

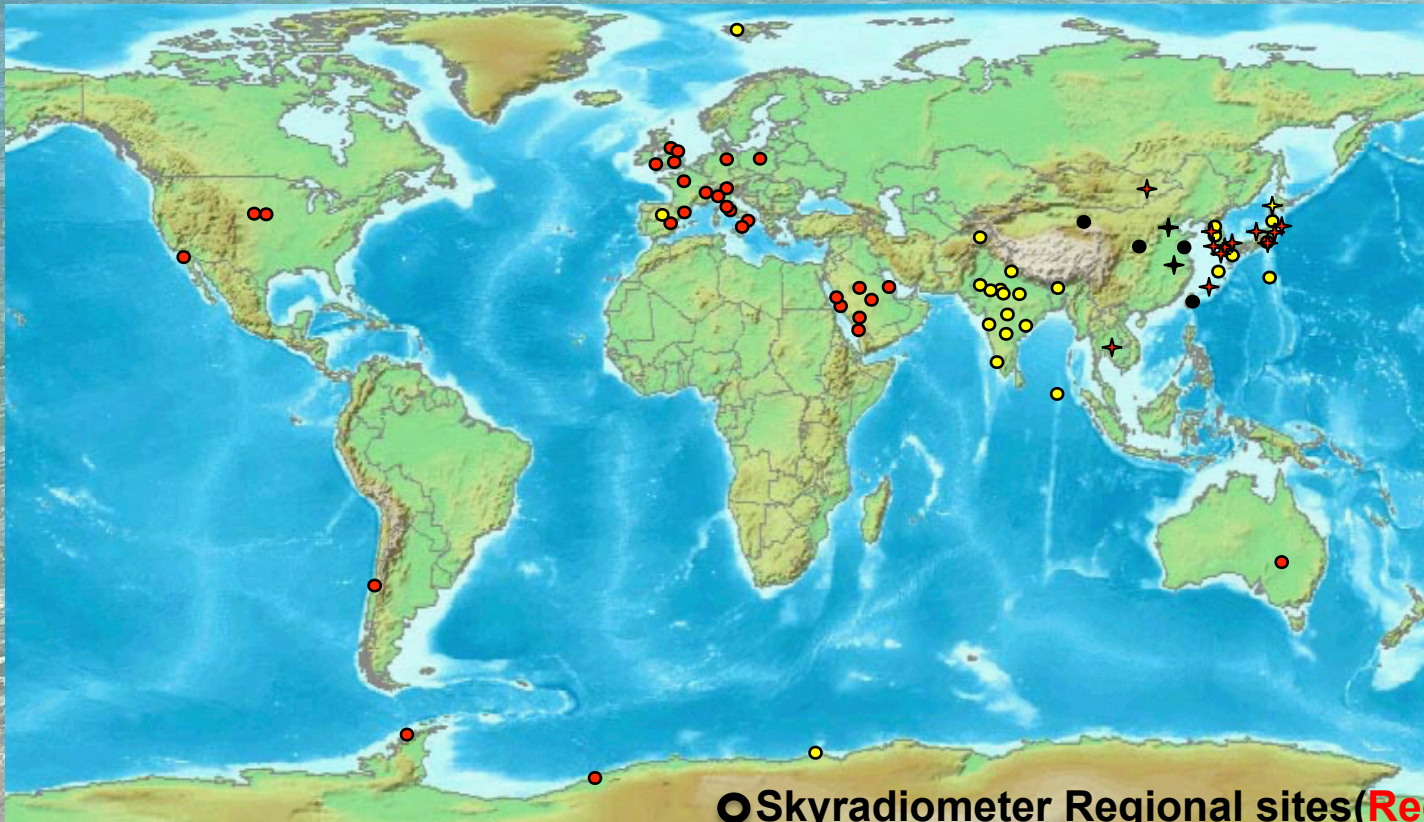
# The Skynet network

SKYNET is an International network, recently admitted as GAW contributing network, with headquarter located in Japan, dedicated to studies on aerosols and their interaction with clouds and solar radiation.

