[B4.3-0008-24]

Whitening events observed in the Valles-Marineris on Mars

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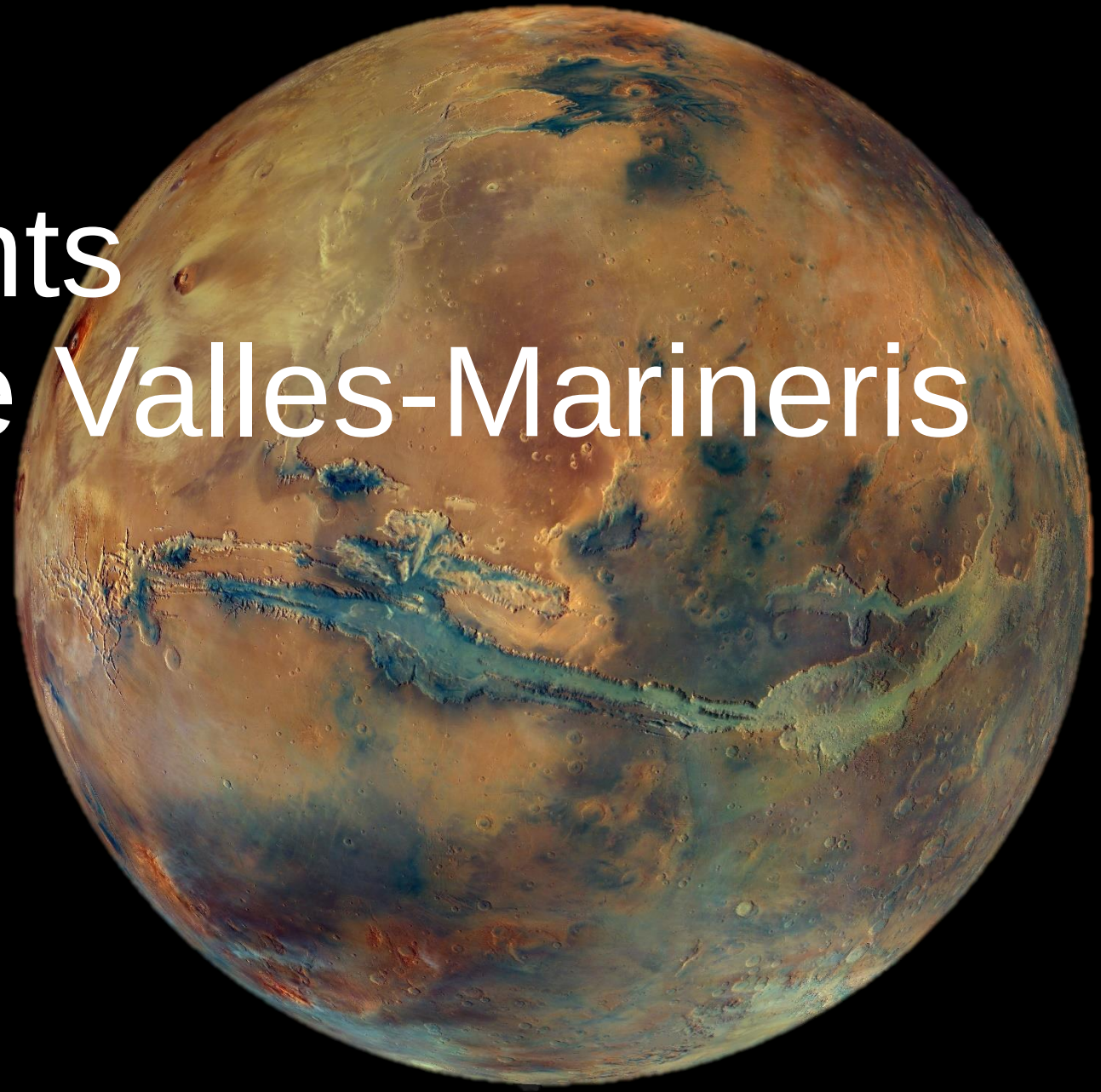


