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A comparison of parametrized and explicitly resolved gravity wave momentum fluxes over the European Alps.

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A fundamental requirement of any parametrization of sub-gridscale orography (SSO) is that the total (resolved plus parametrized) drag on a mountain range should be independent of the model resolution. However, parametrizations are typically developed and tested (and inevitably tuned) for a single model resolution and so this issue tends not to be addressed.

In this study the behaviour of the Met Office SSO drag parametrization and in particular, the component of the drag attributed to gravity wave drag, is assessed. Thus the parametrized gravity wave momentum fluxes in the coarser resolution versions of the Unified Model (UM) are compared with the explicitly resolved momentum fluxes in the high resolution versions of the UM.

This comparison is done by simulating the seven mountain wave cases identified by the Mesoscale Alpine Programme. The UM has therefore been run at horizontal resolutions ranging from 60km down to 1km. At 60km resolution most of the gravity wave momentum fluxes must be parametrized, whilst at 1km resolution most of the momentum flux is resolved.

Results from this comparison will be described and illustrated and the implications for the future development of the SSO drag parametrization will be discussed.