UPDATES TO THE PDS ANALYST'S NOTEBOOK. T. C. Stein, 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, 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, supported by documentation describing context for the observations, processing methodology, and data formats (an.rsl.wustl.edu). Notebooks are available for NASA landed missions, including Mars 2020 Perseverance rover, Mars InSight Lander, Mars Science Laboratory Curiosity rover, Mars Exploration Rovers Spirit and Opportunity, Mars Phoenix Lander, and the lunar Apollo and LCROSS missions.

Data and documents from active missions are incorporated into the AN when released to the PDS archive. New features and capabilities are added at the request of users. This abstract covers updates to the Notebook during 2022.

Notebook Summary: The AN content is divided into sections that are modeled after a physical notebook. The sections are Mission, Sol, Search, Maps, Sample science (Mars 2020 AN), Resources, User management, and Help.

Users can tailor their experience by using a free account that provides a synchronized experience across machines and browsers and manages the user's viewing history, image annotations and measurements, personalized bookmarks, and data orders. A user's account name and password are the same for all Notebooks that support accounts. Data and documents may be ordered using a cart paradigm common to commerce web sites.

Notebook Updates: The AN is updated regularly commensurate with scheduled data releases to the PDS archive. During 2022, new data were added for InSight Lander (data acquired July 1, 2021–June 30, 2022); MSL Curiosity rover (data acquired sols 3193–3547); and Mars 2020 Perseverance rover (data acquired 180–539). Current data release status can be accessed from the Notebook Home tab.

Map tool contours. The Map tool in the Mars 2020, MSL, and MER Notebooks show each rover's movement over time during surface operations. Waypoint locations and the drive traverse are plotted on a basemap. An elevation contour overlay is now part of the map display (Figure 1). By default, interval increments change dynamically based on map zoom level. Contour appearance and interval can be adjusted via map settings.

Z-axis data export for locations within images. The AN Image viewer tool includes location, distance, and profile measurement tools for mosaics and stereo images that have corresponding XYZ data in the archive. Identified locations can be exported in Excel spreadsheet and Shapefile format. Z-axis values are now included in Shapefile exports.

Overview browse image settings. An overview window is shown when data and science targets are selected in the AN, including a browse image for image data and a locator image for targets. A new setting allows the user to select the default action when clicking the overview browse image. For single frame images and mosaics, the options are to show a quick view full resolution image or the Image viewer tool, with the further option of opening in the existing browser window or a new one. For targets, the user may specify whether clicking on the browse image shows the full-resolution locator image in the current browser window or a new one. The setting is found in the User tab under Settings > Display > Overview.

InSight Mission completion. The long-running InSight mission ended in December 2022 after more than four years of surface operations. Data collected through September 30, 2022, have been released in the PDS archive and are included in the InSight AN. Later data will be added according to the mission archive plan during 2023. Addition end-of-mission data and documents, as yet unidentified by the team, will be included.

New Mars 2020 image types. Image mosaics and derived data from the Hazcam and Navcam engineering cameras were released for sols 0–179 and 420–539 in 2022. The new data are included in the Mars 2020 AN although the Image viewer measurement tool is still in development. Data for sols 180-419 are scheduled for release by the science team in 2023.

Mars 2020 sample science and activity plan timelines. The Mars 2020 AN contains a new section dedi-

Figure 1. MSL Curiosity AN map showing elevation contours (white), rover waypoints, and drive traverse overlaying a HiRISE basemap.

cated to sample science containing initial reports, relevant metadata and images, and pre-release reports for the first ten collected samples. The initial reports are near-real-time records of activities produced by the science team surrounding sample acquisition, analogous to field notes. They are preliminary, and the interpretations and even some of the underlying measurements will be revised and described more fully in detailed follow-on publications.

Also included is pre-release version of the intended dossier archive of sample science activities currently in development. The pre-release reports have not been peer reviewed nor are part of the mission archive. The Perseverance science team is preparing a formal archive of sample dossier material.

Mission activity plans in timeline form have been added to the Mars 2020 AN, accessible from the Sol tab summaries and from sample science details pages. Individual planned activities are linked to resulting data products where round-trip tracking is well known (Figure 2).

