Deutscher Wetterdienst
Wetter und Klima aus einer Hand

50 Years of Routine Ozone Soundings at Hohenpeissenberg

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Summary

- *regular Brewer-Mast ozone-sondes since November 1966*
- *1 per week until 1977, 2 to 3 per week since 1978*
- *AMT4 and VIZ radio-sondes until 1994, Vaisala RS80 1995 to ≈2005, Vaisala RS92 since ≈2006, Vaisala RS41 starting 2017*
- *radio-sonde type has effect on ozone data*
- *no long-term change in Brewer-Mast performance since 1975?*
- *regular Dobson total ozone since January 1968*
- *regular lidar ozone profiles since September 1987*

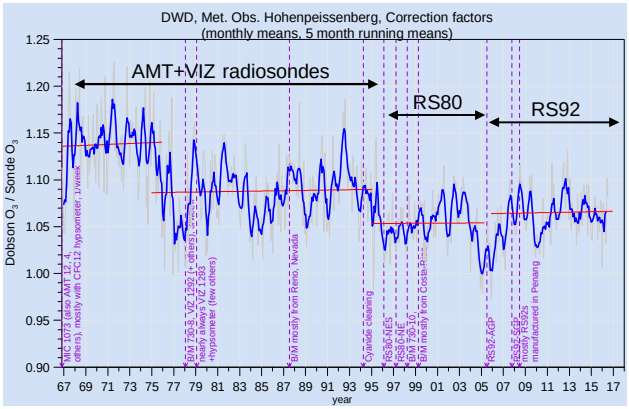
- *stratospheric ozone decline until mid-1990s, beginning recovery since*
- *tropospheric ozone increase until 1990, flattening since*
- *stratospheric cooling*
- *tropospheric warming*

- *sondes = all-weather workhorse for ozone monitoring, incl. troposphere*
- *all profiles available through www.woudc.org*

Twin launch (from tent !) in late 1960s.

Brewer-Mast ozone sonde, 1997 (left, in Styrofoam box) with Vaisala RS80 pTU-sonde (blue box on the right)

quality control, comparisons, long-term stability



Time series of monthly mean total ozone normalization factors (=Dobson total ozone / sonde total ozone). Dashed vertical lines give (some) known changes, most of which have no clear effect. Radiosonde changes, however, seem to have an effect. Apparent ≈2% annual cycle: sondes report too high ozone in winter, Dobson reports too low ozone in winter.

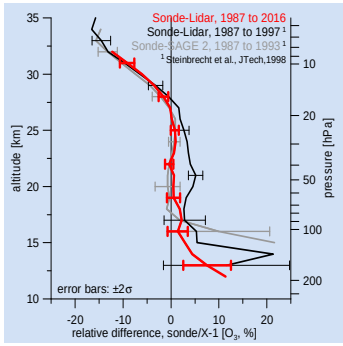
ozone equation (Brewer-Mast)

$$p_{O3} = 4.3085e^{-3} \cdot I \cdot t \cdot C_{pump} \cdot T \cdot C_{Dobs}$$

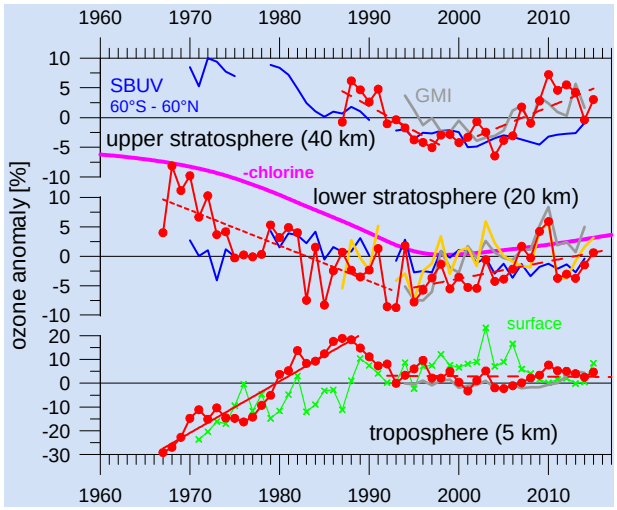
$$nbar, \mu A, \frac{s}{100ml}, T = 300\ K,\ 35\ nbar \approx 1\ \mu A$$

Difference profiles
Sonde – Lidar/SAGE (all data!)

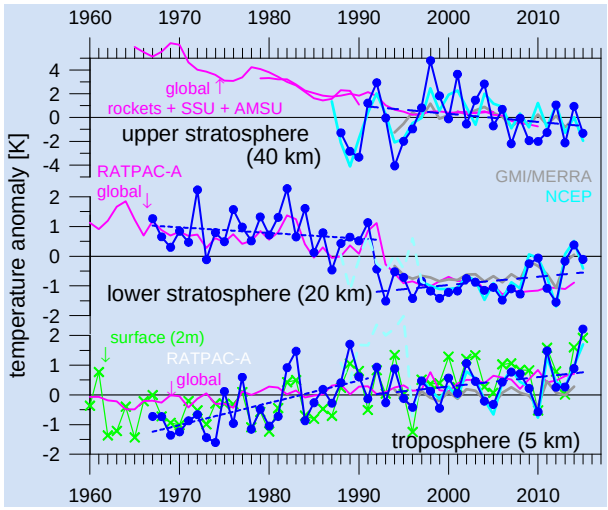
- below 20 km: Meteorological/sampling bias!
- above 30 km: Insufficient pump correction (still Dütsch 1966!)
- little change over time
- Constant bias → trends, variations OK



ozone annual means @ Hohenpeissenberg (48°N, 11°E)



temperature annual means @ Hohenpeissenberg (48°N, 11°E)



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Meteorological Observatory Hohenpeissenberg
http://www.dwd.de/ozon