

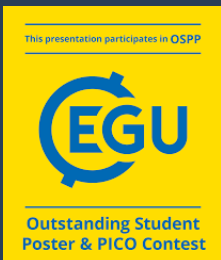
LABORATORY SIMULATIONS OF MARTIAN SOUTHERN SPRING : THE OUTCOME OF CO₂ COLD JETS

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Abstract #13204



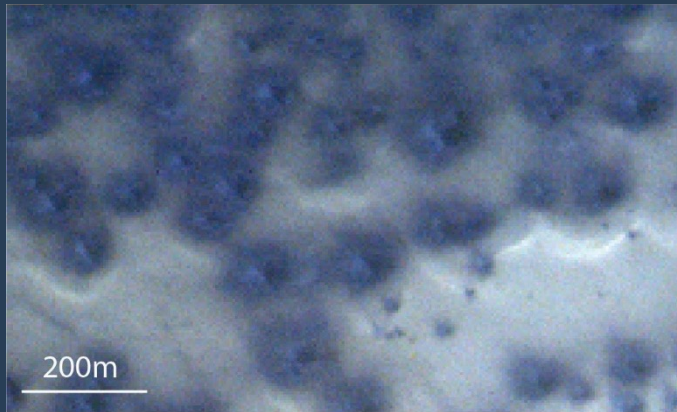
(Brief) Introduction

Kieffer model explaining how spots, fans and spiders are formed in the polar areas in Spring

