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The 2010 flood in the Sele river basin (Southern Italy)

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On the 7th of November 2010, a deep Atlantic trough across the North-African Coast triggered an intense flux of hot-humid and unstable currents toward Italy. On the 8^{th} of November, this trough extended over the Italian Peninsula, enhancing wind currents from south-west in the lower atmospheric layers in the west-facing regions. This structure has been almost stable within the following three days, from the 8th to the 10th of November. The southern currents, filled of humidity gained during their passage over the Tyrrhenian Sea, have generated diffuse rainstorms. Raingauges located along the Apennine range of the Campania Region have measured rainfall depths with estimated return period up to 90 years within time intervals of 48 hours, particularly across the Sele River basin (5.000 km^2). At catchment scale, the overall rainfall event appeared as an unusual succession of three important sub-events, with a temporal scale of ten hours each. These sub-events generated three successive floods, with increasing peak values, within Sele sub-catchments (spatial extents of 1000-2000 km^2) characterised by response times of the order of 10 hours. The overall event generated a major flood within the Sele River basin, with relevant damages to urban infrastructures, network utilities, agricultural and industrial settlements. The measured water level within Sele cross-section at Albanella (10 km uplsope the sea outlet) was the highest level ever measured since the gauge station has been established in 1933. A time series of spatial average rainfall depth from 1933 to 2010 have been reconstructed from historical daily raingauge data, in order to assess the return period of the spatial average rainfall depth across the entire Sele River basin. The probabilistic distribution of the catchment average annual maximum rain depth in two days is efficiently modelled by Gumbel law and the estimated return period of the two-days rain depth in 8-9 November 2010 is 130 years. Campania Region is now developing a new flood forecasting system for the Sele River basin to be integrated within the Regional Flood Warning system.