Operational flash flood forecasting platform based on grid technology

V. Thierion (1), P.-A. Ayral (1), V. Angelini (2), S. Sauvagnargues-Lesage (1), S. Nativi (2), and O. Payrastre (3)

(1) EMA, LGEI, Ecole des Mines d'Alès, Alès, France, (2) IMAA-CNR, Istituto di Metodologie per l'Analisi Ambientale of Italian National Research Council, Prato, Italia, (3) SPC-GD, Service de Prévision des Crues Grand Delta, Nîmes, France

Flash flood events of south of France such as the 8th and 9th September 2002 in the Grand Delta territory caused important economic and human damages. Further to this catastrophic hydrological situation, a reform of flood warning services have been initiated (set in 2006). Thus, this political reform has transformed the 52 existing flood warning services (SAC) in 22 flood forecasting services (SPC), in assigning them territories more hydrological consistent and new effective hydrological forecasting mission. Furthermore, national central service (SCHAPI) has been created to ease this transformation and support local services in their new objectives.

New functioning requirements have been identified:
- SPC and SCHAPI carry the responsibility to clearly disseminate to public organisms, civil protection actors and population, crucial hydrologic information to better anticipate potential dramatic flood event,
- a new effective hydrological forecasting mission to these flood forecasting services seems essential particularly for the flash floods phenomenon.

Thus, models improvement and optimization was one of the most critical requirements. Initially dedicated to support forecaster in their monitoring mission, thanks to measuring stations and rainfall radar images analysis, hydrological models have to become more efficient in their capacity to anticipate hydrological situation.

Understanding natural phenomenon occuring during flash floods mainly leads present hydrological research. Rather than trying to explain such complex processes, the presented research try to manage the well-known need of computational power and data storage capacities of these services.

Since few years, Grid technology appears as a technological revolution in high performance computing (HPC) allowing large-scale resource sharing, computational power using and supporting collaboration across networks. Nowadays, EGEE (Enabling Grids for E-science in Europe) project represents the most important effort in term of grid technology development.

This paper presents an operational flash flood forecasting platform which have been developed in the framework of CYCLOPS European project providing one of virtual organizations of EGEE project. This platform has been designed to enable multi-simulations processes to ease forecasting operations of several supervised watersheds on Grand Delta (SPC-GD) territory. Grid technology infrastructure, in providing multiple remote computing elements enables the processing of multiple rainfall scenarios, derived to the original meteorological forecasting transmitted by Meteo-France, and their respective hydrological simulations.

First results show that from one forecasting scenario, this new presented approach can permit simulations of more than 200 different scenarios to support forecasters in their aforesaid mission and appears as an efficient hydrological decision-making tool. Although, this system seems operational, model validity has to be confirmed. So, further researches are necessary to improve models core to be more efficient in term of hydrological aspects. Finally, this platform could be an efficient tool for developing others modelling aspects as calibration or data assimilation in real time processing.