Exp #1

Exp #2

Orbital data from CaSSIS in (ideally) 4 filters



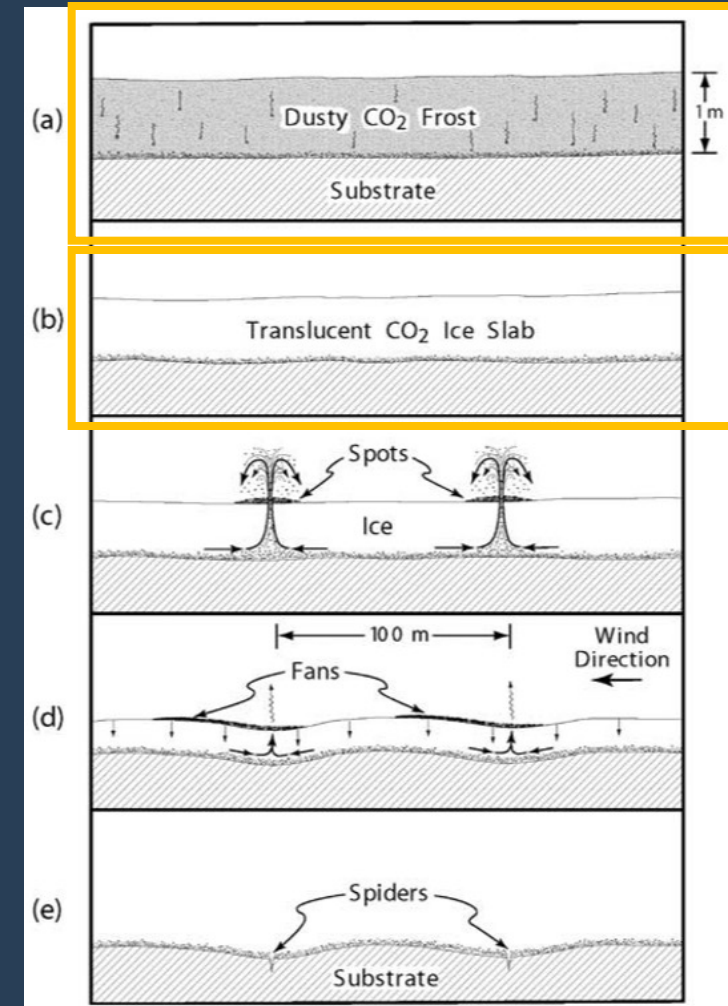
MY34_002093_264_O_NPB

Ls 174.8°



MY34_003484_266_O_NPB

Ls 243.4°



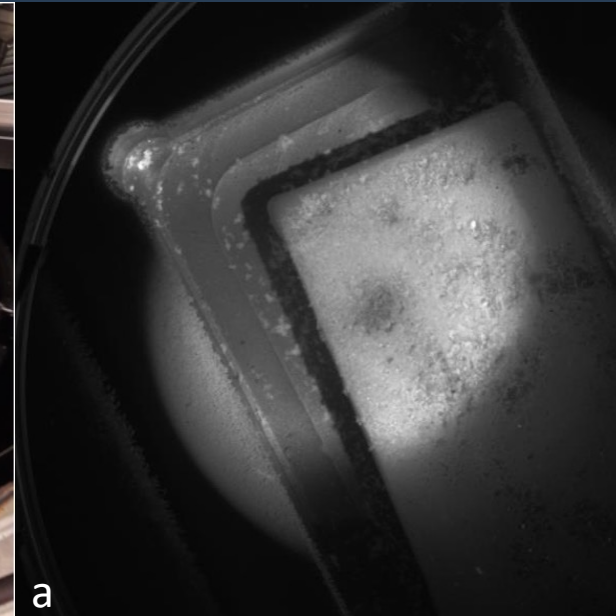
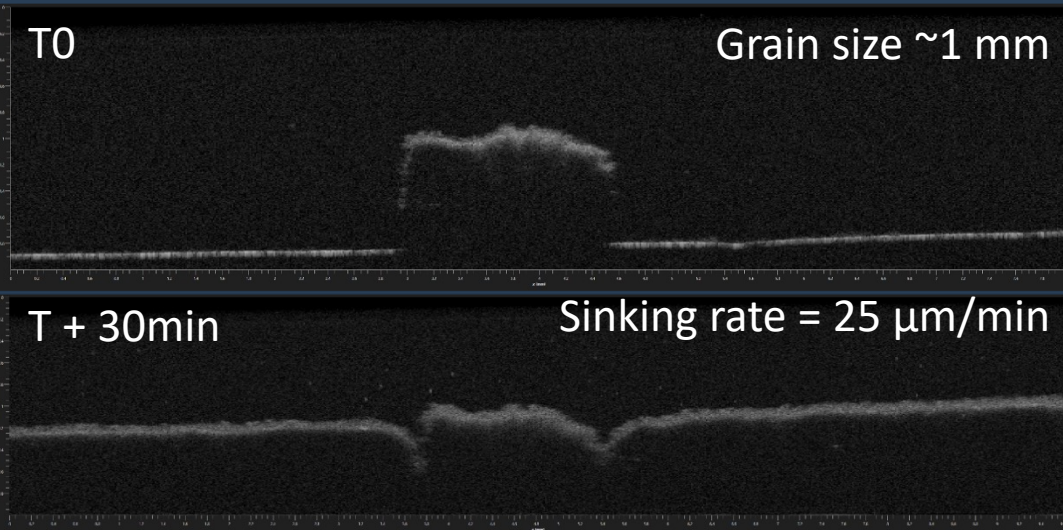
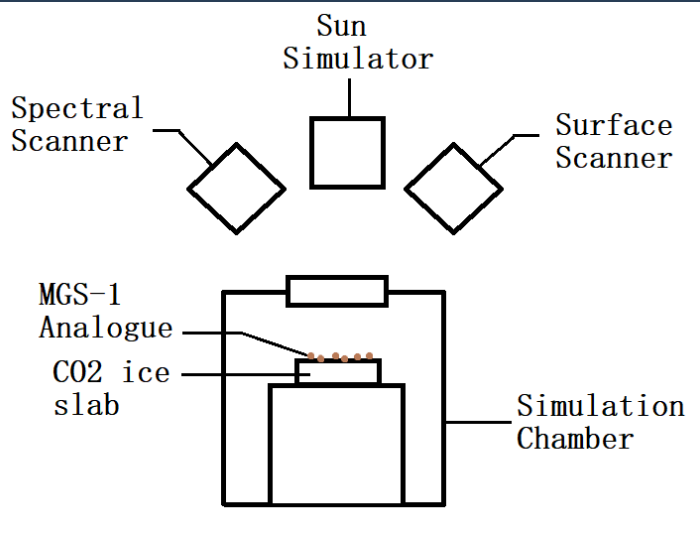
from Kieffer H. et al. (2006)

SCITEAS-1 Simulation Chamber

Self-cleaning experiment

Quantify the sinking rate of dust analogue on CO₂ ice slab

Caveats : basal sublimation of slab due to sample holder temperature
ambient pressure and no cooling involved (sample holder pre-cooled with LN₂)



