EGU2020-20563
https://doi.org/10.5194/egusphere-egu2020-20563
EGU General Assembly 2020

The 17-year ROM SAF radio occultation climate data record

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The Radio Occultation (RO) technique is based on measurements of phase shifts of GNSS radio waves by an instrument onboard a low-Earth orbiting satellite. The processing of the measurements yields the refractive index of the Earth's atmosphere, from which the temperature, pressure, and humidity fields can be retrieved. It is a limb-sounding technique, with a high vertical resolution, and with observational information retrieved from near-surface to the upper stratosphere. Numerous studies have demonstrated the accuracy of GNSS Radio Occultation (RO) data, and their usefulness as a stable climate reference. Homogeneity of the data records are obtained by reprocessing of the data using uniform processing software and a priori data throughout the length of the climate record. We here present results from a validation of the 17-year ROM SAF RO Climate Data Record (CDR), based on a new reprocessing of Metop, CHAMP, GRACE, and COSMIC data using excess-phase and amplitude data from EUMETSAT (the Metop mission) and UCAR/CDAAC (the CHAMP, GRACE, COSMIC, and Metop missions).

A central issue for the generation of RO-based CDRs is whether data from different satellite missions can be combined to form long time series of multi-mission data. This presentation explores the consistency of gridded monthly-mean data from different RO missions through comparison with ERA-Interim reanalysis data, and through a study of mission differences during mission overlap periods. It is shown that within a core region from the upper troposphere to the middle stratosphere, roughly 8 to 35-40 kilometers (depending on latitude and geophysical variable), there is a high consistency amongst the RO missions, allowing for the construction of long-term stable data sets for use in climate studies and climate monitoring.