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Climate Initiative for Iberian Mountain Areas (CIMAs): improving our understanding of climate variability over mountain areas using high resolution modelling.

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Mountain areas are particularly sensitive to global warming as they usually present a complex distribution of climates and ecosystems and feedbacks tend to amplify the effects of climate change. Additionally, the large spatial variability of temperature gradients and heterogeneity in the occurrence, amount and distribution of precipitation and snow cover in mountainous areas are especially relevant for water resources and stresses the need for high altitude observations and high-resolution modelling over complex terrain. However, harsh meteorological conditions and the complex orography associated with this environment that, as part of the Mediterranean domain, has been underscored as a climate change hot-spot, hinder the obtention of a good coverage of high-altitude observations and pose challenges for regional climate models.

CIMAs is a joint effort aiming at improving our understanding of climate variability over mountain regions in Iberia. A pilot area has been selected over the Sierra de Guadarrama (Spanish Central range, about 50 km from Madrid) aiming at studying climate variability through very high (1 km) resolution simulations, exploring models' ability to capture relevant processes at that scale. A set of observational sites ranging from high altitudes to low levels at both sides of the mountain range has been used.

ERA Interim, ERA5 and different WRF nested simulations, spanning the last three decades and reaching 1 km resolution, have been compared to a dense network of *in situ* observations. Results show a clear improvement with increasing resolution for temperature, but some altitude-related biases for precipitation. In this sense, some sensitivity tests to changing convection parameterisations and to convection permitting configurations have been assessed.

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