CTX IN-FLIGHT CALIBRATION AND DATA DISSEMINATION S. H. G. Walter, R. R. C. Munteanu, K.-M. Aye, Institute for Geological Sciences, Freie Universität Berlin, Berlin, Germany (s.walter@fu-berlin.de)

Introduction: The Context Camera (CTX) on board NASA's Mars Reconnaissance Orbiter (MRO) has been in orbit since 2006 and has so far delivered more than 130.000 images [1]). The images are one of the most popular data sets for planetary geologists because the data cover almost the entire planet and have good radiometric resolution, allowing very detailed interpretation of surface features. Since the beginning of the mission, the images have exhibited a darkening effect increasing from the center of the images towards the edges, creating visible seam lines when multiple images are stitched together. Due to the symmetric decrease in reflectance plots averaged over all lines, this problem is often referred to as "frown" effect (see Fig. 1).

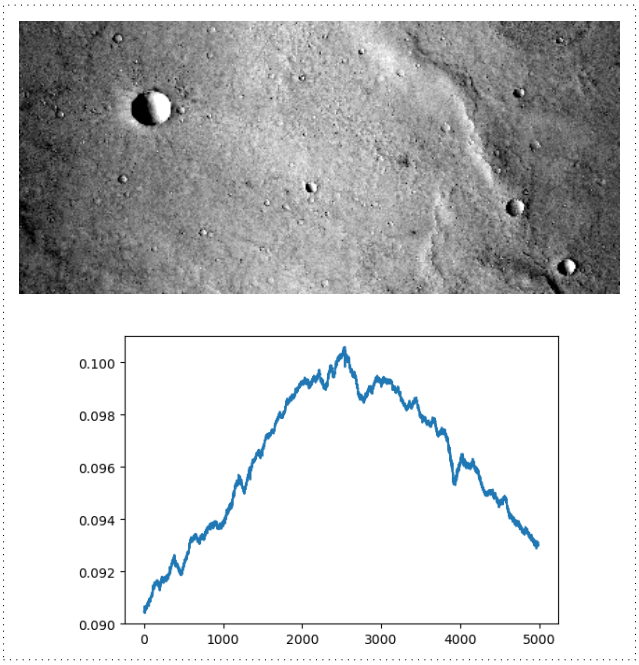

Figure 1: Subset of CTX image N05_064260_1638 (top) together with a line plot of the reflectance samples averaged over all lines (bottom), without frown correction, after nominal ISIS calibration

Background: The Integrated Software for Imagers and Spectrometers (ISIS) pipeline compensates for the frown effect by applying a flat-field correction during the standard calibration routine *ctxcal*, but the flat-field file used is based only on the first year of the mission. Therefore it does not compensate for the effects caused by progressive degradation of the sensor during mission time. Some efforts have been undertaken in the past to remove this remaining effect in the images, but they either have been applied only to a subset of the data or the resulting corrected images have not been made public [e.g., 2, 3].

Methods: To address the progressively changing frown effect over the mission time, we create a separate flat-field for each month of the mission, designated by the first three characters of the product id. First we perform a standard calibration on all related images, usually consisting of about 300 to 1000 images per month. We use the ISIS program *makeflat* and feed it with the pre-processed images for the respective mission month, excluding images taken with the spatial summing mode different to one, whose number of samples in the cross-direction is smaller. We provide the resulting flat-field files that can be used directly in the ISIS environment permanently under this repository: https://dx.doi.org/10.17169/refubium-37236.

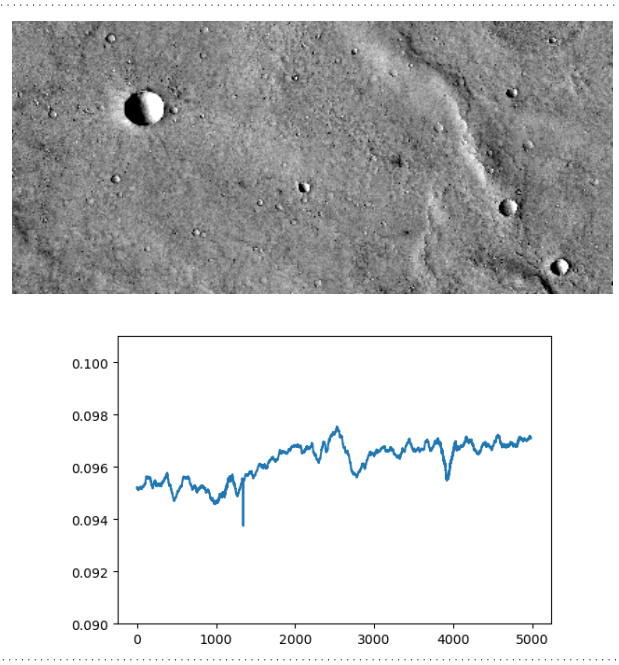

Figure 2: Same subset corrected from the frown-effect by applying the additional flat-field correction (mission month N05).

