Ozone, UV, and aerosol observations in Uccle (Belgium) and Utsteinen (Antarctica)

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Uccle data (Regional GAW station, with id "RMI")

Following observations are available at the Royal Meteorological Institute in Uccle, Belgium (50°48'N,4°21'E, 100 m asl):

- **Ozone column**
  - July 1971 – May 2009: Dobson instrument nr 40;
  - July 1983 – present: Brewer MK II nr 016;
  - September 2001 – present: Brewer MK III nr 178.
- **Ozone profiles with ozone sondes**
  - January 1969 – March 1997: Brewer Mast ozone sondes;
  - April 1997 – present: Z-ECC ozone sondes.

  Note that different radiosonde systems were used.
- **UV spectral measurements**
  - March 1989 – present: Brewer MK II nr 016;
  - September 2001 – present: Brewer MK III nr 178.
- **Solar radiation data**
  - Jan 1964 – present: global solar radation with Eppley pyranometer;
  - Jan 1988 – present: diffuse solar radation with Eppley pyranometer.
- **Aerosol Optical Depths (AODs) in the UV**
  - January 1990 – present: from Brewer MK II nr 016 DS observation at 5 wavelengths between 300 and 320 nm [Cheymol and De Backer 2003];
  - September 2001 – present: from Brewer MK III nr 178 DS observation at 5 wavelengths between 300 and 320 nm [Cheymol and De Backer 2003];
  - August 2006 – present: from Brewer MK III nr 178 sun scans at 340 nm [De Bock and De Backer, 2010].

Antarctic data (candidate GAW station)

Following observations are available at the Belgian Princess Elisabeth Station at Utsteinen, Antarctica (71°57'S,23°20'E, 1390 m asl, Fig 2):

- with Brewer MKIII nr 100 (Fig 3) for Jan, Feb, Dec 2011 / Jan, Feb, Nov, Dec 2012 / Jan, Feb 2013 and planned for next Antarctic summer seasons:
  - **Ozone column**;
  - **UV spectral measurements**;
  - **AOD in UV** at Brewer DS wavelengths and from sun scans at 340 nm
- Additional aerosol measurements:
  - **Aerosol optical properties (UVA to near IR)** with a CIMEL sun photometer[1] (AERONET, aeronet.gsfc.nasa.gov, station name "Utsteinen") for Feb 2009 / Jan, Feb, Dec 2010 / Jan, Feb, Dec 2011 / Jan, Feb, Nov, Dec 2012 / Jan, Feb 2013 and planned for next Antarctic summer seasons;
  - **Mass of absorbing aerosols** & **absorption coefficient** with aethalometer for Feb 2009 / Jan, Feb, Dec 2010 / Jan–Apr, Nov, Dec 2011 / Jan–Aug, Nov, Dec 2012 / Jan 2013 – present and ongoing during winter;
  - **Total aerosol mass** with TEOM-FMDS for Jan–Apr, Dec 2011 / Jan–Aug, Nov, Dec 2012 / Jan 2013 – present and ongoing during winter;
  - **Aerosol size distribution** with a laser aerosol spectrometer for Feb–Jun, Nov, Dec 2012 / Jan 2013 – present and ongoing during winter;
  - **Aerosol scattering coefficient** with nephelometer for Feb, Nov, Dec 2012 / Jan 2013 – present and ongoing during winter;
  - **Aerosol number concentration** with a condensation particle counter for Feb, Nov, Dec 2012 / Jan 2013 – present and ongoing during winter.
- **global solar radiation** with an EKO pyranometer[1] for Dec 2012 – present and ongoing during winter

[1] This instrument is owned by the Belgian Institute for Space Aeronomy, Brussels.

