

## Lidar Observation of atmospheric minor species and energy flow over equatorial region

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We developed a remotely controlled large sophisticated lidar system in Indonesia, and we observed the temperature structure from the upper stratosphere to lower thermosphere in the equatorial region, metallic atom layers in mesopause region, and the vertical distribution of the water vapor which carries an important role on tropical cumulus cloud convection activity. We were aimed at getting the observation information that was indispensable for understanding of the complicated dynamics / chemical reaction process in the mesopause region and the atmospheric coupling process from the troposphere to the lower thermosphere. We summarize provided result as follows; (1) From the observational result of the sodium metal layer in the mesopause region, sometimes altitude of sporadic layer and the wind shear altitude have correlation but sometimes there is no correlation. It is find that the sporadic layer without the correlation with wind shear occurred after the midnight. (2) It was confirmed that kinetic energy propagated without damping to higher altitude than Arecibo, from the Rayleigh lidar observation result of the stratosphere and the mesosphere. In addition, temperature was higher than a model in the whole mesosphere, and double peak structure in the stratopause and mesospheric inversion layers at 75-85km were observed in temperature profiles. (3) The upper end altitude of the stratosphere aerosol layer caught by a lidar linked QBO from 40km to 30km. From highly precise observation of stratosphere aerosol layer and cirrus, the evidence of the material exchange between the troposphere and stratosphere were provided. (4) From the Mie lidar observation, 20-day oscillation was dominant at an altitude of 10-14km, but 30- and 60- day oscillation were dominant at an altitude of 5-8km by the analysis of the cloud occurrence frequency. This result suggests that origin was different above and below the altitude of 8km. (5) The short period perturbation (period of 10-20 minutes) were observed in tropospheric water vapor mixing ratio in the night by Raman lidar. This perturbation was usually seen in the fine weather night. We are planning to develop new multi lidar system for the cirrus structure, troposphere-stratosphere airflow, and layered structures of metallic atoms in the mesosphere.

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