In addition, we are in the process of updating our "integrated Mars Analysis and Research System" (iMars) to include the full amount of frown-corrected CTX images, readily processed and available for download in GIS-ready formats. As with the previous system, users can select footprints and visualize the data directly in the map view. Special tools for switching between images of surface areas with multiple coverage provide an excellent infrastructure for analysing surface changes and seasonal or interannual variations. We provide a complete overhaul of the graphical interface, which is accessible under https://maps.planet.fu-berlin.de/ctx.

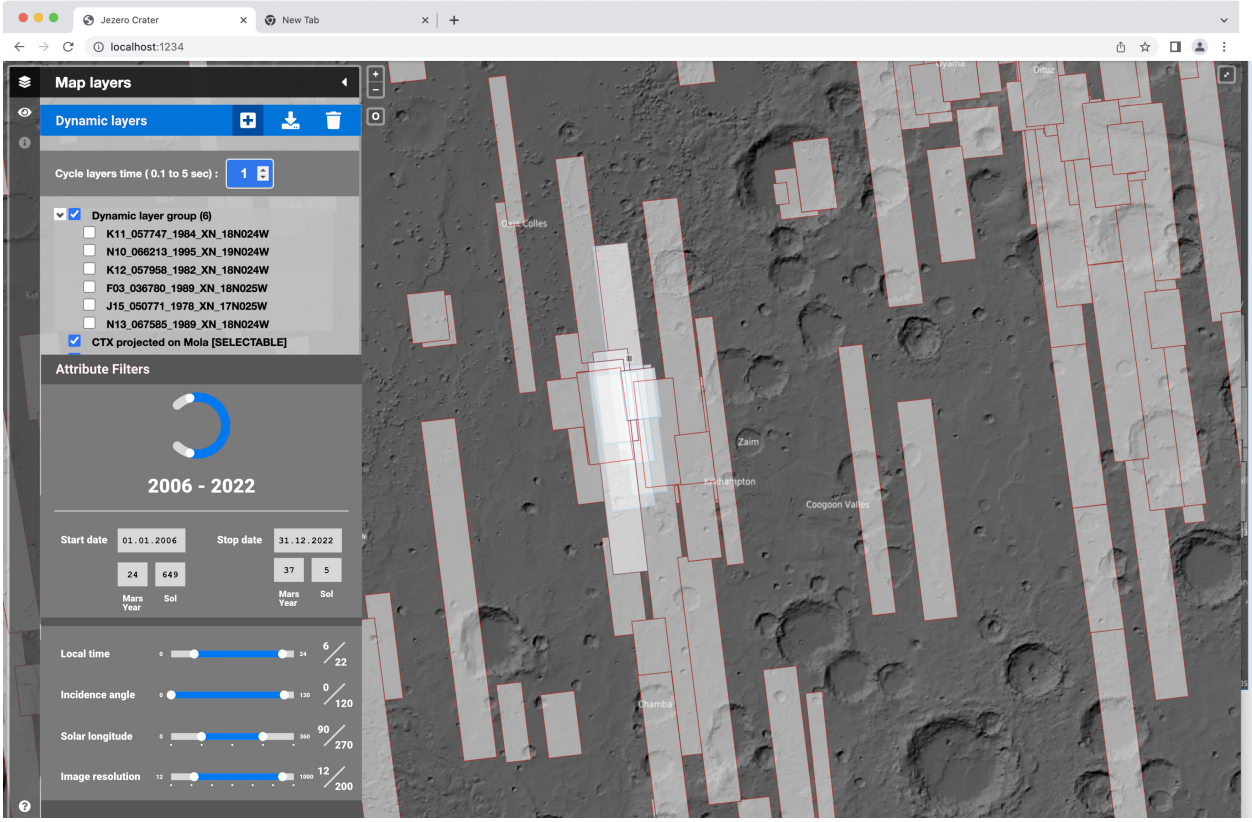

Figure 3: Conceptual layout of the next update of our iMars web-gis for data dissemination.

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References: [1] M. C. Malin et al., *JGR Planets* (E5 2007). [2] S. J. Robbins et al., *LPSC 52*, #2066. [3] J. L. Dickson et al., *LPSC 49*, #2480.