Analysis of special observations by PFS-MEx
Mini-grant – Paulina Wolkenberg

Table 1. Project segmentation in Work Packages and Tasks, with evaluation of the timeline.

WP		TASK	Research unit	DESCRIPTION	SEMESTER			
					I	II	III	IV
1	Algorithm implementation	1a	IAPS - INAF	Retrieval of atmospheric parameters and surface temperatures	X			
2	Supplementary data	2a	IAPS - INAF	Extraction of MCS-MRO data	X			
		2b	UPV/EHU	Collection of images over volcanoes	X	X		
3	Data analysis	3a	IAPS - INAF	Comparison of data over volcanoes		X	X	X
		3b	IAPS – INAF	Analysis of data over volcanoes		X	X	X
		3c	LMD	Simulation of atmospheric thermal fields over volcanoes using the mesoscale model			X	X

Tasks already finished and objectives achieved:

1)   From Work Package 1 - Algorithm implementation -1a – retrieval of atmospheric parameters and surface temperatures
2)   From Work Package 2 – Supplementary data – 2a- extraction of MCS-MRO data

Tasks still active:

1)   From Work Package 2 – Supplementary data – 2b – collection of images is still in progress, predicted to finish – December 2023
2)   From Work Package 3 – Data analysis – 3a – comparison of data over volcanoes – has started in June 2023 and is still in progress
3)   From Work Package 3 – Data analysis – 3b – analysis of data over volcanoes – has started in June 2023 and is still in progress

Tasks will continue in year 2024:

1)   From Work Package 3 – Data analysis – 3a – comparison of data over volcanoes – thermal fields
2)   From Work Package 3 – Data analysis – 3b - analysis of data over volcanoes

Task will start in year 2024

1)   From Work Package 3 – Data analysis – 3c - simulation of atmospheric thermal fields over volcanoes using the mesoscale model

Note:

Task 2b could be a little delayed because MARCI images are still missing for three other volcanoes except of Arsia. It could be delayed due to a complex process that involves the generation of large volumes of data that are retrieved from the PDS and processed to obtain images showing aerosols around the volcanoes. In addition to it, due to the complexity of the process, the pipeline broke down. The pipeline will be fixed soon to process the remaining data.

This task is predicted to finish by the end of year 2023 according to the plan (Tab.1).

1) Task 1a – Retrieval atmospheric parameters – done
2) Task 2a – Extraction of MCS-MRO data - Quasi simultaneous observations by PFS and MCS – qualitative comparison - done.
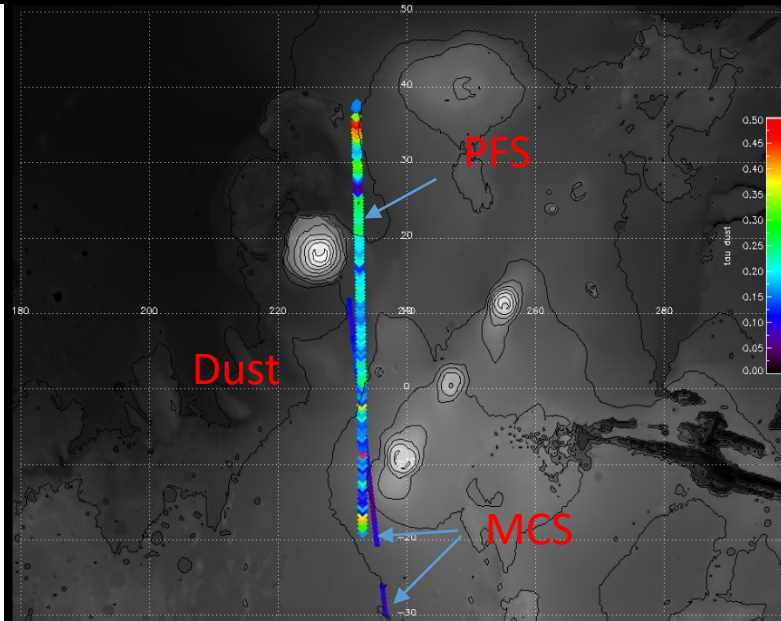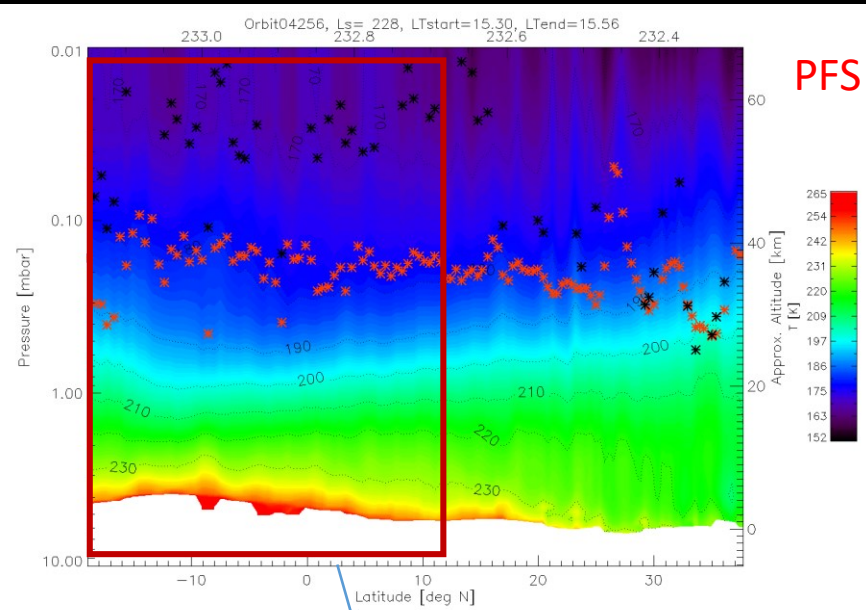

