Severe weather forecasting with the integration of lightning detection network, radar and satellite in operational center

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In recent years the operational suite in weather forecast offices has s changed a lot. Besides conventional meteorological information, the recent development and implementation of many new observations such as satellite, weather radars, and lightning detection networks has resulted in a large amount of meteorological products for weather forecasters with the supply of vital and real-time information. However, the forecaster's ability to manually integrate these data into a comprehensive analysis of the current state of the atmosphere and prepare a timely forecast is hindered by the volume of data and the differing characteristics of the various observing systems.

For severe weather monitoring and forecasting, information obtained from lightning detection networks, radars and satellites are considered most important. Lightning detection networks and radars are capable of storms surveillance with shorter time intervals between observations covering an area over a few hundred kilometers while the integration of lightning data with Doppler weather radar and meteorological satellites provides meteorological surveillance for a larger area and in real-time. Lightning detection systems allow for the surveillance of electrically active storms on areas larger than that covered by a weather radar, but it is not yet possible to evaluate spatial and temporal evolution of the storm quantitatively. With a Doppler weather radar, hazard storm potential (e.g. flash flood, hail, strong wind, tornado), precipitation estimation and forecasting (in conjunction with numerical weather prediction models) are already possible.

This paper describes the experience of lightning data analysis and severe weather monitoring and forecasting in a meteorological operational center. Located in a region particularly prone to hazardous weather events (intense lightning and precipitation,

hail, flash floods and others) in the south of Brazil, SIMEPAR operates and maintain a hydrometeorological system with a S-Band Doppler weather radar, automatic hydrometeorological network, satellite reception and processing, and also integrates the Brazilian Lightning Detection Network with the management and distribution of lightning information for several operative end users.

With a strong interest in research and development of applications for severe weather analysis and forecasting and for the operative use of lightning information, several tools were developed not only for the integration of lightning, radar, satellite, numerical models and automatic weather stations for nowcasting purposes, but also for analysis and correlation of lightning strikes with power supply faults with the objective of producing an environment for the forecaster to analyse meteorological data and produce severe weather warnings and nowcasting.

For the monitoring and forecasting of severe weather, a description of our activities and operational experiences with data integration and dissemination of information in real-time will be presented in this conference, with emphasis on our recent developments and results of usage of lightning information for hazardous weather forecasting. A description of our lightning detection network management, product generation and dissemination and future perspectives will also be presented.