Comparison of Gravity Waves in the Southern Hemisphere Derived from Balloon Observations and the ECMWF Analyses

Valerian Jewtoukoff* , Riwal Plougonven[1], Albert Hertzog , Francois Lott[2], and Alvaro De La Camara[2]

[1]Laboratoire de Météorologie Dynamique (LMD) – Polytechnique - X – LMD Ecole Polytechnique, Route de Saclay, 91128 Palaiseau cedex, France
[2]LMD – CNRS : UMR8539 – France

Abstract

The increase of spatial resolution allows the ECMWF operational model to explicitly resolve a significant portion of the atmospheric gravity wave (GW) field, but the realism of the simulated GW field in the ECMWF analyses still needs to be precisely evaluated. Here the authors use data collected during the Concordiasi stratospheric balloon campaign to assess the representation of GWs in the ECMWF analyses over Antarctica and the Southern Ocean in spring 2010. The authors first compare the balloonborne GW momentum fluxes with those in ECMWF analyses throughout the campaign and find a correct agreement of the geographical and seasonal patterns. However, the authors also note that ECMWF analyses generally underestimate the balloon fluxes by a factor of 5, which may be essentially due to the spatial truncation of the ECMWF model. In- termittency of wave activity in the analyses and observations are found comparable. These results are confirmed on two case studies dealing with orographic and nonorographic waves, which thus supports that the ECMWF analyses can be used to study the geographical and seasonal distribution of GW momentum fluxes. The authors then used both datasets to provide insights on the missing GW drag at 60∘S in general circulation models in the Southern Hemisphere spring. These datasets suggest that a significant part of the missing drag may be associated with nonorographic GWs generated by weather systems above the Southern Ocean.

*Speaker