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Primavera: how can NMHSs profit from high-resolution climate modeling?

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Many National Meteorological and Hydrological Services (NMHSs) face the challenge to inform national governments, decisions makers and society in general about the severity and return frequency of observed climatic extremes and how these project to future climates. In national Climate Scenarios, often developed in collaboration with the NMHSs, these questions are addressed. However, the change in climatic extremes is often difficult to determine and some extremes are also difficult to simulate in the current climate due to the relatively coarse spatial resolution.

In this presentation, the H2020 project Primavera (https://www.primavera-h2020.eu/) is presented which aims to develop a new generation of advanced and well-evaluated high-resolution global climate models, capable of simulating and projecting regional climate with unprecedented fidelity, for the benefit of governments, business and society in general. The concept of model fidelity is central to PRIMAVERA, and its foundations are in process understanding. It is clear that many of the most pressing questions about regional climate change urgently require advances in process simulation.

PRIMAVERA draws on key scientific and technological advances in: i) seamless weather and climate projection; ii) process-based assessment; iii) high-performance computing (HPC); iv) IT, networks and post-processing capacity for large datasets. Optimally combining these advances is a huge challenge and has never been attempted before.

A concrete example of the benefit of using high-resolution global modeling is that in the future, more Atlantic hurricanes can be expected to travel north and affect the European region. It shows how the combination of tropical and extra-tropical phenomena can give birth to some unprecedented weather and climate extremes, which will severely affect European society. Accurate simulation and projection of phenomena such as the transition of a tropical cyclone into an extra-tropical cyclone requires global high-resolution. In current CMIP5 models, these phenomena are lacking due to a too coarse resolution to simulate these phenomena and, therefore, estimates of future climate risk based on such models cannot be trusted.

Other examples presented are changes in the position of the Atlantic storm tracks and enhanced land-atmosphere exchange in the development of future drought as simulated in the high-resolution models.
With this approach, we believe that PRIMAVERA will be a catalyst for a step change in capability for climate prediction and projection, providing a robust foundation for future climate services and climate policy at national and European levels.