



Anthropogenic Climate Change Attribution to a Record-breaking Precipitation Event in October 2024 in Valencia, Spain

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Cut-off lows are, and will be in the future, one of the main threats related to severe weather in the Iberian Peninsula, especially in the Mediterranean arc. Cut-off lows are often accompanied by heavy precipitations in a short time promoting flash-floods, as well as hail, strong convectively wind gusts and/or tornadoes.

On the week of October 27th – November 4th, 2024, a cut-off low affected the Iberian Peninsula with extreme socio-economical impacts in several Spanish regions and, especially, in the Valencia area. The phenomena on the surface have varied depending on the region: large hail (5-7 cm), several tornadoes, strong wind gusts and, above all, extreme precipitations. The most severe day was October 29th in the Valencia region, with rainfall accumulations higher than 300 mm in a notable area and locally registering 771 mm in 24 hours. In addition, the Turís official weather station registers numerous rainfall intensity national records. Moreover, the convective system promotes 11 tornadoes (two of them with intensity IF2) and large hail (~ 5 cm). The social impact of the floods in Valencia was very high, with more than 16.5 billion euros of damage to infrastructure (roads, railways, etc.), housing and croplands, as well as 231 fatalities and three missing.

In this survey, we focus on Valencia's floods on October 29th. Here, by performing model simulations with the WRF-ARW model and using a storyline approach, we find an enhancement in intensity and a significant increase in extreme accumulated rainfall area (e.g., 100 mm, 180 mm, 200 mm, and 300 mm) caused by current anthropogenic climate change conditions compared to preindustrial ones.