SCITEAS-2

Simulation Chamber

Frost deposition experiment

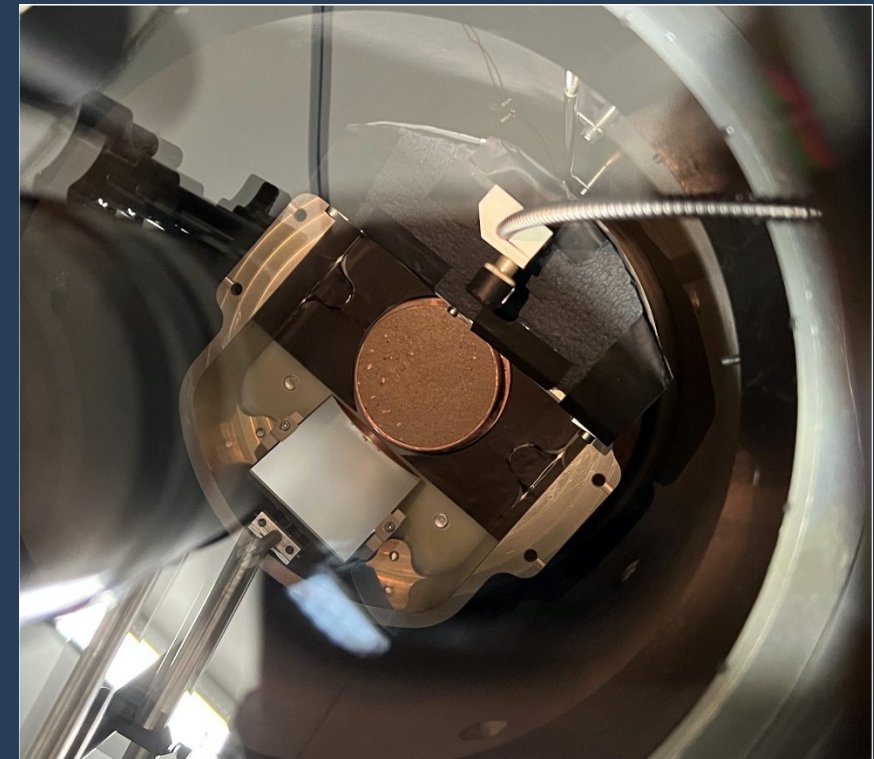


- (1) CO2 gas line
- (2) CMOS colour camera +
long dist. microscope
- (3) Filter Wheel (with 6 filters incl.
CaSSIS BLU, PAN, RED & NIR)
- (4) CCD monochrome camera
- (out of frame) Primary Pump
& Cryocooler

Reaching ~6mbar and 145K/65K

Side view Setup
MGS-1 Analogue

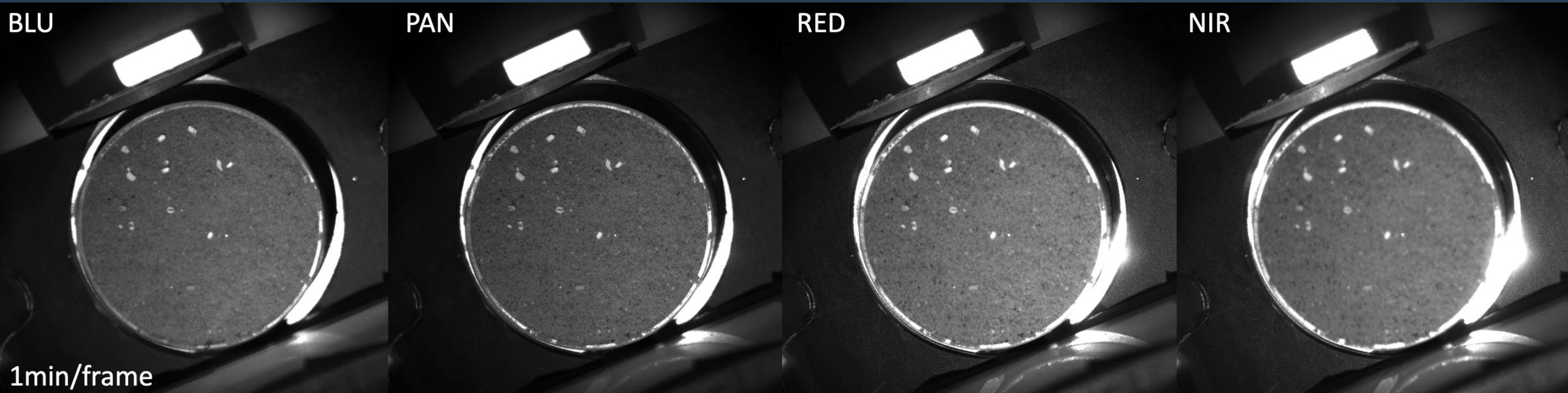
Top view of setup in the chamber



Results

H₂O deposits

Frame 1 (H₀)

