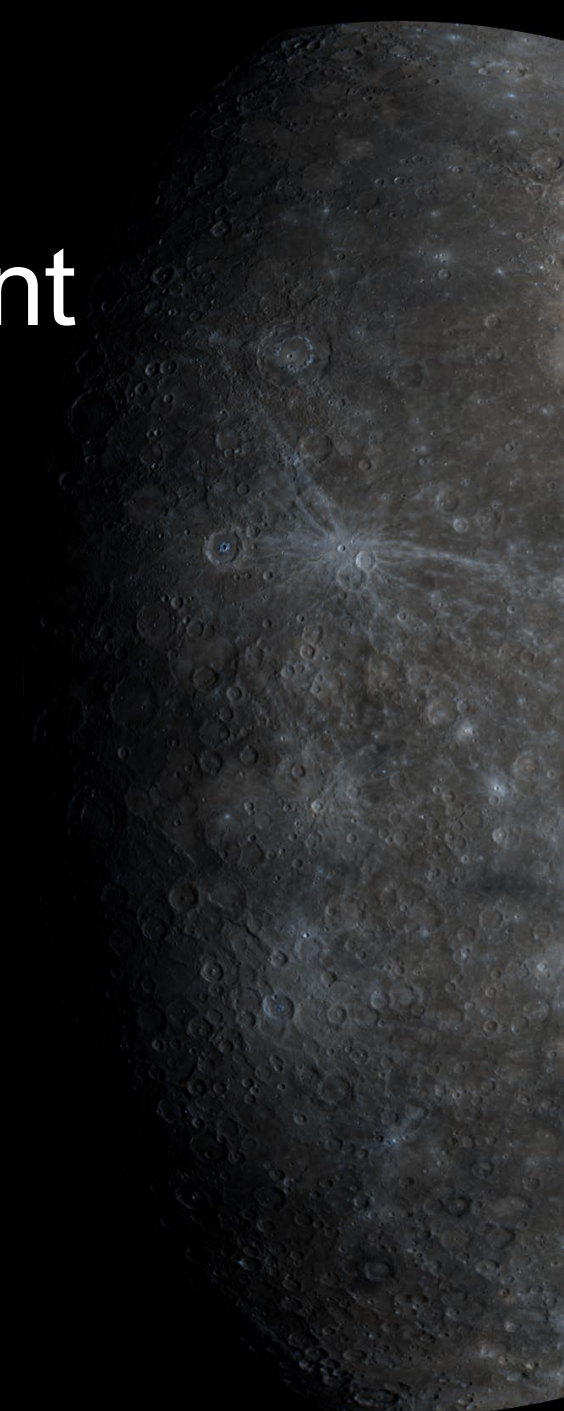


Mercury Exploration Assessment Group (MExAG)

November 16, 2021

Steven A. Hauck, II, MExAG Chair

Case Western Reserve University



MExAG Steering Committee



Steven A. Hauck, II
Case Western Reserve U.
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NASA ARC
Early Career Member



Gang Kai Poh
Catholic U./ NASA GSFC
Early Career Member



Suzanne Imber
U. of Leicester
International Liaison



Shoshana Weider
NASA HQ
NASA Liaison

MExAG Goals Document Process

- As a newer AG, MExAG is developing its 1st goals documents
- Process kicked off at MExAG 2021, 1st annual meeting
- Draft Science Goals and a preliminary set of Objectives circulated to the community for feedback
- Revised Science Goals and Objectives will be a focus of discussion at Feb 2022 MExAG annual meeting
- Community and Technology Goals are next in the process

Focus Area

Science

Technology

Community

MExAG Goals Process

Goals

Objectives

Interdisciplinary Theme

Below the surface

At the surface

Above the surface

Draft MExAG Science Goals – Goal 1

Goal	Objectives
S1) Understand the formation of Mercury	S1.1) Investigate compositional building blocks
	S1.2) Explore formation scenarios
	S1.3) Understand the internal structure

Draft MExAG Science Goals – Goal 2

Goal	Objectives
S2) Characterize Mercury's evolution since formation	S2.1) Study past geological processes
	S2.2) Research processes behind geochemical diversity
	S2.3) Explore the history of the intrinsic magnetic field
	S2.4) Infer long-term effects of variations in exospheric and magnetospheric source and loss mechanisms
	S2.5) Investigate the origin and evolution of the polar deposits

