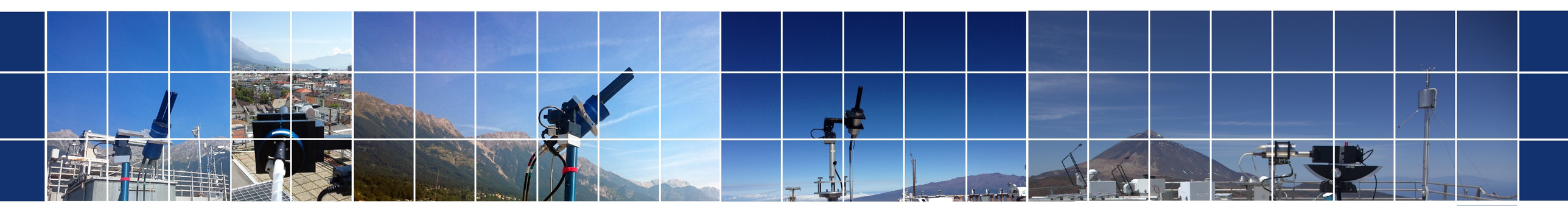

PANDONIA

ESA Ground-Based Air-Quality and Satellite Validation Network

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MOTIVATION

Uninterrupted, well-maintained, homogeneously calibrated time series of ground-based remote sensing data are the backbone for validation of trace gas columns measured from satellite.
While these data are available for O_3 validation, no comparable network is existing for validation of other satellite-derived trace gas data as e.g. NO_2.
PANDONIA shall be a key element for validation of existing and upcoming satellite missions with a focus on atmospheric chemistry.

SATELLITE MISSIONS

Table 1 : Existing and upcoming satellite missions where PANDONIA plays a key role in the validation infrastructure.

Mission	Launch	Instrument	Products
		ESA missions	
EarthCARE	2016	MSI	Aerosol, Clouds
ADM-Aeolus	2016	ALADIN	Aerosol, Clouds
Sentinel 3A	Late 2015	MWR, OLCIS, LSTR	Aerosol, H_2O
Sentinel 5P	2016	TROPOMI	O_3, NO_2, SO_2, HCHO, Aerosol, Clouds, CO*, CH_4*
Sentinel 3B	Early 2017	MWR, OLCIS, LSTR	Aerosol, H_2O
Sentinel 4	2021?	UVN	O_3, NO_2, SO_2, HCHO, Aerosol
Sentinel 5	2021?	UVNS	O_3, NO_2, SO_2, HCHO, Aerosol, Clouds, CO*, CH_4*
		Third party missions	
AQUA	1999	MODIS	Aerosol
TERRA	2002	MODIS	Aerosol
AURA	2004	OMI	O_3, NO_2, SO_2, HCHO, BrO, Aerosol

* not measured by PANDONIA

CORE INSTRUMENT

Spectrometer system for direct sun, sky radiance and direct moon observations: Pandora and Pandora-2S.

Table 2 : Specifications of Pandora / Pandora-2S spectrometer system.

Optical bench	temperature-stabilized symmetric Czerny-Turner (Avantes)
Detector	2048×64 back-thinned Hamamatsu CCD
Wavelength range	270 to 530 nm
	and 400 to 900 nm*
Resolution	0.6 nm
	1.1 nm*
Oversampling	4.5
Field of view	2.2° direct-sun observations, 1.6° sky observations

* only Pandora-2S

MAJOR DATA PRODUCTS

- ▶ O_3 and NO_2 total and tropospheric columns
- ▶ O_3 and NO_2 near surface concentrations
- ▶ Effective O_3 and NO_2 temperature
- ▶ Spectral AOD from 340 to 900 nm.
- ▶ SO_2, HCHO, BrO and H_2O total columns