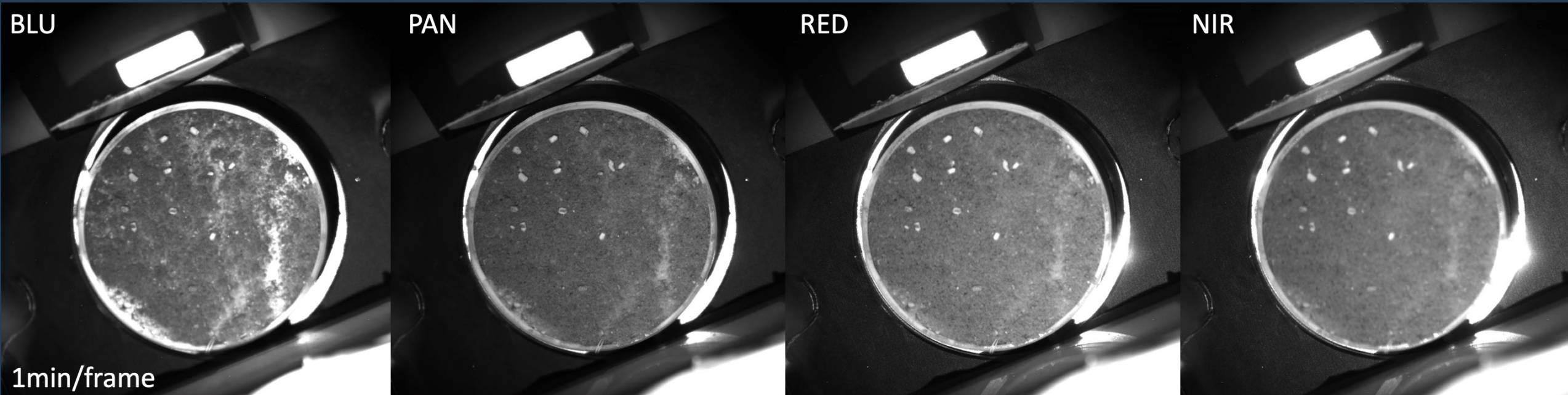


- Caveats
- Sample temperature (~95-65K) is colder than on polar areas of Mars in springtime
 - Quantity of water is not controlled and linked to room humidity (~38% in this case)
 - Frost deposits not homogeneous on the surface (but maybe more realistic?)