MCS and PFS observations are taken in MY28 before GDS. Small water ice opacities are observed by the two instruments over the overlapping region. Dust opacity is at standard level (0.1 – 0.2) observed by both instruments. Atmospheric thermal fields are in qualitative agreement.
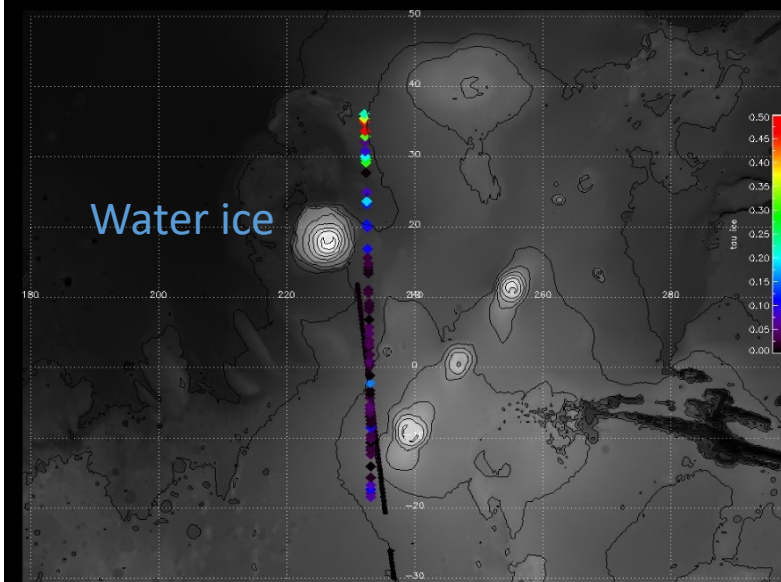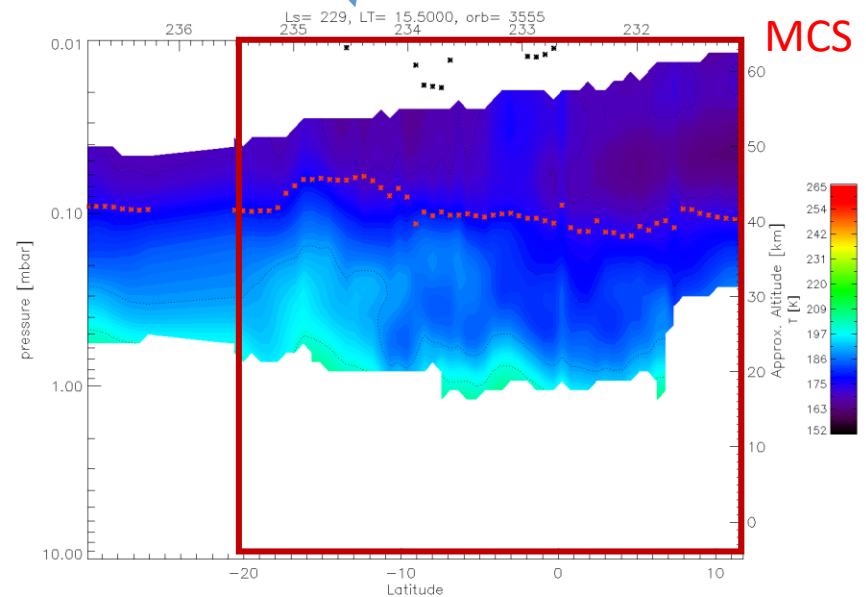
Workpackages 2 and 3:

1) Task 2b – collection of images over Tharsis – still in progress, will be finished by the end of 2023

2) Task 3a – comparison of data over volcanoes - quasi simultaneous observations by PFS and cameras VMC, HRSC and MARCI – still in progress - below an example of observations by three instruments