OBSERVATION SITES

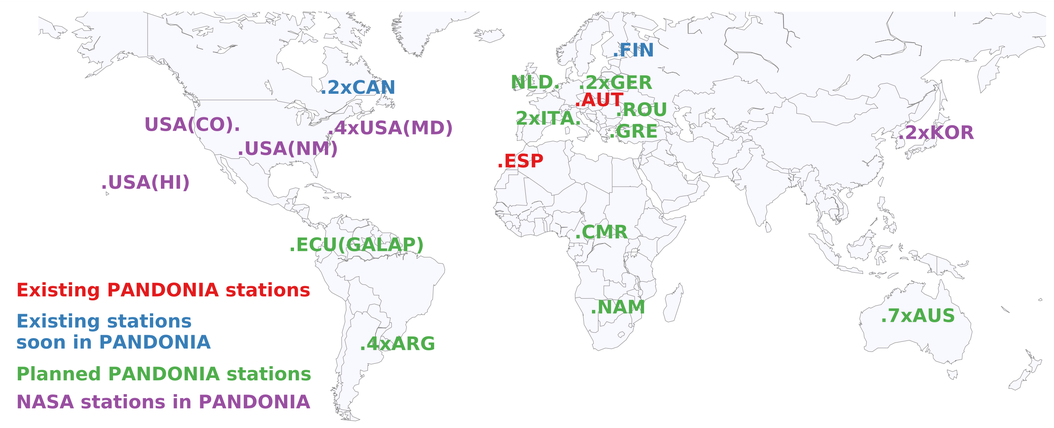

Figure 1 : Existing (red), soon (blue), planned (green) and NASA (purple) stations as part of the PANDONIA network (effective Aug 2015).

HOMOGENEITY

Calibration methodology

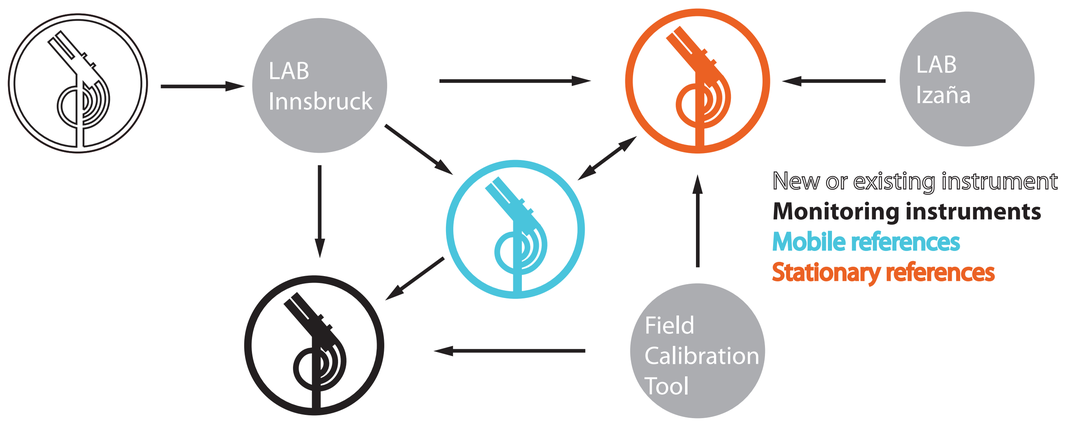

Figure 2 : Calibration procedure for PANDONIA instruments. Laboratory characterized instruments become either monitoring (black), mobile reference (blue) or stationary reference instruments. Mobile reference instruments transfer the calibration from stationary references to the monitoring instruments ⟶ no interruption of the time series!

Data handling

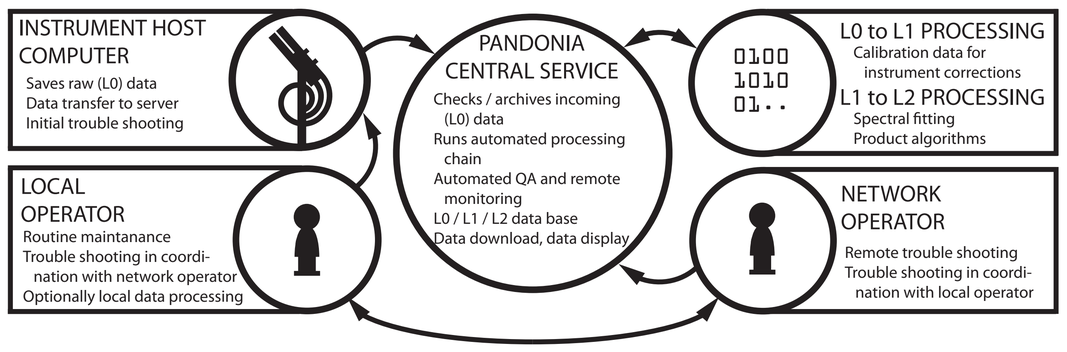

Figure 3 : Data and information flow in the PANDONIA network. Centralized data control and processing, multilayer trouble shooting with on-site manpower favor high instrument availability and near real time delivery of the final data products.

Acknowledgments:
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