

## Methane on Mars: PFS and VLT, Keck, IRTF, SUBARU joint observations campaigns

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### Abstract

During April and May 2012 the Planetary Fourier Spectrometer (PFS) onboard Mars Express (MEx) performed a series of observations of Mars' atmosphere in combination with the campaigns of four important ground-based telescopes: CRIRES-VLT, NIRSPEC-Keck2, HIPWAC-IRTF, and IRCS-SUBARU. VLT is located in Paranal (Chile). Keck, SUBARU, and IRTF are located in Mauna Kea (Hawaii).

This is the first time that simultaneous ground-based and remote-sensing observations of Martian atmosphere have been performed. The final aim is to verify CH<sub>4</sub> on Mars, constrain its source, and investigate the distribution of H<sub>2</sub>O/HDO ratio. Moreover, the intercomparison of these analyses is of extreme importance for it will help us to understand the reason for the discrepancies among the results of various groups previously reported, and validate the various retrieval methods involved in the analyses.

The areas of most interest for Methane have been targeted in the various campaigns. The observations cover different areas of possible sources of CH<sub>4</sub>, such as the areas where the extend plumes of CH<sub>4</sub> were detected by previous ground-based and PFS/MEx observations [1,2] and suggested potential mud volcanism areas [3,4].

An example of PFS and SUBARU joint observations is shown in Figure 1. The map shows the region of Mars observed by IRCS on April 13<sup>th</sup>, from 05:00 to 12:00 UTC. *Acidalia Planitia* [30-60°N, 300-360°E] *Terra Sabae* [30S-30°N 300-330°W] and the North pole have been observed in early summer (Ls = 96°). PFS tracks of observations (yellow) are also shown in Figure 1 for the time period 10-17 April (cyan is

for actual simultaneous observations). Proper retrieval of methane abundance with PFS requires several observations to be averaged in order to get sufficient SNR. If necessary, simultaneous and "quasi-simultaneous" (+/- 3 days) observations may be averaged together. Sub-Earth and Sub-Solar points are also shown in Figure 1 for April 13<sup>th</sup>, 7:00 am UTC (blue and yellow circles, respectively).

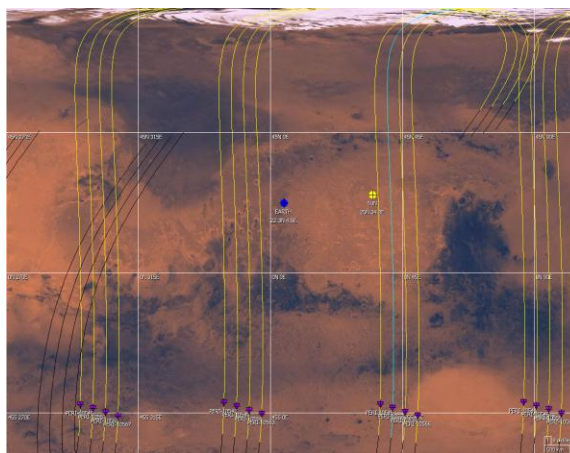


Figure 1: Example of PFS and SUBARU joint observations on April 13<sup>th</sup> 2012.

We will describe in details the joint observations campaigns and report available preliminary results.

### References

- [1] Geminale et al., 2011, Planet. Space Sci., 59, 137 -148.
- [2] Mumma et al., 2009, Science, 323, 5917, 1041-1045.
- [3] McGowan, 2011, Icarus, 212, 622-628.
- [4] Dorothy and Carlton, 2010, Icarus, 208, 636-657.