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Optimization for airglow imaging in an urban area

Hidehiko Suzuki[1*], Shuka Sakurai[1], Makoto Taguchi[1]

[1]Rikkyo University

An airglow imaging technique is a quite common and powerful tool for upper atmospheric study, since it can deduce horizontal wavelength and direction of phase propagation of atmospheric gravity waves. For example, a coordinated imaging observation by OMTI (Optical Mesosphere Thermosphere Imagers) system is conducted by Nagoya University in Japan. A combined field-of-view (FOV) of the imagers covers almost entire sky above Japan, and therefore, provides information about long traveling atmospheric waves such as ducted waves and TIDs [S. Suzuki et al., SGEPSS Fall Meeting, 2012]. However, there is no airglow imager which has a FOV centered in the central part of Japan (Tokyo and Kanto area). The difficulty of airglow imaging in the urban area arises from strong contamination by artificial lights in the city. In particular light pollution is severe in the visible wavelength region which is also the most sensitive band for Si CCD device. However, luminosity of city light is relatively weak in the near infrared region (800˜950 nm). Thus, imaging observation of some of the OH bands in this region can avoid the severe city light pollution. We performed spectra survey on both city lights and airglow during nighttime in the spectral region of 350˜970 nm using a grating spectrometer in the central area of Tokyo (Ikebukuro). As a result we found that the OH7-3 band near 890 nm is the most adequate for an airglow imaging observation using a typical CCD sensor in the urban area.

Keywords: Airglow, Mesopause, OH airglow, Atmospheric gravity wave, spectroscopy