Geophysical Research Abstracts
Vol. 19, EGU2017-8155, 2017
EGU General Assembly 2017

The effect of cloud liquid water on temperature retrievals from microwave measurements

Leonie Bernet (1,2), Francisco Navas-Guzmán (1), Niklaus Kämpfer (1,2)

(1) Institute of Applied Physics, University of Bern, Bern, Switzerland, (2) Oeschger Centre for Climate Change Research, University of Bern, Bern, Switzerland

Ground-based microwave radiometry provides atmospheric profiles for both clear sky and cloudy weather conditions. The effect of clouds on measurements from microwave radiometers is low compared to other remote sensing techniques but cannot be neglected at certain frequencies. In this study, clouds have been characterized and included in microwave retrievals in order to investigate their effect on tropospheric temperature profiles measured by the TEMPERA microwave radiometer. TEMPERA retrieves atmospheric temperature profiles by measuring emitted radiation of molecular oxygen at around 60 GHz. Because cloud liquid water also absorbs and emits radiation at the used frequency range, it is important to analyse the influence of liquid water on the microwave retrieval.
In order to characterize the clouds, data from various instruments have been used, all located at the aerological station of MeteoSwiss at Payerne (Switzerland). Cloud base altitudes were detected using ceilometer measurements while the integrated liquid water (ILW) was measured by a HATPRO radiometer. Additional cloud information was obtained from a co-located sky camera and using an automatic partial cloud amount detection algorithm (APCADA). All this information has been used to characterize the clouds by means of a Liquid Water Content (LWC) profile. Different LWC profiles (shapes and values) have been tested to find the best cloud characterization depending on cloud type, altitude and ILW.
Temperature profiles have been obtained incorporating this liquid water profile in the inversion algorithm and they have been evaluated against retrievals without considering clouds, in order to assess the liquid water effect on microwave measurements. The results have been compared with the temperature profiles from radiosondes which are regularly launched twice a day at the aerological station. Two years of data have been analyzed and almost 300 non-precipitating cloud cases were studied. The statistical analysis carried out over all the cases evidenced that temperature retrievals improved in most of the cases when clouds were incorporated in the inversion algorithm.