EXTREME RAINFALL DETECTION SYSTEM FOR UN WFP

A. Ajmar[1], A. Albanese[1], W. Camaro[1], E. I. Cristofori[1], S. Dalmasso[1], F. Disabato[1], R. Vigna[1]

ITHACA, Via Pier Carlo Boggio 61 – 10138 Torino, Italy

ABSTRACT

INTRODUCTION

In order to support UN World Food Programme (WFP) emergency preparedness and response capacity, ITHACA has implemented an Extreme Rainfall Detection System (ERDS). This system is able to provide near-real time alerts related to potential exceptional rainfalls, allowing the monitoring and forecasting of potentially flood events worldwide.

METHODOLOGY

The near-real time detection of extreme events is mainly based on a precipitation analysis of data from Tropical Rainfall Measuring Mission (TRMM) Multisatellite Precipitation Analysis (TMPA). Locally, collaboration with local institution (e.g. Cepetec in Brazil) and WFP offices (e.g. Myanmar and Bangladesh) allows the integration of in–situ acquired rainfall data, used to validate the system.

ERDS system includes forecasting capabilities, able to provide up to 7 days lead time alerts for heavy rain and flood, using deterministic and probabilistic weather prediction models.

An example of the application of the system is represented in figure 1, for the test case of Bangladesh flood event in July 2011.

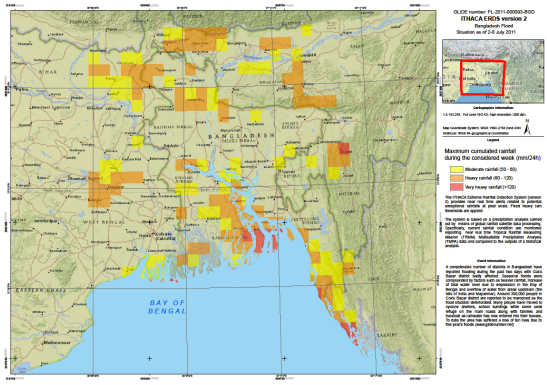

Figure 1 – Example of ITHACA ERDS flood alerts in Bangladesh in July 2011.

The current version of the system is an evolution of a previous one, and it is designed to increase the capability of disseminating timely and meaningful warning information. Major improvements include:

1. a complete review of the algorithms for the definition of extreme rainfall thresholds, based on average climatological values;
2. the introduction of a tool based exclusively on morphometric parameters (i.e. a river network and a Digital Elevation Model), in order to identify flood prone areas, associated with different hazard levels;
3. the creation of historical flood scenarios (figure 2), derived by the aggregation of the results of an automatic classification procedure, developed by ITHACA, which processes a 12 years historical archive of MODIS satellite imagery and provides a daily information on water bodies extent;

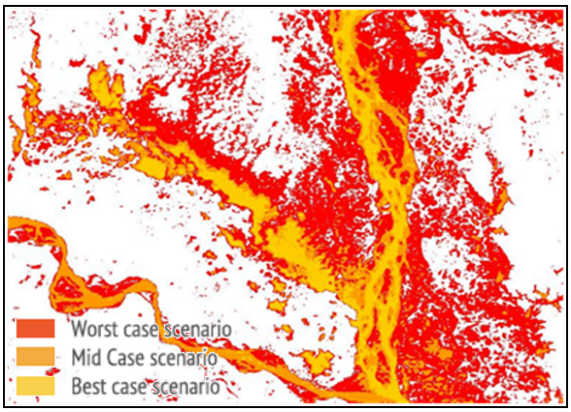

Figure 2 – Example of flood scenario derivable from the automatic classification of MODIS historical archive (example over Bangladesh).

4. the realization of a WebGIS platform, developed in a complete Open Source environment, (figure 3) to process and disseminate understandable warnings conceived especially for non specialized

users, with the possibility to associate alerts with historically derived flood scenario. Available capabilities include the visualization of near real-time rainfall amount, forecasted rainfall for different lead times, extreme rainfall alerts and potentially flooded areas, both for current events and historical ones. The combination of such information with reference data allows to generate value-added and event specific information (e.g. affected population and land cover);

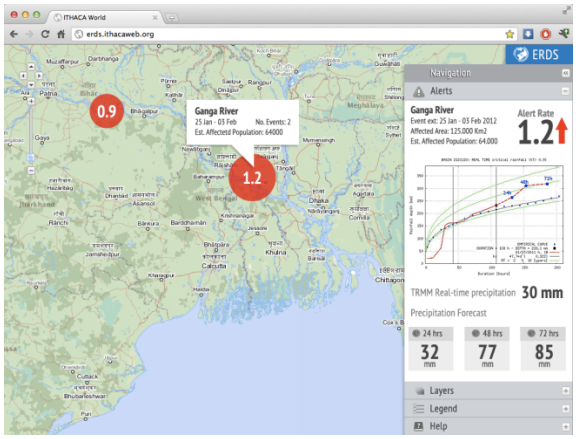

Figure 3 –WebGIS user interface highlighting extreme rainfall and flood alerts.

5. the validation of the system, to improve system reliability and to better fulfil end users' needs. For that purpose, the WebGIS platform contains a section for collecting feedbacks from local partners concerning real consequences on the ground, during and after heavy rain events.

CONCLUSIONS

ERDS is conceived to be a strategic tool providing an immediate yet complete and intuitive information at a glance and in a way that is easily understandable also for non-technical users, during the preparedness phase of the emergency cycle.

Monitoring in near-real time rainfall at global scale and comparing values and distribution in times with climatological data, makes possible the identification of extreme rainfall events, in most cases referable as main cause of flood events.

Morphometric analysis and the exploitation of historical remote sensing archives (i.e. MODIS), alone or in combination, allows to produce and associate flood scenarios to extreme rainfall events.

Due to the availability of reference data and geoprocessing tools, information about the grading of event (e.g. the potentially affected population, damages to agriculture and transportation network, etc.) is possibly derived.

The user interface is a WebGIS application built in strict collaboration with final users, in order to clearly and efficiently provide information needed in the early stages of an emergency response activation.

REFERENCES

Chu, Pao-Shin, Xin Zhao, Ying Ruan, Melodie Grubbs, 2009: Extreme Rainfall Events in the Hawaiian Islands. J. Appl. Meteor. Climatol., 48, 502–516 and European Civil Protection

Huffman, G.J., R.F. Adler, D.T. Bolvin, G. Gu, E.J. Nelkin, K.P. Bowman, Y. Hong, E.F. Stocker, D.B. Wolff, 2007: The TRMM Multi-satellite Precipitation Analysis: Quasi-global, multi-year, combined-sensor precipitation estimates at fine scale. J. Hydrometeor., 8(1), 38-55.