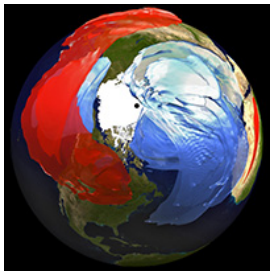

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Evaluation of revised gravity wave parametrizations using statistics of first-guess departures

The effect of unresolved gravity waves which play a crucial role for accurate numerical weather prediction (NWP) is parametrized separately as subgrid-scale orography (SSO) parametrization and non-orographic gravity waves (NGW) parametrization in global models. These parametrizations are known for large uncertainties due to lack of direct observations of momentum flux. However, it is still possible to evaluate these parametrizations indirectly using a massive volume of various kinds of observation which is available through data assimilation in an NWP system. In this study, the performance of the revised SSO and NGW parametrizations in the Japan Meteorological Agency Global Spectral Model is examined in terms of the statistics of fit between first guess (FG) and observation processed in data assimilation.
The introduction of the latitudinal dependency of source momentum flux to the NGW scheme indicating the improved representation of the quasi-biennial oscillation in long integration shows positive impact on FG departure for radiosonde, microwave sounders and GNSS radio occultation in the stratosphere. However, the revised SSO scheme, which represents the effect of the low-level flow blocking and gravity wave drag and improves medium-range forecasts, deteriorates the FG departure for microwave sounding channels in stratosphere over sharp orography such as the southern Andes and the Antarctic Peninsula particularly in winter. The experiment with different setting of parameter values in orographic gravity wave drag parametrization which shows better fit of FG with observation around these regions, results in counteraction of the improvement of medium-range forecasts in mid-latitude troposphere.

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