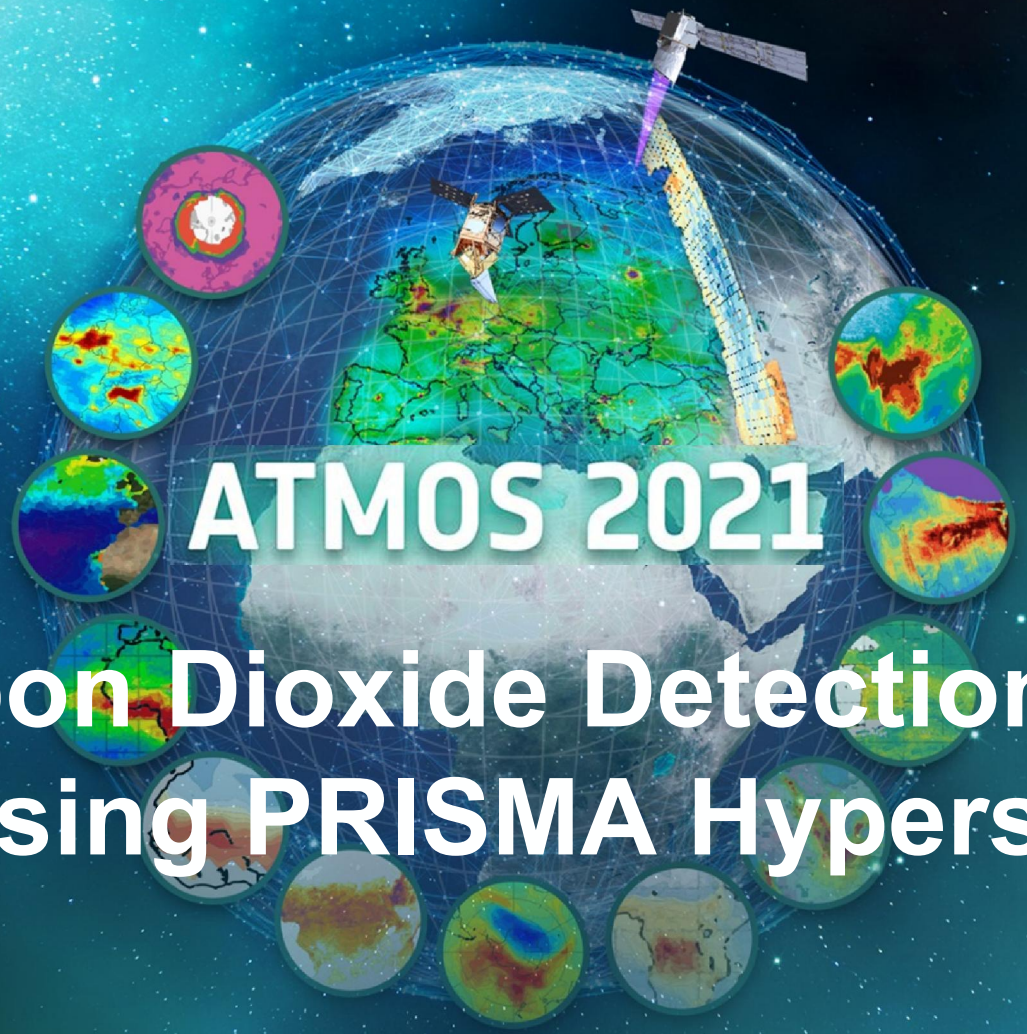

Volcanic Carbon Dioxide Detection and Retrieval by using PRISMA Hyperspectral Satellite Data

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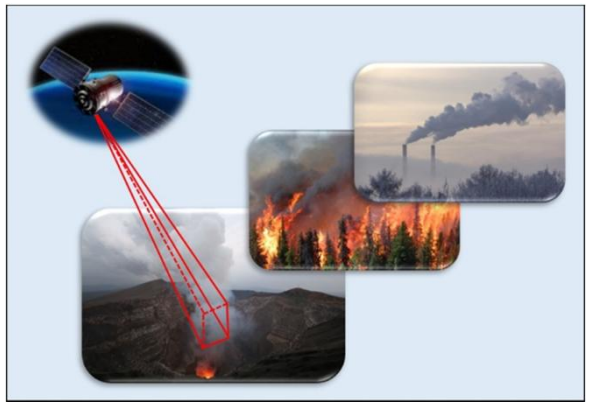
Istituto Nazionale di Geofisica e Vulcanologia