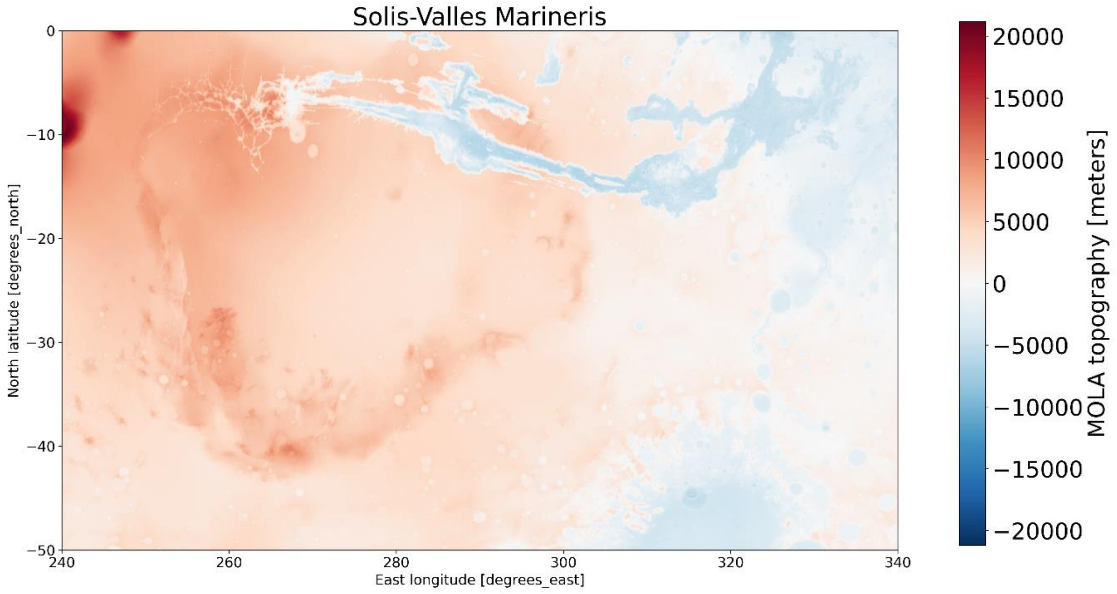
Credit : ESA/DLR/FU Berlin/G. Michael

1. Introduction

Valles-Marineris (VM)

- The largest valley system on Mars

Location	0° S～18° S
	260° E～340° E
Depth	~8km



Topographic map

Whitening events found in satellite images

Black VM (EMM/EXI 20210830T06)

White VM (EMM/EXI 20211224T06)

2. Previous Study / Purpose of this study

Bright haze observed inside the Valles-Marineris by Mars Express [Inada et al. (2008)]

- They observed 3 times in northern spring by HRSC (Table1).
- The haze appeared thinner 3 days later and disappeared in 9 days.
- The analysis suggested that the composition of the haze was dust.

Table1. (right) Summery of observation based on [1]

Orbit Number	Instrument	Observation Date	Ls, deg	Local Time
438	HRSC	25 May 2004	38	0915
438	OMEGA	25 May 2004	38	0915
449	HRSC	28 May 2004	40	0915
460	OMEGA	31 May 2004	41	0907
471	HRSC	3 June 2004	42	0900
482	OMEGA	6 June 2004	45	0853

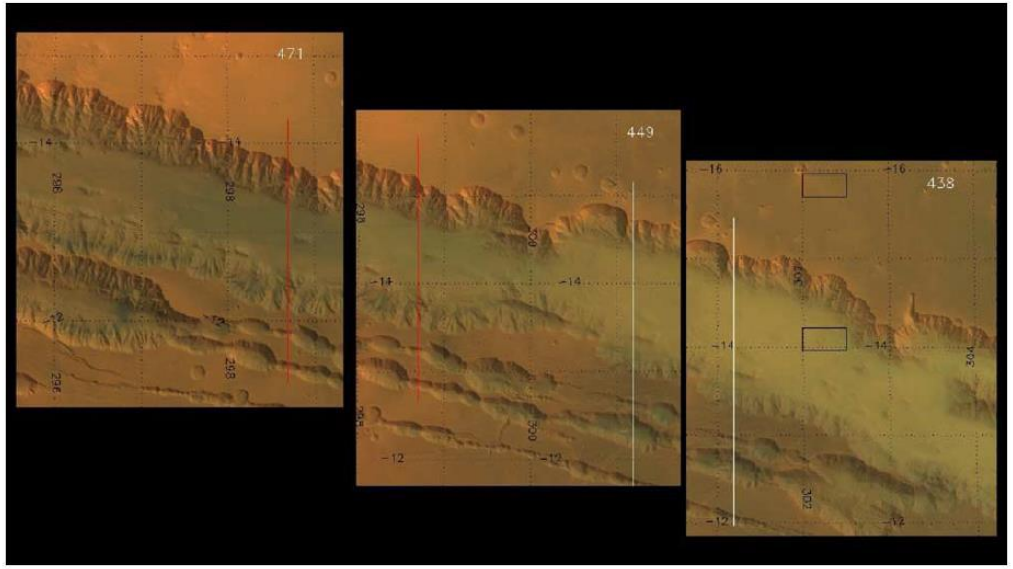


Fig4. HRSC true color images of VM [1]

Purpose of this study

- To investigate the seasonality and local time variation of these white VM.
- To clarify the composition of white VM.

3. Data

EXI	Emirates eXploration Imager
Observation mode	xos1
Data	L2A (Calibrated images)
Wavelengths	Visible (437nm, 546nm, 635nm)
Spatial Resolution	4km ~ 8km
Period	MY36

EMIRS	Emirates Mars InfraRed Spectrometer
Covering range	6.0 – 100 μm
Data	L3atm : retrieved physical atmospheric parameters e.g.) τ_{ice} (water ice optical depth)
Period	MY36

4. Method

✓ The investigation of the seasonal and local time variation of whitening events (EXI)

