

Summary of the 6th IAA Planetary Defense Conference (PDC)

April 29 – May 3, 2019
College Park, MD, USA

Presented to the 21st NASA Small Bodies Assessment Group (SBAG) Meeting

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June 24, 2019

Conference Resources Online

- Conference website: <http://pdc.iaaweb.org/>
 - Abstract, paper, presentation files, etc. will be made available for download soon
- Conference video recordings (invited remarks, technical talks, hypothetical asteroid impact scenario exercise proceedings, etc):
 - <https://sservi.nasa.gov/event/2019-iaa-planetary-defense-conference-live-stream/>
- Hypothetical asteroid impact scenario exercise materials:
 - <https://cneos.jpl.nasa.gov/pd/cs/pdc19/>
 - NB: A separate scenario involving a comet was also provided, but not worked through as part of the exercise: <https://cneos.jpl.nasa.gov/pd/cs/pdc19c/>
 - See upcoming talk by Paul Chodas about the hypothetical asteroid exercise today at this meeting, immediately following this talk
- Video recording of public event featuring Bill Nye, organized by The Planetary Society:
 - <http://www.planetary.org/get-involved/events/2019/bill-nye-vs-asteroids.html>
 - <https://livestream.com/viewnow/2019BillNyeVSTheAsteroids>
- Conference photographs:
 - <https://johnshopkinsappliedphysicsla.shootproof.com/gallery/9339321/home>

Conference Participation Summary

- Conference co-chairs:
 - Bill Ailor, Gerhard Drolshagen, Brent Barbee
- Excellent welcoming remarks were provided by NASA Administrator Bridenstine
- 281 attendees
 - Representing 22 different countries
 - Included 33 members of the press
 - Included 28 students
- 4,870 livestream viewers throughout the conference week
- 100 technical presentations
- 94 posters

Conference summary report is currently being authored and will be made available online when complete.

Group Photograph of Conference Attendees



Conference Venue



The Hotel at The University of Maryland

2019 PDC Sessions (single track)

1. Key Developments
2. Advancements in NEO Discovery & Characterization
3. Apophis
4. Deflection & Disruption Models & Tests
5. Mitigation Campaign Design
6. Impact Consequences & Disaster Response
7. Issues Affecting Decision To Act
8. Communications To The Public

Conference Series

2021 Planetary Defense Conference to be hosted by the United Nations Office of Outer Space Affairs (UNOOSA) in Vienna, Austria

- 2019: 6th IAA Planetary Defense Conference; College Park, MD, USA
- 2017: 5th IAA Planetary Defense Conference; Tokyo, Japan
- 2015: 4th IAA Planetary Defense Conference; Frascati Roma, Italy
- 2013: 3rd IAA Planetary Defense Conference; Flagstaff, AZ, USA
- 2011: 2nd IAA Planetary Defense Conference; Bucharest, Romania
- 2009: 1st IAA Planetary Defense Conference; Granada, Spain
- 2007: 2nd Aerospace Corp. Planetary Defense Conference; Washington, DC, USA
- 2004: 1st Aerospace Corp. Planetary Defense Conference; Anaheim, CA, USA

2019 PDC Media Coverage (1/2)

- Over 20 media interviews of experts at the conference
 - For print/web, radio, and TV
 - Washington Post, NPR, Newsweek, CNN, NBC MACH, Space.com, The Verge, BBC Newshour/World News, Canada Global News Radio, K-CBS San Francisco, iHeart Radio, CBS Evening News w/ Chip Reid, Voice of America, KCBS/KCAL9, KNX InDepth (CBS News LA Affiliate)
 - Both live and recorded
 - Stories continued to be published after the conclusion of the conference
- Web/Social Media:
 - ~27,000 views of impact scenario feature, ~13,000 view of Apophis feature, 9300 mentions from followers tweeting under the #PlanetaryDefense and #ExerciseOnly hashtags