25/11/2021

ASI-PRISMA Hyperspectral Space Mission



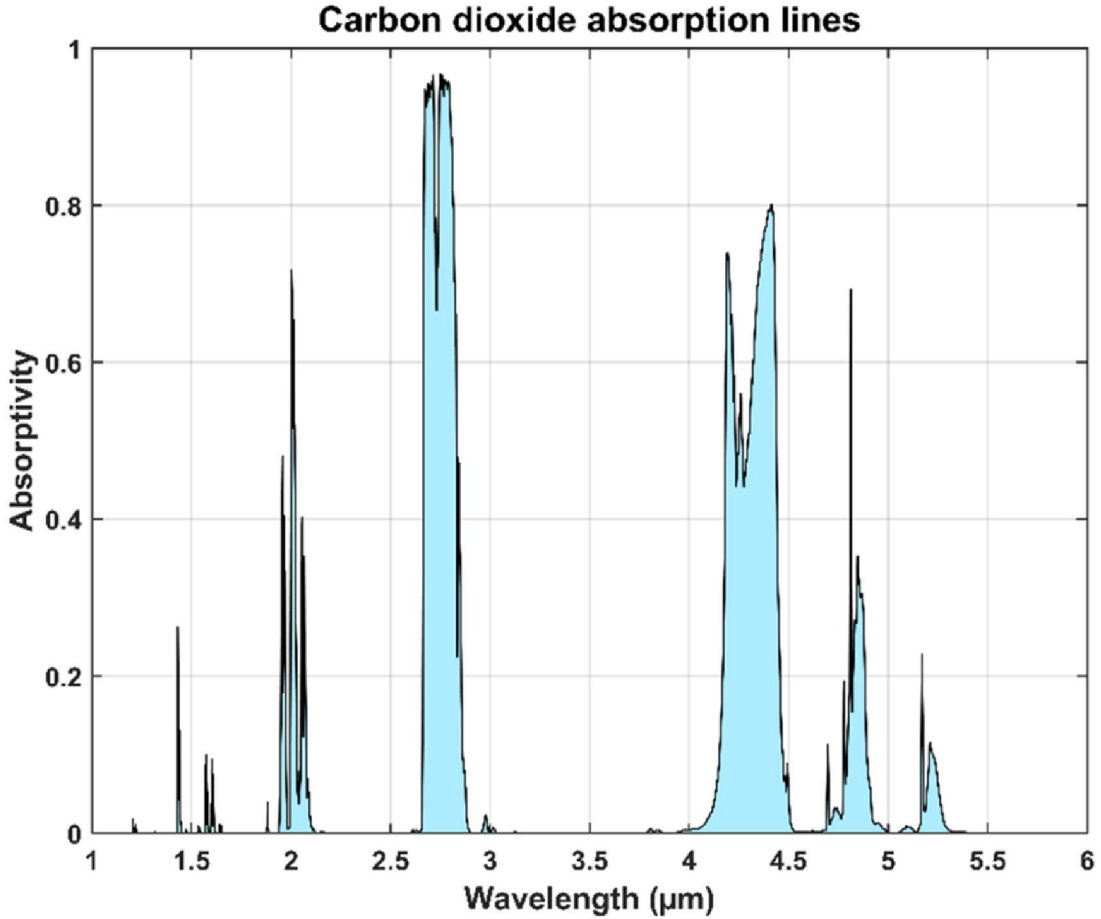
The Italian Space Agency launched the hyperspectral imaging platform, PRecursore IperSpettrale della Missione Applicativa PRISMA, on March 22, 2019. PRISMA is a polar orbiting satellite in LEO and holds

- panchromatic camera operating in the spectral range 0.4-0.7 μm, acquiring images at 5 m spatial resolution
- hyperspectral sensor with 66 and 173 channels in the VNIR (Visible and Near InfraRed) and SWIR (Short-Wave InfraRed) regions, respectively and a spatial resolution of 30 m.

