



SBAG

SMALL BODIES ASSESSMENT GROUP



Small Bodies Assessment Group

Report to Planetary Science Subcommittee

January 27, 2011

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Planetary Science Institute



Activities Since July 2010 PSS

- SBAG 3 held August 3-4, 2010 in Pasadena CA
- ESMD Explore NOW workshop, August 10-11, 2010 in DC
- SBAG 4 held January 24-26, 2011 in DC. First half was a session, **“Technology Forum on Small Body Scientific Exploration”**
- “Roadmap for Small Bodies Exploration in the Solar System” drafting underway. 2nd half of SBAG4 meeting devoted to section discussions.



Current Focus: Roadmap for Small Bodies Exploration

- GOAL: To generate a primary source document for the future of small bodies robotic and human exploration by NASA.
- A living document laying out where we are, where we want to go and what is needed to get there in the exploration of small bodies.
- Updated with the availability of new studies, such as the decadal survey, and new research, discoveries, and new technologies.
- The generation and maintenance of the document is transparent and open to community participation.



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Roadmap for Small Bodies Exploration

- Science Issues
- Population Identification and Characterization
- In-situ Study
- Sample Return
- Laboratory Studies
- Theoretical Studies
- Human Exploration
- **Technology Capabilities and Needs**
- Data Archiving and Access



SBAG4: Technology Forum on Small Body Scientific Exploration

- 1) What science opportunities for both near-term (< 10y) missions and longer-term (> 10y) missions are enabled by existing technologies? How are these science opportunities limited by existing technology?
- 2) What science goals are or should be driving what technology development? What technology synergies and cross-cutting technologies have the potential for changing the way small body science is done? How should we prioritize technology development?
- 3) How might technologies discussed enable small bodies science support for human exploration/activities?
- 4) Identify holes (if any) in the technology developments due to lack of communication between scientists and technologists, hampering the achievement of science goals?



Plans for Evolving SBAG Steering Group

Timescale: Next year, once Roadmap is finished and in maintenance mode

- SG members will be assigned Roadmap section subcommittees to monitor and provide section status reports and lead community modification efforts when needed.
- Expand SG to include two engineers to promote communication and synergy between science and engineering communities involved in small bodies exploration.
- Implement staggered 3 year appointments to SG.



Issues for PSS from SBAG3

(HQ Responses provided by L. Johnson at SBAG 4)



Issues for PSS from SBAG3 (condensed)

- 1) *NASA policy should require assessment of flyby opportunities of asteroids and comets by all missions, in the near-term including ESJM and JUNO.*

The thought here is of something systematic within the agency, not necessarily at the initiative and expense of the mission, but something missions could count on as a resource. There would also have to be an assessment of cost and risk to determine if an opportunity was practical.



Issues for PSS from SBAG3 (condensed)

- 2) *A space-based IR survey of NEOs (~\$500M) is needed to identify targets critical to reducing cost and risk for a human mission to an NEO posed by a mission of long duration. This would be the logical first robotic precursor mission for ESMD.*

This arose from a discussion of WISE survey results and human mission simulations at SBAG3. The small bodies community is, of course, very supportive of plans to expand human exploration activities to NEOs.



Issues for PSS from SBAG3 (condensed)

- 3) *Reprise of prior finding regarding the importance of improved launch date window certainty in planning Discovery and New Frontier proposals, and a suggestion that this might be substantially helped by a due date 12 months after AO release.*

This was discussed in the midst of recent Discovery proposal call, with much frustration expressed by proposers at the meeting about the current process.



Issues for PSS from SBAG3 (condensed)

- 4) *At the request of Jim Green, SBAG identified a proposed time and location for the next IPEWG meeting. We proposed a March date at a Tucson resort.*

This was superceded by a request from HQ that JPL organize the meeting in late August in Pasadena. SBAG will participate in the organization and is considering moving its SBAG5 meeting in Pasadena in early August to dovetail with IPEWG.

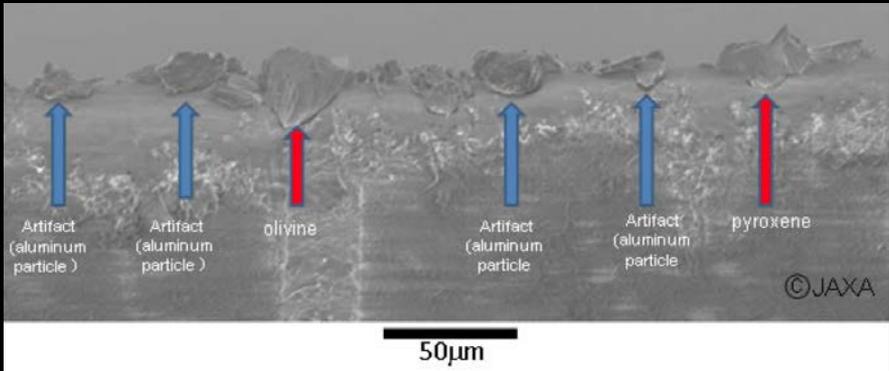


Small Bodies Science Nugget: First Asteroid Sample Return!



JAXA Hayabusa mission returns sample collection canister to Earth from S-type NEO Itokawa. More than 10,000 particles inside. Analysis confirms asteroidal origin. NASA's share will be > 1000 loose grains < 150 μm in diameter, but most < 10 μm in diameter. This will be more material than was returned by the Stardust mission.

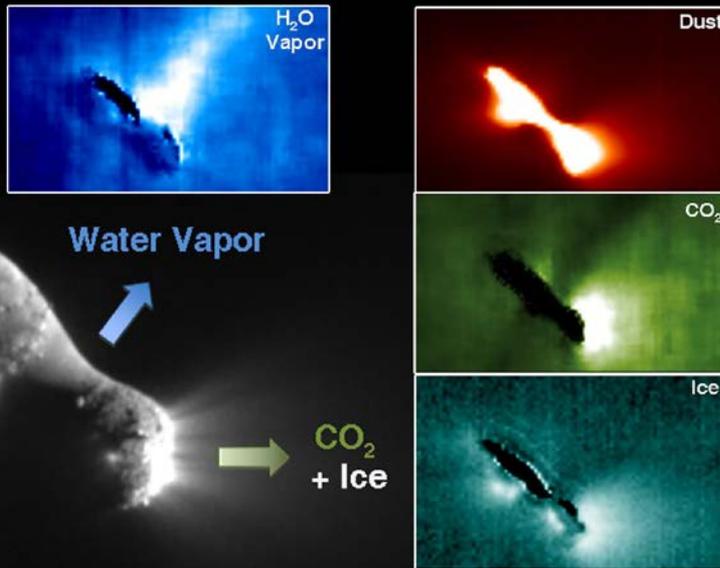
Photo Credit: Mike Zolensky, NASA JSC



JAXA has selected Hayabusa 2 to go to a C-type asteroid.



Small Bodies Science Nugget: EPOXI Flies by Hartley 2



EPOXI discovers a cloud of fluffy water ice particles surrounding Hartley 2 (could be the size of marbles or basketballs depending on their density).



Comet activity in the inner solar system are thought to be driven by the sublimation of water ice. Hartley 2 activity is shown to be driven by carbon dioxide ice.



Small Bodies Science Nugget: Hubble observes aftermath of asteroid collision

It is estimated that in Feb/Mar 2009, a 10-15 ft diameter asteroid struck a 400 foot wide asteroid at high velocity, resulting in a cloud of gravel-like ejecta slowly spreading out behind the impacted asteroid. The X-pattern is a consequence of the details of the directions in which material was ejected and where the asteroid was in its orbit at the time of impact.