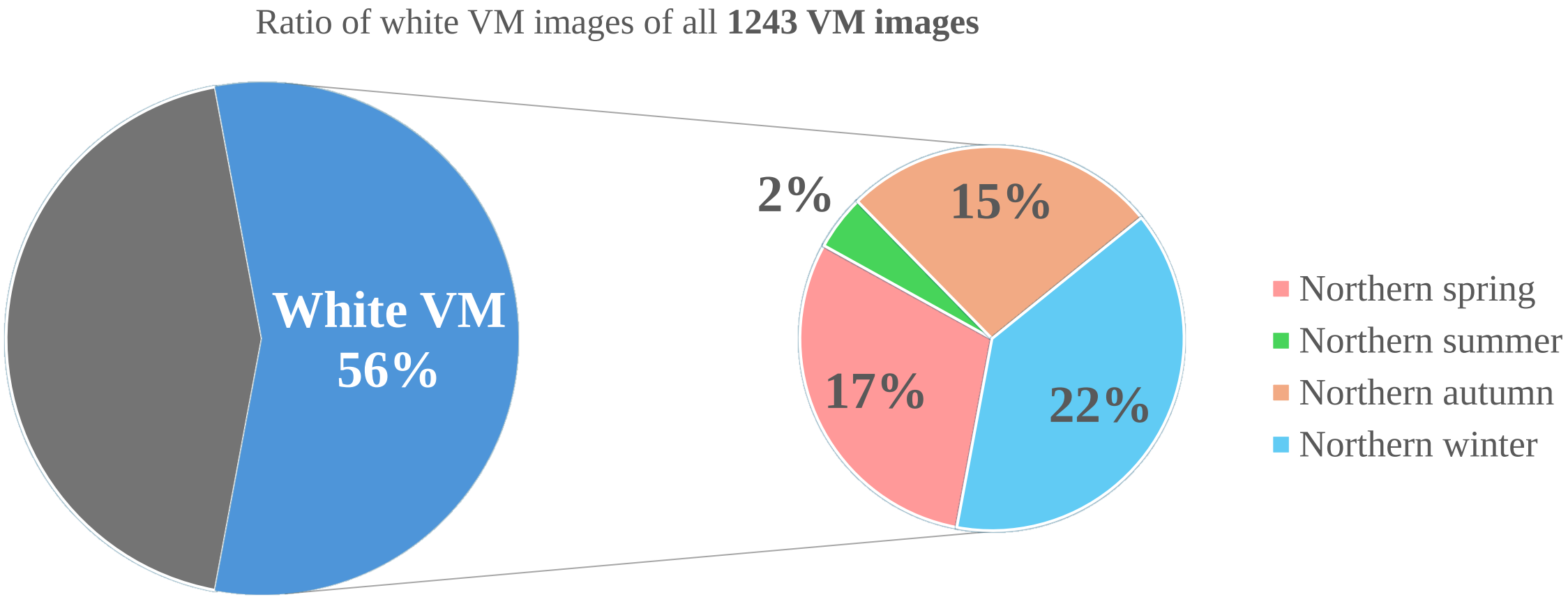
1. Data processing
   We converted L2A images into longitude-latitude coordinate by Ogohara et al. (2011).
2. Visual inspection
   We extracted white VM by visual inspection.
3. Statistical analysis
   We investigated the seasonal and local time variations of whitening events

✓ Composition of whitening events (EMIRS)

We compared the optical depths of water ice and dust inside the VM observed by EMIRS.

5. Results

Seasonality of the whitening events



Note that $L_s = 100° - 120°$ and $L_s = 196° - 218°$ were missing.

