

Agenzia Regionale per la Protezione dell'Ambiente – Valle d'Aosta
Regional Environment Protection Agency – Aosta Valley

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VALLE D'AOSTA: THE NEW LOCATION

On January 25, 2007, Brewer spectrophotometer MKIV #066 was moved from Ispra-JRC (45.8 °N, 8.6 °E, 240 m) – operational since 1991 – to Saint-Christophe, Aosta (45.7 °N, 7.4 °E, 569 m, Fig. 2). The instrument is installed on the roof of building (Fig. 4) of the ARPA Valle d'Aosta (Environment Protection Agency) which is now the agency in charge.

The absolute calibration was performed by the IOS inc. (International Ozone Service) in April 19-23, 2007, showing that the instrument is still working reliably. Measurements of total ozone, total nitrogen dioxide, AOD and spectral UV irradiance are regularly carried out following the schedule used at Ispra. Brewer data can be seen in real time on the ARPA Valle d'Aosta web site (www.uv-index.vda.it, Fig. 3).

The new location is in a semi-rural context, just out-of-town, slightly influenced by anthropogenic activity. The site is at the bottom of a large valley with a wide field of view (Fig. 1). A detailed characterisation of the new site is presented in table (Table 1).

Because of the topography of the territory, thermal inversions and Föhn events (low ambient humidity, higher temperature and strong wind) are very frequent which makes very interesting the study of aerosol optical depths and total ozone content.