2019 PDC Media Coverage (2/2)

- Selected instances of 2019 PDC media coverage:
 - NPR: <https://www.npr.org/2019/04/29/718296681/this-week-nasa-is-pretending-an-asteroid-is-on-its-way-to-smack-the-earth>
 - NBC: <https://www.nbcnews.com/mach/science/what-if-killer-asteroid-were-headed-toward-earth-nasa-plans-ncna999031>
 - CBS: <https://www.youtube.com/watch?v=yxwe4IH-0kw>
 - CNN: <https://www.cnn.com/2019/04/26/world/nasa-fema-asteroid-impact-exercises-scn-trnd/index.html>
 - ABC: <https://abcnews.go.com/Technology/inside-nasas-plan-launch-spacecraft-smash-asteroid/story?id=62909398>
 - Space.com: <https://www.space.com/why-fake-asteroid-impact-hazard-management.html>
 - Planetary Society radio show: <http://www.planetary.org/multimedia/planetary-radio/show/2019/0508-2019-2019-pdc-planetary-radio-live.html>
- Numerous smaller media outlets covered the conference as well.

2019 PDC Statements of Support

- Statements of support, available online, were produced during the conference for:
 - The Apophis 2029 opportunity
 - <http://iaaweb.org/iaa/Scientific%20Activity/pdcstatement3.pdf>
 - AIDA / HERA
 - <http://iaaweb.org/iaa/Scientific%20Activity/pdcstatement2.pdf>
 - NEOCam
 - <http://iaaweb.org/iaa/Scientific%20Activity/pdcstatement1.pdf>

Selected Preliminary Recommendations (1/3)

- Study the legal aspects of planetary defense and incorporate legal provisions into planetary defense planning and preparation.
 - For example, during the hypothetical asteroid threat exercise conducted at the conference, a good-faith attempt to deflect the incoming asteroid did deflect the majority of the asteroid's original mass from the original impact location (Denver, Colorado, USA) but still left a fragment of damaging size on course to impact New York. This example raises questions about the associated liabilities, legalities, etc.
- The uncertainties associated with the deflection imparted to an NEO via a nuclear device need to be studied (similar to the way that "beta" is studied for kinetic impactors).
- Uncertainty in how much applied deflection "Delta-V" (change-in-velocity) an NEO can absorb without accidental fragmentation continues to cause difficulties in designing and sizing NEO deflection missions, i.e., When is the Delta-V too high? Will dividing the Delta-V into smaller applications via multiple spacecraft avoid accidental NEO fragmentation? How many spacecraft/launches are needed? These considerations can dramatically affect the required size, cost, complexity, and development timeline for mitigation missions and need to be understood well enough for effective planning and implementation of missions in a real scenario.

Selected Preliminary Recommendations (2/3)

- Incorporating nuclear device deflection modeling capabilities into the CNEOS NEO Deflection App website would be useful.
- Conference participants expressed frustration at the contrived nature of the hypothetical asteroid threat exercise, and at their inability to influence the exercise outcome. In general, the exercise goals and format should be re-examined in view of these and other thoughts.
- Publishing the "Day 0" hypothetical threat exercise material online much farther in advance of the conference abstract deadline could provide more opportunities to researchers to perform meaningful studies on the hypothetical scenario.
- The realism of the hypothetical threat exercises could be enhanced by better incorporating uncertainties and associated statistical models, etc.

Selected Preliminary Recommendations (3/3)

- Develop improved designs for documentation, imagery, etc., intended for public communications (e.g., improved ways to communicate scenario status with uncertainty, the concept of the "risk corridor," etc.)
- Consider whether the various web-based services used by the planetary defense community are prepared to handle potentially large increases in traffic during a real scenario, and consider improvements should they be found necessary.

Appendix

Other Conference Discussion Points (1/2)

- Time slots allotted to presentations were short, which some feel is too limiting for presenters and prevents adequate Q&A. At the same time, support seems to remain strong for the conference's long-standing single-track format.
- There is interest in adding short (e.g., ~2 minute) presentations about poster papers at the end of each session. This was done in the past and may be done again at future iterations of the conference.
- Establishing an *International Journal of Planetary Defense* was suggested.
- Consider including social events oriented towards "early career" individuals.

Other Conference Discussion Points (2/2)

- There was some confusion at the outset of the exercise among participants about exactly where they should go and what they should do.
- A real NEO impact on Earth known in advance would potentially attract a significant number of prospective observers on the ground (both interested members of the lay public and actual scientists), and managing that phenomenon ought to be considered in ground response planning.