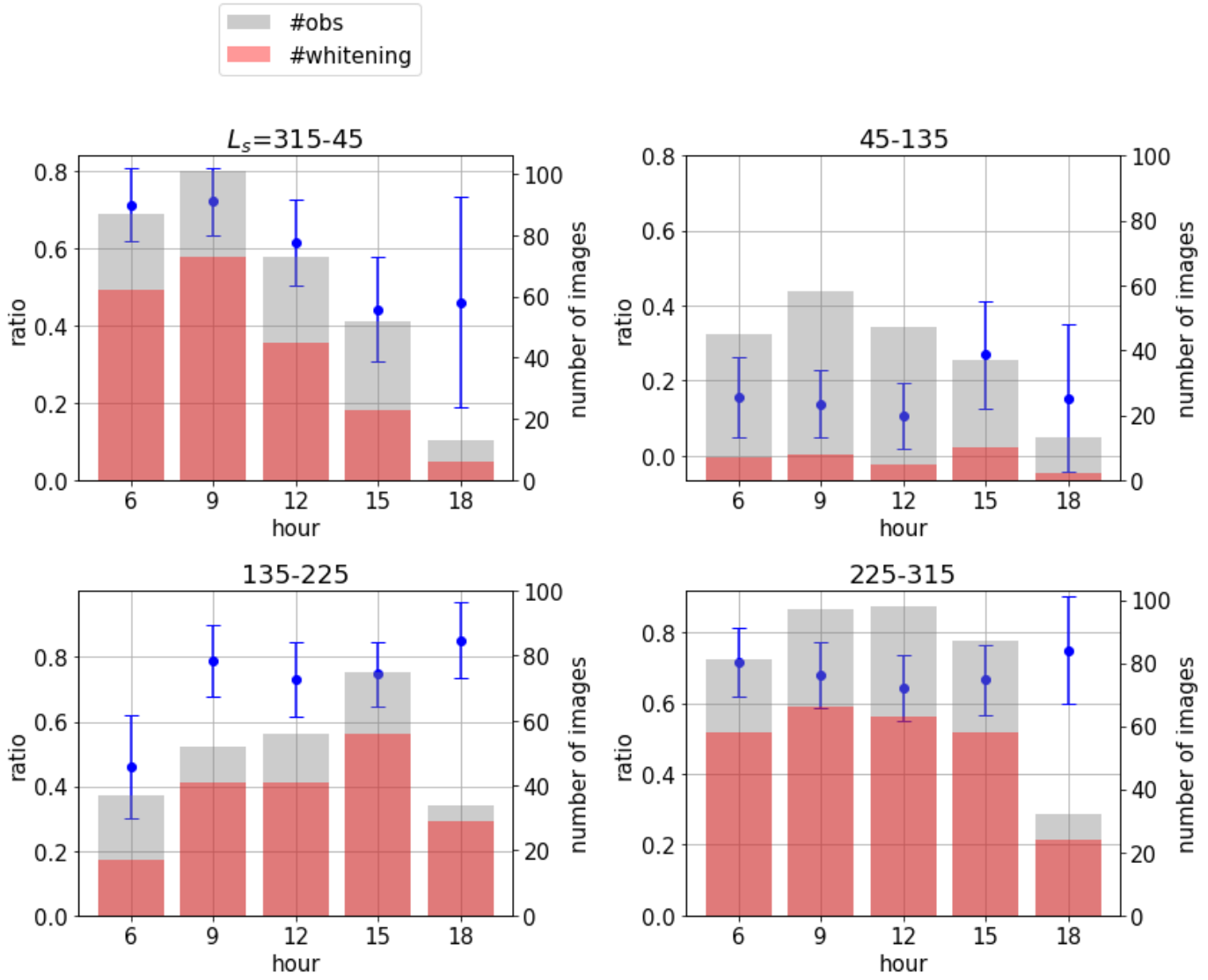
5. Results

Local time variation in each season

- Note that local time at 300° E are shown.

Gray bar	The number of VM images
Red bar	The number of white VM images
Blue dot	The ratio of the White VM images among all VM images at the same local time
Error bar	95% confidence interval of the mother ratio

Season in the NH	Local time variation
Spring	The ratio tend to decrease from 0900LT to 1500LT.
Summer	Low ratio throughout the day
Autumn	The ratio tends to increase from 0600LT to 0900LT.
Winter	High ratio throughout the day



5. Results

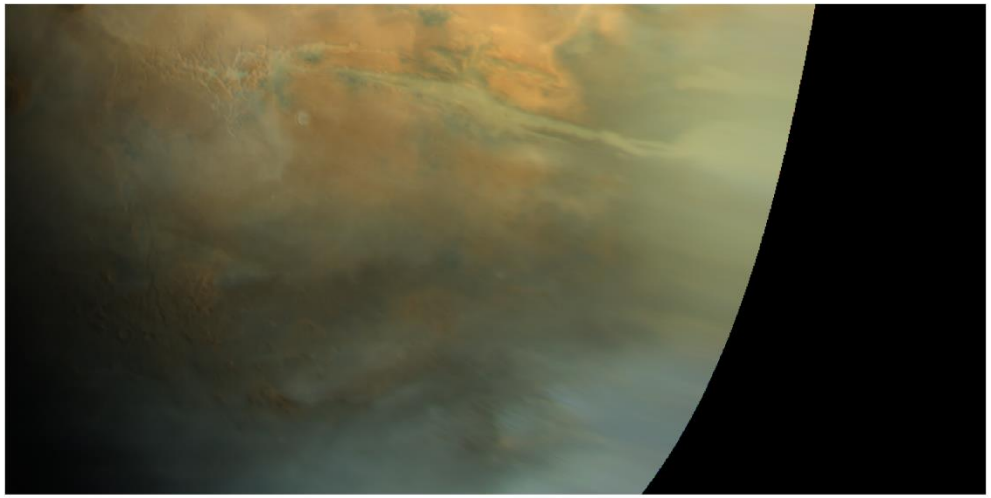
Composition of whitening event

- Compare the optical thickness of water ice and dust.
- We could find a few cases where EMIRS observed the inside of the VM when the whitening event was occurred.

	Observation Date	Ls, deg	Local Time
Black VM	30 Aug 2021	92	1330
White VM	03 Dec 2021	136	1045

Black VM (EMM/EXI 2021/08/30)

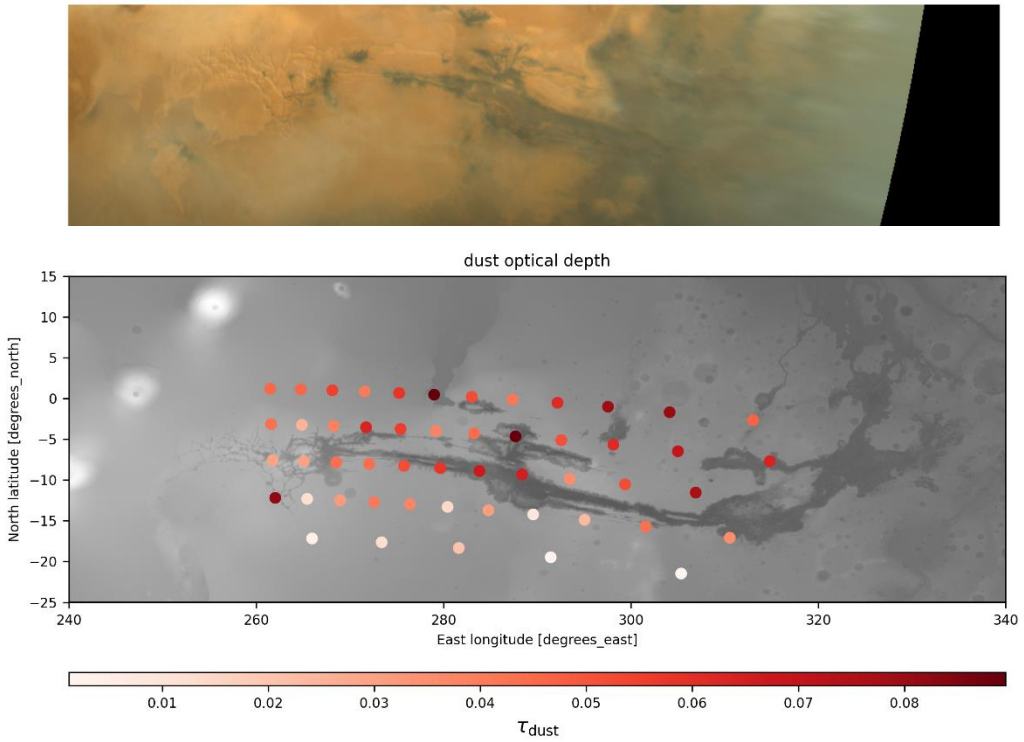
White VM (EMM/EXI 2021/12/03)



