Streamlining Synergy with Satellite Missions through Trans-National Access to Atmospheric Research Infrastructures

ATMOS 2021

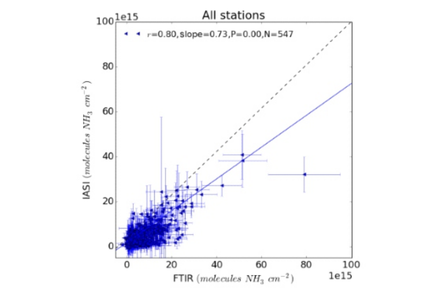
Doina Nicolae, National Institute of R&D for Optoelectronics
Iwona S. Stachlewska, University of Warsaw, Faculty of Physics
Carmela Cornacchia, Consiglio Nazionale delle Ricerche
Arnoud Apituley, Royal Netherlands Meteorological Institute
Rosa M. Petracca Altieri, Consiglio Nazionale delle Ricerche
Ulla Wandinger, Leibniz Institute for Tropospheric Research
Vassilis Amiridis, National Observatory of Athens
Ottmar Möhler, Karlsruhe Institute of Technology
Giuseppe Gargano, Consiglio Nazionale delle Ricerche

Contributions in the past

Long-term activities

- Aerosol products from Calipso by correlative observations with EARLINET
- Aerosol products from CATS by correlative observations with EARLINET
- NH3 IASI & CrIS validation using FTIR stations
- HCHO & NO2 TROPOMI validation using the FTIR network
- Wind products from Aeolus by correlative observations with ground-based cloud radars and Doppler lidars
- Aerosol products from Aeolus by correlative observations with EARLINET

NH3 IASI & CrIS validation using FTIR stations

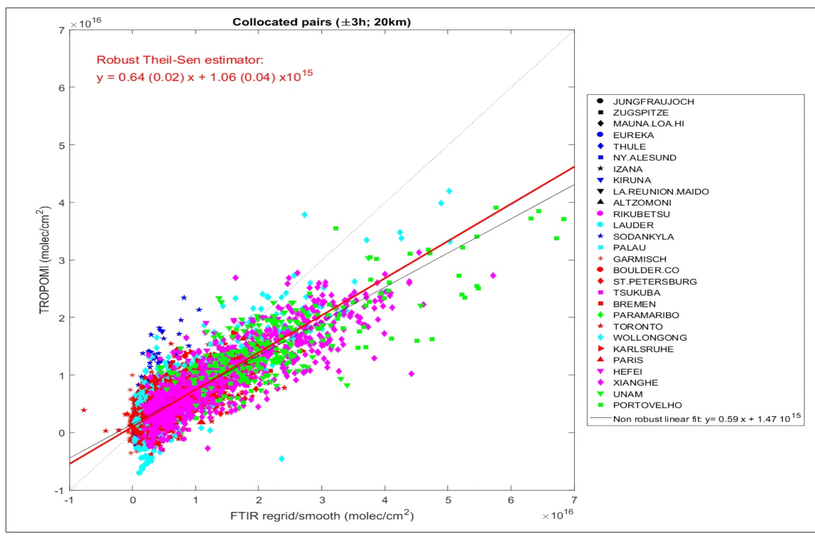


Correlations between the FTIR and IASI total columns with filters thermal contrast > 12 K, $t_{diff} < 90$ min, $x_{diff} < 25$ km. The trend line shows the results of the regression analysis.

Table 3. Summarized results of the comparison between FTIR-NH_3 and IASI-NH_3 total columns within the coincidence criteria threshold ($x_{diff} < 25$ km, $t_{diff} < 90$ min). N is the number of averaged total columns, MRD is the mean relative difference (in %), r and slope are the correlation coefficient and slope of the linear regression.

Sites	N	MRD in % (rms 1σ)	r	slope
Bremen	53	−22.5 ± (54.0)	0.83	0.60
Toronto	170	−46.0 ± (47.0)	0.79	0.84
Boulder	38	−38.2 ± (43.5)	0.76	1.11
Tsukuba	15	−28.3 ± (35.6)	0.67	0.57
Pasadena	16	−47.9 ± (30.1)	0.59	0.83
Mexico	65	−30.8 ± (43.9)	0.64	1.14
Saint Denis	20	−61.3 ± (78.7)	0.65	1.26
Wollongong	62	6.0 ± (74.3)	0.47	0.92
Lauder	108	−29.7 ± (57.3)	0.55	0.77
Combined	547	−32.4 ± (56.3)	0.80	0.73

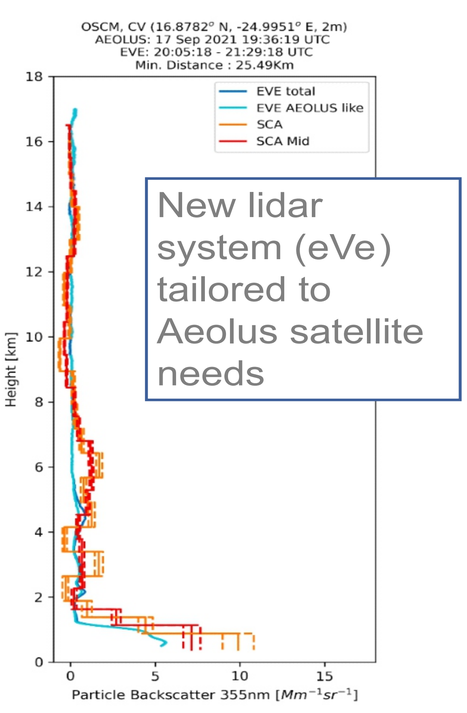
HCHO & NO2 TROPOMI validation using the FTIR network



