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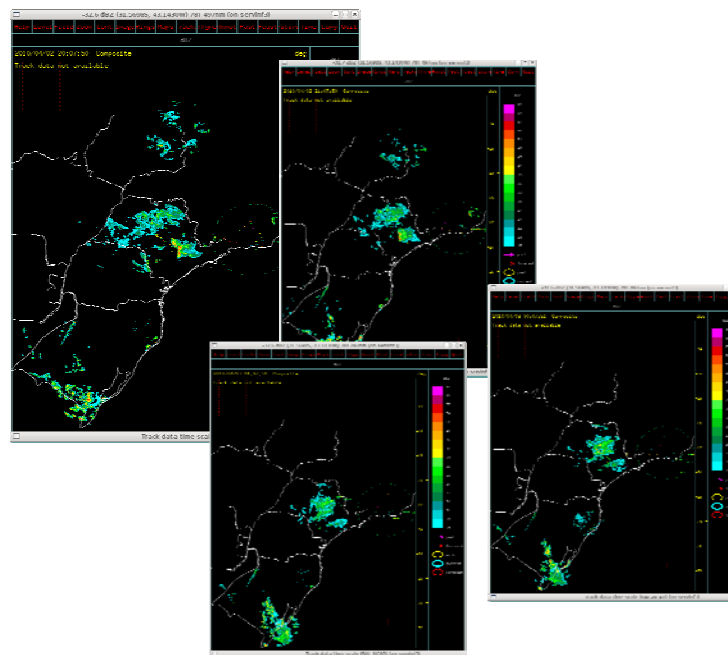
INTRODUCTION

- > The Meteorological Research Institute (IPMet) of UNESP has been monitoring the three-dimensional structure of thunderstorms, since 1992 and 1994, respectively, using two S-band Doppler radars in the central and western part of the State of São Paulo. Recently a research opportunity was called to develop tools that could be deployed for monitoring larger areas of the country where existing meteorological radars could be integrated, primarily in the south and southeastern regions of Brazil.
- > The Meta 2 of the project is designed to integrate the currently existing nine radars in the region to supply infrastructure in support of Aviation, Civil Defense and many other sectors of society.
- > The main contribution of IPMet for this milestone is to provide a technical platform whereby radar data in polar format are exchanged in real time and then processed according to local needs, using algorithms incorporated in the TITAN (Thunderstorm Identification Tracking Analysis and Nowcasting) system developed at NCAR- National Center for Atmospheric Research.
- > Considering that such technology already exists and is freely available, certainly this will allow the radar community in Brazil to step forward quickly.
- > Therefore it is proposed by IPMet that TITAN system should be deployed to mosaic the nine available radar systems, six of them being operated by the Brazilian Air Force using the GAMIC data format, while the other three, two of IPMet and one of Simepar, are using the SIGMET data format.

RADAR DATA

- > TITAN system was successfully deployed to compose the integrated network of 8 radars;
- > Individual data set was first converted to a TITAN readable format, named MDV (Meteorological Data Volume) file format;
- > Data from these multiple radars, in volume-scan mode, were integrated into one volume and TITAN can identify each storm cell, tags it with a specific identifier, determines the storm properties (such as height, volume, area, centroid, intensity, rainfall, speed of motion) tracking it over time.
- > The period selected for the pilot study was the one from 01 to 06 April 2010;
- > During this period Rio de Janeiro city experienced very heavy rains responsible for landslides and the deaths of many people;
- > This period has been reported as one of the greatest natural disaster over Rio de Janeiro.

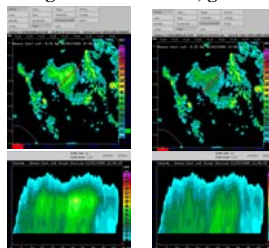
RESULTS



Temporal evolution of the precipitating systems over the South-Southeast regions of Brazil, based on the resulting mosaic of the eight radars (six from DECEA- Air space Control Department and two from IPMet/UNESP). The figures are for the period from 02 to 03 April 2010, during 5 hours of observation.

TITAN Filtering Algorithm

TITAN has built in tools for special data treatment such as Bright band removal, ground clutter mitigation, etc.



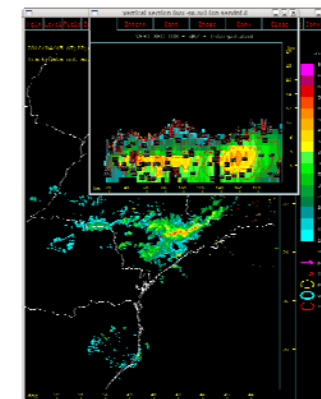
An example of the “BrightBand” removal algorithm applied to the Bauru radar data

Acknowledgments

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> TITAN allows, in realtime monitoring, that a forecaster interacts with the radar mosaic by selecting a particular radar that is displaying cells initially identified as potential storm cells and from that on concentrate his/her analysis for a possible warning of severe weather for that particular region.

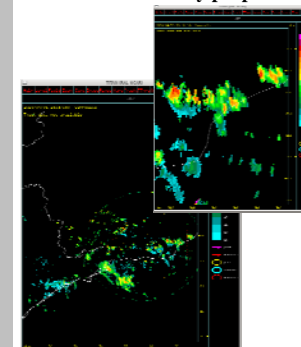
> An example of the “zoom” facility is given over a region of the State of São Paulo where intense rainfall is observed highlighting this facility available with TITAN, observed on April, 3 2010, at 07:22 UT.



Zoom over the ESP including a vertical cross section along the baseline (red dotted line) where the most intense precipitation is observed.

SEVERE STORM OVER RIO DE JANEIRO

From the same mosaic, now a zoom is made over the State of Rio de Janeiro, during the period of 05 and 06 April when a severe storm was observed by Pico do Couto radar. A mesoscale convective system – MCS, that contribute for the observed major floods in the city of Rio de Janeiro, Niteroi and including coastal areas. Many people died as a result of landslides and flood.



This pilot study intended to show, first of all, the facilities of TITAN system to integrate and to analyse in realtime data from multiple radars, as a mosaic, and also allowing to identify and track multiple cells that have potential to produce severe weather. This alone would fulfill one of the main goals defined as a milestone in the META2 of the SINAL-SOS Project.