3) Task 3b – analysis of all dataset – still in progress

PFS

VMC

Olympus

HRSC
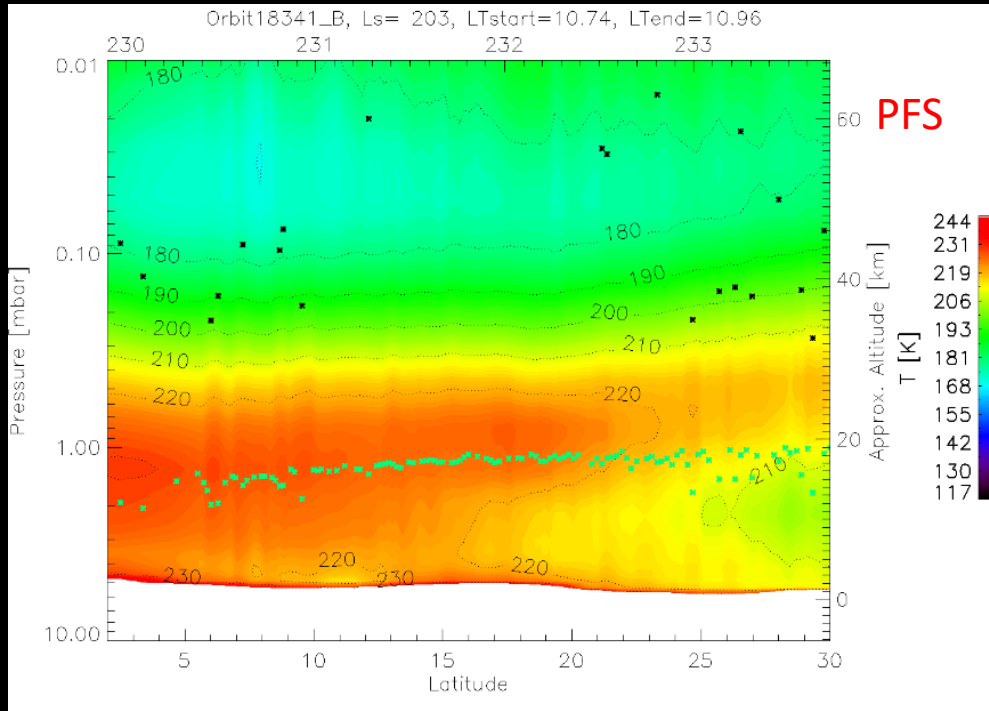
Dust and water ice opacities are plotted as green and black asterisks, respectively. The pressure scale (Y-axis) is also used to the aerosol opacity scale. Atmospheric thermal inversion is observed below 25 km of altitude along this orbit due to the suspended dust in the atmosphere.
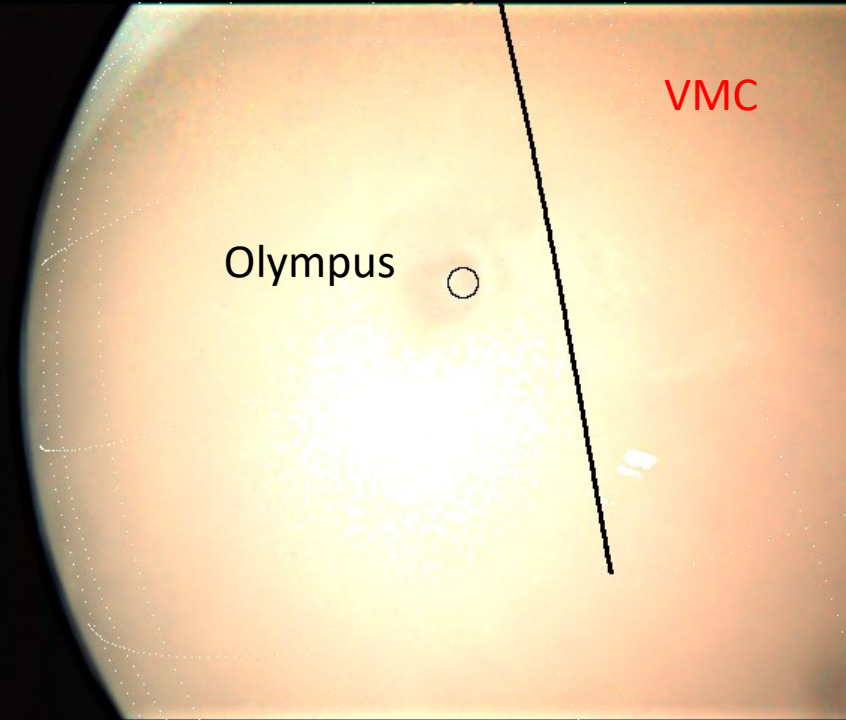
VMC image of Olympus Mons and nearby for orbit 18348. Black line corresponds to the ground track of PFS for orbit 18341_B.

HRSC image orbit 18334. HI334_0000-HRSC (limb)

All instruments show a large amount of dust in the atmosphere.