DATA VISUALIZATION WITH THE PDS ANALYST'S NOTEBOOK IMAGE VIEWER

T. C. Stein, R. E. Arvidson, F. Zhou; McDonnell Center for Space Sciences, Dept. of Earth and Planetary Sciences, Washington University in St. Louis, 1 Brookings Drive, CB 1169, St. Louis, MO 63130, tstein@wustl.edu, arvidson@wustl.edu, zhou@wustl.edu.

Introduction: The Planetary Data System (PDS) Analyst's Notebook (AN) [1] is an interactive web application containing peer-reviewed, publicly available data delivered by the instrument teams from NASA's landed missions to Mars and Earth's Moon, supported by documentation describing context for the observations, processing methodology, and data formats. The Image Viewer within the Notebooks for Mars Exploration Rovers [2] and Mars Science Laboratory [3] supports data visualization of archive images.

Location and Measurement Tools: The Image Viewer (Figure 1) allows users to find locations and make distance measurements in single-frame stereo pairs with companion XYZ archive data products, and in mosaics created from these images. Currently, only Navcam, Hazcam, and MER Pancam archives contain the requisite data.

The location tool shows both the location within the image (in pixel (i, j) space) and position on the ground (in rover, local, and site frame (x, y, z) space) for given points within the image. In addition, the azimuth and elevation for any point within the image are available in both site and rover frame.

The measurement tool provides the distance between two user-selected points within a given image. Exclusion zones for portions of an image pair without stereo coverage are highlighted to assist the user. These zones occur where there is no left/right image overlap or where there is insufficient image contrast for automated stereo processing to match features between the left and right images.

In addition, topographic profiles can be generated on single-frame images, showing elevation in site frame vs. distance along the profile.

Drawing Tools: Image annotation is available in the form of common drawing elements: line, arrow, rectangle, ellipse, polyline, polygon, and text. The style of each element—color, width, font size, etc.—can be set individually, and elements can be repositioned in the image.

Science Targets: When an image is opened, known science targets are shown on the image, with the default appearance dependent on the calculation of the target position within the image, either "known" or "approximate". A target's position is classified as **known** when the target was initially defined at the same site and drive as the current image. For targets that were defined on images from other site/drive locations, target positions are considered **approximate** due to slip and skid associated with rover movement. Within the image, the appearance of target markers and names can be changed or hidden.

Saving annotations: The Image Viewer automatically saves changes which remain associated with the image. By using an optional account and signing into the AN, users can return to images with previous measurements and drawings intact. Users only can view their own annotations.

Data export: Annotated images can be saved in PNG format, and measurement data can be exported to Excel workbook and ESRI Shapefile format.
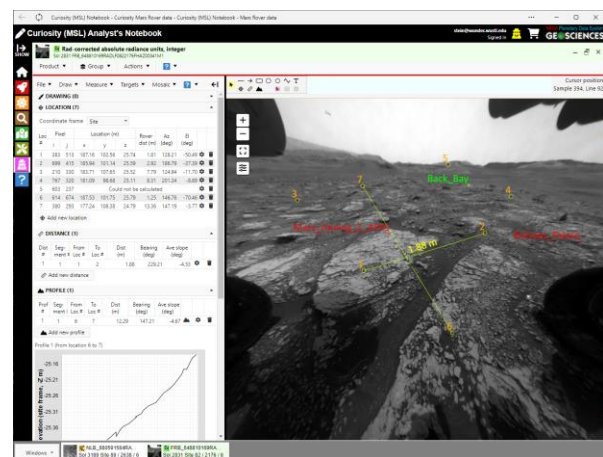
Figure 1: Image Viewer with annotated Hazcam image from Analyst's Notebook for Curiosity rover.

Future work: The first release of Mars 2020 [4] mission stereo image data was made March 22, 2022 and included data from the first 90 sols of the mission. We are working to incorporate those data into the Analyst's Notebook for Perseverance Rover and to enable Image Viewer functions in the Mars 2020 AN.

References:
[1] Stein, T.C. et al. (2010), LPS XLI, Abstract #1414. [2] J.A. Crisp, et al. (2003) doi:10.1029. [3] Grotzinger, J. et al. (2012) doi:10.1007/s11214-012-9892-2. [4] Farley, K.A., et al. (2020), doi:10.1007/s11214-020-00762-y.