One reason astronomers believe something interesting is happening in that window is that phenomena tend to disappear within it. EGRET, out in space, has picked up low-energy gamma rays coming from a few dozen so-called active galactic nuclei (AGN), which are thought to be powered by the accretion of material around a massive black hole. But on the ground, facilities tuned to the higher end of the gamma ray spectrum, such as the Whipple Observatory, have only spotted one of these sources. In between the high and low energies, gamma rays from almost all of these objects are cut off. But at what level? "That's the big mystery," says Rene Ong, who heads a University of Chicago group collaborating with Tümer's team.

Knowing the cutoff level of AGNs could help illuminate a number of phenomena, including a fog of infrared photons that shrouds the universe. Some of the gamma rays from distant AGNs never even reach Earth, presumably because they are weakened by this fog. Determining the energies of these rays would give researchers their first probe of the density and nature of this mysterious infrared background, says Salamon. A complete gamma ray spectrum for AGNs might also resolve a debate about the nature of the huge jets of material commonly found shooting out from the centers of these nuclei. One camp of astrophysicists argues that the jets are largely made up of electrons and positrons; the other camp prefers protons and atomic nuclei. Each side makes slightly different predictions about what energy gamma rays the jets should emit, so observations in the unexplored part of the spectrum "might settle this important question," says Lamb.

Settling that and other questions, astronomers say, can be done with mirrors. Gamma rays themselves can't penetrate the atmosphere, but when one hits, it prompts a cascade of electron-positron pairs whose rapid movements generate shock waves. These shocks produce a cone of so-called Cerenkov light. Lower energy gamma rays produce less Cerenkov light than higher energy rays do, and so "to get to low energies, you need to collect as many Cerenkov photons as possible," says Salamon. Solar One's mirrors, each measuring 20 feet by 20 feet, could, if combined, provide a collecting area 750 times the size of Arizona's Whipple.

Those exploring this approach are starting small, however. In August, Tümer, Ong, and their colleagues showed that they were able to detect Cerenkov light with just 3 heliostats. Each mirror reflected light to its own photomultiplier tube, allowing the researchers to pick out of the background light nanosecond-length intense pulses that are typical of Cerenkov radiation. If further tests are successful, astronomers may then make a formal proposal to operate 50 to 300 heliostats at Barstow, says Ong. With 300 mirrors, Tümer estimates, Solar One could observe gamma rays ranging from 10 GeV to 500 GeV, bridging the gap between ground-based measurements and those made in space.

Solar One may face some friendly competition on another continent. In southern France, Patrick Fleury of Ecole Polytechnique heads a team investigating a solar power plant in Themis. Although Themis has many fewer mirrors than Barstow has, the site has a number of advantages, notes Fleury. It is at an elevation of 1500 meters, much higher than Barstow, and suffers less light pollution, both of which mean Cerenkov cones should be easier to see. By the end of the year, Fleury's group plans to conduct a test run with six heliostats; the eventual goal would be to bring all of the site's 160 heliostats on line, Fleury says, allowing astronomers to observe gamma rays as weak as 30 GeV.

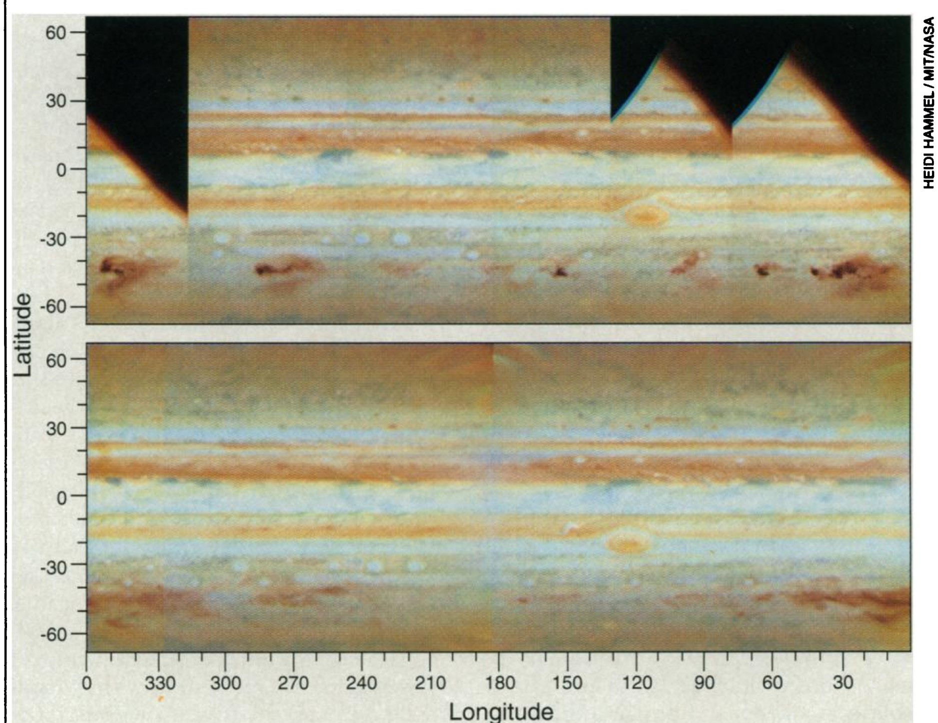
Not all gamma ray astronomers, however, are ready to embrace conversions of Solar One or Themis. They argue that filling the gamma ray gap demands a specialized new detector. "To think you can do it with petty cash and a solar farm is fanciful," says Trevor Weekes of Whipple Observatory. One concern, for instance, is that the Solar One and Themis plants may be able to collect the Cerenkov light from a broad spectrum of gamma rays, but are not well set up to inform astronomers exactly what energy gamma rays produced the light.

As a result, rather than retool solar power plants, some gamma ray astronomers are drawing up plans for next generation detectors such as the "Big Bowl," a 500-meter-diameter hole lined with custom-designed mirrors. But even Salamon, who originated the Big Bowl notion, warns that the $100 million to $150 million needed to construct such a telescope is not likely to be available anytime soon. "It might turn out, for the financial reasons alone, that the solar power plant is the way to go," he says.

–John Travis

PLANETARY SCIENCE

A Giant Licks Its Wounds



Jupiter won't be shaking off the effects of July's impacts by comet Shoemaker-Levy anytime soon—that's what the latest images from the Hubble Space Telescope show. Contrary to some early predictions, the dark splotches of high-altitude debris, shown in a view of the planet's entire surface on 23 July just after the last impact (*top*), were still visible a month later (*bottom*). But they are fading as the debris is stretched along latitude bands by Jupiter's fierce winds and drifts southward, where it encounters winds blowing in the opposite direction and forms swirls. Heidi Hammel of the Massachusetts Institute of Technology, who produced the images, guesses that the debris could be around for a year or two—plenty of time for astronomers to catch more of the healing process.

–Richard A. Kerr