Phoenix Lander. The 2008-era Phoenix AN has been re-released using the modern framework of Notebooks for later missions. New features include mission summaries like the Mission overview and Time tables; faceted data search; Image viewer with measurements; science targets with Mars Target Encyclopedia literature references; data set DOIs; optional user accounts; and cart-based data ordering. The previous version of the Phoenix Notebook remains available.

Future Development: The Map tool is being updated with an overlay of science target locations along the drive traverse. Initially developed for MSL, targets will be selectable from the map and links provided to existing details about the target and related data. The update will be extended to the MER AN, and then to the Mars 2020 AN when the science target archive is released.

Future mission support: Work has begun to extend Analyst's Notebook support for the Mars Sample Return Program Collection Record Inventory has begun, including incorporation of operations and contextual information related to depot creation and sample transfer.

We expect to begin AN support of the Dragonfly Mission in 2023.

Notebook functionality for all missions is based on previous user suggestions, and feedback continues to be sought. User support is available within the AN from the Help section's feedback form, by email to an@wunder.wustl.edu, or using the PDS Geosciences Node forum linked from the AN help section.

Acknowledgement: The Analyst's Notebook is developed through funding provided by the Planetary Data System Geosciences Node. Ongoing cooperation of mission science and operations teams is greatly appreciated. The Analyst's Notebook is available at an.rsl.wustl.edu.

References:

[1] Stein, T.C. et al. (2010), LPS XLI, Abstract #1414.

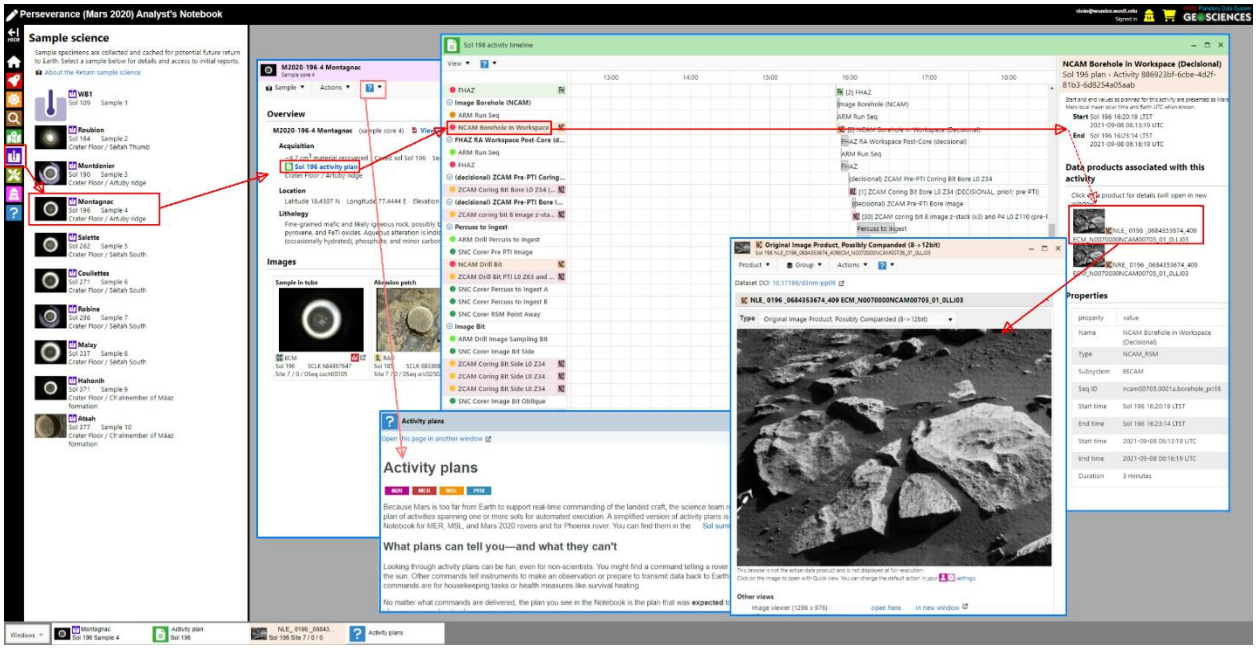

Figure 2. Screen capture of the Mars 2020 Perseverance rover Analyst's Notebook showing links between sample science, an activity plan timeline, and data products.