



Ozonesonde observations at Marambio, Antarctic Peninsula, during 1989-2012

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Ozonesonde observations have been carried out at the Marambio station in the Antarctic Peninsula (64° S, 56° W) since late 1980s. The highest frequency of soundings has been obtained during the spring season, when severe ozone depletion has been observed each year since the start of the observational program at Marambio. Regular soundings have also been made during other seasons, in average we have performed more than 50 soundings per year. Here we have first studied the homogeneity of the long-term ozonesonde record. Similar studies have been recently initialized also at other sites. At Marambio, similar to several other sites, there have been changes in sonde types and receiving systems during the long-term observational program. For trend studies it is important to investigate whether these changes have been significant. One of the issues in the sonde network is related to the usage of two different types of the ozone sensor sensing solutions. In Marambio the sensing solution type was changed from 1% KI to 0.5 % KI in April 2006. We investigate whether this has caused improvements in data accuracy and what is the best method to homogenize the time series. Transfer functions have been suggested based on experimental results. For example in Sodankylä we performed a series of ozonesonde comparison flights to assess the effect of these two sensing solutions under polar conditions. We can use these data to recalculate the sonde time series over Marambio. To validate the results we have involved comparisons with total ozone retrievals by satellite based measurements and the local Dobson measurements. The satellite overpass measurements were provided by TOMS instrument aboard Nimbus-7, Meteor-3 and Earth Probe, GOME aboard ESA's ERS-2 and OMI aboard NASA's EOS-Aura. Finally we have calculated ozone profile trends over Marambio. We have applied a trend model to study inter-annual and longer term changes of the ozonesonde vertical profiles. The trend model included Antarctic EESC (Effective Equivalent Stratospheric Chlorine) and proxies for the dynamical variability. We found that proxies for the dynamical variability can be used to explain the observed inter-annual changes, while the EESC term in the model is needed to understand the longer term changes.