<http://www.skynet-isdc.org/index.php>



(Status April 2016)

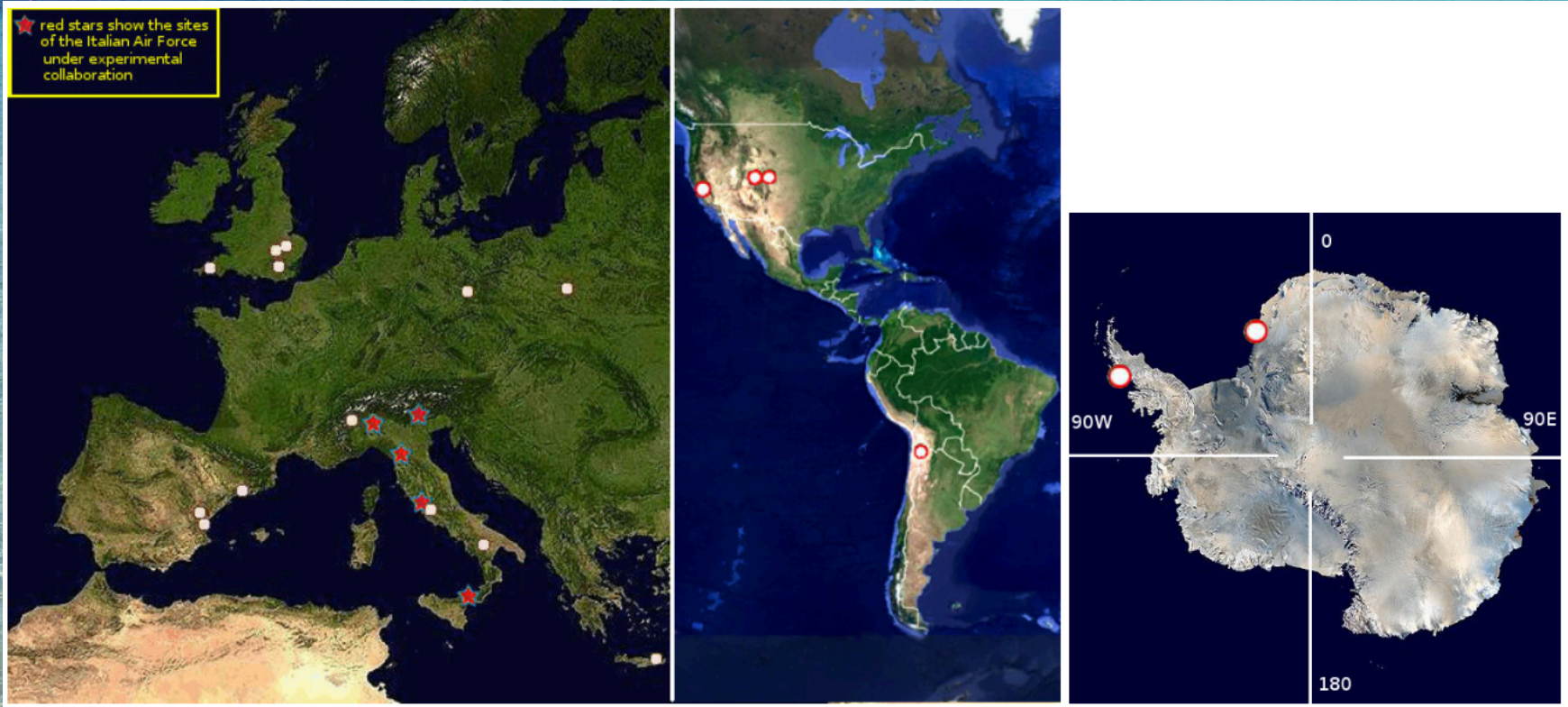


- Skyradiometer Regional sites (Red are ESR)
- ✦ Skyradiometer, pyranometer, Lidar, microwave

# The European Skynet Radiometers network, ESR

ESR/SKYNET network is the European Regional sub-network,  
managed by ISAC/CNR (M. Campanelli) and the University of Valencia ( V. Estelles)

<http://www.euroskyrad.net/>



ESR consists of 18 sites in Europe, USA and Antarctica, each equipped with a sun-sky radiometer model PREDE/POM whose data are daily processed automatically by the Regional Skynet Data Center, in the Research Area of Rome.