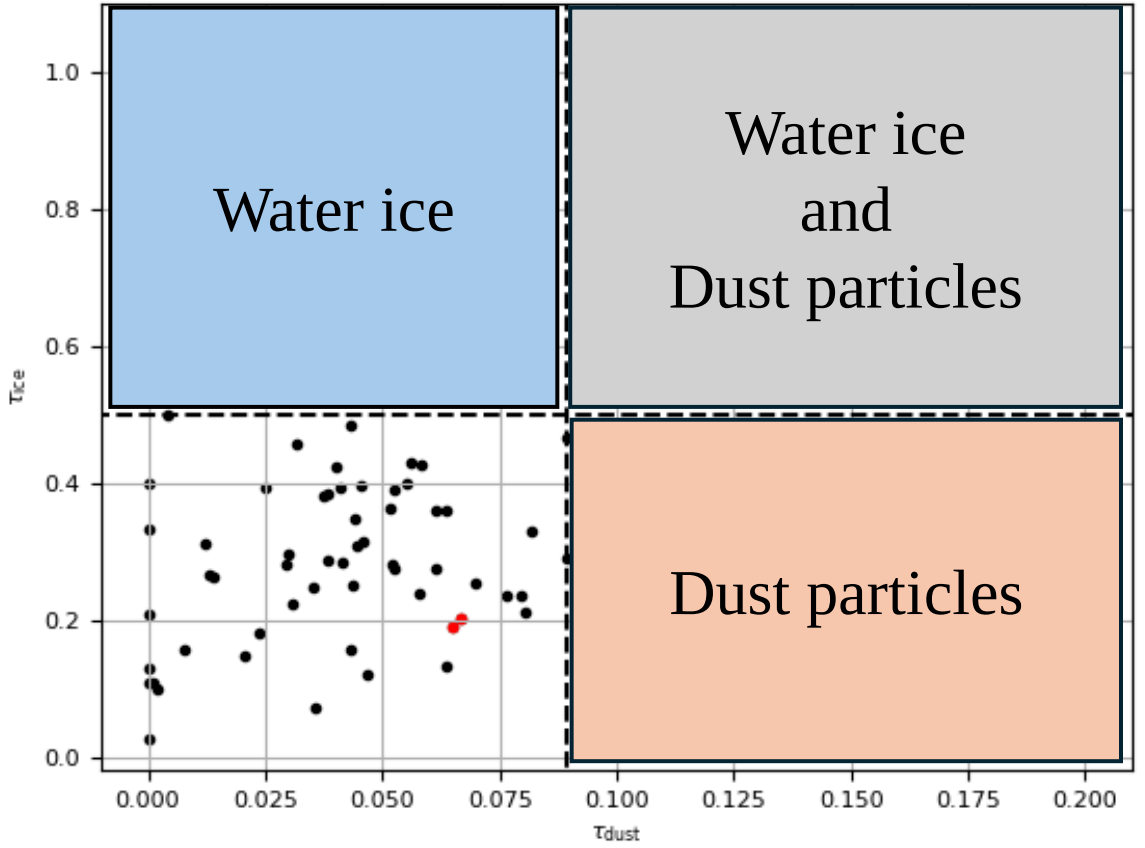
5. Results

Black VM

We show τ_{dust} on the topographic map (left below).
τ_{dust} and τ_{ice} are plotted (right).



