. The integrated nowcasting tools were tested during the CHUVA Project Campaign. CHUVA is a project that will carry out seven field experiments to investigate the different precipitation regimes in Brazil. Four field campaigns have already been realized in the following places: Alcantara (MA), Fortaleza (CE), Belem (PA) and Vale do Paraíba (SP). The last campaign was jointed with the GOES-R Geostationary Lightning Mapper - pre-launch algorithm validation. The CHUVA main tool to test the nowcasting system is a X-POL radar. This system is a Web based Geographic Information System called SOS-CHUVA/ForTraCC (Severe storm Observation System using data for the CHUVA project). This system is a useful tool to interpret, summarize and integrate the environmental information and display or sends warning for emergency management groups. This is an open access system to also serve the population giving real time information to reduce citizen vulnerability. Take advantage of the instrumentations employed in each campaign a nowcasting pilot project was set up for each region, including the specific vulnerability and needs. The SOS-CHUVA shows real time high resolution radar and lightning data (update each 6 minutes, timeliness smaller than 10 minutes) the forecast for the next minutes and the probability to happen lightning, among several others functions. For the regions

outside radar coverage, the system has the hidroestimator and the HidroTrack, a precipitation estimation and nowcasting for the next two hours. The system also has the 24 hours, high resolution BRAMS-1 km weather forecast. This study describes the new development of the ForTraCC system and the use combined with a Web based Geographic Information System called SOS-CHUVA/ForTraCC

2 - ForTraCC new devellopment

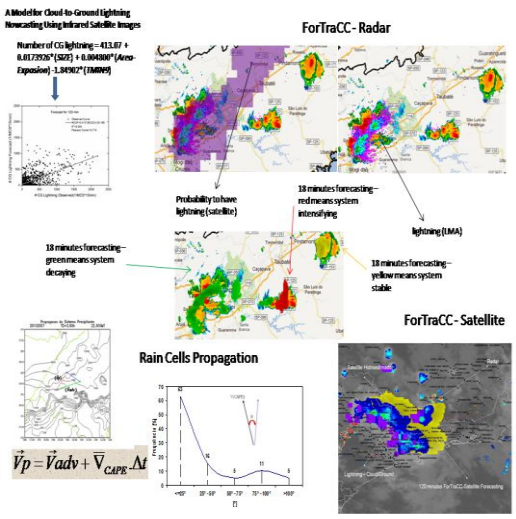

Figure 1: Mosaic describing ForTraCC features using radar and satellite.

Figure 1 illustrate the improvements employed or to be employed in the near feature in the ForTraCC system. In the left upper side we shows the diagnostic equation to be used with ForTraCc forecast parameters to describe the number of CG lightning 120 minutes later. The new propagation equation, for rain cells is describe in the bottom of the left side. New results shows that the rain cell propagates with a combination of the density weighted 700 hPa and the CAPE gradient (from high resolution model). This new equation is been tested to be implemented in ForTracc to forecast system displacement. In the upper and bottom right side we present example of the radar and satellite ForTracc been used in the CHUVA-SOS Vale do Paraíba.

3- The SOS/ForTraCC-CHUVA

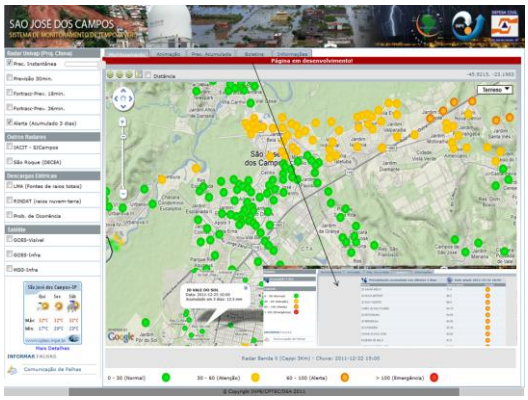

Figure 2: Example of the SOS-CHUVA/ForTraCC Vale do Paraíba

Figure 2 shows an example of the SOS-CHUVA/ForTraCC Vale do Paraíba. This Fig. shows the amount of rainfall for each São José dos Campos city neighborhoods in the last three days, presenting red label for rainfall larger than 100mm (as suggested by Civil Defense). The description of the values can also me access in the bulletin format.

4- Conclusions

This study briefly presents the new features developed for ForTraCC radar and satellite and presents the SOS/ForTraCC CHUVA, a GIS web based system that gives real time access to the users and decision makers.

5- Acknowledgements

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6- References

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