

Monitoring of molecular compositions in mesosphere with a network of ground-based millimeter-wave radiometers

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Chemical composition in mesosphere and lower thermosphere (MLT) region is strongly affected by changes of solar-terrestrial environment; for example, energetic particle precipitation into the earth atmosphere induces composition change in the mesosphere and lower thermosphere. Changes of gravity-wave activities also make the composition changes caused by temperature variations in various timescales.

To investigate these changes related to environment changes in the altitude region, we have started a project of network measurements of the distribution of mesospheric minor constituents, such as ozone, by using ground-based millimeter-wave spectral radiometers with a high-sensitivity superconducting (SIS) mixer receiver. We have been operating three millimeter-wave radiometers in the southern hemisphere; Atacama highland in Chile (23S, 68W), Rio Gallegos in Argentina (52S, 69W), and Syowa station in Antarctica (69S, 39E), and one radiometer in Rikubetsu, Japan(44N, 144E). Especially, at Syowa station, we have been monitoring ozone and nitric oxide (NO) spectra in 250 GHz band, and we have clearly detected temporal variations of NO column density in the MLT region including sudden enhancements of NO suggested to be associated with the energetic electron precipitation events.

In the presentation, we report features of observed variations of mesospheric ozone and NO as well as details of instruments, data validation and future extensions.

Keywords: mesosphere, composition change, millimeter-wave measurement