Geophysical Research Abstracts
Vol. 18, EGU2016-8287, 2016
EGU General Assembly 2016

IAP RAS microwave radiometry complex: sounding atmospheric thermal structure from the ground up to 55km.

Mikhail Belikovich, Alexander Shvetsov, Vitaly Ryskin, Dmitry Mukhin, Mikhail Kulikov, and Alexander Feigin

Institute of Applied Physics of the Russian Academy of Sciences, Atmospheric Physics and Microwave diagnostics department, Nizhny Novgorod, Russian Federation (belikovich@appl.sci-nnov.ru)

Thermal structure is the key characteristic of the atmosphere. Depending on the altitude, it is measured by different methods. In troposphere a plethora of in-situ techniques exists while in middle atmosphere remote sensing is primary type of measurement. The remote sensing is conducted in different wavelengths: optical, infrared and microwave. Satellite based measurements are the most popular kind of remote sensing measurements as it provides global coverage. Ground based passive microwave remote sensing technique has its place when one need permanent monitoring with high time resolution in order to study short-term local events like gravity waves.
Institute of Applied Physics of the Russian Academy of Sciences (IAP RAS) develops multi-purpose radiometry complex for constant atmospheric monitoring. For now, it measures temperature profiles from ground to 55km, tropospheric water vapor and ozone. It consists of several radiometers with spectral bands ranging from 20 to 112 GHz. In 2015 two radiometers were added in order to measure thermal structure at surface level and troposphere: scanning device operating in 55-59GHz, and device at 50-55GHz. The change led to modifying the retrieval software.
The work presents the description of the radiometry complex and corresponding retrieval software. The main part is devoted to new radiometers and enhancements in retrieval procedure. The retrieval algorithms are described: for each device separately and for the whole temperature retrieval part of the complex. The use of the single procedure for the group of radiometers helps to merge the profile with each other correctly. The main issue of the single procedure (numerical complexity aside) is dealing with the possible difference in calibration of the devices. Error analysis of the procedures is conducted. The characteristics of the complex and the retrieval algorithms are presented. The capabilities of the algorithms are shown on simulated and real data; the last one was collected in IAP RAS (Russia, Nizhniy Novgorod, 56°20'N 44°00'E).
The work was supported by the Russian Ministry of Education and Science (Contract No. 14.607.21.0107, unique identifier RFMEFI60714X0107).