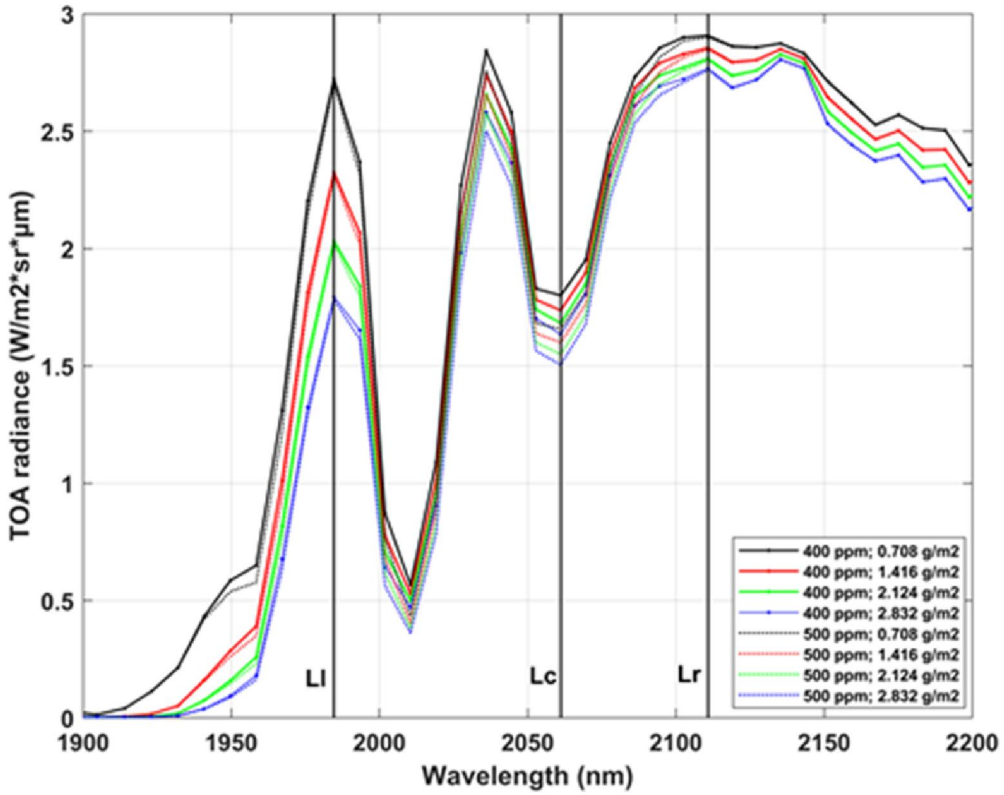
After three months of verifications its operational activity is started in June 2019 (http://prisma-i.it/index.php/en/)