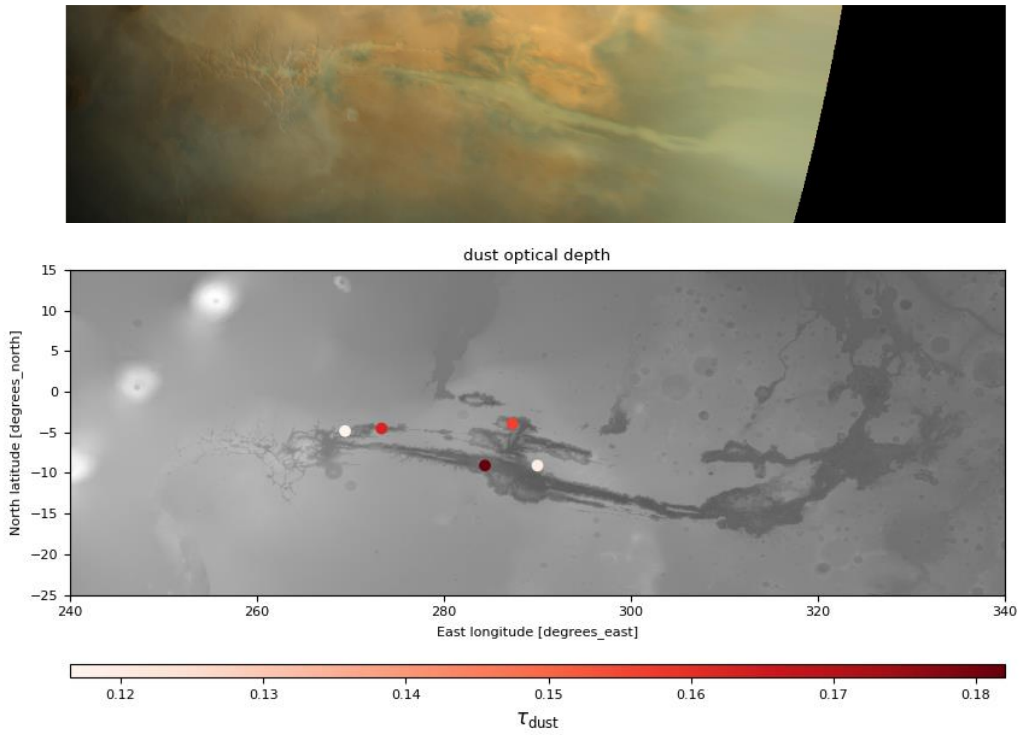
The composition of the whitening event could be

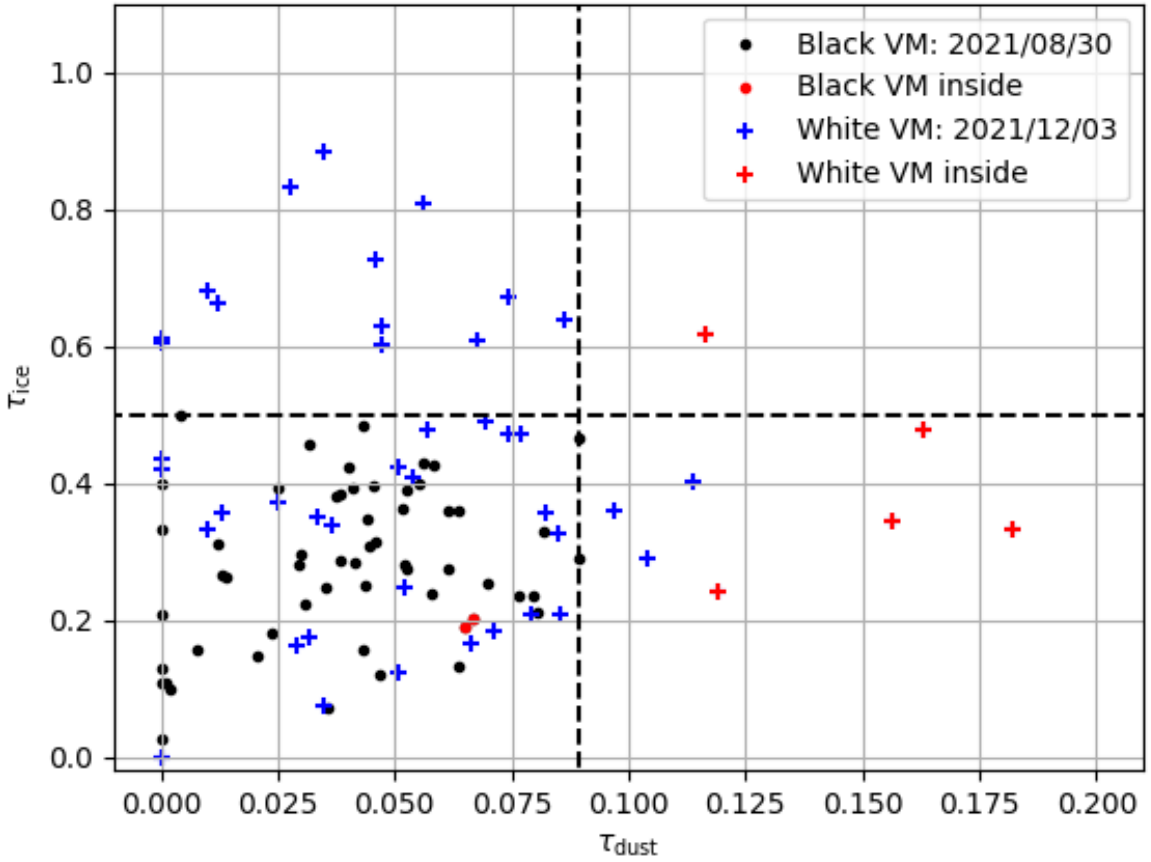


5. Results

Composition of one whitening event

The largest 5 τ_{dust} values are shown (left below).

