



The December 2008 flood event in Rome: Was it really an extreme event?

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In mid December 2008, Italy suffered bad weather with heavy snowfall blanketing the north and strong winds and downpours pelting the centre-south. In particular, during the period between 10th and 12th December, intense precipitation struck the Tyrrhenian Sea side of the peninsula, inducing a flood event, which captured the attention of the national and international media, on the Tiber river and on its tributary, the Aniene. The relevance of the event was caused by the actual damages occurred in several zones over Rome area, in particular due to the downpours and to damages which would have occurred if Tiber river had overflowed its banks.

The event, which was initially considered as extreme, was indeed severe but not so exceptional as shown by the meteo-hydrological post-event analysis. The peak water level of 12.55 m, recorded on 13th December at 1:30 a.m. (local time) at the Ripetta station, which is situated along the Tiber river in the centre of Rome, was higher than those observed during the last ten years (which to the utmost reached 11.41 m in December 2005). However, it did not reach the historical maximum of 16.90 m observed in 1937. Moreover, on the basis of the Ripetta historical series, such a level is associated to an ordinary flood event. Even if the flood was ordinary, a state of emergency was declared by the Rome's Mayor, since the event caused severe damages by disrupting flight and train services, blocking off major roads leading into Rome, flooding underpasses and sealing off industrial activities sited in the flooded areas, in particular nearby the confluence of the Aniene river with the Tiber river. In addition, hundreds of people were evacuated and a woman died in a her car which was submerged by a wave of water and mud in an underpass.

Given these premises, the present work examines the relation between a severe, but not extraordinary, event and the considerable damages that occurred as a consequence. First, the meteorological evolution of the event, as modelled by the Hydro-Meteo-Marine forecasting system (Sistema Idro-Meteo-Mare – SIMM), is considered. SIMM, operational since 2000, is an integrated meteo-marine forecasting chain, formed by a cascade of four numerical models, telescoping from the Mediterranean basin to the Venice Lagoon. In this operational integrated system, the meteorological model consists of the parallel version of the BOlogna Limited Area Model (BOLAM). In this study, BOLAM run in three configurations, the operational one using the Kuo cumulus parameterisation scheme, an intermediate version employing the more advanced Kain-Fritsch convection scheme, and a fully updated version including a more advanced advection scheme, explicit advection of five hydrometeors, and state-of-the-art parameterization schemes for radiation, convection, boundary layer turbulence and soil processes.

Then, the event actually occurred is described by means of both the rain and water-level gauges available over the Tiber river basin and EUMETSAT satellites. Ground-based observations were compared with historical data in order to evaluate the frequency and the relative magnitude of the December 2008 flood event. The last part of the work is dedicated to the description of the damages by considering three different aspects: spatial distribution, type and entity of damage. Consideration about the vulnerability of the areas more hit and the predictability of the damage occurred are also addressed.