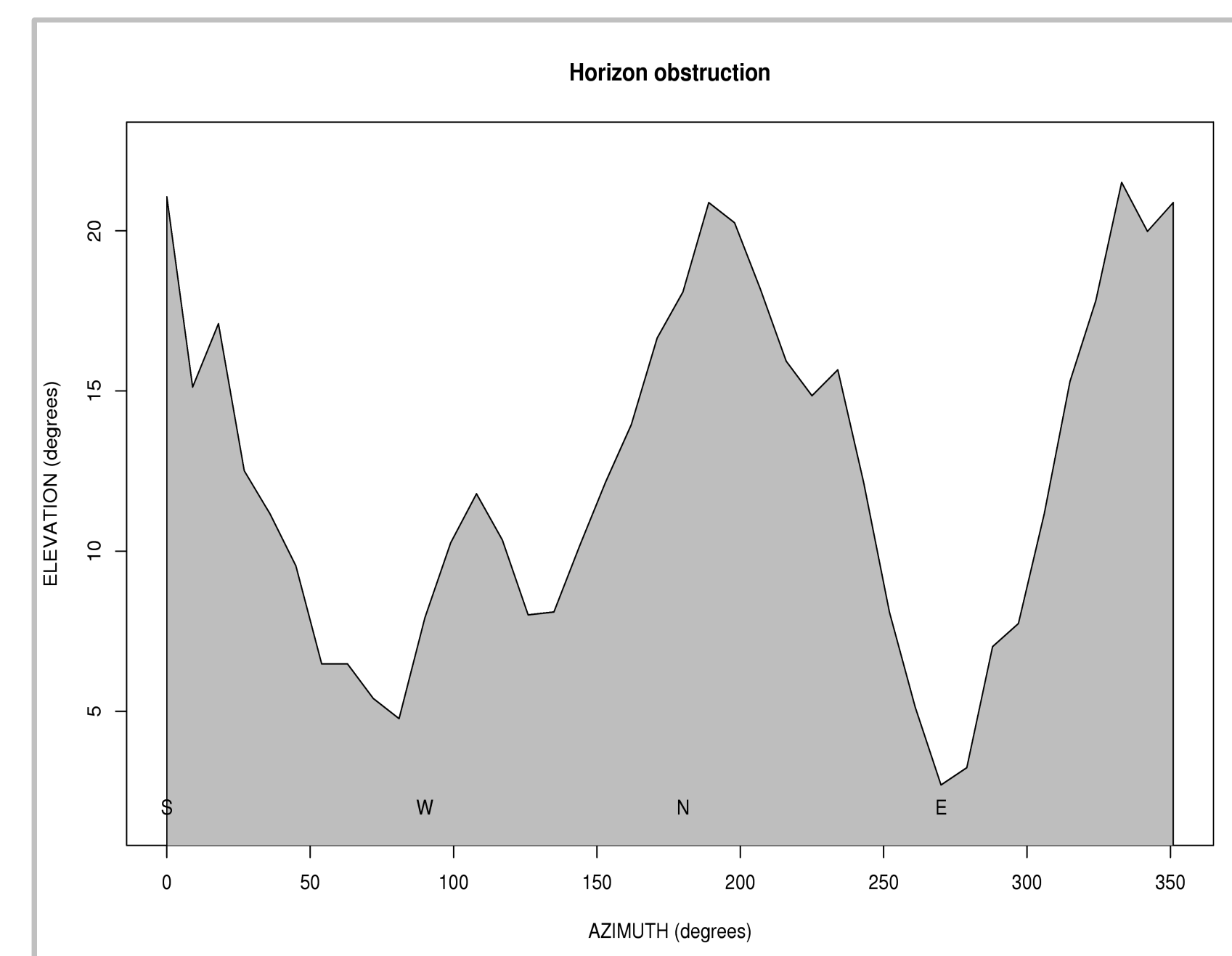


Fig. 1 – Horizon obstruction in Saint-Christophe, totally due to mountains.