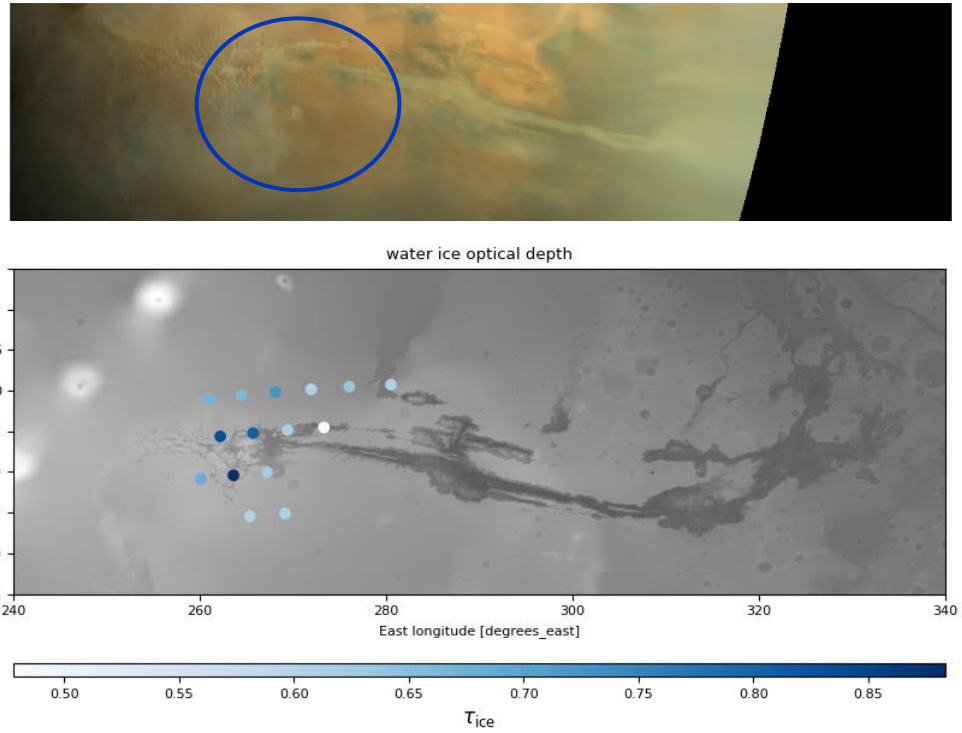


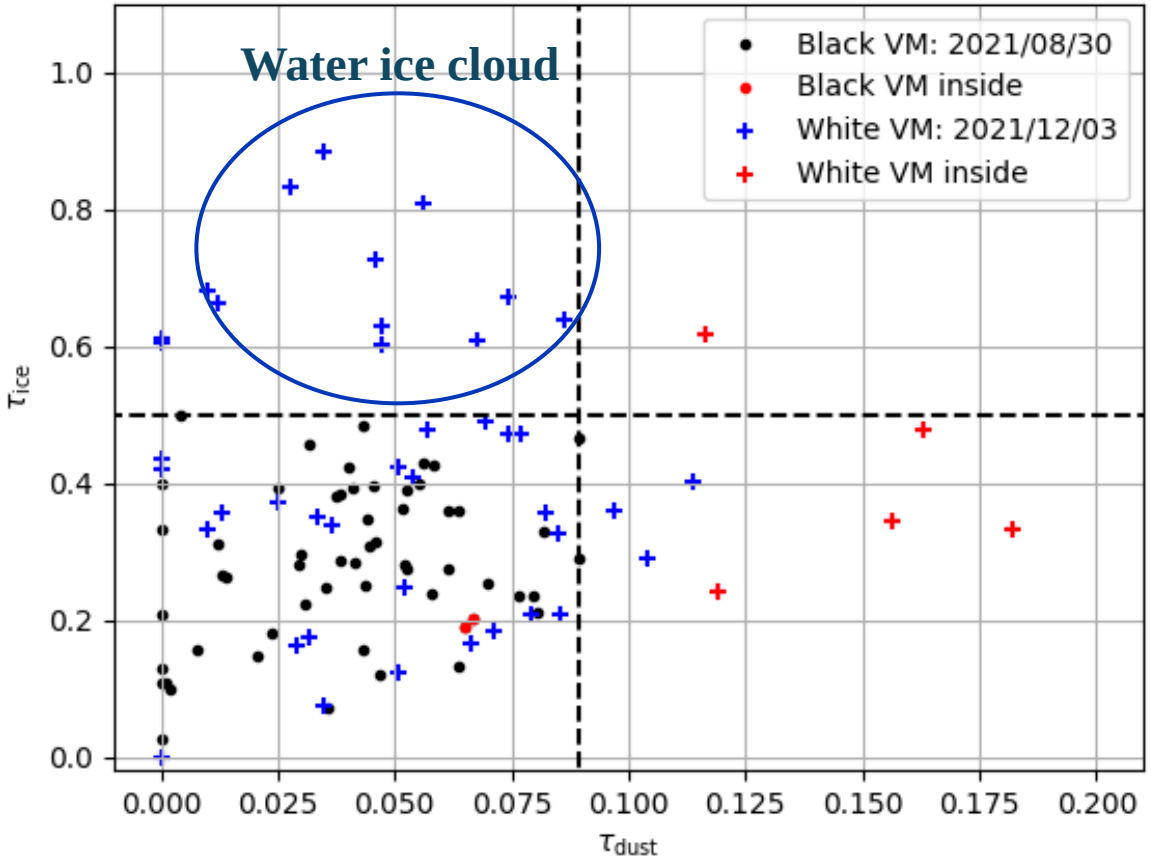


5. Results

Composition of whitening event

We show the largest 15 τ_{ice} values .
They came from cloud outside the VM.





