Geophysical Research Abstracts
Vol. 19, EGU2017-3465, 2017
EGU General Assembly 2017

The advances in airglow study and observation by the ground-based airglow observation network over China

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Ground-based airglow observation networks over China used to study airglow have been established, which contains 15 stations. Some new results were obtained using the networks. For OH airglow observations, firstly, an unusual outbreak of Concentric Gravity Wave (CGW) events were observed by the first no-gap network nearly every night during the first half of August 2013. Combination of the ground imager network with satellites provides multilevel observations of the CGWs from the troposphere to the mesopause region. Secondly, three-year OH airglow images (2012-2014) from Qujing (25.6°N, 103.7°E) were used to study how orographic features of the Tibetan Plateau (TP) affect the geographical distributions of gravity wave (GW) sources. We find the orographic forcings have a significant impact on the gravity wave propagation features. Thirdly, ground-based observations of the OH (9-4, 8-3, 6-2, 5-1, 3-0) band airglow over Xinglong (40°2N, 117°4E) in northern China from 2012 to 2014 are used to calculate rotational temperatures. By comparing the ground-based OH rotational temperature with SABER's observations, five Einstein coefficient datasets are evaluated. We find rotational temperatures determined using any of the available Einstein coefficient datasets have systematic errors. We have obtained a set of optimal Einstein coefficients ratios for rotational temperature derivation using three years data from ground-based OH spectra and SABER temperatures. For the OI 630.0 nm airglow observations, we used three-year (2011–2013) observations of thermospheric winds (at ∼250 km) by Fabry-Perot interferometers at Xinglong to study the climatology of atmospheric planetary wave-type oscillations (PWTOs) with periods of 4–19 days. We found these PWTOs occur more frequently in the months from May to October. They are consistent with the summertime preference of middle-latitude ionospheric electron density oscillations noted in other studies. By using an all-sky airglow imager at 630.0 nm over Xinglong, we studied the evolution (generation, amplification, and dissipation) of mesoscale field-aligned irregularity structures (FAIs) (∼150 km) associated with a medium-scale traveling ionospheric disturbance (MSTID) event. We also investigates the statistical features of equatorial plasma bubbles (EPBs) using airglow images from 2012 to 2014 from a ground-based network of four imagers in the equatorial region of China.