ノルウェー・トロムソで観測された OH 大気光イメージに見られる中間圏大気重力波の伝搬方向

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Propagation direction of the nighttime mesospheric gravity waves in the OH airglow images at Tromsø, Norway

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An important aspect of the wind dynamics in the mesosphere is to know characteristics of the atmospheric gravity waves, such as propagation direction, zonal and meridional wavenumbers, horizontal wavelength, apparent phase speed, and intensity perturbation amplitude, because it is widely known that the atmospheric gravity waves transport momentum from the lower atmosphere to the mesosphere and the lower thermosphere. Statistical analysis of the OH airglow images measured with all-sky cooled-CCD imagers at low and middle latitudes suggest seasonal, latitudinal dependencies of the wave characteristics. In particular, the wave propagation direction shows clear seasonal variations dependent on latitudes and may also be on longitudes. For example, northward or northeastward propagations are predominant in summer at Rikubetsu (43.5ºN, 143.8ºE) and the MU radar site (34.9ºN, 136.1ºE), Japan; but westward and southwestward propagation are predominant in winter at Rikubetsu and the MU radar site, respectively. Another statistical result at equatorial region suggests that eastward and westward directions are predominant in winter and summer, respectively, at Kototabang (0.2ºS, 100.3ºE), although the propagation direction can be found in all directions. These seasonal, geographical dependencies of the wave propagation direction are controlled by wind filtering, ducting processes, and relative location to the wave source in the lower atmosphere. A new all-sky airglow imager (imager #12 of the Optical Mesosphere Thermosphere Imagers (OMTIs)) was installed at the Ramfjordmoen research station in Norway (69.6ºN, 19.2ºE) in January 2009. The imager has a filter wheel to programmatically select one of the six optical filters (557.7 nm, 630.0 nm, OH band (720-1000 nm), 589.3 nm, 572.5 nm, and 732.0 nm) for one exposure interval. This study focuses on the OH airglow images to study the mesospheric gravity waves in winter. The gravity waves predominantly propagate north/northeastward. While we need further investigations of the physical mechanism, the bias of the propagation direction may be attributed to (1) the relative location to the tropospheric low pressure cell, which is typically located around the northern Atlantic Ocean in winter, and/or (2) orographical force by the tropospheric weather system in the Norwegian topography. The observed characteristics of the gravity waves are also compared with the background wind profiles measured with a meteor radar and a MF radar at the same site in order to know the wind filtering effect on the gravity-wave propagation direction.