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Sensitivity of Radiosounding Temperature and Humidity Trends to Estimation Algorithms and Subsampling Effects (Young Scientist Travel Award)

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Inaccurate trend calculation may lead to incorrect conclusions about the current state and future evolution of the climate. Radiosonde profiling in-situ observations have proven to be essential for the study of weather and climate and have been frequently used for the estimation of trends. It is still challenging to provide a robust trend estimate for temperature and humidity from radiosonde datasets because radiosounding time series are affected by significant temporal gaps and by several inhomogeneities. These sources of uncertainty in the trend estimation must be added to other contributions like the trend sensitivity to the choice of fitting methods and the specific nature of each dataset and to its features.

This work, carried out in the frame of the Copernicus Climate Change Service (C3S), aims to analyze source uncertainties in the estimation of decadal trends in radiosounding historical time series due to the choice of linear estimation methods and to quantify the effects of spatial and temporal subsampling. The work has been carried out using a substantial subset of radiosounding stations (656) available at global scale within version 2 of the Integrated Global Radiosonde Archive (IGRA) data archive, covering the period from 1978 to present.

To explore the sensitivity of linear trends to the choice of fitting methods, linear trend (slope) based on Student's t-test and three resistant and non-parametric fitting methods have been considered: LADFIT robust linear fitting, based on least absolute deviation method; LANZANTE robust linear fitting, a resistant and non-parametric regression based on the median of pairwise slopes and LMROB robust linear fitting, based on MM-estimators linear regression models.

The presented work will shortly discuss a comparison among the decadal trends estimated for the period between 1-1-1978 to the present using the different fitting methods applied to temperature and relative humidity profiles daily time series (0000 and 1200 UTC) on all pressure levels from 1000 to 10 hPa at different latitudes and at global scale using IGRA data.

In addition, the presented work discusses the effects of different spatial subsampling and different temporal subsampling due to missing data in the time series at different latitudes and at global scale.