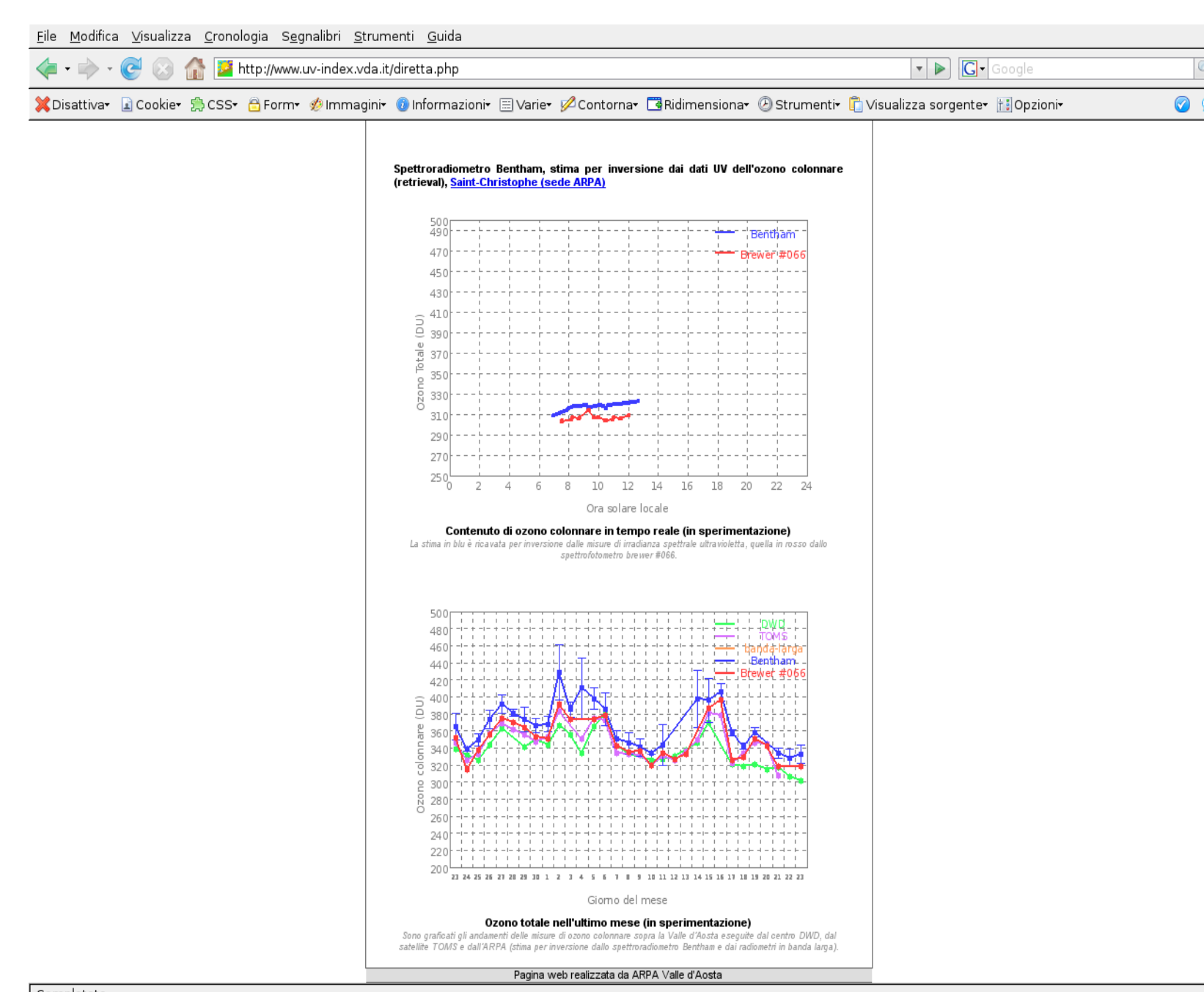


Fig. 3 – Screenshot of ARPA Internet site. Ozone measurements (Brewer and Bentham) are plotted in real time.

