Statistical investigation of gravity wave propagation in the Czech Republic and above

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Propagation of gravity waves (GWs) is studied in the troposphere and thermosphere/ionosphere. The investigation of GW propagation in the troposphere is based on measurements by large scale array of absolute microbarometers with high resolution that is located in the westernmost part of the Czech Republic. On the other hand, the propagation of GWs in the thermosphere/ionosphere is observed remotely, using multi-frequency and multi-point continuous HF Doppler sounding system operating in the western part of the Czech Republic. The reflection heights of sounding radio waves of different frequencies are determined from ionospheric sounder, located in Pruhonice in the vicinity of Prague. Propagation velocities and directions are in both cases calculated from time/phase delays between signals recorded at different locations. The investigation of propagation of GWs in the ionosphere is performed in three dimensions as the observation points (reflection points of radio signals) are separated both horizontally and vertically. It is shown that GWs in the ionosphere usually propagate with wave vectors directed obliquely downward, which means upward propagation of energy. In addition, seasonal and diurnal changes of propagation directions were found. Typical propagation velocities of GWs observed at ionospheric heights are much higher (~100 to 200 m/s) than those observed on the ground (several tens of m/s).