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Co-variability of spring and autumn precipitation over France: Evidence of missing processes in current climate models?

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In a previous paper, negative correlations between domain-averaged spring and autumn precipitation of the same year were found in two domains covering France and Central Europe for the period 1972–1990 (Hirschi et al. 2007). Here we further investigate this link and its temporal evolution over France during the 20th century and relate it to the atmospheric circulation. The link is analyzed using observational data sets of precipitation, mean sea level pressure and teleconnection patterns. Moreover, we analyze various global and regional climate models in terms of this phenomenon.

The temporal evolution of the described link in precipitation over France is analyzed over the 20th century by means of a running correlation with a 30-year time window. The investigation of various observational precipitation data sets reveals a decreasing trend in the spring to autumn correlations, which become significantly negative in the second half of the last century. These negative correlations can be explained by significantly negative spring to autumn correlations in observed mean sea level pressure, and by the significantly negatively correlated spring East Atlantic and autumn Scandinavian teleconnection patterns.

Except for the ERA-40 driven regional climate models from ENSEMBLES, the analyzed regional and global climate models, including IPCC AR4 simulations, do not capture this observed variability in precipitation. This is associated with a failure of most models in simulating the observed correlations between spring and autumn mean sea level pressure.

References:
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