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Trends and year-to-year variability of the Arctic tropopause pressure and temperature

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Series of monthly mean tropopause pressure and temperature have been derived for the locations Oslo(10.1º N, 59.6º E), Andøya (69.3º N, 16.0º E) and Ny-Ålesund (78.9º N, 11.0º E) as well as zonal averages at 60º, 70º and 80º N for the period 1979 to 2002, based on the ERA-40 reanalysed data. These monthly averages are analysed with respect to long-term trends and year-to-year variability, using multi-linear regression as the main tool. Parameters included are the atmospheric tele-connection pattern series (NOAA-CPC analysis), QBO, the local 30-hPa level temperature, solar flux and volcanic aerosols.

Almost all monthly (and seasonal) pressure means reveal negative trends, but most of them not significantly at the 95 % level. A preliminary multi-linear regression analysis of the year-to-year tropopause pressure variability reveals a dominant influence of middle stratosphere temperature, especially at the highest latitudes, varying significantly with season. Particularly puzzling are time-delayed highly significant correlations between these two parameters. The influence of the QBO is moderate and stronger at the highest latitudes. With respect to tele-connection patterns, the Scandinavia pattern is the most prominent at both sites, in contrast to results on total ozone from the same locations.

Also other patterns show an impact distinctly different from their influence on total ozone, implying that modulation of the tropopause pressure is not the only way in which tele-connection pattern influence total ozone.