"Boundary-layer Air Quality-analysis Using Network of Instruments" – BAQUNIN Super site

Marco Cacciani (1), Stefano Casadio (2,3), Anna Maria Iannarelli (3), Monica Campanelli (4), Anna Maria Siani(1), Stefania Argentini (4), Enrico Cadau (5), Daniele Di Erasmo (3), Gabriele Mevi (3) e Cristiana Bassani (6)

(1) Sapienza Università di Roma, (2) ESA/ESRIN EOP-GMQ, Frascati, Italy, (3) SERCO, Frascati, Italy, Italy, (4) CNR-ISAC,Roma, Italy, (5) Sardegna Clima Onlus, (6) CNR-IIA, Monterotondo, Roma, Italy

Context: BAQUNIN support contract (ESA/ESRIN Sensor Performance, Products and Algorithms section)

Purpose: Joint instrumental suite for validating the satellite atmospheric composition products (level 2) in Urban and Semi-rural environment

Super Site concept: Ground based active and passive remote sensing instruments operating in synergy, offering quantitative and qualitative information for a wide range of atmospheric parameters. Acquired data, quality checked and harmonised in terms of the Generic Earth Observation Metadata Standardformat (GEOMS) and information content, are freely distributed via the ESA Atmospheric Validation Data Centre (EVDC, http://evdc.esa.int/).

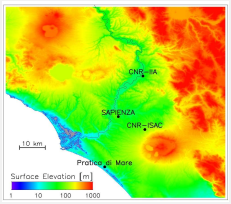
Instruments	Locations	Ownership	Operability	Data available since
Pandora 2S (Spectrometer)	Sapienza, ISAC, IIA	ESA	day / night (moon)	2016
Cimel (Sun-photometer)	Sapienza	Univ. Lille	day	2016
Prede Pom 01 (Sun-sky radiometer)	Sapienza	ISAC	day	2010
MFRSR (Radiometer)	Sapienza	Sapienza	day	2004
Pyranometer (Radiometer)	Sapienza	Sapienza	day	2018
Brewer (Spectrophotometer)	Sapienza	Sapienza	day	1992
Yes Broad-band UV (Radiometer)	Sapienza	Sapienza	day	2000
Meteorological Sensors	Sapienza	Climate Consulting Srl	day / night	2014
All Sky Camera	Sapienza	ESA	day / night	2018
LIDAR (Raman and elastic+depol.)	Sapienza	Sapienza	day / night (overpass ±1h)	2016
SODAR (triaxial Doppler)	Sapienza	Sapienza/ISAC	day / night	1990

PRODUCTS	INSTRUMENTS
O_3 surface, tropospheric and total column	PANDORA ‡, BREWER
NO_2 surface, tropospheric and total column	PANDORA ‡, BREWER
SO_2 surface, tropospheric and total column	PANDORA ‡
HCOH surface, tropospheric and total column	PANDORA ‡
H_2O total column, profile	PREDE, PANDORA ‡ ,CIMEL, LIDAR, MFRSR
Aerosol Optical Depth (AOD)	PREDE, PANDORA ‡ ,CIMEL, LIDAR, MFRSR
Aerosol backscattering and extinction coefficient	LIDAR
Scattering and Absorption Angström Exponent (SAE & AAE)	CIMEL
Angström exponent (AE)	PREDE, PANDORA ‡ ,CIMEL
Single Scattering Albedo (SSA) Volume Size Distribution (VDS), Real and Immaginary part of Refracting Index, Phase Function	PREDE ,CIMEL
Solar Irradiance	PYRANOMETER
Spectral Irradiance	PANDORA2S ‡
UV Dose, UV Index	BREWER
Cloud top/bottom	LIDAR
Cloud fraction	All Sky Camera
Thermal Turbolence, Wind Speed and Direction	SODAR
Surface aitr temperature, humidity, pressure and wind	Meteorological sensors, WFR

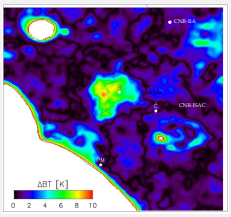
‡ → "triplets": instrument operating in urban , semi-rural and rural environment

Roof of Physics Department at Sapienza University: position of the instruments.

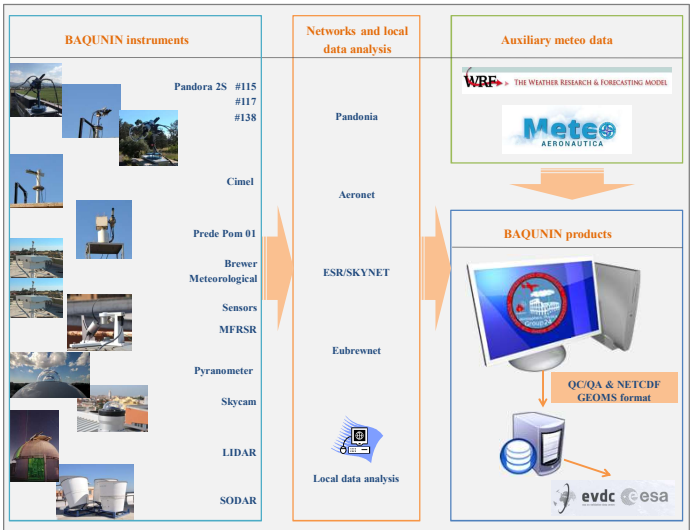
BAQUNIN geographical context



SRTM digital elevation model of Tiber Valley (log scale)



Tiber Valley 9am/9pm thermal contrast from (A)ATSR-1/2 (1991-2012) 10.8 μm clear sky brightness temperature (TOA). The urban signature is clearly visible in the center of the figure.



BAQUNIN data harmonisation for Satellite Validation

Before submission to EVDC, network and locally produced Level 2 data will underpass:

- ❑Additional quality checks in terms of available uncertainties and flags
- ❑Time/space resampling, depending on original spatial/temporal resolution
- ❑Nomenclature and units harmonisation
- ❑Format (GEOMS) conversion

BAQUNIN Team		
Stefano Casadio	Stefano.Casadio@esa.int Stefano.Casadio@serco.com	SERCO co ESA ESRIN / Sapienza
Anna Maria Iannarelli	Annamaria.Iannarelli@serco.com	SERCO co Sapienza
Daniele Di Erasmo	daniele.dierasmo@serco.com	SERCO
Marco Cacciani	Marco.Cacciani@uniroma1.it	Phys. Dep. Sapienza
Annamaria Siani	Annamaria.Siani@uniroma1.it	Phys. Dep. Sapienza
Monica Campanelli	m.campanelli@isac.cnr.it	ISAC-CNR Tor Vergata
Enrico Cadau	Enrico.Cadau@esa.int	SERCO / Sardegna Clima ONLUS
Gabriele Mevi	althar@live.it	SERCO
Cristiana Bassani	cristiana.bassani@iia.cnr.it	IIA-CNR Montelibretti

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