Geophysical Research Abstracts
Vol. 18, EGU2016-13670, 2016
EGU General Assembly 2016
© Author(s) 2016. CC Attribution 3.0 License.

The dependence of wintertime Mediterranean precipitation on the atmospheric circulation response to climate change

Giuseppe Zappa, Brian Hoskins, and Ted Shepherd
University of Reading, Reading, United Kingdom (g.zappa@reading.ac.uk)

Climate models indicate a future wintertime precipitation reduction in the Mediterranean region which may have large socio-economic impacts. However, there is large uncertainty in the amplitude of the projected precipitation reduction and this limits the possibility to inform effective adaptation planning. We analyse CMIP5 climate model output to quantify the role of atmospheric circulation in the precipitation change and the time of emergence of the Mediterranean precipitation response. It is found that a simple circulation index, i.e. the 850 hPa zonal wind (U850) in North Africa, well describes the year to year fluctuations in the area-averaged Mediterranean precipitation, with positive (i.e. westerly) U850 anomalies in North Africa being associated with positive precipitation anomalies. Under climate change, U850 in North Africa and the Mediterranean precipitation are both projected to decrease consistently with the relationship found in the inter-annual variability. This enables us to estimate that about 85% of the CMIP5 mean precipitation response and 80% of the variance in the inter-model spread are related to changes in the atmospheric circulation. In contrast, there is no significant correlation between the mean precipitation response and the global-mean surface warming across the models. We also find that the precipitation response to climate change might already emerge from internal variability by 2025 relative to 1960-1990 according to the climate models with a large circulation response. This implies that it might soon be possible to test model projections using observations. Finally, some of the mechanisms which are important for the Mediterranean circulation response in the CMIP5 models are discussed.