Intensive campaigns

- PRE-TECT experiment >>> to separate dust from total aerosols in CALIPSO: Crete, Spring 2017
- ASKOS experiment >>> AEOLUS Cal/Val: Cape Verde / Summer of 2021, 2022
- TROPOMI Validation Experiment >>> aerosols, ozone, NO2: Cabaw, 2019
- … many other

eVe lidar @ ASKOS experiment for AEOLUS Cal/Val, Cape Verde / Summer of 2021



New lidar system (eVe) tailored to Aeolus satellite needs

Opportunities in the future

ATMO-ACCESS project: access to facilities and services operated by ACTRIS, ICOS and IAGOS

- Access to multiple stations (Observation Facilities, Mobile Exploratory Platforms)
- Access to Central Laboratories
- Access to multiple components (aerosol, clouds, trace gases / remote sensing, in-situ)
- Recurrent access (calibration)
- Combined access: (physical + remote + virtual)

ATMO ACCESS
Access to Atmospheric Research Facilities

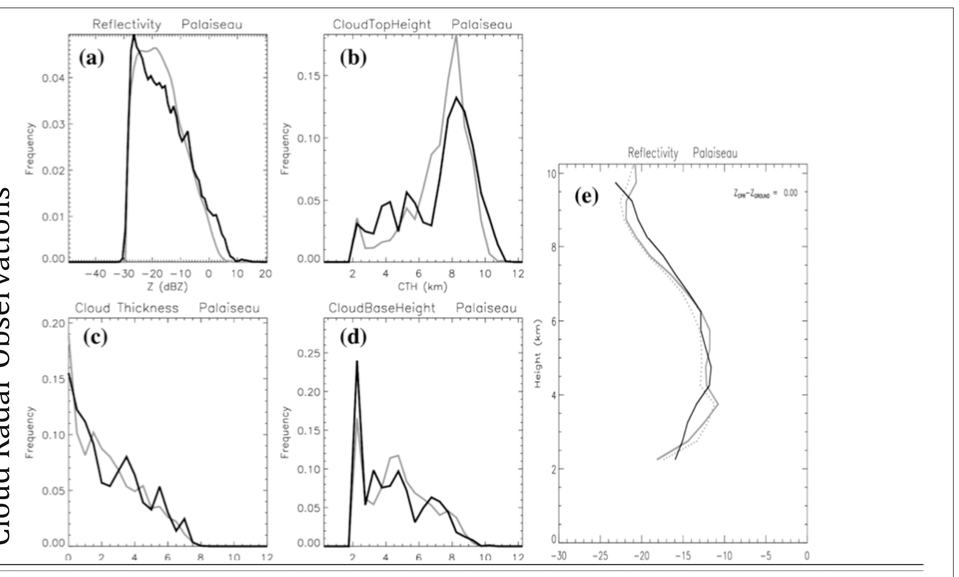
Potential projects:

- Access to tailored products from ACTRIS reactive trace gases remote sensing stations (corelative)
- Cal/Val of Aeolus wind products by ground-based 24/7 Doppler lidars (corelative)
- Cal/Val of EarthCARE aerosol & cloud products by ACTRIS aerosol and cloud remote sensing stations (corelative)
- EarthCARE Cal/Val campaign in the Eastern Mediterranean in Spring 2024 (campaign)
- EarthCARE HALO aircraft Cal/Val campaign for in Autumn 2024 (campaign)

Long-term collaboration agreements with atmospheric Research Infrastructures

- Highly coordinated
- Geographically distributed (Europe+, diverse environments)
- Standardized workflows and procedures
- Fixed and mobile facilities, including calibration laboratories
- Dedicated offices for access to facilities and services
- Training & supporting expertise
- Collaboration with European and global networks

Assessment of CloudSat Reflectivity Measurements and Ice Cloud Properties using Ground-Based Cloud Radar Observations



Location (lat, lon)	Radar frequency (name)	Radar sensitivity (dBZ at 10 km)	Observational period
Darwin, Australia (12.425°S, 130.891°E)	35 GHz (MMCR)	−41 (cirrus mode)	December 2006–April 2007
Darwin, Australia (12.425°S, 130.891°E)	5 GHz (CPOL)	−21	December 2006–April 2007
Niamey, Niger (13.477°N, 2.176°E)	94 GHz (WACR)	−34	21 June 2006–December 2006
Lindenberg, Germany (52.209°N, 14.122°E)	36 GHz (MIRA)	−40	August 2006–April 2007
COPS site, Germany (48.540°N, 8.397°E)	94 GHz (WACR)	−34	April 2007–December 2007
Palaiseau, France (48.713°N, 2.208°E)	95 GHz (RASTA)	−30	December 2006–February 2007

Co-design of the access (user – provider)

Complex projects: combination of virtual, remote and physical access / research, technology, training

Decrease of costs through coordinated TNA