

Atmospheric gravity waves derived by simultaneous observations of all-sky imagers, a sodium lidar, and foil chaff in the WAVE2004 campaign in Japan

M. Kubota (1), S. Kawamura (1), Y. Koizumi (2), Y. Murayama (1), M. Yamamori (1), and the WAVE2004 Team

(1) National Institute of Information and Communications Technology, (2) University of Tokyo

The WAVES in airglow campaign in 2004 (WAVE2004), which aimed to elucidate the formation process of waves in airglow structures from both dynamical and chemical perspectives, was conducted using rocket-borne and ground-based instruments in Japan on 17 January 2004. In this experiment, we observed a large-scale atmospheric gravity wave (AGW), which appeared in both the vertical profiles of sodium density obtained by a Na lidar and the horizontal distributions of airglow emission obtained by an all-sky imager (ASI). The horizontal wavelength, horizontal phase velocity, period, and propagation direction of the AGW were estimated as 673-774 km, 107-122 m/s, ~1.75 hours, and north-northeastward, respectively. The vertical wavelength, obtained by the Na lidar, varied with the altitude. Below an altitude of about 88 km, the measured vertical wavelength showed good agreement with that calculated from the horizontal wavelength by using the dispersion equation. The variation of the vertical wavelength with altitude seemed to depend on the variation of the background wind velocity. Several hours before the AGW observation, the ageostrophic wind component was enhanced in the tropopause region by a distortion of the jetstream in the southwest portion of Japan. We suggest that this event is closely related to the generation of the large-scale AGW observed in WAVE2004. The consistency of the occurrence time, the location, and the wind velocity in the jetstream strongly support this idea.