Results

H₂O deposits

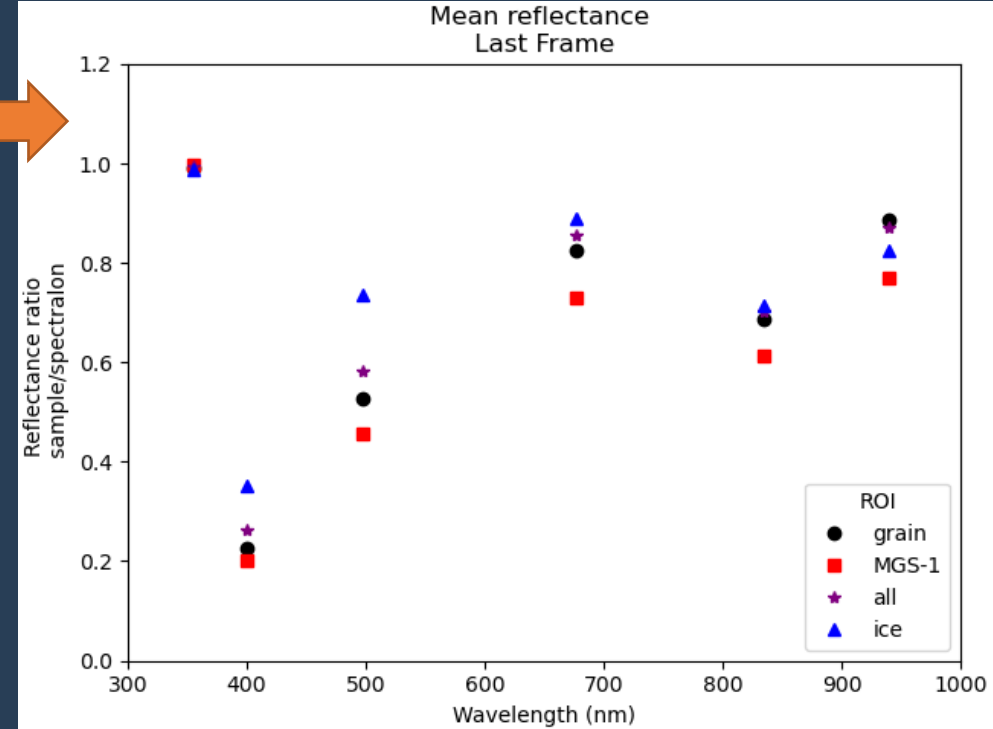
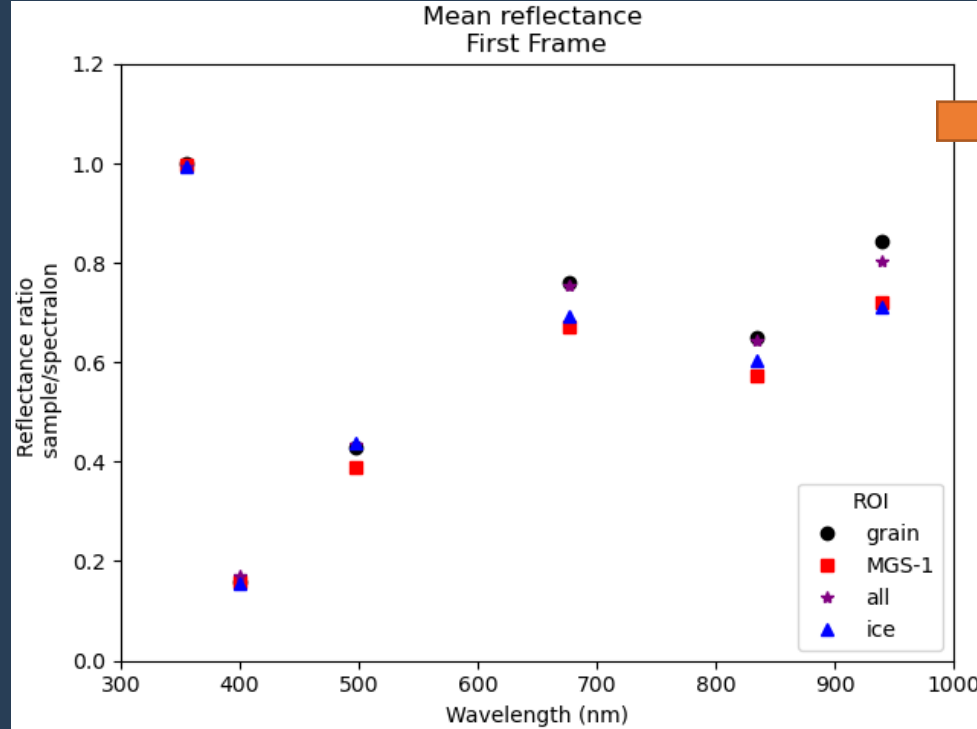
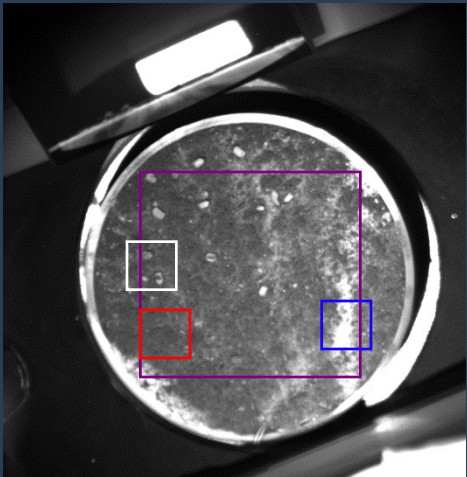
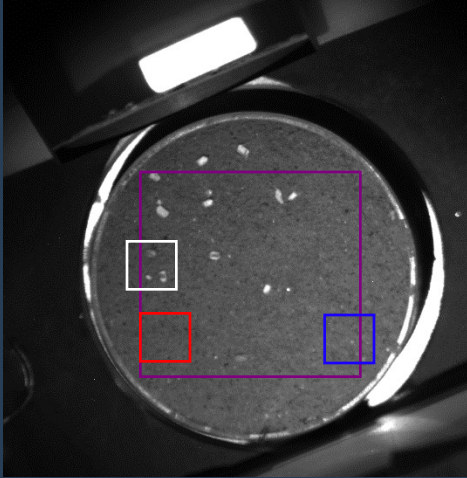
Frame 247 (H ~4h)



