Identifying Community Needs for a Mars Exploration Rovers (MER) Data Catalog

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1. MOTIVATION

**MER Data Legacy**

<table>
<thead>
<tr>
<th></th>
<th>Spirit</th>
<th>Opportunity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sols</td>
<td>2210</td>
<td>5111</td>
</tr>
<tr>
<td>Products\textsuperscript{1}</td>
<td>&gt;3 mil</td>
<td>&gt;5.5 mil</td>
</tr>
<tr>
<td>Volume\textsuperscript{1}</td>
<td>2.5 TB</td>
<td>4.6 TB</td>
</tr>
</tbody>
</table>

- MER was the first long-duration surface-based exploration of another world; up to 14.5 years of daily data from multiple instruments has been accumulated.
- Lack of MER Team membership (with its corporate knowledge) shouldn’t be a barrier to MER data analysis.
- When astronauts go to Gusev and Meridiani, they must be able to ground-truth each of our measurements.

**Takeaway Points**

We are creating a user-focused catalog of MER data that will

- Enable analysis by non-MER team members
- Be searchable by target name, geologic features, etc.
- Include data quality indicators, analysis tips, and tutorials

**Catalog\textsuperscript{2} vs. Archive\textsuperscript{3}**

- **Catalog** A place in which public records or other important historic documents are kept.
- **Archive** Now usually distinguished from a mere list or enumeration, by systematic or methodical arrangement, alphabetical or other order, and often by the addition of brief contextual information.

The MER data are archived in the PDS; researchers with expert knowledge of the mission can find data using the MER Analyst's Notebook\textsuperscript{4}.

The data would be more accessible to a greater number of people if they were thoroughly cataloged.

**Goals**

The MER Data Catalog Project aims to remove barriers of entry to the rich MER datasets by

- Providing the capability to search archived data products using user-friendly, descriptive terms such as location, target, and rock or soil class
- Cataloging geologic and atmospheric features apparent in image data (i.e., bedforms, meteorites, dust devils, etc.)
- Augmenting data products with contextual information and data quality indicators (e.g., locations of all data products acquired during multi-sol campaigns, low signal-to-noise (S/N) “touch and go” observations vs. high S/N long integrations)
- Documenting the instruments and datasets at a level accessible to workers new to MER analysis

2. METHODOLOGY

**MER Data Catalog User Survey**

In order to best meet community needs, we are surveying potential users to determine their

- Research interests
- Institutional settings
- Obstacles to MER data analysis
- Desired search terms, tools, and features

**Cataloging Pilot Study**

To estimate the length of time required to catalog the MER dataset, we are training high school-aged apprentices to

- Identify geologic features (float rocks, ventifacts, etc.) in MER images
- Identify and cross-reference all data products acquired on a given geologic target

3. PRELIMINARY SURVEY RESULTS

Many users cannot find the data they need with existing resources.

- What obstacles currently prevent you from using MER data the way you’d like to? Please select all that apply.
- Requests for tools include:
  - Guides to science & engineering payloads
  - Tips written by science & operations teams
  - Sunrise, sunset, Phobos/Deimos rise/set times
  - Conversions: Sol, date; LMST, rover clock time
  - Search by Ls

4. NEXT STEPS

In the next year, we will

- Submit a PDART proposal to fund this project
- Submit a White Paper to the Decadal Survey recommending that a user-focused, searchable data catalog be a standard component of all planetary missions

**Join us!**

We’re looking for:

- Accessibility Specialist
- PDS Liaison
- Database programmer(s)
- User interface programmer(s)
- MER team members’ contributions

Once funded, we will

- Actively recruit as catalogers people with non-traditional backgrounds who are interested in space exploration
- Connect our catalogers to our professional networks if they want to pursue a career in planetary science or exploration

The survey will be open through May 2020. If you are interested in using MER data, please participate! Access the survey with this QR code, or at [http://www.merdatacatalog.com/survey](http://www.merdatacatalog.com/survey)

The survey should take approximately 5-10 minutes to complete. No identifying information is collected, and all data will be presented in aggregate. Conducting a survey constitutes experimenting on humans; this survey has received approval from the Cornell University Institutional Review Board (IRB) Office.

REFERENCES AND ACKNOWLEDGMENTS:

- Number of data products and volume of data on the PDS. T. Stein, pers. comm.;