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Atmospheric conditions during DEEPWAVE and its link to the observed mountain wave activity

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We present results of a comprehensive analysis of the atmospheric conditions during the Deep Propagating Gravity Wave Experiment (DEEPWAVE) campaign in New Zealand in austral winter 2014. Different datasets and diagnostics are combined to characterize the background atmosphere from the troposphere to the upper mesosphere. It is explored, how weather regimes and the atmospheric state compare to climatological conditions and how they relate to reported findings of the airborne and ground-based gravity wave observations. Key results of this study are the dominance of low-level southwesterly flows and tropospheric blocking situations over New Zealand during June, July, and August 2014. A varying tropopause inversion layer was found to be an important feature with respect to wave reflection. The subtropical jet was frequently diverted south from its climatological position at 30°S and was most often involved in strong forcing events of mountain waves at the Southern Alps. The polar front jet was typically responsible for moderate and weak tropospheric forcing of mountain waves. The stratospheric planetary wave activity amplified in July leading to a displacement of the Antarctic polar vortex. This reduced the stratospheric wind minimum by about 10 m s-1 above New Zealand. Satellite observations in the upper stratosphere revealed that orographic gravity wave variances for 2014 were largest in May, June and July, i.e. the period of the DEEPWAVE field phase.