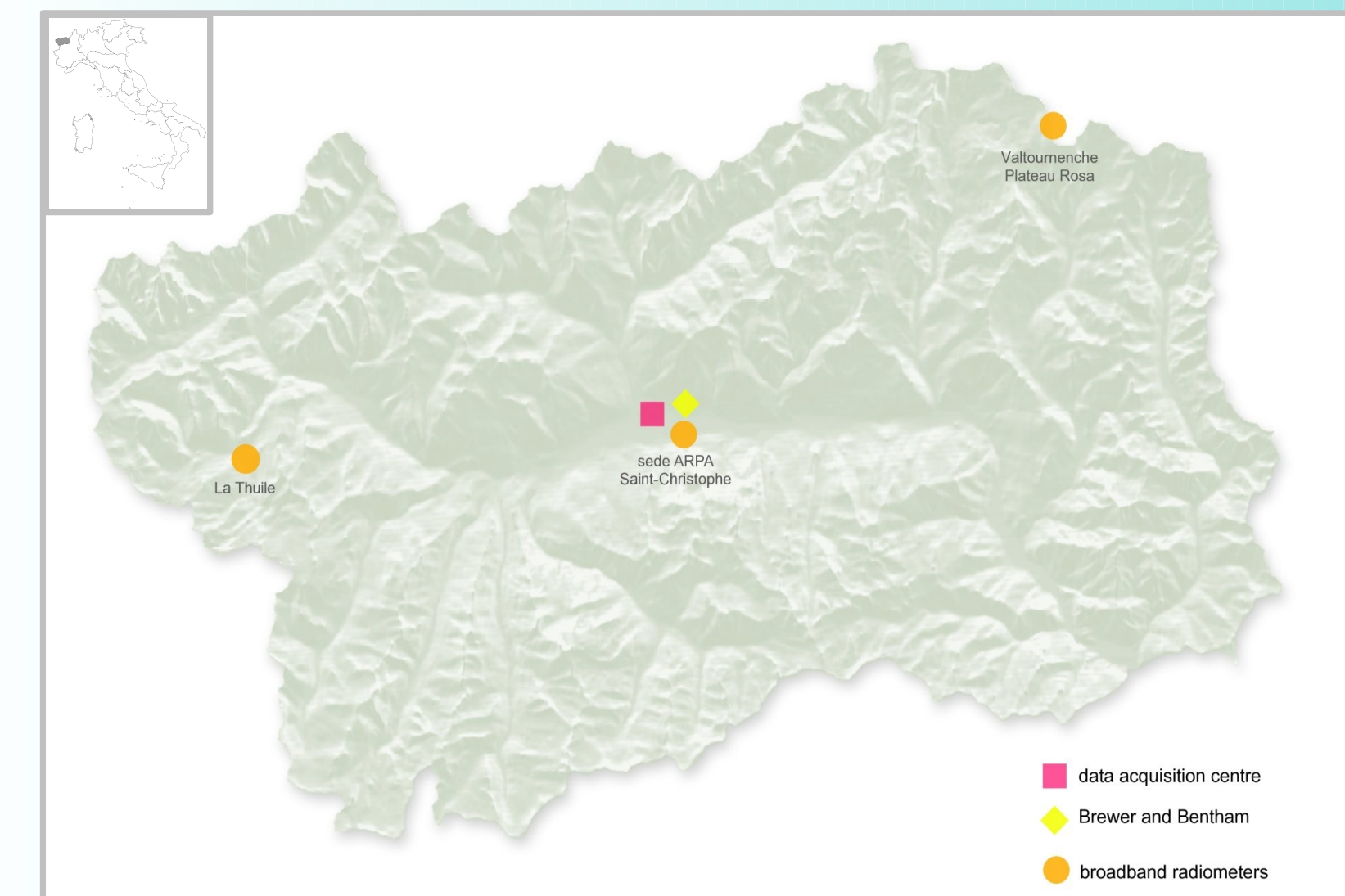


Fig. 2 – Aosta Valley and the solar radiometry observatory of ARPA.



Fig. 4 – The Brewer #066 on the roof of ARPA building, the new location.

Name of station:	ARPAVDA
Name of place:	Saint-Christophe (Aosta), Italy
Responsible institute:	ARPA Valle d'Aosta and La Sapienza – Univ. of Rome
Latitude:	45.74 °N
Longitude:	07.36 °E
Altitude:	569 m asl
Surface:	soil, grass, buildings, snow
Environment:	semirural, few pollution sources
Temperature range:	-14÷36 °C
Precipitation:	470 mm per year
TOMS ozone range:	250÷450 DU
Max UV-index:	9
Sunshine duration:	2÷11 hours
(winter/summer)	
Collocated data:	UV spectra, broadband UV, solar radiation
Start date:	29/01/2007

Table 1 – Characterisation of Saint-Christophe Brewer station.

THE SOLAR RADIOMETRY OBSERVATORY OF ARPA VALLE D'AOSTA

ARPA Valle d'Aosta has been investing many efforts about the measurements of solar radiation in the last years, with reference to the monitoring of global changes and their effects on mountain territories.

The solar radiometry observatory of ARPA Valle d'Aosta is equipped with a Bentham double monochromator spectroradiometer and three broadband UV radiometers (Fig. 7), located at three different altitudes (569 m, 1640 and 3500 m asl). The instruments are well calibrated and regularly participate to intercomparisons (QASUME, COST726...). Moreover, a Meteosat Second Generation link allows to estimate the real time cloudiness on Aosta Valley and to retrieve the UV-index on the entire territory.

The Brewer spectrophotometer will be extremely useful also as an important source of inputs for the radiative model used by ARPA (libRadtran).

COMPARISON BETWEEN BREWER AND ARPA INSTRUMENTS

- the UV indexes recorded by Bentham spectroradiometer (QASUME-calibrated) were compared with the Brewer UV measurements. Even if an accurate spectral calibration (QASUME) is to be done and is planned for this summer, and a cosine and temperature correction is not yet applied to Brewer measurements, the results are comparable within 10% (Fig. 5).

- the ozone measured by Brewer was compared with the ozone retrieved from the UV spectra recorded by the spectroradiometer, using a retrieval algorithm and libRadtran [1]. Percentage differences lie between -5% and +5% (Fig. 6). In broken cloud conditions, the algorithm overestimates the retrieved O₃ because of a well known absorption effect by clouds [2]. Also the use of standard profiles instead of the real ones could enhance the retrieval uncertainty.