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Results

H₂O deposits



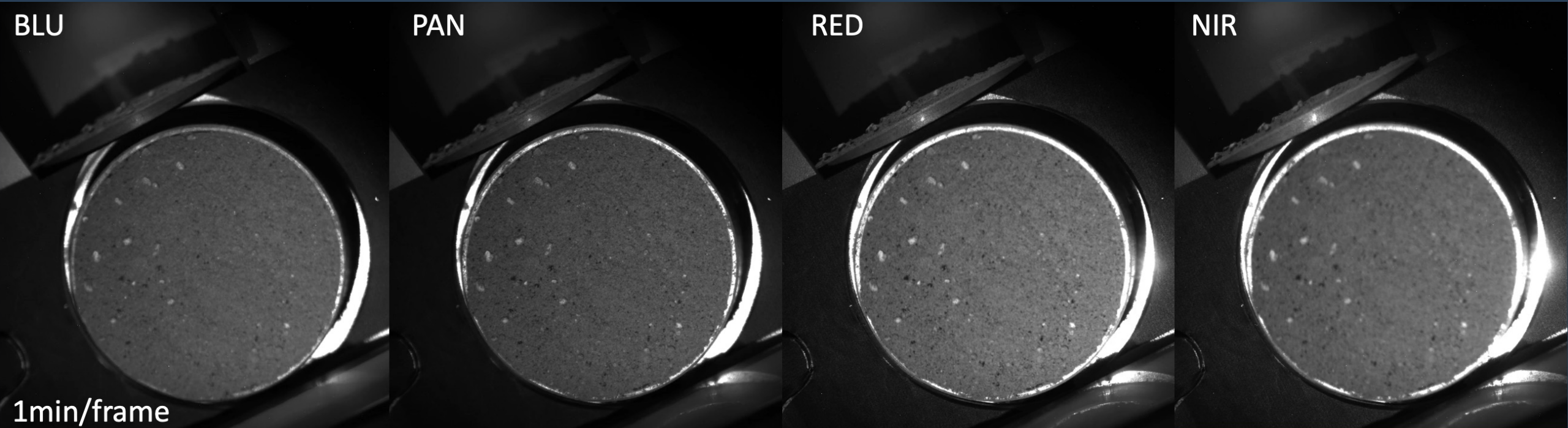
ROI reflectance increase

	Grain	MGS	All	Ice
Filter 2 :	42%	28%	55%	125%
Filter 3 :	23%	17%	33%	68%
Filter 4 :	8.7%	8.5%	13.6%	28.8%
Filter 5 :	5.7%	6.5%	9.2%	18.3%
Filter 6 :	5.2%	6.7%	8.6%	15.8%

Results

CO₂ deposits

Frame 1 (H₀)

