

Harmonization of radiosounding climate data records for the Copernicus Climate Change Service.

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Among its objectives, the Copernicus Climate Change Service (C3S) aims to facilitate access to observations provided by Baseline and Reference in-situ networks. The aim of this (C3S 311a Lot3) contract is the redistribution of harmonized Baseline and Reference data products from atmospheric in-situ observations networks measuring: surface temperature, atmospheric temperature and humidity (vertical profiles), ozone (column and profiling concentration), wind profiles (from radiosoundings), CO, CO₂ and CH₄ (column concentrations), and water vapour content (columnar from GNSS only). For these ECVs demonstrable Baseline and Reference quality measurement networks are assured.

The focus of the first year of this C3S service is the harmonization of global baseline historical radiosounding time series identified at present by the The Universal RAwinsonde OBservation program (RAOB) and the GCOS Upper-Air Network (GUAN). Data are available through the IGRA (Integrated Global Radiosonde Archive) data archive. A novel approach has been developed and implemented to adjust for inhomogeneities due to issues such as instrumentation changes, calibration drifts or observing station relocations. Moreover, each harmonized time series is provided along with an estimation of the uncertainty calculated in a consistent and metrologically rigorous way.

The new approach for the harmonization of the radiosonde climate data records (CDRs) first deals with a “physical” harmonization of the more recent radiosonde data (from c.2004 to present) by comparison with the GCOS Reference Upper-Air Network (GRUAN) and the 2010 WMO radiosonde intercomparison datasets or, whenever feasible, by applying the GRUAN data processing to the RAOB and GUAN radiosounding profiles. Then a statistical approach is applied to remove seasonal and diurnal variabilities and to adjust for systematic effects in the time series (e.g. due to solar radiation biases or other instrumental issues). This is obtained by comparison with the performance of the most recent radiosondes assuming they have an enhanced quality and a deeper metrological characterization than the past instruments. Finally, to harmonize those stations where the existing metadata are not sufficient to adjust the time series, a kriging technique is used.

The performance of this method will be discussed and comparison with the non-adjusted radiosonde time series and with the reanalysis data will be reported.

The harmonized data will become available during 2018 through the C3S Climate Data Store (CDS). In addition, by end of 2018 the users will be able to access other existing harmonized CDRs provided in the past by other groups and scientific institutions who have spent a large effort on the adjustment of radiosonde historical radiosonde time series.