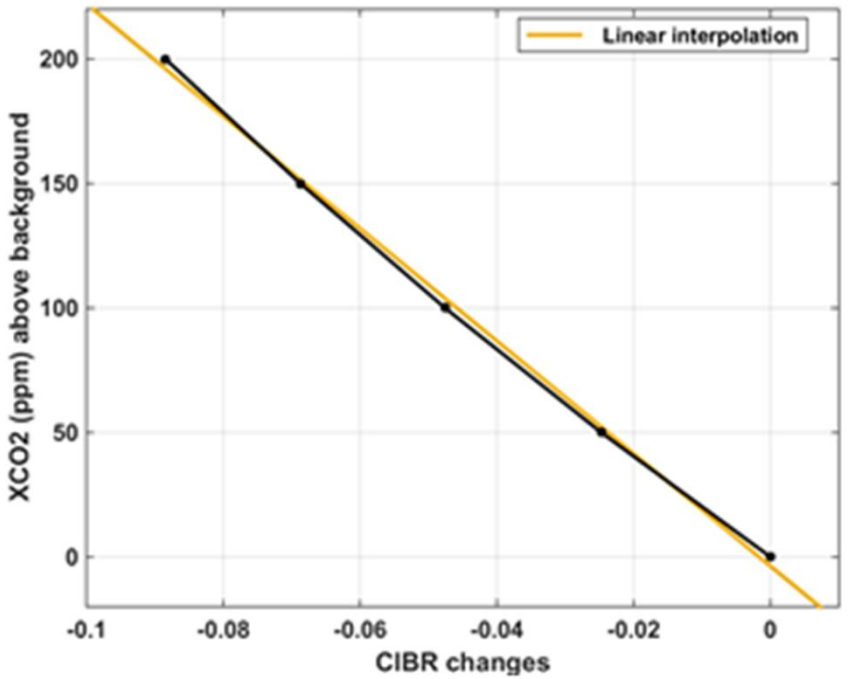
Instrument Main Characteristics	
Swath / FOV	30 km / 2.45°
GSD	• Hyperspectral: 30 m • PAN: 5 m
Spatial Pixels	Hyperspectral: 1000 PAN: 6000
Spectral Range	VNIR: 400 – 1010 nm SWIR: 920 – 2505 nm
Spectral Resolution	≤ 12 nm
Spectral Bands	VNIR: 66 SWIR: 171
Radiometric Quantization	12 bit
VNIR SNR	> 200:1 on 400 – 1000 nm > 500:1 @ 650 nm
SWIR SNR	> 200:1 on 1000 – 1750 nm > 400:1 @ 1550 nm > 100:1 on 1950 – 2350 nm > 200:1 @ 2100 nm
PAN SNR	> 240:1
Absolute Radiometric Accuracy	Better than 5%

