The Lampedusa Atmospheric Observatory for Climate Studies in the Mediterranean

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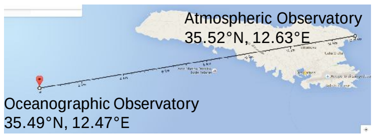
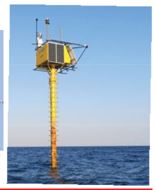
The Station for Climate Observations

The Station for Climate Observations on the island of Lampedusa (http://www.lampedusa.enea.it), in the central Mediterranean sea, is composed of an Atmospheric Observatory and a recently developed Oceanographic Observatory. Lampedusa is a small island, with a surface area of about 20 km^2, sparse vegetation, limited pollution sources. The highest elevation of the island is 123 m.

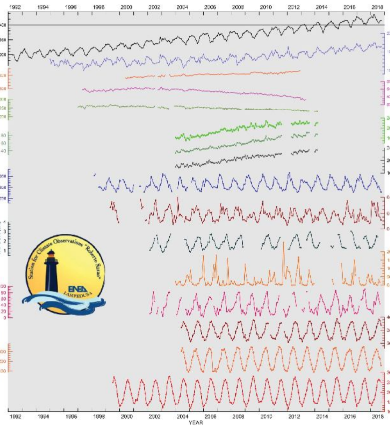
The two sections constitute an integrated Mediterranean observatory that allows the datailed characterization of the atmospheric structure and composition and their changes, and the investigation of air-sea interactions and water column properties. The integrated observatory is particularly well equipped for satellite validation and satellite ocean colour vicarious calibration activities.





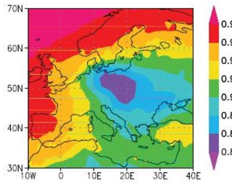
The Atmospheric Observatory

The Atmospheric Observatory, AO, was set up in 1997 at Capo Grecale, the North-Eastern promontory of Lampedusa (35.52°N, 12.63°E). The observatory is dedicated to climate, and all essential atmospheric climate variables, together with other atmospheric properties, are routinely measured. The AO contributes to several international climate monitoring programmes (World Meteorological Organization Global Atmosphere Watch, Aerosol Robotic Network, Integrated Carbon Observation System, Aerosol Clouds and Trace gases Research InfraStructure, etc.).

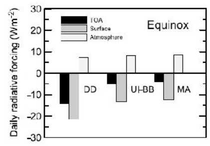


Monthly averages of several measured parameters.

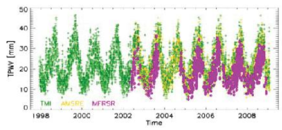
Satellite validation studies and integrated analyses



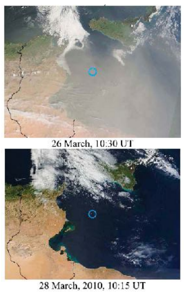
Derivation of aerosol absorption correction factors for the retrieval of UV index from OMI (Arola et al., 2009).



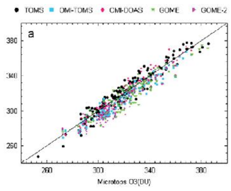
Estimate of the average aerosol radiative forcing by combinbg ground-based and CERES observations (Di Biagio et al., 2010).



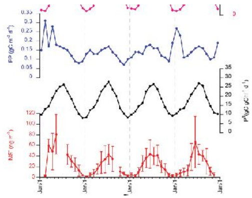
Comparison among ground-based (MFRSR) and satellite determinations (TMI and AMSRE) of total precipitable water (Liberti et al., 2010).



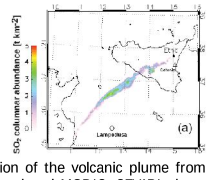
Determination of the Saharan dust shortwave and longwave radiative effects by combining surface measurements, MODIS and CERES observations (di Sarra et al., 2011; Meloni et al., 2015).



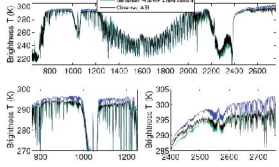
Comparison among ground-based (Microtops) and different total ozone determinations from different satellite sensors (Gomez-Amo et al., 2013).



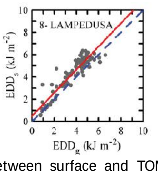
Determination of ocean primary productivity by combining MODIS chl and surface radiation measurements between 2005 and 2008 (Becagli et al., 2013).



Investigation of the volcanic plume from Etna using ground-based and MODIS, SEVIRI observations, and Lagrangian modelling (Sellitto et al., 2016).



Determination of Saharan dust infrared refractive index by using ground-based, airborne, and IASI measurements (Liuzzi et al., 2016; Meloni et al., 2018).



