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Long-term observations of tropospheric ozone over Northern Finland

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Ozonesondes provide long-term measurements of tropospheric ozone profiles at several sites worldwide. Here we present ozonesonde time series from a northern high-latitude site Sodankylä, which has continuous data record since 1989, and comparisons with other northern high-latitude sites. Sodankylä is at 67.4° N, 26.6° E and the location of the observing station has not changed during the past two decades. The sounding system at Sodankylä involves electrochemical concentration cell ozonesondes since the beginning of data series. Comparisons with the local Brewer spectrophotometer ozone data were used to detect possible inconsistencies in the data record. Secondly we performed a series of dual sonde flights, involving various sub-types of ozonesondes and preparation procedures. The results agreed with similar experiments at other sites, showing no systematic differences in tropospheric data, while in the stratosphere systematic differences can be corrected by transfer functions. We found that quality controlled long-term sonde data from Sodankylä provide evidence of increase of tropospheric ozone since mid-1990s. Similar tendencies are seen in the data observed at other high-latitude stations, with significant increases during January to April season. Finally, we applied a statistical model on the sonde data, which included Arctic Oscillation and proxies for stratospheric variability. The model explained 75 % of the observed variability in the free troposphere during January to April season.