

Scenarios of atmospheric rivers affecting Western Europe during the XXI Century

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Extreme precipitation events in Europe during the winter half of the year have major socio-economic impacts associated with floods, landslides, extensive property damage and life losses. In recent years, a number of works have shed new light on the role played by Atmospheric Rivers (ARs) in the occurrence of extreme precipitation events in Europe as was the case in major historical floods in Duero (Pereira et al., 2016) and Tagus (Trigo et al., 2015) rivers in Iberia.

We analyse ARs reaching Europe, for the extended winter months (October to March), in simulations from six CMIP5 global climate models (CGMs) to quantify possible changes during the current century, with emphasis in five western European prone coastal areas. ARs are represented reasonably well in GCMs for recent climate conditions (1980-2005). Increased vertically integrated horizontal water transport is found for 2074- 2099 (RCP4.5 and RCP8.5) compared to 1980-2005, while the number of ARs is projected to double on average for the same period. These changes are robust between models and are associated with higher air temperatures and thus enhanced atmospheric moisture content, together with higher precipitation associated with extra-tropical cyclones. This suggests an increased risk of intense precipitation and floods along the Atlantic European Coasts from the Iberian Peninsula to Scandinavia (Ramos et al., 2016).

References:

- Pereira et al., (2016) Spatial impact and triggering conditions of the exceptional hydro-geomorphological event of December 1909 in Iberia, *Nat. Hazards Earth Syst. Sci.*, 16, 371–390.
Ramos et al., (2016) Projected changes in atmospheric rivers affecting Europe in CMIP5 models, *Geophys. Res. Lett.*, 43, 9315–9323.
Trigo et al., (2015) The record precipitation and flood event in Iberia in December 1876: description and synoptic analysis, *Front. Earth Sci.* 2:3.

Acknowledgements

This work was supported by the project FORLAND – Hydrogeomorphologic risk in Portugal: driving forces and application for land use planning (PTDC/ATPGEO/1660/2014) funded by Fundação para a Ciência e a Tecnologia, Portugal (FCT). A. M. Ramos was also supported by a FCT postdoctoral grant (FCT/DFRH/SFRH/BPD/84328/2012).