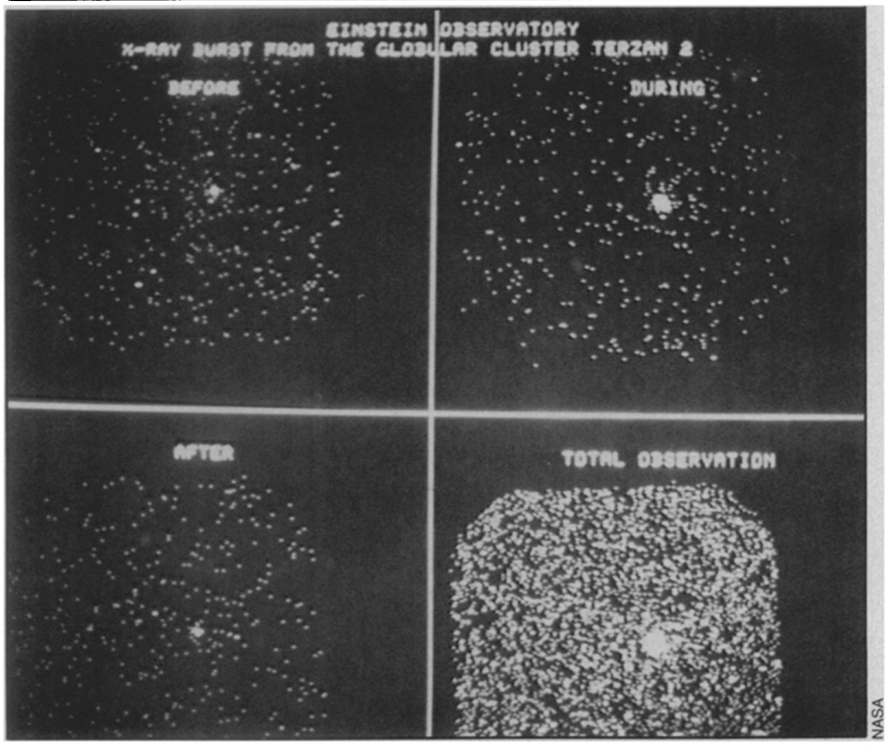
An X-ray burster caught in the act



X-ray bursters, X-ray sources that emit sudden bright outbursts, inhabit the centers of some of the globular clusters of stars that surround our galaxy. For the first time, Jonathan Grindlay of the Harvard-Smithsonian Center for Astrophysics and other X-ray astronomers have managed to take a picture of an X-ray burster having an outburst. They used the imaging X-ray telescope on the HEAO-2 satellite. The actual burst lasted about 50 seconds out of a total observing time of 20 minutes. The burster is located within 2 seconds of arc of the center of the globular cluster Terzan 2.

New infrared telescope eyes Jupiter

The planet Venus is frustrating enough, hidden from potential observers by its dense, hazy atmosphere. The atmosphere contains many clues to the planet's nature and evolution, but the hardrock world itself has been both source and reservoir for the gases that surround it today. Fortunately, there are at least radar studies and data from a few robot landing craft to give some idea of the nature of the surface.

With Jupiter, however, the atmosphere is essentially the whole show; many researchers believe that there may be virtually no "planet" at all at the center of what thus would be just a ball of increasingly compressed gas. Understanding Jupiter, then, becomes in large measure a matter of understanding the depths of its atmosphere, and apart from perhaps an hour of data to be gathered by the atmospheric entry probe of the mid-1980s Galileo mission, a major key to the inner reaches of the gasball consists of measurements in the infrared. The atmosphere gets hotter with depth, so infrared temperature measurements can reveal the locations of "windows" through which to observe the chemistry and dynamics of the ball at different levels.

A formidable new tool for such studies went into operation this month atop Hawaii's lofty Mauna Kea: a three-meter infrared telescope operated for the National Aeronautics and Space Administration by the University of Hawaii's Institute for Astronomy. The instrument only achieved "first-light" — its first successful optical imaging — on May 2, and the overall facility will not be fully operational until the end of the year. But already it is being turned toward Jupiter's atmospheric windows, in support of the upcoming Voyager 2 spacecraft encounter.

Though Voyagers 1 and 2 have a much closer view than any instruments on earth, the spacecraft need the telescope's help. The Voyager infrared instruments can isolate tiny Jovian features for scrutiny, but the computer commands that aim the sensors must be sent to the spacecraft weeks ahead of time. And that's the problem.

Just like Jupiter's visible features, the giant planet's infrared aspect changes — and sometimes more so. New cloud layers form in mere days, blocking infrared emissions from below, while other clouds dissipate or shift position. Thus the Voyager project team includes a "target-selection working group" whose job is to second-guess such changes, in hopes that when the spacecraft arrive, deep "windows" will exist where the infrared instruments are looking. "You look at a planet half a billion miles away," says the group's coordinator, Richard J. Terrile of Jet Propulsion Laboratory in Pasadena, "and you're essentially trying to predict weather one month in advance."

In mid-December of last year, for example, says Terrile (who was using data from the five-meter Palomar telescope and a 2.2-meter instrument on Mauna Kea), Jupiter's north equatorial belt was considerably brighter by infrared (hence hotter, and deeper in the atmosphere) than the corresponding southern-hemisphere feature. During the next few weeks, the northern belt began to darken — presumably from the formation of a high, cold cloud layer — but Terrile's team predicted that it would still be a better infrared target than the southern belt. The prediction, he says, seems to have been successful, giving Voyager 1's IR sensor a close-up of "some of the hottest areas on the planet."

Now the new Mauna Kea telescope is adding to the Jovian weather-watch for Voyager 2, and Terrile may assemble his existing data (taken at the key wavelength of 5 microns) into an infrared "movie" showing the planet's whole circumference. Later on, the new telescope will aid the 1980 and 1981 Voyager encounters with Saturn, as well as the Galileo Jupiter mission and other planetary studies. In addition, some of the instrument's time will go to more distant targets such as galactic nuclei and interstellar dust. □