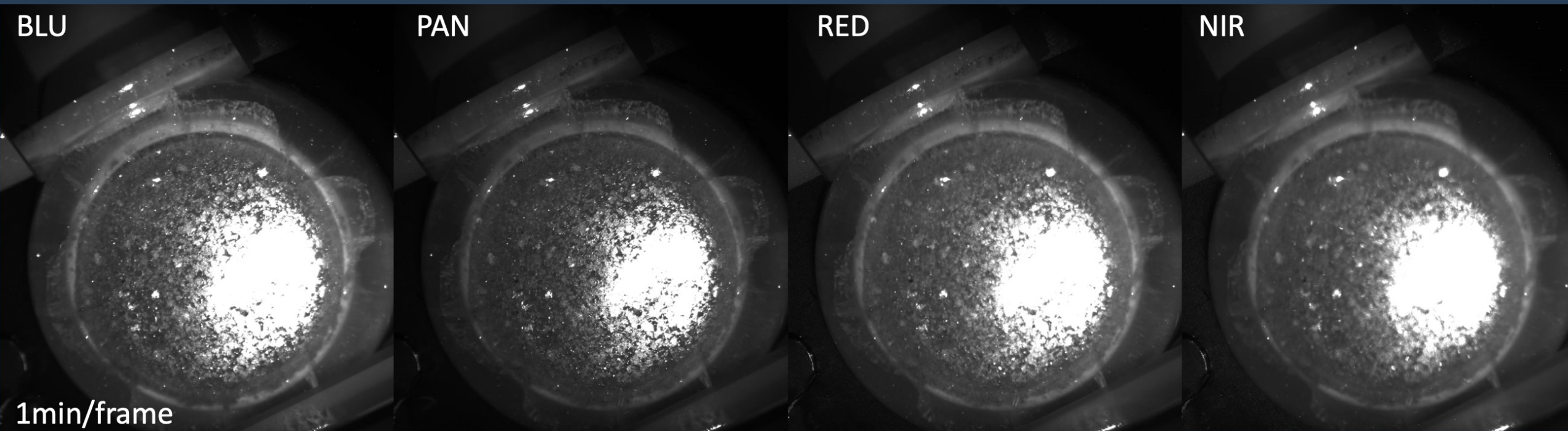


Setup drawbacks : - light source masks ice properties in significant portion
- sensitive to entries in lab room (saturated frames / bright flash)