**Products are available on the web page every 1 hour for this Campaign**

# The ESR products

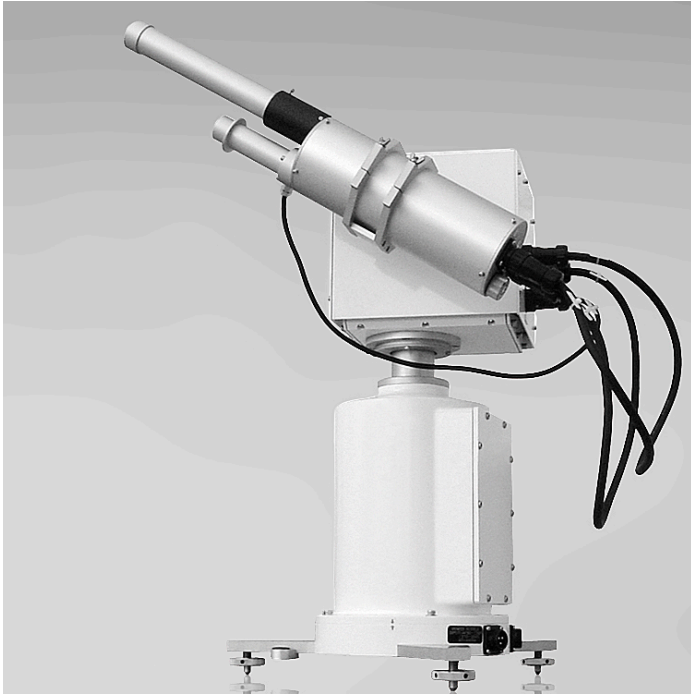
List of Products	wavelengths	Time resolution ( in clear sky)	Software
Aerosol Optical depth (AOD)	340, 380, 400, 500, 675, 870, 1020 nm	1 min	Skyrad Sunrad
Angstrom exponent	400-1020 nm; 400-870 nm	1 min	Skyrad Sunrad
Single scattering Albedo	340, 380, 400, 500, 675, 870, 1020 nm	10 min	Skyrad
real and imaginary part of refractive	340, 380, 400, 500, 675, 870, 1020 nm	10 min	Skyrad
Phase function and asymmetry factor	340, 380, 400, 500, 675, 870, 1020 nm	10 min	Skyrad
Volume size distribution		10 min	Skyrad
AOD of fine and coarse modes :	( under development)	1 min	Sunrad
Columnar Water Vapour	940 nm (only for some sites)	10 min 1 min	Skyrad Sunrad

The products ( listed in Table I ) are retrieved from sky-radiometers PREDE-POM model 01 or 02, using Skyrad4.2 and Sunrad pack inversions. *Also CIMEL 318 data can be processed by our software.*

Data can be downloaded from the web page, after the request of a password.

Acknowledgement or co-authorship to the PI of the site is required.

# The instrument



**PREDE- POM01**

**315, 380, 400, 500, 675, 870, 1020 nm**

**PREDE- POM02**

**315,340, 380, 400, 500, 675, 870, 1020, 1627, 2200 nm**

# Inversions

- **Skyrad 4.2** ( standard ESR )
- **Skyrad 5.0**
  - different approach in the a priori information needed for stabilizing the ill-conditioned Fredholm integral equation.
  - approach is more similar to AERONET
  - underestimation of coarse mode for dust events ?
- **SR-CEReS** ( under development for the International Skynet)

**ALL CODES ARE OPEN SOURCE**

# Which are the difference between ESR/SKYNET and AERONET ?

## Equipment

CIMEL	PREDE
<p data-bbox="92 519 691 562">Manufacturer: Cimel (France)</p> <p data-bbox="92 622 896 715">Direct and diffuse measurements taken by <b><u>two sensors</u></b></p> <p data-bbox="92 775 813 868">Normal, polarised, or extended NIR versions.</p> <p data-bbox="92 975 529 1018">Solid view angle 1.2°.</p> <p data-bbox="92 1078 942 1170">Temperature measured and correct in the processing</p> <p data-bbox="92 1230 359 1273">Light weight.</p>	<p data-bbox="983 519 1568 562">Manufacturer: Prede (Japan)</p> <p data-bbox="983 622 1850 761">Direct and diffuse measurements taken by the <b>same sensor</b></p> <p data-bbox="983 821 1676 863">Normal or extended NIR versions.</p> <p data-bbox="983 975 1373 1018">Solid view angle 1°</p> <p data-bbox="983 1078 1477 1120">Temperature controlled.</p> <p data-bbox="983 1230 1358 1273">Robust and stable</p>

