

# Sources of inertia-gravity waves revealed in the radiosonde observation at Jang Bogo Station (JBS), Antarctica

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Sources and propagation characteristics of inertia gravity waves (IGWs) in the lower stratosphere ( $Z = 15\text{--}22\text{km}$ ) are investigated using high-resolution radiosondes launched at Jang Bogo Station (JBS), Antarctica ( $74^\circ\text{S}$ ,  $164^\circ\text{E}$ ) for 4 years (2014–2017). The IGWs are extracted individually using the Stokes parameter spectra method employed in Yoo et al. (2018). The average intrinsic frequency, vertical wavelength, and horizontal wavelength are  $2.04f$  (where  $f$  is the Coriolis parameter), 1.47 km, and 216.77 km, respectively. With the wave characteristics, a three-dimensional backward ray-tracing calculation is performed using the Gravity wave Regional Or Global Ray Tracer (GROGRAT). Considering the uncertainties within the initial wave parameters, 125 rays with the slightly different parameters from the original wave are integrated, and waves that satisfy a convergence criterion are used to identify the sources. Among the total 153 IGW cases, 16, 17, and 120 waves are terminated in the lower stratosphere ( $Z = 12\text{--}18.5$  km), tropopause ( $Z = 8\text{--}12$  km), and troposphere ( $Z < 8$  km), respectively. Most of the observed waves propagate from the southwest and northwest of JBS ( $50^\circ\text{--}80^\circ\text{S}$  and  $50^\circ\text{--}180^\circ\text{E}$ ) with pronounced seasonal variations. We classify the possible sources of the IGWs terminated in the troposphere into i) orography, ii) frontal system, iii) polar front jet, iv) convection, and v) inertial instability induced by the strong anticyclonic flows. Out of the 137 waves, 82 waves are associated with the frontal system, whereas 18, 15, and 7 waves are classified into the waves induced by convection, orography, and polar front jet, respectively. This implies that the frontal activity is the most important source for the observed IGWs at JBS. Among 16 waves terminated in the lower stratosphere, 10 IGWs are found to be attributed to the imbalanced flow.