Draft MExAG Science Goals – Goal 3

Goal	Objectives
S3) Investigate processes currently ongoing at Mercury	S3.1) Characterize present-day geologic activity
	S3.2) Investigate magnetospheric dynamics
	S3.3) Understand exospheric and magnetospheric source and loss processes

Draft MExAG Science Goals – Goal 4

Goal	Objectives
S4) Establish Mercury's context in our solar system and others	S4.1) Apply our knowledge of Mercury to understand other planetary bodies and vice versa
	S4.2) Understand Mercury's significance as an end member in our solar system
	S4.3) Inform our understanding of rocky exoplanets

Additional MExAG Activities

- MExAG Quarterly Newsletter 4
 - Newsletters highlight: Recent events, solicitations for input, Mercury meetings, recent Mercury publications
- Seeking community input on priorities for Mercury datasets in need of preservation and/or restoration
 - By request of NASA HQ
- Facilitating Mercury AGU Special Session
- MExAG 2022 Annual Meeting planning

MExAG Open (March 2021) Findings

Most recent MExAG Annual Meeting was Feb 2021

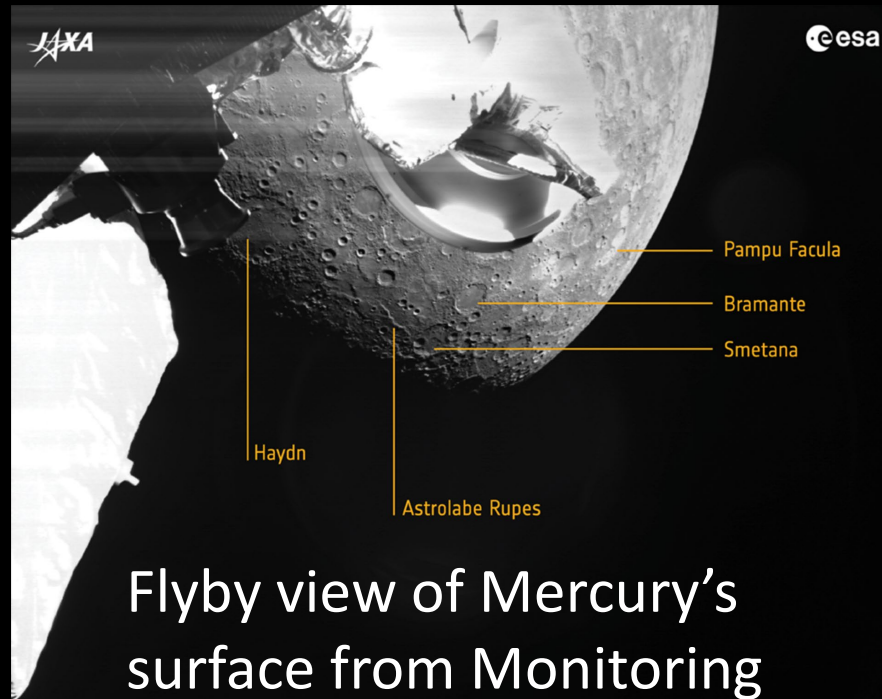
3. Cross-divisional mission support
4. Ground-based observation support

Full text of findings appended to slide package for reference.

