

Orographic drag uncertainties impact forecast skill

Irina Sandu(1), Ayrton Zadra(2), Nils Wedi(1), Simon Vosper(3), Andy Elvidge(3)

1 ECMWF, Reading, UK

2. Environment and Climate Change Canada, Montreal, Canada

3. UK MetOffice, Exeter, UK

Despite their importance for the large-scale circulation, to date the representation of drag processes remains a major source of uncertainty in global models. Among the different drag processes the representation of orographic drag is particularly challenging. This has been recently highlighted by the WGNE 'Drag project' which demonstrated that the main NWP and climate models differ significantly in representation of the total parametrized surface stress and in the partitioning of surface stress among various physical processes, particularly in regions with orography. Here we show that the representation of the resolved orography is also very different, even among models with similar headline resolution. We also use the Integrated Forecasting System of the European Centre for Medium-Range Weather Forecasts (ECMWF) to demonstrate how much these inter-model differences either in the resolved orography or the subgrid orography affect the skill of medium-range weather forecasts. We demonstrate that the representation of the resolved orography plays an important role for the prediction of both near-surface temperatures and the large-scale circulation. The degradation in forecast skill resulting from using a smoother resolved orography can only partially be alleviated by using more variability in the subgrid orography. This suggests that the parametrized drag does not affect the flow in exactly the same way as the resolved drag.