# Data Analysis

<b>CIMEL</b>	<b>PREDE</b>
<p data-bbox="88 344 865 419"><b>RADIANCE CALIBRATION FOR DIFFUSE MEASUREMENTS IS REGULARLY NEEDED</b></p> <p data-bbox="88 568 852 733">Calibration of direct solar measurement is performed against a reference master instrument calibrated on high mountain by Langley plot</p> <p data-bbox="88 789 890 908">Cloud screening performed by the AERONET software on both direct and diffuse irradiances</p>	<p data-bbox="929 344 1856 509">The ratio between Diffuse and Direct measurements is used in the inversion: <b>NO NEED OF RADIANCE CALIBRATION WITH THE LAMP FOR DIFFUSE MEASUREMENTS</b></p> <p data-bbox="929 568 1856 691">Calibration of direct solar measurement is performed monthly, in situ, by an improved Langley plot ( Campanelli et al., 2007 )</p> <p data-bbox="929 789 1837 955">Cloud screening: <b>SUNRAD</b> similar to the AERONET direct irradiance <b>SKYRAD</b> using pyranometer measurements when available</p>

Campanelli, M., et al, 2007: Application of the SKYRAD improved Langley plot method for the in situ calibration of CIMEL sun-sky photometers. Appl. Optics, 46, 2688-2702, doi:10.1364/AO.46.002688.

## From the side of the data user

ESR/SKYNET has more frequent measurements (AOD 1 minute instead of 15 minutes; inversions every 10 minutes instead of 30-60 minutes)

**We can change the scenarios of measurements**

It is good to have an alternative method to compute the same quantities. Researchers occasionally demand alternative methodologies

**Processing can be done on either a server or client basis**

## From the side of the site owner

Prede POM, used to be more robust and fast than Cimel

**Skynet instruments only need direct solar radiation calibration, mostly performed in situ by an improved Langley method (Campanelli et al. 2007): the need to send them so frequently for calibration is reduced. A traceability program of 4 years is going to begin with the PMOD/Davos**

Aeronet depends on NASA funding.

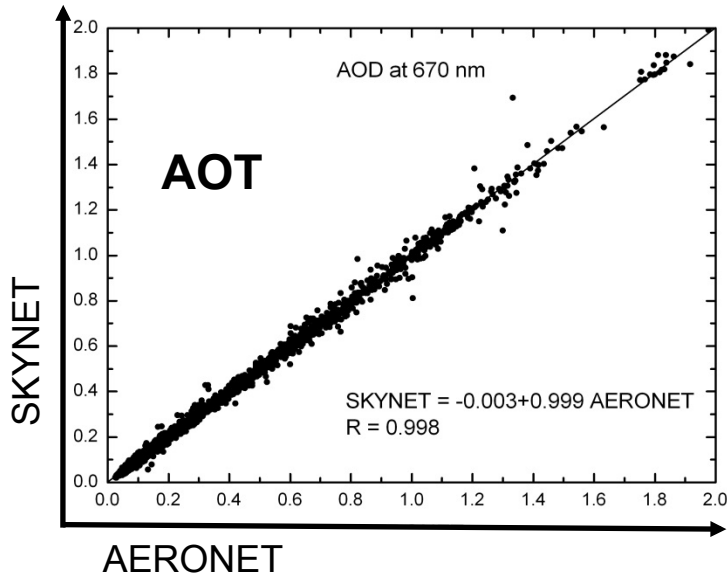
Skynet is on voluntary basis with no central fundings.