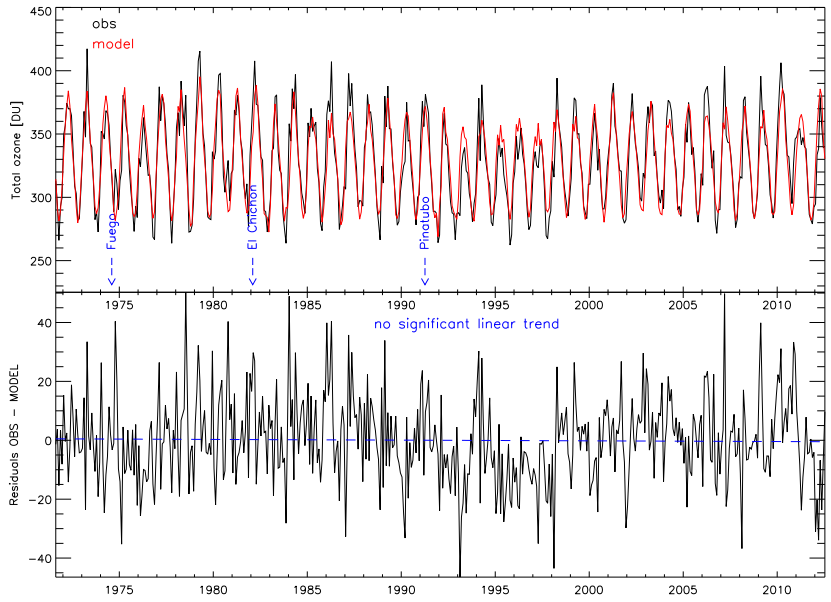

Figure 1. Results of a multiple regression analysis of total ozone column measurements at Uccle: comparison of observed and modeled data (upper panel) and differences (lower panel)

Figure 1 shows the result of a multiple linear regression analysis, using mean ozone, NAO index, EESC, QBO, solar flux, aerosol content and a linear trend as explanatory variables. For the different seasons the following variables were retained:
Winter: mean ozone, aerosol concentration, NAO;
Spring: EESC, mean ozone, QBO, solar flux, linear trend, NAO;
Summer: mean ozone;
Fall: mean ozone, NAO.

In Uccle the effect of the EESC on the total ozone column is only seen during spring, the season with the highest variability.

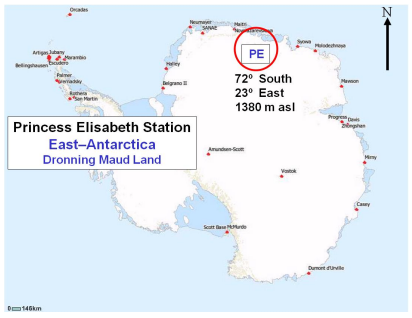

Figure 2. Location of the Princess Elisabeth station in Antarctica.

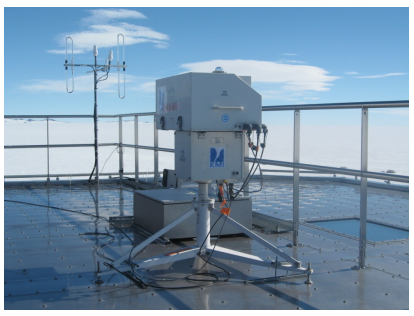

Figure 3. Brewer Nr 100 at the roof of the Princess Elisabeth Station.

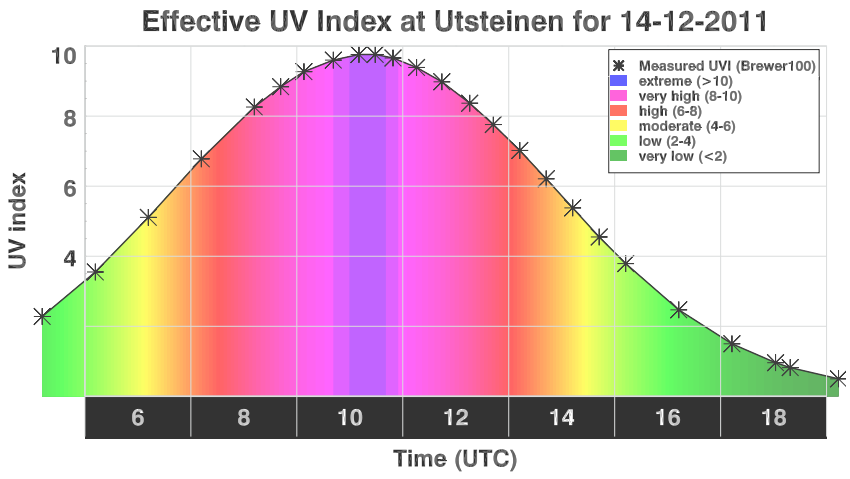

Figure 4. UV index measured at Utsteinen on 14 December 2011.

At high southern latitude the combination of low aerosol, high albedo and low ozone columns causes high UV intensities with high risk of sunburn.

References

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- De Bock, Veerle, H. De Backer, A. Mangold, and A. Delcloo, Aerosol Optical Depth measurements at 340 nm with a Brewer spectrophotometer and comparison with Cimel observations at Uccle, Belgium, Atmos. Meas. Tech., 3, 1577-1588, doi:10.5194/amt-3-1577-2010, 2010.

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