Intercomparison of tropospheric temperature profiles retrieved from two microwave radiometers

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The importance of the knowledge of the temperature structure in the atmosphere has been widely recognized. Temperature is a key parameter for dynamical, chemical and radiative processes in the atmosphere. Different techniques allow to measure atmospheric temperature profiles as radiosonde, FTIR, LIDAR or satellite and ground-based microwave radiometers. The main advantage of microwave radiometers against other instruments is a high temporal resolution with a reasonable good spatial resolution. Moreover, the measurement at a fixed location allows to observe local atmospheric dynamics over a long time period.

This study presents an inter-comparison of temperature profiles retrieved from two microwave radiometers which is taking place at the aerological station of MeteoSwiss in Payerne (Switzerland). The campaign started in December of 2013 and it comes as a collaboration between the Microwave Group of the University of Bern and the Federal Office of Meteorology and Climatology, MeteoSwiss. The main goal of this campaign is the inter-comparison of instruments and algorithms. The microwave radiometer operated regularly in Payerne is a commercial equipment developed by RPG-HATPRO (Radiometers Physics GmbH). The inversion algorithms for this instrument are based on multiple regressions and Artificial Neuronal Networks (ANN). The second radiometer (TEMPERA) is a system developed by the Microwave Group of the Institute of Applied Physics (University of Bern) and the inversion algorithm is based on the optimal estimation method by using the QPack2/ARTS2 software ([1], [2]). In addition to the tropospheric temperature profile, TEMPERA also allows to retrieve a stratospheric profile up to 1 hPa as the instrument disposes of a digital FFT spectrometer that allows to spectrally resolve the pressure broadened oxygen lines. The tropospheric temperature profiles from both radiometers are validated with independent in-situ temperature measurements performed by means of radiosondes. These radiosondes are regularly launched twice a day at 11:00 and 23:00 UTC in the atmospheric survey station in Payerne.

Other important goal of this campaign is the cloud characterization in order to improve the temperature retrieval algorithms under cloudy conditions.

References

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