EVALUACIÓN EN SIMULACIONES A ESCALA SUB-KILOMÉTRICA DE ACTIVIDAD CONVECTIVA DE ALTO IMPACTO EN EL CONTEXTO DE LA INICIATIVA "DESTINATION-EARTH"

EVALUATING SUB-KILOMETRIC SIMULATIONS FOR HIGH-IMPACT CONVECTIVE ACTIVITY UNDER THE "DESTINATION-EARTH" INITIATIVE

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SUMMARY

Here we evaluate two different extreme convective events which left high societal impact in recent years, and which were really difficult to forecast. We use new HARMONIE-AROME model simulations at subkilometric resolutions to try to investigate if, at such resolution, their forecast can be improved and to better diagnose and understand the dynamics and behaviour of these phenomena. These simulations are done under the context of the Destination-Earth European Union Initiative.

Very high-resolution (sub-kilometric) simulations are becoming more and more frequent thanks to the increase of modelling knowledge and computational resources. Due to this fast progress, it then becomes essential to verify these simulations in the representation of high-impact convective weather. In this work, we evaluate this kind of simulations (500 m. of resolution) on two specific problems which are highly sensible to increasing resolution: A very high-impact static convective storm formed in front of Valencia (Spain) and a tropical-like cyclone (Medicane Ianos) over the Ionian Sea.

We evaluate these simulations, with special focus on the representation of convective activity and mesoscale dynamics, from an operational numerical weather prediction model in their research mode, the HARMONIE-AROME model under the Destination Earth On Demand Extremes initiative. HARMONIE-AROME is a convection-permitting model which belongs to ACCORD modelling community, and it's used operationally at AEMET and in some European countries. Thus, it becomes necessary to evaluate this model's behavior for very high-impact convective event forecasting, given also their expected worse impact with anthropogenic climate change.

The storm in Valencia produced heavy precipitation and reported the largest accumulation for one day in May for Valencia. The socioeconomic impact was also severe. This event had very low predictability in high-resolution convection-allowing models. The associated environment was not especially favourable to support convective activity, but the formation of low-level wind convergence may organize convective systems. Therefore, this storm is a challenge from a numerical modelling point of view. None of the national operational models over the region showed signals of convective activity with such features in the east of Spain. However, initial simulations at 500 m of resolution seems to be able to simulate the system.

Ianos was a rare Mediterranean tropical-like cyclone, behaving as a hurricane, that impacted the eastern Mediterranean on 17 and 18 September 2020, especially Greece, leaving severe damage. Operational forecasts of this event were not highly valuable, thus is it a highly recommended case study.