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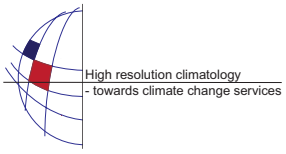

Feature-based verification of synoptic-scale Rossby wave breaking in the ECHAM5-HAM model

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Breaking synoptic-scale Rossby waves (RWB) are central to the daily weather evolution of the extratropics and subtropics and for the meridional transport of chemical constituents and momentum. Synoptic-scale RWB events are manifest as elongated and narrow structures in the tropopause level potential vorticity (PV) field. A feature-based verification approach is used to assess the representation of these structures in present day climate simulations carried out with the ECHAM5-HAM climate model with different resolutions (T42L19, T63L31 and T106L31) in comparison to the ERA-40 data set. The algorithm extracts RWB objects from the tropopause-level PV field and allows verifying the frequency of occurrence of RWB objects.
The model captures the location of the RWB frequency maxima in the northern hemisphere well in all resolutions. However, in the T42L19 simulation the frequency of events is underestimated in the entire northern hemisphere by 28% (averaged over all seasons and grid-points). The higher-resolution simulations capture the overall frequency of RWB much better, with a fairly small improvement from the T63L31 to the T106L31 run. In the higher-resolution simulations significant differences to the ERA-40 data are regionally confined and vary with the season. The most striking feature is that the model overestimates the frequency of RWB in the subtropical Atlantic in all seasons except for spring.