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Stratospheric ozone observations over northern Finland from 1989 to 2009

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Regular ozonesonde observations in Sodankylä, northern Finland (67.4° N, 26.6° E), were started in January 1989. Weekly ozonesonde launches have been made during each season and various campaign activities have increased the sounding frequency especially during winter and spring season. In January, February and March more than half of the sondes have sampled air inside the stratospheric vortex. Here we first discuss data quality aspects such as results from dual ozonesoundings and comparisons with other available ozone data, secondly we present ozone profile trend analysis.

During January to April season sonde observations show large inter-annual and longer term variations in the lower stratosphere from 150 to 30 hPa (approximately 14-24 km). In this layer negative trends of -1.97 $\pm$ 0.95 %/year have been observed during time period 1989-1997 and non-significant trends for the time period 1998-2009: -0.57 $\pm$ 0.70 %/year. A statistical model including proxies for dynamical and chemical variability was used to simulate the observed inter-annual and longer term variability. Model suggests that large part of the winter/springtime Arctic lower stratospheric ozone changes from late 1990s until 2009 can be explained by dynamical variables, while variables such as Arctic EESC (Arctic Effective Equivalent Stratospheric Chlorine), VPSC (Volume of Polar Stratospheric clouds) and Volcanic Aerosol are needed to explain observed decrease in Arctic lower stratospheric ozone until 1997.