**There is limit by Aeronet in accepting new sites; there is no limit by Skynet.**

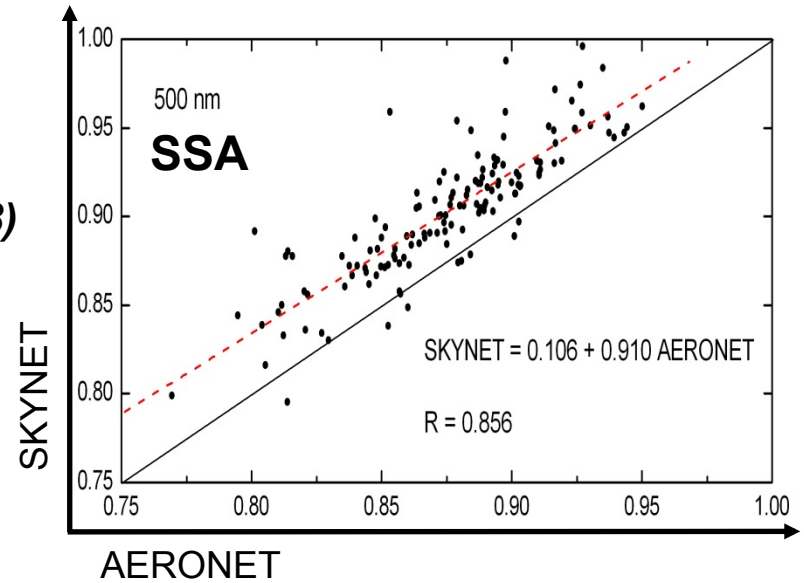
More protective data policy in SKYNET.



