

ASTRONOMY

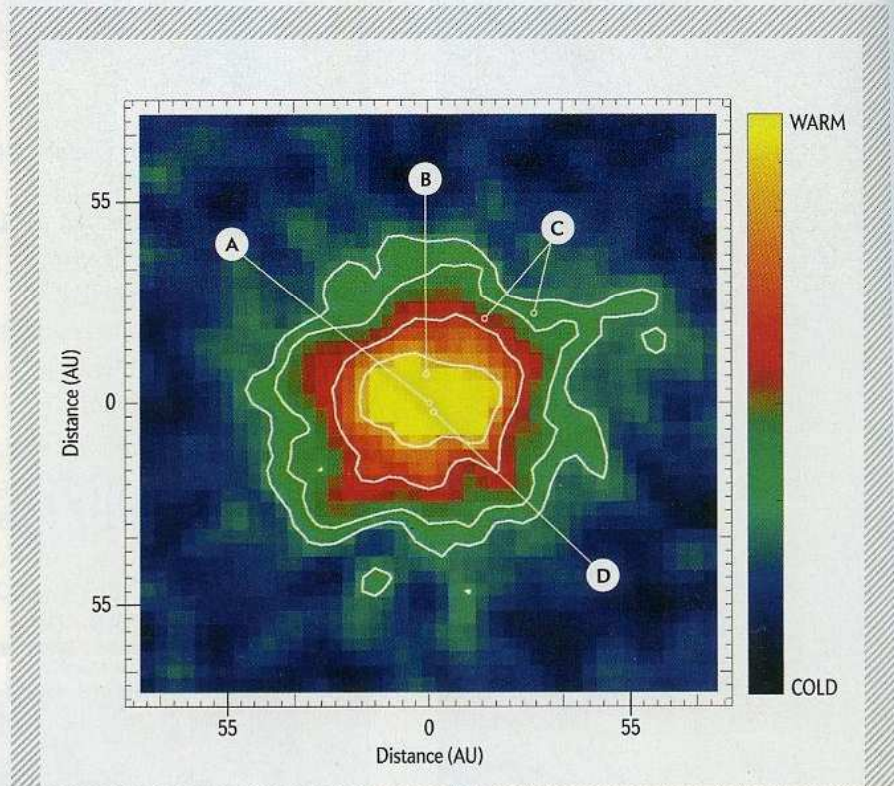
The Dust Belt Next Door

A nearby solar system shares features with our own

Shining just 12 light-years from Earth, the star Tau Ceti so resembles the sun that it has appeared in numerous science-fiction stories and was the first star astronomers ever searched for signs of intelligent life, half a century ago. In 2012 Tau Ceti grew still more intriguing when astronomers reported five possible planets somewhat larger than Earth circling closer to the star than Mars orbits the sun—one of which is in the star's habitable zone. Newly released far-infrared images taken by the Herschel Space Observatory yield even more insight about Tau Ceti's solar system: greater detail about its dust belt.

Dust arises when asteroids and comets collide, so its location reveals where these dust-creating objects—which are too small to be seen directly—orbit a star. In Tau Ceti's case, "it's quite a wide dust belt," says Samantha Lawler of the University of Victoria in British Columbia. As her team reported in November, the belt's inner edge is roughly two to three astronomical units (AUs) from the star, which is the position of our own sun's asteroid belt. (An AU is the distance from Earth to the sun.) Tau Ceti's dust belt extends out to 55 AU, which would be just beyond our system's main Edgeworth-Kuiper belt, the zone of small bodies whose largest member is probably Pluto. Presumably full of asteroids and comets, Tau Ceti's dust belt most likely lacks a planet as large as Jupiter, Lawler says. The gravity of such a massive planet would have ejected most small space rocks.

Within a year a new array of radio telescopes in Chile called ALMA should provide a sharper view of the disk, especially of its inner edge. The ALMA images will help astronomers deduce whether the star's five proposed planets are indeed real. If the disk overlaps the planets' hypothesized orbits, then they probably do not exist; they would have expelled most asteroids near



A Look at Tau Ceti

Published in the November 1, 2014, issue of *Monthly Notices of the Royal Astronomical Society*, the far-infrared image above reveals Tau Ceti's dust belt at a previously unseen level of detail.

—K.C.

A TAU CETI. The star, located at the image's center, heats the dust particles that orbit it.

B WARM DUST. The dust radiates that heat at far-infrared wavelengths, picked up by the Herschel Space Observatory. Yellow denotes the brightest radiation, which comes from the particles orbiting closest

to the star because they are warmest.

C COOL DEBRIS. Red indicates cooler dust, and green indicates the coldest and most faraway particles.

D PLANETS. The five possible planets orbiting Tau Ceti are so close to the star that their orbits would be difficult to see at this scale.

the star, removing the source of dust.

If those planets do exist, however, Lawler's team suggests that Tau Ceti's planetary system may resemble what our solar system would have looked like

had the four giant planets—Jupiter, Saturn, Uranus and Neptune—never formed: small planets orbiting close to the star, and nothing but asteroids, comets and dust beyond. —Ken Croswell