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PSA PRODUCT USER GUIDE MERCURY GEOLOGICAL MAP H01

CHANGE LOG

Reason for change	Issue	Revision	Date
Initial version	1	0	05/13/2026
Post review upload with minor changes — addition of text to author affiliations, change of ESA logo for most recent, removal of duplicate line, removal of PNG versions due to being obsolete.		1	08/28/2026

CHANGE RECORD

Issue 1	Revision 1		
Reason for change	Date	Pages	Paragraph(s)
Edited executive summary to reflect files present.	08/28/2026	4	1
Added DOI of published article edited extended introduction to reflect files present (removal of two 600DPI PNGs as they are unnecessary)	08/28/2026	4	2

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1. INTRODUCTION

1.1 Executive Summary

This repository contains the digital data that accompanies the Journal of Maps publication “Geology of the Borealis quadrangle (H01), Mercury.” It includes GIS shapefiles of mapped geological units, and features, along with PDF map sheets and JPEG previews of the map sheets. These files allow users to explore, view, and reuse the geological mapping in standard geospatial software or as high-quality map layouts. The dataset provides a convenient way to access the map data in both editable and ready-to-view formats for further study or reference.

1.2 Extended introduction

This document refers to is the supplementary data for the Journal of Maps publication titled: “Geology of the Borealis quadrangle (H01), Mercury” ([10.1080/17445647.2026.2718817](https://doi.org/10.1080/17445647.2026.2718817)).

Included in this dataset are

1. The three-class ArcGIS shapefiles for the H01 quadrangle.
2. The three-class ArcGIS shapefiles for the H01 quadrangle + 5° overlap.
3. The five-class ArcGIS shapefiles for the H01 quadrangle.
4. The five-class ArcGIS shapefiles for the H01 quadrangle + 5° overlap.
5. 600 DPI PDF of the three-class map sheet.
6. 600 DPI PDF of the five-class map sheet.
7. 150 DPI JPG of the three-class map sheet preview.
8. 150 DPI JPG of the five-class map sheet preview.

This map has been produced as part of a series of Mercury quadrangle maps in preparation for the ESA-JAXA BepiColombo mission to Mercury.

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1.3 Abbreviations and Acronyms

DOI - Digital Object Identifier

PUG – Product User Guide

ESA - European Space Agency

JAXA – Japan Aerospace Exploration Agency

PSR - Permanently Shadowed Region

RBD - Radar Bright Deposits

NASA - National Aeronautics and Space Administration

MESSENGER – MERcury Surface, Space ENvironment, GEOchemistry, and Ranging

MDIS – Mercury Dual Imaging System

HIE – High Incidence East

HIW – High Incidence West

USGS – United States Geological Survey

ArcGIS Pro – Name of a commercial software

GIS – Geographic Information System

MLA – Mercury Laser Altimeter

1.4 Reference and Applicable Documents

This data follows the same methods as Man *et al.* 2023 (Geology of the Neruda quadrangle (H13), Mercury) - <https://doi.org/10.1080/17445647.2023.2256353>

2. SCIENTIFIC OBJECTIVES

To produce these datasets, we used NASA MESSENGER data from the MDIS instrument.

Sources:

MESSENGER MDIS Map-projected v1.0 Basemap Reduced Data Record (BDR)

MESSENGER MDIS Map-projected v2 Low incidence Angle Basemap Reduced Data Record (LOI)

MESSENGER MDIS Map-projected high incidence East/West illumination basemaps (HIE/HIW)

MESSENGER MDIS Basemap Enhanced Color Mosaic

MESSENGER USGS DEM North Pole 665m v2

The objective of this project was to produce the first geomorphological map of Mercury's north polar region HO1, known as Borealis. The map was constructed in preparation for the ESA-JAXA BepiColombo mission in order to provide key surface geological context and targets for the science phase of the mission. This map is part of a series of quadrangle maps that cover Mercury's globe and will be part of the global product when all quadrangles have been completed. We mapped HO1 in ArcGIS Pro, a GIS environment where we loaded in the data sources listed above and re-projected them in a North Polar Stereographic. We then digitised surface features and contacts at a drafting scale of 1:300k–1:700k for publication scale of 1:3M. The map sheets were constructed in ArcPro's layout mode. Mapping methods follow Man et al., (2023).

2.1 Acknowledgements

We acknowledge NASA, the MESSENGER mission (Solomon et al., 2001), Johns Hopkins Applied Physics Laboratory, Arizona State University, Carnegie Institution of Washington, the MDIS instrument team (Hawkins et al., 2007, Denevi et al., 2016, 2018), the MLA instrument team Cavanaugh et al., 2007, Becker et al., 2016). The data used for this project is publicly available on NASA's Planetary Data System Archive (<https://pds.nasa.gov/>) and the USGS Astrogeology website <https://astrogeology.usgs.gov/>.

If using this work, Creative Commons Attribution 4.0 International applies.

3. DATA PRODUCT GENERATION

For source data production please refer to the MESSENGER mission and individual instrument team documentation. <https://messenger.jhuapl.edu/index.html>

The dataset this PUG refers to was peer-reviewed as part of the Journal of Maps submission.

4. ARCHIVE FORMAT AND CONTENT

This archive consists of two PDF files, two JPEG files and four ArcGIS Pro Layer Package files.

Man_H01_ThreeClass/FiveClass and Man_H01_ThreeClass/FiveClass_Overlap

These four-layer packages contain five feature classes:

1. ThreeClass or FiveClass,
2. ContactsBorealis,
3. LinearFeaturesBorealis,
4. SurfaceFeaturesBorealis,
5. 5. PSR/RBD.

The ThreeClass/FiveClass feature class (depending on which layer package is in use) is a polygon feature class with the symbology for the different geomorphological units. The ContactsBorealis feature class contains polyline of features such as crater rims and wrinkle ridges. The LinearFeaturesBorealis contains polylines of unit contacts and surface breaking thrust faults. The SurfaceFeaturesBorealis feature class contains polygons, symbolized as ornaments and includes items such as crater rays, faculae and hollows. The PSR/RBD feature class includes polygons for areas in permanent shadow that house radar bright deposits.

Opening the products:

The layer packages are compatible with ArcGIS Pro. To open them they can be double clicked and a new ArcGIS Pro project will open. In an existing product they can be added using the “Add Data” function in the map view. The layer packages are designed in a way so that the symbology is already formatted so the products can be used straight away with little setup. The layer packages do not contain any of the source basemaps as these are publicly available elsewhere.

5. KNOWN ISSUES

No known issues

6. SOFTWARE

ArcGIS Pro would be useful for working with this dataset. QGIS would be possible but please contact the author if you require the shapefiles in a different format.

A PDF viewer to open the PDFs.

7. APPENDIX:

Not applicable.