Comparison between surface and TOMS and OMI erythemal irradiance (Meloni et al., 2005; Mateos et al., 2013).

Operational Instruments

- Meteorological station [air pressure, temperature, humidity, wind direction and velocity, precipitation (Vaisala)]; **1999-**
- Cavity ring-down spectroscopy analyzer [atmospheric CO_2, CO, CH_4 (Picarro G2401)]; **2012-**
- Brewer MK III spectrophotometer (total ozone, spectral UV irradiance, aerosol optical depth); **1998-**
- Aerosol lidar [together with University of Rome; multi-wavelength aerosol backscattering and depolarization profiles]; **1999-**
- Visible Multi Filter Rotating Shadowband Radiometer [MFRSR; aerosol optical depth at several wavelengths, diffuse-to-direct irradiance ratio, column water vapor, aerosol single scattering albedo (Yankee Environmental Systems MFR-7)]; **2001-**
- Ultraviolet Multi Filter Rotating Shadowband Radiometer [UV-MFRSR; aerosol optical depth at several wavelengths, diffuse-to-direct irradiance ratio (Yankee Environmental Systems UV-MFR-7)]; **2004-2006, 2010-**
- Cimel sun-photometer [part of AERONET]; **2000-2005, 2010-**
- Middleton 4-channel sun-photometer, wide field of view [aerosol optical depth, column water vapour]; **2013-**
- Middleton 4-channel sun-photometer, narrow field of view [aerosol optical depth, column water vapour]; **2013-.**
- PM-10 aerosol sampler [FAI Hydra, University of Florence]; **2004-**
- PM-10 aerosol sampler for EC/OC [Tecora Echo PM; University of Florence]; **2010-**
- Particle soot/absorption photometer [PSAP; aerosol absorption coefficient; Cyprus Institute]; **2010-**
- Precision Spectral Pyranometer [downward shortwave irradiance (Eppley)]; **2003-**
- Precision Infrared Radiometer [downward longwave irradiance (Eppley)]; **2003-**
- Precision Spectral Pyranometer [upward shortwave irradiance (Eppley)]; **2015-**
- Precision Infrared Radiometer [upward longwave irradiance (Eppley)]; **2015-**
- CMP21 pyranometer [downward shortwave irradiance (Kipp and Zonen)]; **2006-**
- CGR4 pyrgeometer [downward longwave irradiance (Kipp and Zonen)]; **2007-**
- Shaded CGR4 pyrgeometer [downward longwave irradiance (Kipp and Zonen)]; **2007-**
- Shaded Precision Spectral Pyranometer [diffuse downward shortwave irradiance (Eppley)]; **2006-**
- CHP1 pyrheliometer [direct normal irradiance (Kipp and Zonen)]; **2011-**
- Photosynthetic radiation radiometer [downward photosynthetically active radiation, PAR (Li-cor)]; **2004-**
- Shaded photosynthetic radiation radiometer [diffuse downward PAR (Li-cor)]; **2016-**
- Actinic radiation spectrometer [actinic radiation spectra, photodissociation rates (Metcon GmbH)]; **2004-**
- UV-Vis-near IR spectrometer [global spectral irradiance (Satlantic HyperOCR)]: **2013-**
- UV-Vis-near IR spectrometer [diffuse spectral irradiance (Satlantic HyperOCR)]; **2013-2015.**
- CARAGA aerosol sampler [dust/aerosol total deposition; LISA]; **2011-2017.**
- Aerosol deposition sampler [aerosol total deposition, DOC/DOM, chemical composition; CNR/IBF]; **2015-**
- Total sky imager [cloud cover (Yankee Environmental Systems TSI 440)]; **2003-**
- Water vapor Raman lidar [day/nighttime vertical profiles of water vapor, aerosol extinction (jointly with University of Rome)]; **2019-**
- Vaisala radiosonde [temperature, pressure, humidity, wind (Vaisala Digicora III)]; **2004-**
- RPG Hat-Pro Microwave radiometer [temperature, water vapour, clouds vertical profiles]; **2009-2014.**
- IR camera [IR radiance in the atmospheric window (Heitronics)]; **2009; 2010-2014; 2017-**
- Ozone analyzer [surface ozone mixing ratio; ISAC/CNR]; **2014-**
- NOAA gas sampling unit [weekly analyses of CO_2, CH_4, N_2O, CO, SF_6, H_2, ^{13}C, ^{18}O, made at NOAA]; weekly analyses, **2006-**

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Sellitto et al. (2016), Synergistic use of Lagrangian dispersion and radiative transfer modelling with satellite and surface remote sensing measurements for the investigation of volcanic plumes: the Mount Etna eruption of 25-27 October 2013, Atmos. Chem. Phys., 16, 6841–6861.