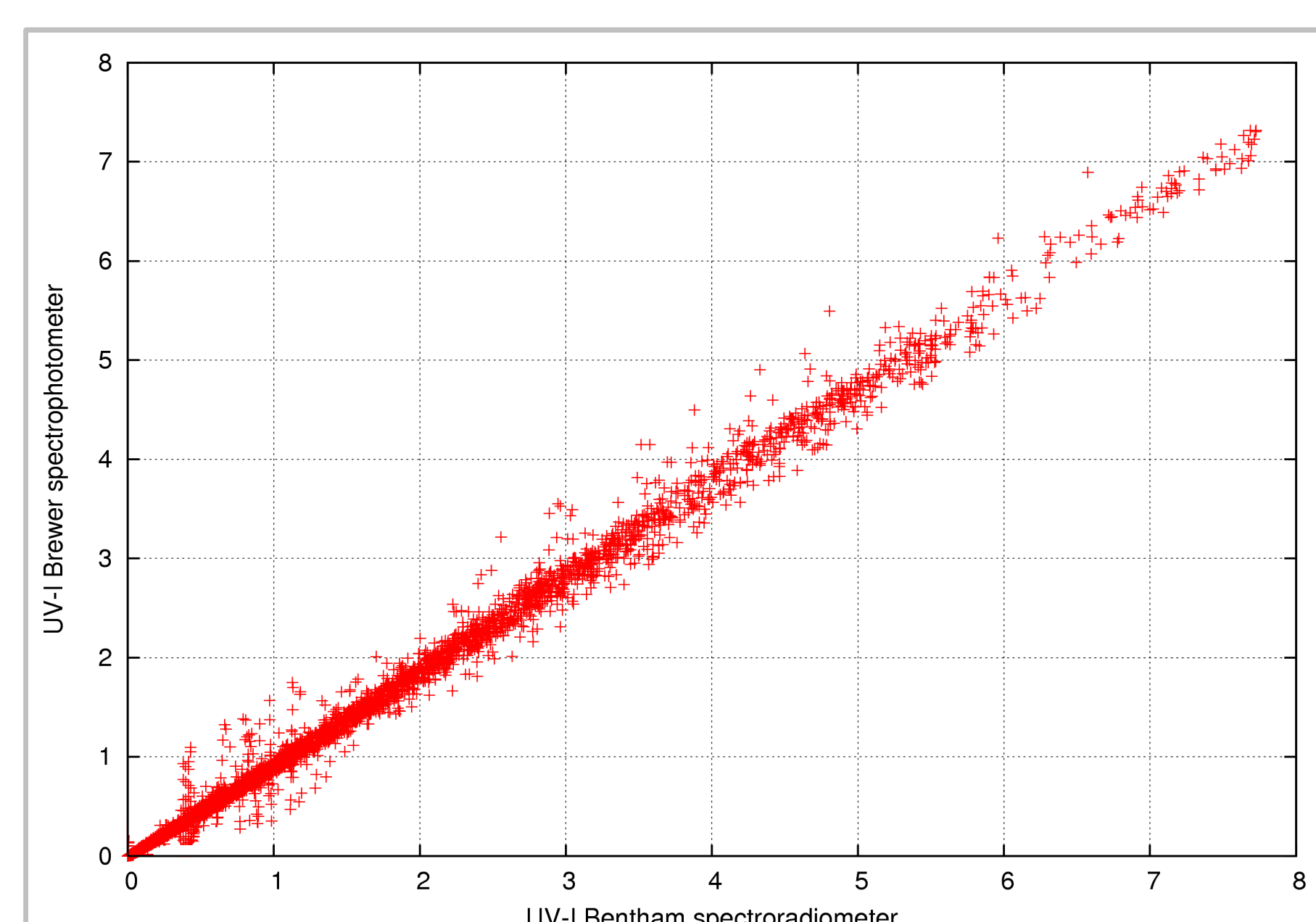


Fig. 5 – Bentham and Brewer UV indexes.