BepiColombo 1st Flyby of Mercury

Surface

Exosphere



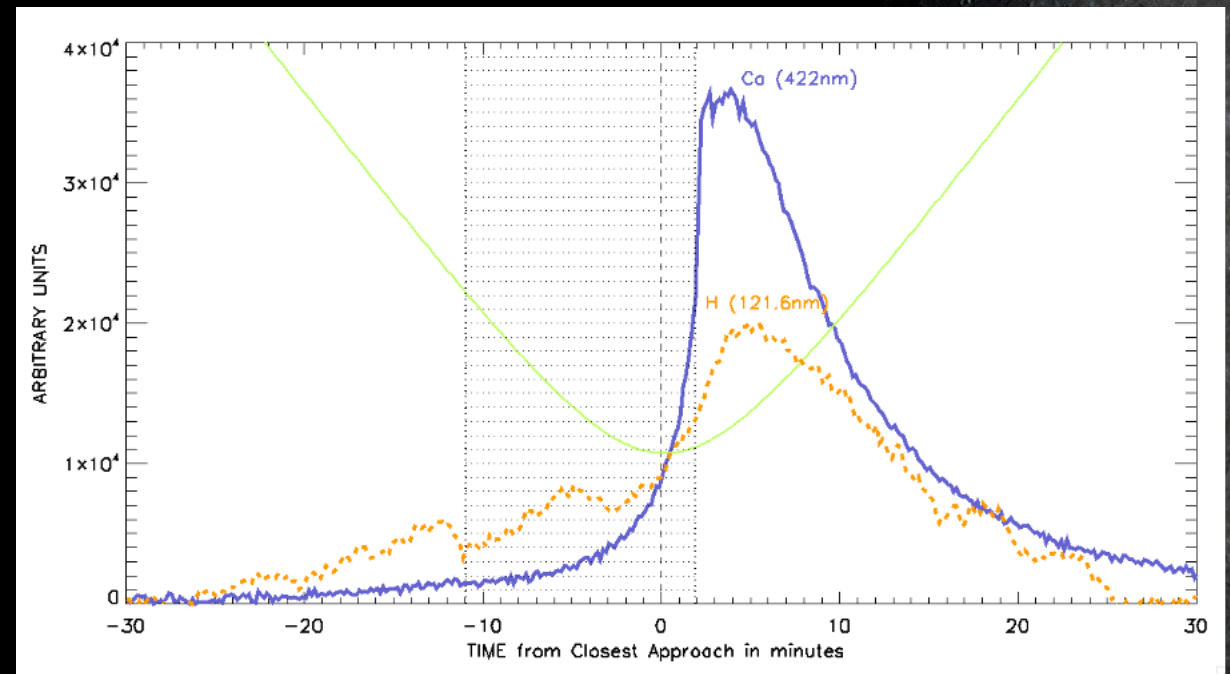
Flyby view of Mercury's surface from Monitoring Camera on Transfer Module



North

BepiColombo, Monitoring Camera #3

1 October 2021
23:44:57 UTC



BepiColombo's first view of exospheric calcium and hydrogen

Upcoming Mercury Meetings and Events

- Fall AGU Meeting: 13–17 December 2021
- Mercury's Surface Response to the Interplanetary Environment: Identifying Needed Studies in Laboratory Astrophysics (virtual), 24–27 January 2022
- MExAG 2022 Annual Meeting (virtual), 1–3 February 2022
- LPSC, 7–11 March 2022
- Mercury 2022: Current and future science of the innermost planet, 7–10 June 2022, Orléans, France
 - Continuation of meetings to bring together MESSENGER, BepiColombo, and broader Mercury science communities
- BepiColombo:
 - Mercury Flyby 2, 23 June 2022

MExAG: <https://www.lpi.usra.edu/mexag>

Twitter: [@ExploreMercury](https://twitter.com/ExploreMercury)

Prior Findings



Finding: Cross-divisional mission support

3. MExAG encourages NASA to enhance cross-divisional support for opportunistic mission science.

NASA spacecraft often have opportunities within their cruise and primary operational phases to conduct science activities of primary interest to other NASA Science Mission Directorate Divisions.

MExAG encourages NASA to develop mechanisms for early identification and planning for support (i.e., planning and funding) of opportunistic science activities that serve communities outside the primary mission division.

Finding: Ground-based observation support

4. MExAG encourages NASA to facilitate ground-based observations of Mercury.

Despite their importance in Mercury exploration, such observations are often difficult to obtain owing to observational and facility requirements. Optical observations are vital for monitoring changes in the exosphere and radar observations are essential for geological and geophysical studies of Mercury, including investigating the polar volatiles and constraining its interior structure. Ground-based observations are also a critically important bridge between missions to Mercury.

MExAG encourages NASA to:

- a) Work with optical telescope facilities on which NASA acquires time (e.g., Keck Observatory) and their Telescope Allocation Committees (TACs) to ease the scheduling of twilight-time observations for Mercury. Many telescopes require half-night or even full night proposals; however, Mercury is only available for 1-2 hours at the beginning or end of the night, disadvantaging observers of the innermost planet.
- b) Engage with Goldstone and Green Bank Telescope, to ensure that there are equitable opportunities for planetary science observations, particularly now that Arecibo is no longer an option.
- c) As the loss of the Arecibo Observatory planetary radar presents a significant loss in the scientific return of ground-based radar observations because it was several times more powerful and sensitive than other current facilities, we encourage NASA to participate in discussions regarding the future of Arecibo Observatory.
- d) Allow observers to obtain letters of endorsement from NASA for Mercury observations in support of the BepiColombo mission during the upcoming flybys and orbital mission.