# Validation of SKYNET products and Calibration

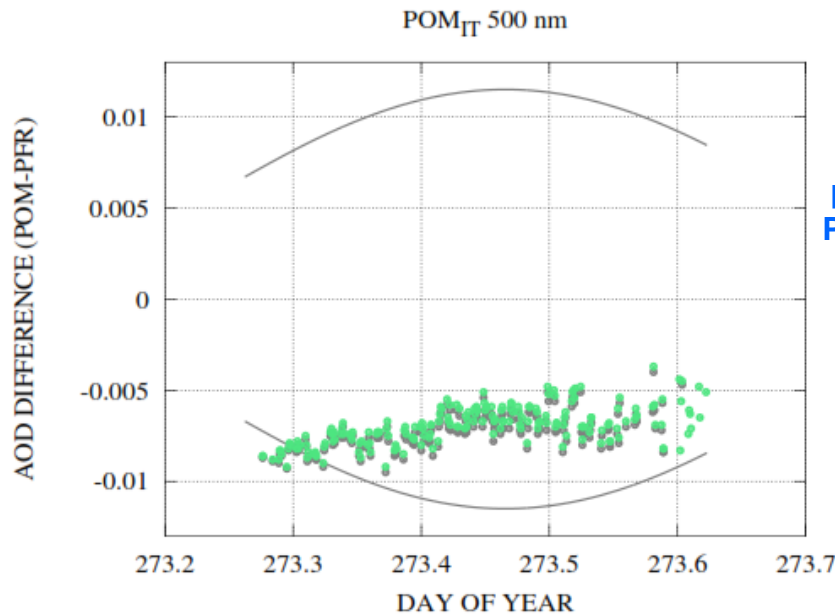


*Che et al. (2008)*

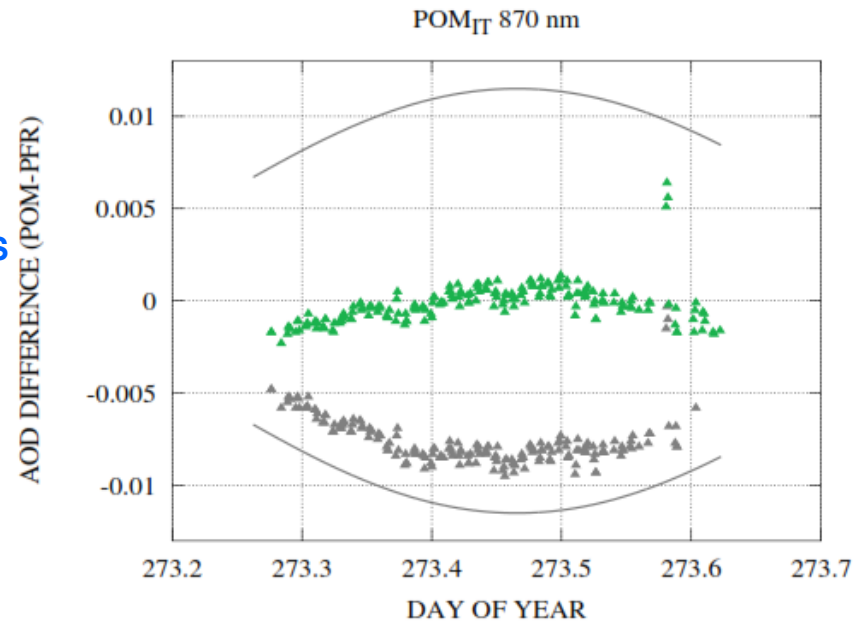


**SKYNET AOT: almost equal to AERONET AOT**

**SKYNET SSA is systematically larger than AERONET SSA  
 +3.10%(500nm), +3.40%(675nm), +7.33%(870nm)  
 AERONET-SSA also have an uncertainty of  $\pm 0.03$ . (Dubovik et al., 2002)**

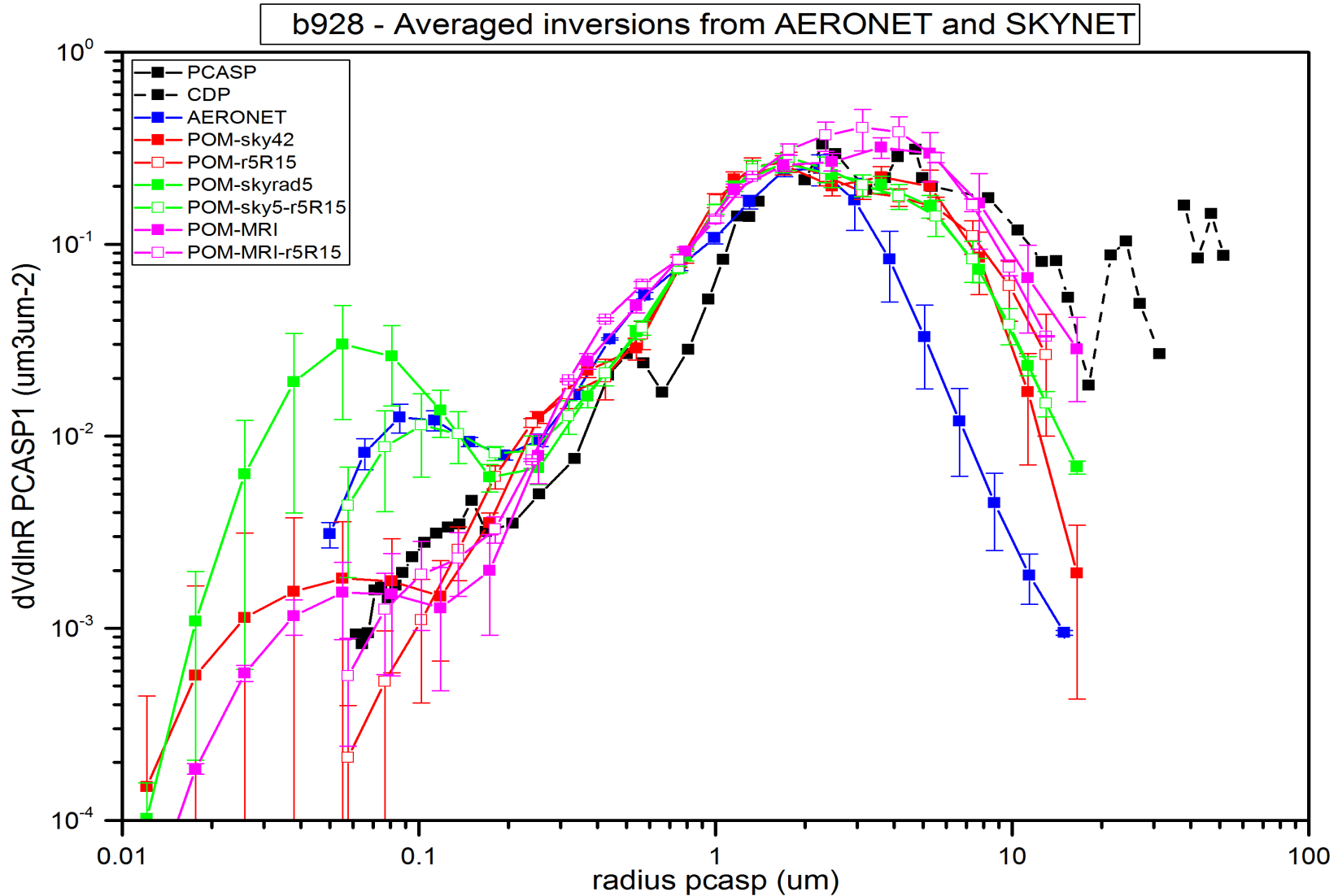


**Traceability  
 program with  
 PMOD/DAVOS  
 will start in  
 June 2017**



ESR attended in August 2015 a Campaign in Cape Verde, Africa, aimed to validate the volume size distribution from skyradiometers with measurements from aircraft.