Scope of the work



Retrieval Algorithm

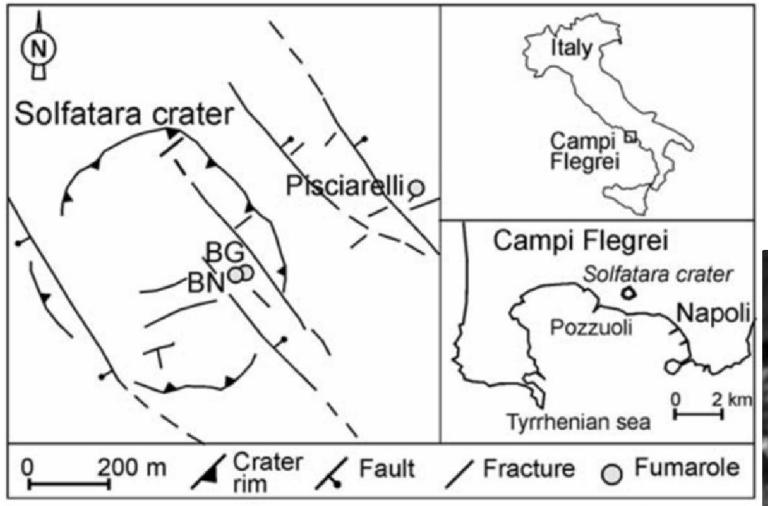


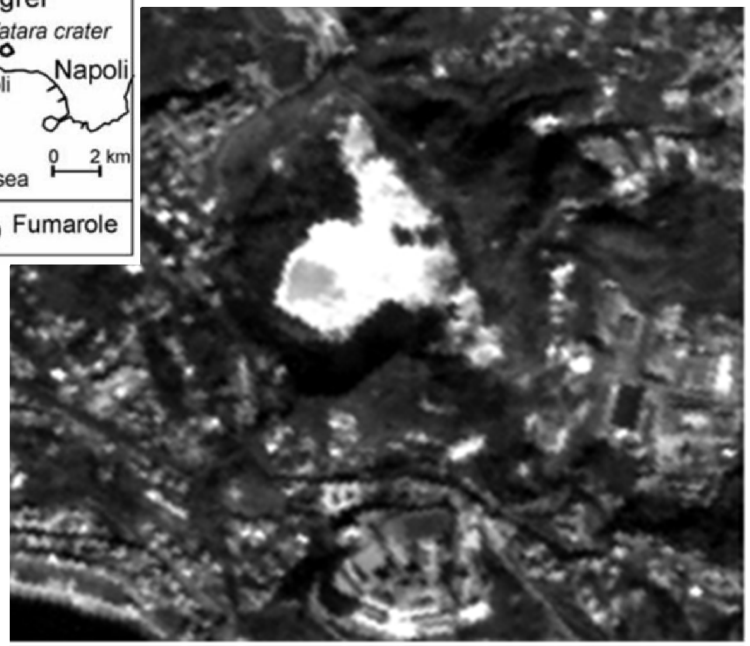


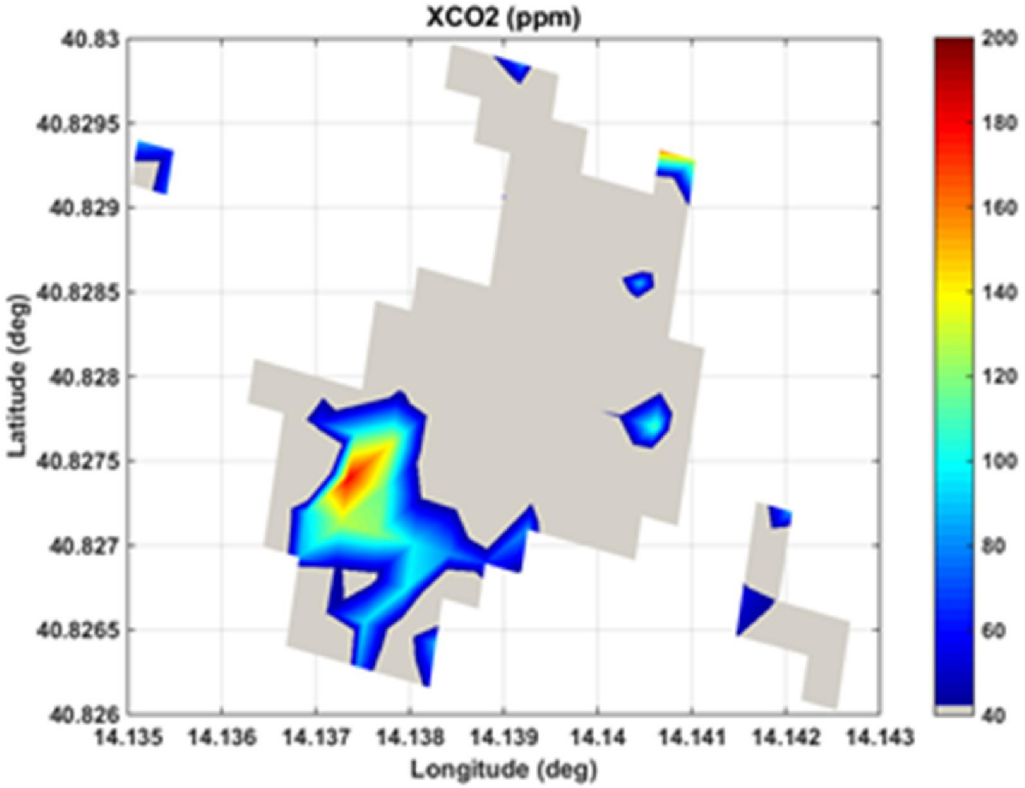
Modelled relation between
CIBR changes and XCO2 enhancements