6. Summary

Summary

✓ The seasonal and local time variations of whitening events inside the Valles-Marineris were examined.
- White VM was seen most frequently in the northern winter.
- We have no ideas to explain the local time variation in the northern autumn.

✓ The composition of one whitening event observed in the northern autumn were examined.
- It was likely to be dust particles.
- The water ice event hasn't found yet.

Future work

- The Local Time of black →white and white → black will be investigated.
- I hope the Hope continue the observation.

7. References

[1] Inada, A., Garcia-Comas, M., Altieri, F., Gwinner, K., Poulet, F., Bellucci, G., Keller, H.U., Markiewicz, W.J., Richardson, M.I., Hoekzema, N., Neukum, G., Bibring, J.-P., 2008. Dust haze in Valles Marineris observed by HRSC and OMEGA onboard Mars Express. J. Geophys. Res. 113, E02004, doi:10.1029/2007JE002893.

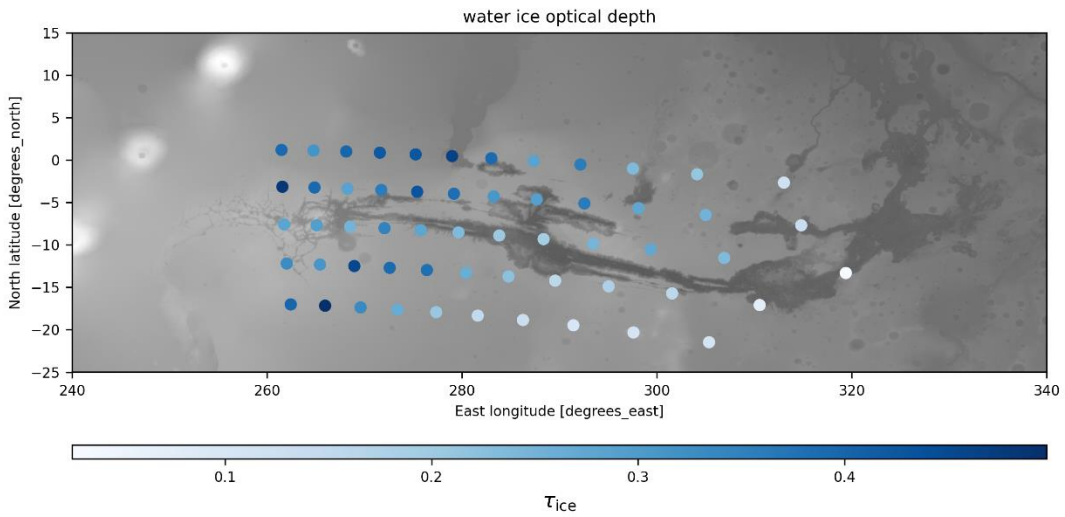
[2] Ogohara, K et al., 2011. Automated cloud tracking system for the Akatsuki Venus Climate Orbiter data. Icarus 217, 661-668, https://doi.org/10.1016/j.icarus.2011.05.017

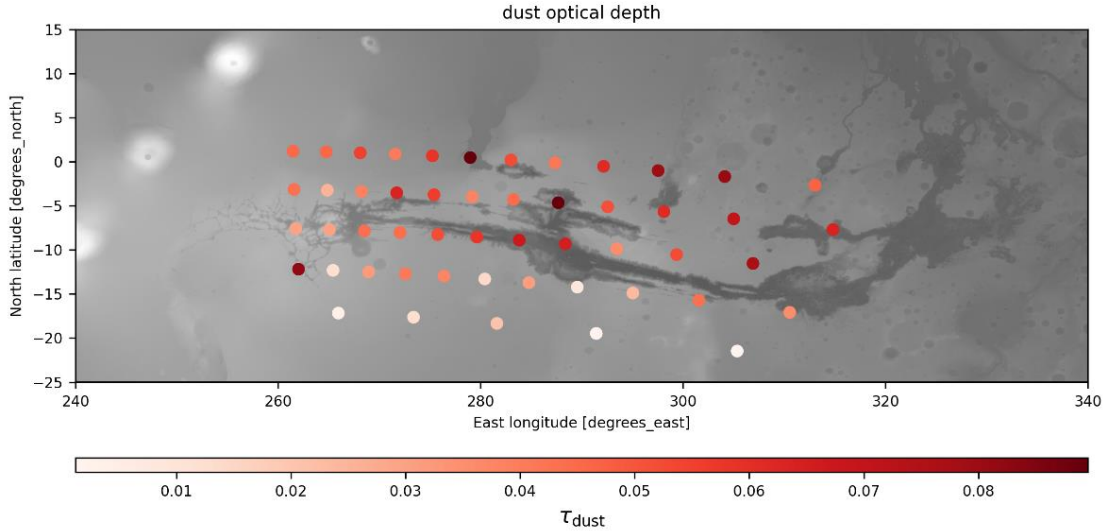
Appendix

5. Results

Black VM

The all τ_{ice} and τ_{dust} values are shown.





5. Results

White VM

The all τ_{ice} and τ_{dust} values are shown.