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Hydro-geomorphologic events in Portugal and its association with Circulation weather types

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Floods and landslides correspond to the most hazardous weather driven natural disasters in Portugal. A recent improvement on their characterization has been achieved with the gathering of basic information on past floods and landslides that caused social consequences in Portugal for the period 1865-2015 through the DISASTER database (Zêzere et al., 2014). This database was built under the assumption that strong social impacts of floods and landslides are sufficient relevant to be reported consistently by national and regional newspapers. The DISASTER database contains detailed information on the location, date of occurrence and social impacts (fatalities, injuries, missing people, evacuated and homeless people) of each individual hydro-geomorphologic case (1677 flood cases and 292 landslide cases).

These hydro-geomorphologic disaster cases are grouped in a restrict number of DISASTER events that were selected according to the following criteria: a set of at least 3 DISASTER cases sharing the same trigger in time (with no more than 3 days without cases), which have a widespread spatial extension related to the triggering mechanism and a certain magnitude. In total, the DISASTER database includes 134 events (3.7 average days of duration) that generated high social impacts in Portugal (962 fatalities and 40878 homeless people). Each DISASTER event was characterized with the following attributes: hydro-geomorphologic event type (e.g landslides, floods, flash floods, urban floods); date of occurrence (year, month and days); duration in days; spatial location in GIS; number of fatalities, injured, evacuated and homeless people; and weather type responsible for triggering the event.

The atmospheric forcing at different time scales is the main trigger for the hydro-meteorological DISASTER events occurred in Portugal. In this regard there is an urge for a more systematic assessment of the weather types associated to flood and landslide damaging events to correctly characterize the climatic forcing of hydro-geomorphologic risk in Portugal.

The weather type classification used herein is an automated version of the Lamb weather type procedure, initially developed for the United Kingdom and often named circulation weather types (CWT) and latter adapted for Portugal. We computed the daily CWT for the 1865–2015 period by means of the daily SLP retrieved from the 20 Century Reanalysis dataset.

The relationship between the CWTs and the hydro-meteorological events in Portugal shows that the cyclonic, westerly and southwesterly are CWTs frequently associated with major socio-economic impacts of DISASTER events. In addition, CWT basic variables (flow strength, vorticity and direction) were used to better understand the impacts of the meteorological conditions in the hydro-meteorological events in Portugal.

Reference: Zêzere, J. L., Pereira, S., Tavares, A. O., Bateira, C., Trigo, R. M., Quaresma, I., Santos, P. P., Santos, M. and Verde, J.: DISASTER: a GIS database on hydro-geomorphologic disasters in Portugal, Nat. Hazards, 72(2), 503–532, doi:10.1007/s11069-013-1018-y, 2014.

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