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Covariability of the seasonal temperature and precipitation in a high-resolution climate simulation for the Iberian Peninsula during the last five centuries

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Precipitation and temperature are generally interdependent variables, and changes in the relationship between them may be more important than those in the variables individually. However, such covariability strongly depends on the climatic regime, and is not yet fully understood. This study analyses the covariability of the simulated temperature and precipitation across different regions of the Iberian Peninsula using a simulation carried out with the regional climate model MM5 for the period 1501-1990, and driven by external climatic forcings. First, the IP is divided in a number of regions based on the low-frequency variability of the correlation coefficient between temperature and precipitation, on a seasonal basis. These correlations are found to be generally positive in winter, and negative in summer and spring (variable but mostly non significant in autumn), although large regional differences and fluctuations are apparent, driven by changes in the atmospheric dynamics and thermodynamics. For the main regions identified, jointed changes in temperature and precipitation are further analyzed by means of a "Gaussian ellipse" model. Special focus is put on specific historic periods, such as the Late Maunder Minimum or the Dalton Minimum, when the role of solar variability and/or volcanic forcings is thought to be relevant in determining climate fluctuations. Similarly, in warming periods, like the 20th century, the covariability exhibits some important signals for specific regions, principally towards an enhanced negative relationship and especially in spring.