Romaniello et al., RS, 2021 and Spinetti et al., RSE, 2008

RESULTS – LA SOLFATARA VOLCANIC CO2 MAP

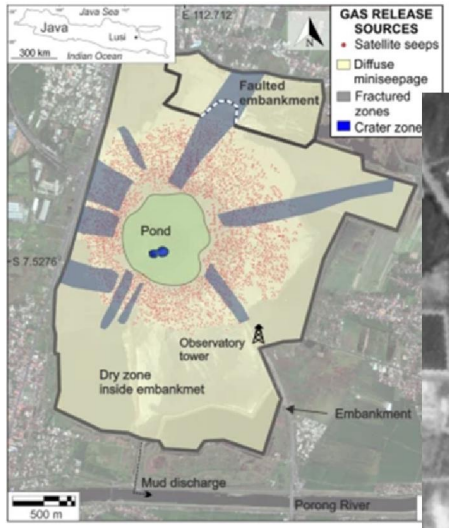


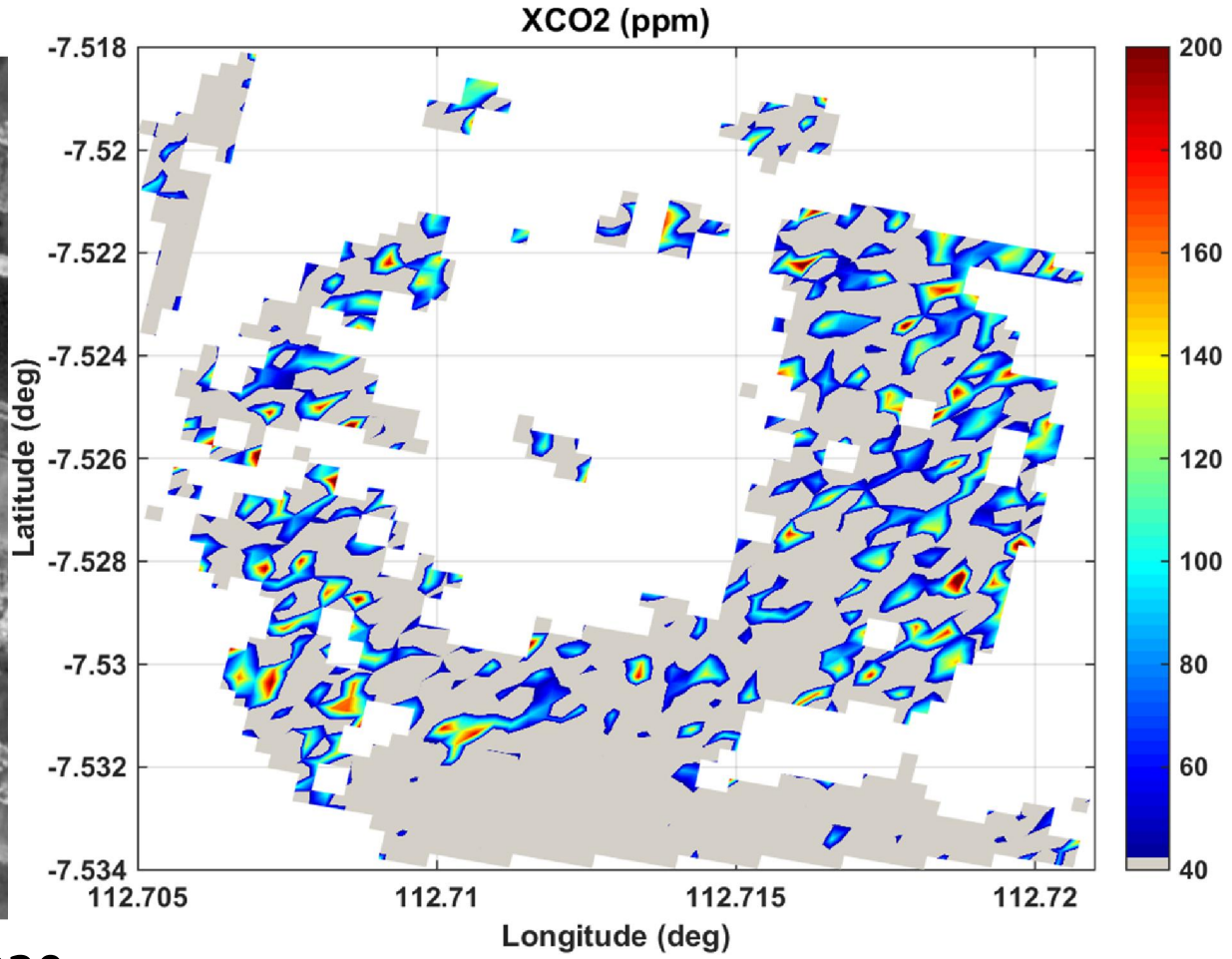




PAN image acquired on February 18, 2021

RESULTS - LUSI VOLCANIC CO2 MAP





PAN image acquired on August 14, 2020