

Analysis of the Distribution and Controlling Factors in the Atmospheric Gravity Wave Potential Energy

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In the past years, global morphology and climatology of gravity waves have been widely studied and the effects of topography and convection systems have been evaluated, but the complete gravity wave distribution could not be explained by these effects. To find the missing controlling factors, a series of synoptic scale analyses is performed in the present study to investigate relationships between synoptic scale factors and potential energy (E_p) associated with gravity waves. Global distribution of E_p during a 12-year period from 2002 to 2013 is derived using temperature profiles retrieved from observations of Sounding of the Atmosphere using Broadband Emission Radiometry (SABER) instrument onboard the Thermosphere Ionosphere Mesosphere Energetics and Dynamics (TIMED) satellite. Synoptic scale factors obtained from ECMWF Interim reanalysis data are employed to investigate the correlation between synoptic systems and E_p . It is found that E_p values are high around extratropical cyclones over mid-latitudes (30° – 60°) and around the Intertropical Convergence Zone (ITCZ) over low-latitudes (10° – 30°). E_p values are low around subtropical highs over both mid- and low-latitudes. This is the first time that a synoptic scale analysis of E_p distribution is performed, and the influence of synoptic scale factors on E_p confirmed.

Keywords: gravity waves, potential energy, synoptic scale factors, TIMED/SABER