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How grid computing helps flood prediction, ground water management and hydrological survey

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The Civil Society at large has addressed to the Earth Science community many strong requirements related in particular to climate changes, natural and industrial risks, and so forth. The main critical point is that on one hand the civil society and all public ask for certainties i.e. precise values with small error range as it concerns prediction at short, medium and long term in all domains; on the other hand Science can mainly answer only in terms of probability of occurrence. A large part of uncertainties have been related to error or lack of data, use of relatively simple models, more complex being the solution, or too few statistics. The use of DCI and new technologies will be a way to answer those challenges.

The paper illustrates six applications in various domains of hydrology; for them the use of Grid technology providing a substantial improvement. The first set of 3 applications concerns flood prediction. Intense and localized rain events are commonly observed in the Mediterranean area. Because of the short response time of the basins, these events lead to flash flood, likely to cause serious damages. Severe fluvial floods frequently occur and have also large impact on societies. That is why the need for systems, including complex models and real-time data, able to help authorities in related crisis management is increasing. The second set of 2 applications is related to water management, a critical point nowadays. Groundwater models are becoming increasingly important in the decision making process as they provide systematic and consistent information on water availability, impacts of climate and land use changes, and analyses of non-point source pollution. An environmental problem in the mediterranean area is the seawater intrusion in regional coastal aquifers, under explicit consideration of uncertainty. Business field of drinking water supply, management and planning need groundwater flow dynamic parameters. Those applications face complex modelling and large set of data. The last application,the EU FP7 EnviroGRIDS project, aims at building capacities in the Black Sea region on new international standards to gather, store, distribute, analyze, visualize and disseminate crucial information on past, present and future states of this region in order to assess its sustainability and vulnerability. E-collaboration, a pillar of Grid technology, plays an important role in this project.

The history and goals of each application are quite different. However their principal motivation is to use the Grid technology to significantly improve flood prediction, groundwater management and comprehensive hydrological survey, all grand challenges for the Civil Society at large.