

# Colour and Stereo Surface Imaging System (CASSIS) on the ExoMars Trace Gas Orbiter (TGO): Potential colour data products and their use for scientific investigations



Western  
University, London, Canada [torabene@uwo.ca]. Physicalisches Institut, Univ. Bern, Bern, Switzerland, <sup>3</sup>INAF, Osservatorio Astronomico di Padova Padova, Italy, <sup>4</sup>Laboratoire de Planétologie de Grenoble, Saint Martin-d'Heures, France, <sup>5</sup>Earth Sci. Natural History Museum, London, UK, <sup>6</sup>JPL, Univ. of Arizona, Tucson, AZ, <sup>7</sup>JHU/APL, Laurel MD, <sup>8</sup>Earth & Atmos. Sci., GT, Atlanta, GA.

## Introduction & Objectives

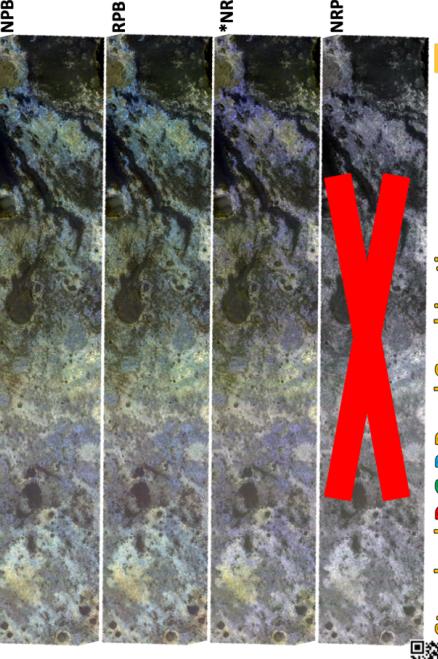
- CASSIS is a pushframe colour and 3D/stereo imaging system on ExoMars-TGO that takes up to 4 colours in the VNIR range (~400–1100 nm) [1]

- Here we present a summary of CASSIS colour imaging and a few examples of CASSIS colour data products (to be produced and provided to the public, or recommended) that are useful for scientific investigations of Mars

- This, and previous [2,3], works are contributing to the final selection of CASSIS products for public release to the CASSIS website and the ESA's Planetary Science Archive (PSA).



CASSIS colour image M034\_002289\_0250 taken with all 4 filters with a reduced swath width of 14048px (\*see abstract for CASSIS observation ID description). Examples of possible R-G-B colour products of Navwr Vallis centered at approximately at 34.003°E, 24.186°N covering a ~38 x 1.8 km. The image was taken on 05-29-2018 at an LMST of 15:46:49 with observation angles of  $p = 46.02^\circ$ ,  $i = 52.11^\circ$ , and  $e = 11.313^\circ$ . NOTE: \*NRP (a.k.a., "No PAN" mode) is useful under very low phase/incidence conditions; NRP is extremely bland and not recommended.

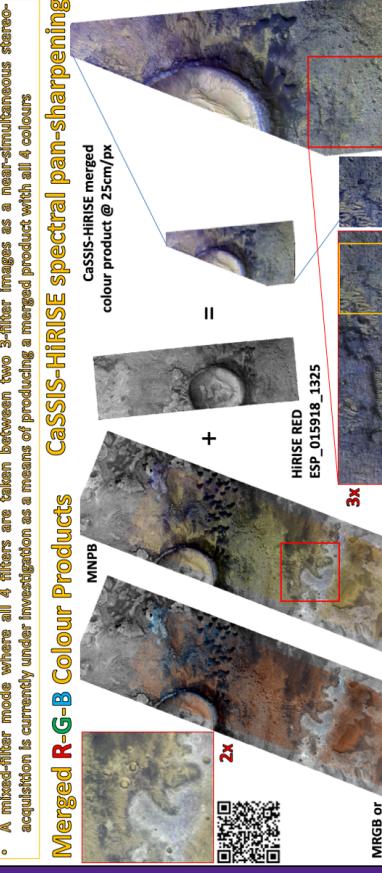


## Merged R-G-B Colour Products

### CASSIS imaging modes and restrictions

- Data transfer rate restrictions between the detector, the proximity electronics and the digital processing module
  - Limits the total number of pixels that can be transferred within the time framelets are acquired with a minimum of 10% overlap
- As a consequence, CASSIS planners must reduce the swath-width size from the maximum value of 2048 px and/or must switch off colour filters
  - CASSIS 4-colour image (colour swath) reduced 40–30% depending on orbital altitude
  - CASSIS 3-colour image (colour swath) reduced 0–30%
- A mixed-filter mode where all 4 filters are taken between two 3-filter images as a means of producing a merged product with all 4 colours
- Acquisition is currently under investigation as a means of producing a merged product with all 4 colours

### CASSIS-HIRISE spectral pan-sharpening



Examples of PAN-merged R-G-B colour products based on CASSIS image M034\_002286\_310\_0. Here PAN was taken at the full 2048px swath width, whereas BLU and NIR were reduced to 1664 pixels (~83% of the full swath) covering a ~30.4 x 7.5 km portion of the Kaiser Crater basin centered at approximately at 18.673°E, 47.381°S. The image was taken on 05-29-2018 at an LMST of 13:24:35 with observation angles of  $p = 56.923^\circ$ ,  $i = 49.623^\circ$  and  $e = 10.853^\circ$ .

### CASSIS-HIRISE

References: [1] Thomas, N. et al. (2017) Space Sci. Rev., 214, 18. [2] Torabene, L. et al. (2018) Space Sci. Rev., 212, 897. [3] Torabene, L. et al. (2019) Icarus, 340, Abstract 2478.



## IGO/CASSIS Quick Reference Guide

Orbit: 2960 x 4242 km; inclined 74°; non-synchronous

Steve acquisition: Red pointing ~10° off nadir plus rotation mechanism

NIR frame (\*up to 4): BLU (500 nm) 2048 x 2560x

NIR (857 nm) 2048 x 2560x

RED (656 nm) 2048 x 2560x

PAN (675 nm) 2048 x 2560x

\*500px or less (\*image restrictions below)

\*2048px or less (\*image restrictions below)

Image length: Stereo – 390–35 frames w/ 10% overlap

Individual – up to 60 frames w/ 10% overlap

Spatial Scale: Image width:

Frame/Map – 30–35 frames w/ 10% overlap

Individual – 60 frames w/ 10% overlap

Image length: Stereo – 390–35 frames w/ 10% overlap

Individual – up to 60 frames w/ 10% overlap

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