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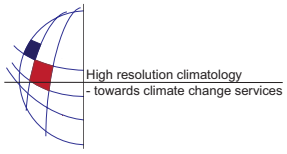

Impact of horizontal resolution on simulations of summertime Euro-Atlantic blocking

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In this study, impacts of horizontal resolution on simulations of summertime Euro-Atlantic blocking were investigated using TL959L60, TL319L60, TL95L60, and TL95L40 MRI AGCM. The TL959L60 model has the state-of-the-art NWP model resolution, whereas the TL95L40 model has the state-of-the-art climate model resolution. Model integrations were conducted for the period 1979 - 2003 using observed interannually-varying HadISST SST as lower boundary conditions. For the period 2075 - 2099, the SST climate-change signals are estimated by the CMIP3 multi-model ensemble mean to which the detrended interannual variations in HadISST have been added. The IPCC SRES A1B scenario was assumed for future emissions of greenhouse gases.

In the present-day climate, the horizontal resolution of the AGCM is an important factor in simulating summertime Euro-Atlantic blocking: the higher the horizontal resolution, the more accurate the simulated summertime blocking frequency. Long-lived blocking is better simulated in high resolution models than in the lower-resolution models. Simulated summertime blocking frequency over Europe clearly decreases under climate change. Blocking is an important nonlinear climatic process, dominant on the sub-seasonal timescale, but relevant to the determination of seasonal-mean precipitation. Summertime drying over Europe appears to be a robust climate change signal in IPCC-AR4 and other related models. However, there is substantially less summertime drying in a model with NWP resolution than in the same model with resolutions closer to those used in AR4. This might be related to an ability of our high-resolution model (which has lowest bias against observations) to simulate accurately a nonlinear climatic process which is poorly simulated in our low-resolution models, as in IPCC-AR4 models.