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EOS
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100 YEARS

LOST IN THE GULF OF MAINE

Bennu and the Jets

Self-Made Waterfalls

Slow Earthquake Origins

AGU
100
ADVANCING EARTH
AND SPACE SCIENCE

“Greenland’s industry is mostly focused on fishing. They have good skills in terms of maritime knowledge and [knowing] how to navigate these pretty difficult Arctic waters,” she explained.

If Greenland went forward with the idea, it wouldn’t need to worry about the sand running out anytime soon.

“As long as global warming is continuing, the ice sheet is going to melt, and with the melt come more sand and gravel,” Bendixen said. The steady stream of sand will continue “for centuries to come,” the authors write.

An “Unsustainable Option”

And yet environmental concerns loom large. Sand mining could “locally enhance or even amplify” the disruption to local ecosystems from climate change, according to the paper. Norpadzlihatun Manap, a visiting researcher at Imperial College London, calls sand mining an “unsustainable option” for Greenland.

“Sand acts as a sink to contaminants,” she explained. Manap noted that unleashing those contaminants may in turn have a negative impact on Greenland’s domestic revenue, which comes largely from the fish and shellfish industry.

The introduction of bulk carrier ships could bring contaminated ballast water to the sensitive Arctic region as well, added Whitman Miller. “The potential for high-impact inva-

“As long as global warming is continuing, the ice sheet is going to melt, and with the melt come more sand and gravel.”

sions is a serious concern and requires the institution of robust biosecurity measures,” he said.

Bendixen agreed that a “thorough environmental impact assessment” must be completed before any sand extraction begins. She said that the next step will be establishing a team of Greenlandic and Danish researchers to investigate outstanding questions and engage with the Greenlandic population.

“They know their country the best,” Bendixen said. “We just want to offer the opportunity to Greenland so that they can decide for themselves.”

By **Jenessa Duncombe** (@jrdscience), News Writing and Production Intern

Bennu and the Jets

Asteroid 101955 Bennu regularly ejects plumes or jets of particles from its surface. This discovery reveals that Bennu, a near-Earth asteroid currently playing host to an orbiting spacecraft, is one of a rare class of active asteroids, of which only about a dozen are known.

“The discovery of plumes is one of the biggest surprises of my scientific career,” said Dante Lauretta, principal investigator of NASA’s Origins, Spectral Interpretation, Resource Identification, Security-Regolith Explorer (OSIRIS-REx) mission. OSIRIS-REx has been orbiting Bennu since 31 December 2018.

Mission scientists, including Lauretta, discussed this and other first discoveries from OSIRIS-REx at a press conference on 19 March.

Satellite Creation

The OSIRIS-REx team first detected a jet of particles on 6 January. The flight navigators noticed bright spots in the craft’s navigational camera that could not be image artifacts. After consulting with mission scientists, the team realized the spots were, in fact, small rocks. The navigation team quickly created new analysis tools to detect the particles and set up a dedicated monitoring campaign between 11 January and 18 February.

“We have seen about 11 such events over that time period, and more are being discovered as we get better at analyzing and processing the data,” Lauretta said. “Three of those events have been substantial, with dozens or over a hundred particles being ejected clearly into the asteroid environment.”

The ejected particles are centimeters to tens of centimeters in size and leave the surface at speeds ranging from tens of centimeters per second to a few meters per second, according to the team.



A jet of particles (center) coming off of asteroid 101955 Bennu on 19 January. This image combines a long exposure from OSIRIS-REx’s navigational camera with a short exposure of the asteroid surface. Mission scientists did not expect Bennu to be an active asteroid. Credit: NASA/Goddard/University of Arizona/Lockheed Martin

“Some of them have been observed to fall back onto the surface,” Lauretta said. “Basically, it looks like Bennu has a continuous population of particles raining down on it from discrete ejection events across its surface.”

Some slower moving particles “are ending up in orbit around Bennu. It’s creating its own set of natural satellites,” he said. “That has never been seen before in any solar system object in history.”

Unexpected and Exciting

The team said that despite the unexpected discovery of particle jets, there is a very low probability that one of the particles will strike OSIRIS-REx in orbit. The researchers are continuing to monitor Bennu for more ejection events, hoping to discover where the ejections are coming from, when they might happen, and what might be causing them.

“This is incredibly exciting,” Lauretta said. “We don’t know the mechanism that is causing this right now. In fact, we’re still learning how to process the data, analyze the information, and make sense of what’s going on at this asteroid.”

By **Kimberly M. S. Cartier** (@AstroKimCartier), Staff Writer