



## **Orographic drag uncertainties impact forecast skill**

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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 WMO Working Group on Numerical Experimentation (WGNE) 'Drag project' which demonstrated that the main NWP and climate models differ significantly in representation of the total parameterized surface stress and in the partitioning of surface stress among various physical processes, particularly in regions with orography.

Here we discuss how uncertain is the representation of orographic drag in models, and we illustrate how this uncertainty affects the skill of medium range weather forecasts. Namely we show how different is the representation of the resolved orography even in models with similar headline horizontal resolution. We also use the results of the WGNE 'Drag project' to illustrate how much models differ in terms of the total parameterized surface stress and its partition among various processes. Finally, we use the Integrated Forecasting System of ECMWF to demonstrate how much these intermodel differences either in the resolved orography or the representation subgrid drag affect the forecast skill.