The project is called SAVEX –D (Sunphotometer Airborne Validation Experiment – Dust) and it was made in collaboration with MetOffice.



# 3/5: Relationship between the aerosol characteristics at the ground and their vertically-resolved and total-column properties



PERGAMON



Atmospheric Environment 35 (2001) 3607–3618

ATMOSPHERIC ENVIRONMENT  
[www.elsevier.com/locate/atmosenv](http://www.elsevier.com/locate/atmosenv)

Physical features of the atmospheric aerosol determined with an aureolemeter and a FSSP probe in the Mediterranean Lampedusa island

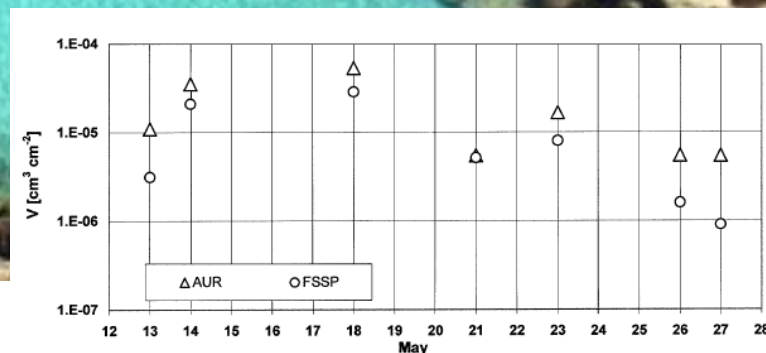
Monica Campanelli<sup>a,\*</sup>, Wolfgang Junkermann<sup>b</sup>, Bruno Olivieri<sup>a</sup>, Glauco Tonna<sup>a</sup>



Measurements from POM 01 were taken in Lampedusa island during summer.

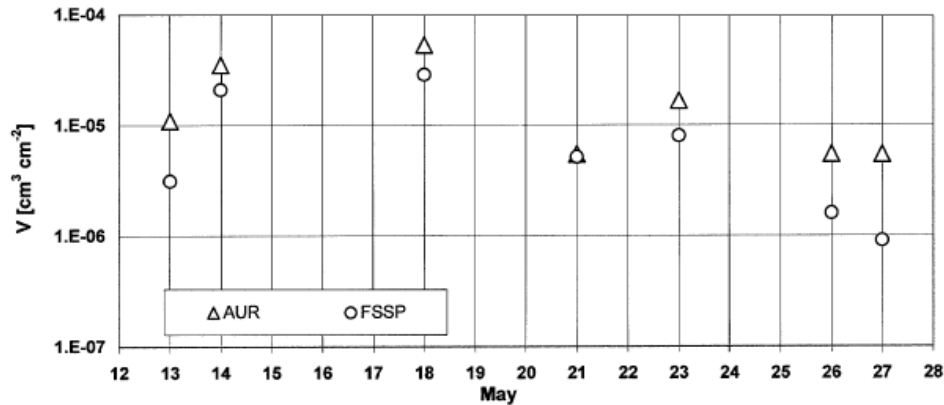
The columnar volume size distribution from the Skyrad inversion was compared against the columnar volume distribution obtained from in situ measurements by an FSSP aboard the light aircraft

The largest discrepancy was found during the passage of desert dust: not recorded by the aircraft  
( maximum heigh 4300 m a.s.l)



# Comparison between the columnar volume distribution from POM and FSSP

The largest discrepancy was found during the passage of desert dust: not recorded by the aircraft ( maximum heigh 4300 m a.s.l)



Total volume integrated bewteen [0.2 – 4]  $\mu\text{m}$

Lampedusa, 13.5.1999