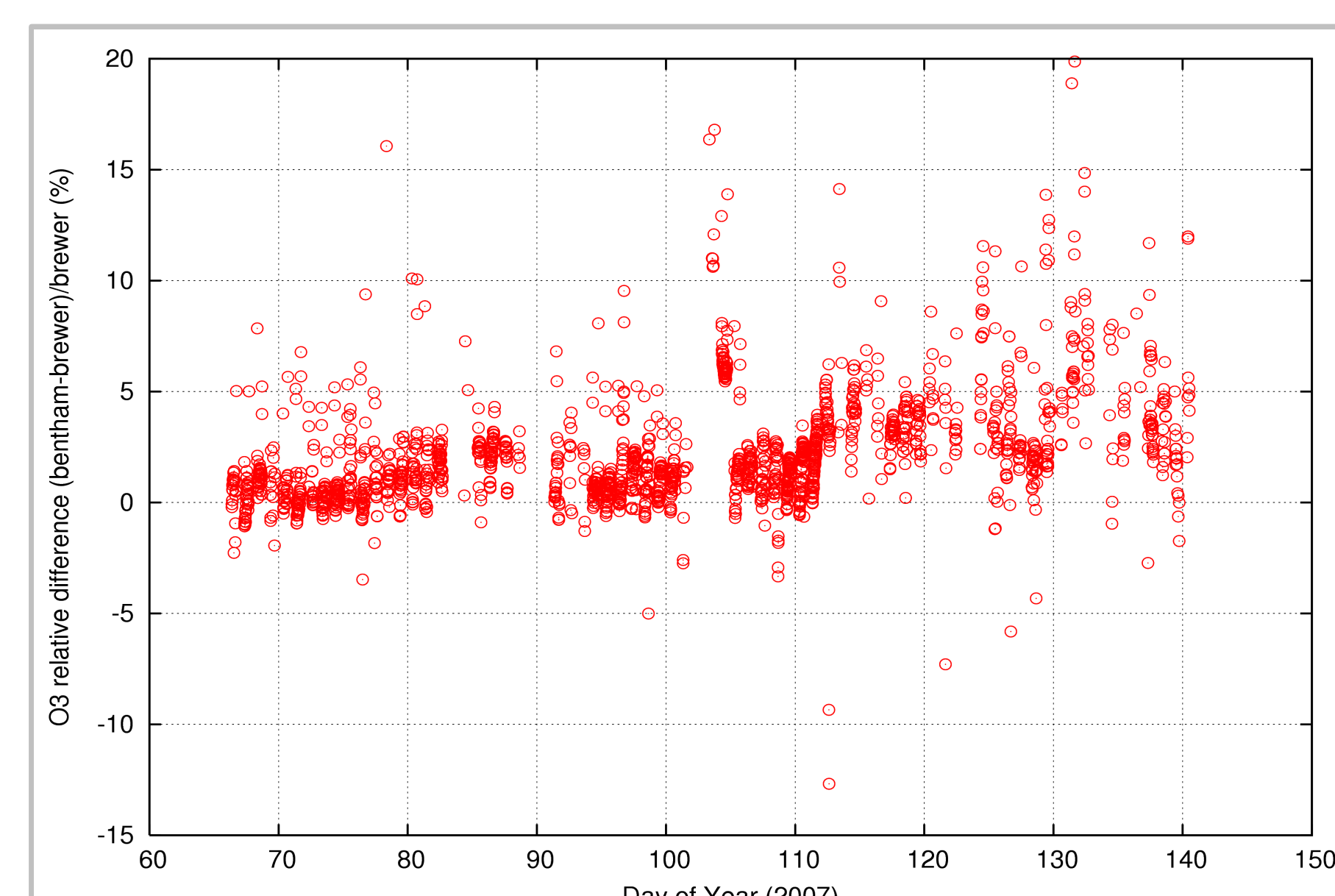


Fig. 6 – Percentage differences between Bentham retrieval and Brewer measurements of ozone.



Fig. 7 – A broadband UV radiometer (left) and the diffuser of the Bentham spectroradiometer (right), used by ARPA Valle d'Aosta.

References:

- [1] Bernhard et al., *Calculation of total column ozone from global UV spectra at high latitudes*, Journal of Geophysical Research. D. Atmospheres. Vol. 108, no. D17. Sept. 2003
- [2] Mayer et al., *Enhanced absorption of UV radiation due to multiple scattering in clouds: Experimental evidence and theoretical explanation*, JGR-Atmospheres 98JD02676 Vol. 103, No. D23, p. 31,241, 1998