Results

CO₂ deposits

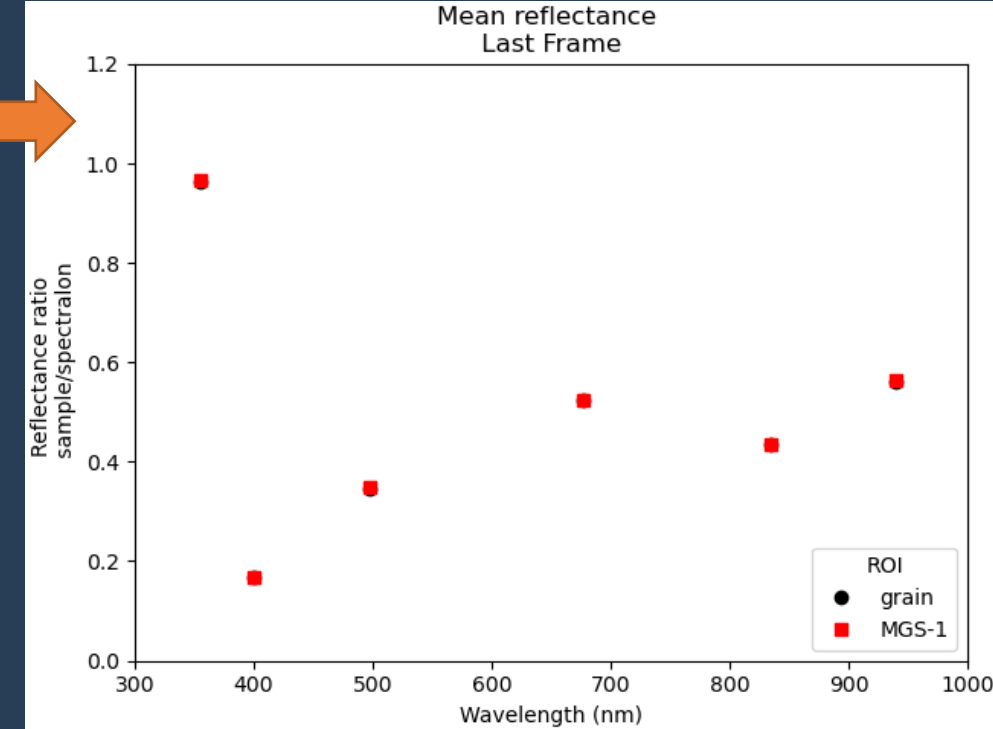
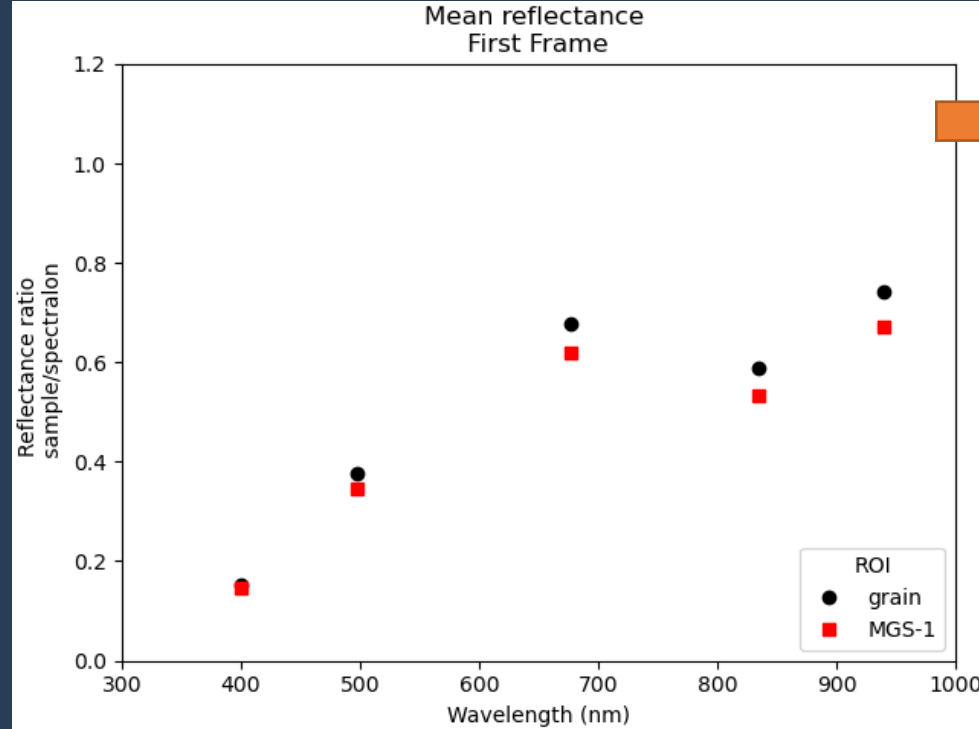
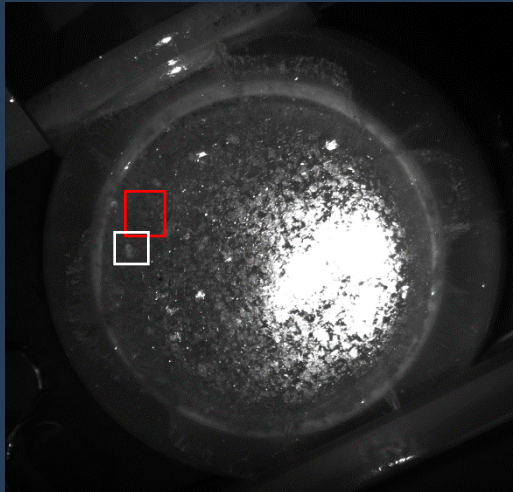
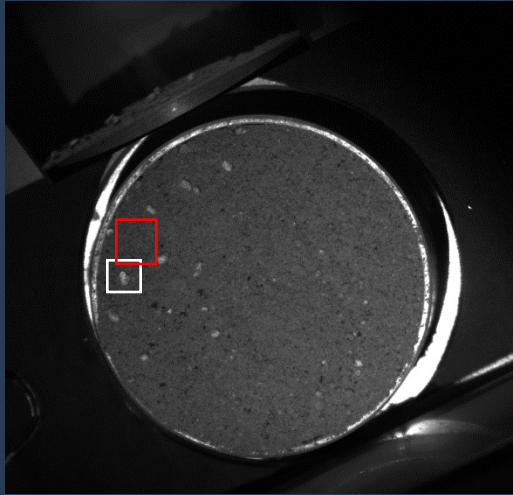
Frame 100 (H ~1h40)



Setup drawbacks : - light source masks ice properties in significant portion
- sensitive to entries in lab room (saturated frames / bright flash)

Results

CO₂ deposits



ROI reflectance increase

	Grain	MGS
Filter 2 :	9.3%	15.3%
Filter 3 :	-7.8%	0.4%
Filter 4 :	-22%	-15%
Filter 5 :	-25%	-18%
Filter 6 :	-24%	-15%

- ☺ Repeatable under controlled martian conditions
- ☺ Thick layer of CO₂ ice formed quickly
- ☹ ☺ Small layer of H₂O over a long period (somehow realistic to Mars but not fully controlled)
- ☹ Quite a long process so few exp. made so far

Next steps

Grow this experimental database

Build RGB images to compare with CaSSIS images

(if possible) new experiments on basal sublimation from ice-covered sample to produce cracks/jets (Kieffer model stage 3)

PEAKED INTEREST ?

Feel free to contact me at camila.cesar@unibe.ch for further discussions !

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