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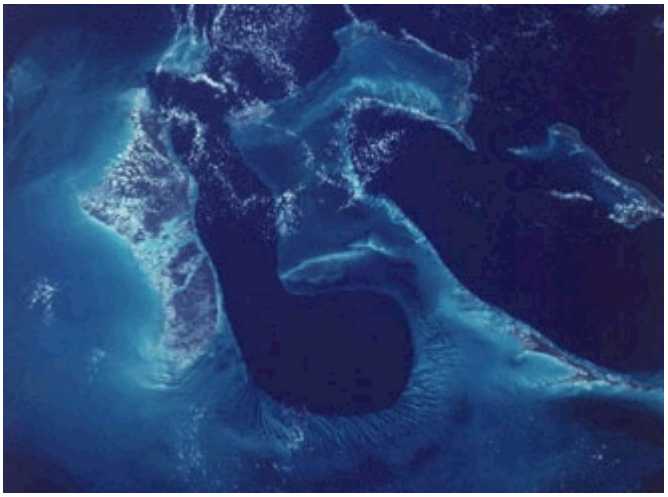
Neutrino Whispers in the Sea

Listening to the ocean may help researchers solve a long-standing mystery about ultrahigh-energy neutrinos--namely why there seem to be more of the elusive particles than theorists can account for. A team of physicists has begun using a Navy sonar station in the Bahamas as a detector for ultrahigh-energy neutrinos. They hope the data they generate about the particles' energies will help sort out the puzzling surplus.



Big blue neutrino detector. The patch of ocean where scientists hope to catch ultrahigh-energy neutrinos.
CREDIT: G. GRATTA

Neutrinos are extremely light particles that rarely interact with matter. Low-energy neutrinos, generated in the sun's nuclear furnace, are routinely caught by detectors in huge tanks of water deep underground. But higher energy neutrinos are too rare to be detected this way--only a handful hit a square-kilometer area in a century. So rather than carting the water to the detector, researchers have taken the detectors to the water. One group is building a detector deep in the Antarctic ice, and two other efforts are under way on the Mediterranean seabed. All these detectors are limited by the fact that light--given off when neutrinos interact with matter--doesn't travel well in water.

Sound, on the other hand, does. In a paper in the June issue of *Astroparticle Physics*, Georgio Gratta and his colleagues at Stanford University and the Scripps Institution of Oceanography describe a plan for using a Navy sonar array near Andros Island. The sonar picks up tiny vibrations created when water is heated by chain reactions started when the high-energy neutrinos slam into atomic nuclei. Acoustic detection was an early favorite of neutrino enthusiasts, but has only recently been made feasible by advances in instrumentation and computing.

Since writing the paper, Gratta's team has collected 3 months of data that are being used to calibrate the system. When the calibration is finished, the team can turn to the mystery of the extra neutrinos. Cataloging their energies and number should help theorists figure out the source of the neutrinos, which in turn should help them choose among the competing theories that explain the surplus.

"From what I've seen it looks very encouraging, though there is a lot of work to be done," says John Learned, a physicist and neutrino astronomer at the University of Hawaii, Manoa.

--KONSTANTIN KAKAES

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