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A Binary Potentially Forming Separate Planetary Systems

Astronomers are presenting today a radio image of the forming stellar system L1551-IRS5 which suggests that this young system is actually a close (50 Astronomical Units separation) binary with individual circumstellar disks. The presence of these circumstellar disks indicates that even close binary systems may be capable of forming planets. This finding is being announced at the American Astronomical Society meeting in Toronto, Canada by Mr. Leslie Looney and Dr. Lee Mundy of the University of Maryland and Dr. Jack Welch from the University of California Berkeley.

The young star in this study, L1551-IRS5, is one of a number of sun-like stars forming in the molecular cloud L1551 in the constellation of Taurus. At a distance of 450 light years, the Taurus clouds are among the nearest star-forming regions in our Galaxy and hence among the best studied. L1551-IRS5 itself is optically invisible, but shines brightly at near infrared wavelengths. Since its discovery, L1551-IRS5 has become one of the best known, and best studied, examples of a young forming star.

The image presented today provides the first high resolution view of the circumstellar disk material that blocks the optical light from the young stars. This material actually appears bright in our image due to thermal emission from the dust (the same dust which blocks optical light). The presence of two individual disks in the L1551-IRS5 system, rather than a single larger disk, surprised astronomers, both because it was thought to be a single star system and because massive circumstellar disks were not thought to be stable in close binary systems. Although we cannot directly resolve the individual disks, it is likely, on dynamical grounds, that the disks are much smaller than their 50 AU separation. While these observations are not currently capable of directly detecting planets, such disks are the most promising sites for future planet formation.

What is being seen in the L1551-IRS5 system is an early stage in the formation of a binary stellar system where material participating in the formation process still surrounds the young stars and is accreting onto the circumstellar disks. This provides an exceptional opportunity to examine star formation in a close binary system and make comparisons to star formation in known single star systems. By investigating different types of systems, astronomers gain insight into the conditions during the formation of our own Solar System.

The image was obtained with the Berkeley-Illinois-Maryland Association (BIMA) Millimeter Array, which consists of nine dish antennas, each six meters (20 feet) in diameter, located in Hat Creek, California (for more information about the Array see http://bima.astro.umd.edu). The high angular resolution capability of the BIMA array allows for the study of solar-system sized circumstellar disks around the nearest young stars. These images provide an unprecedented view of the formation and early evolution of solar type stars.

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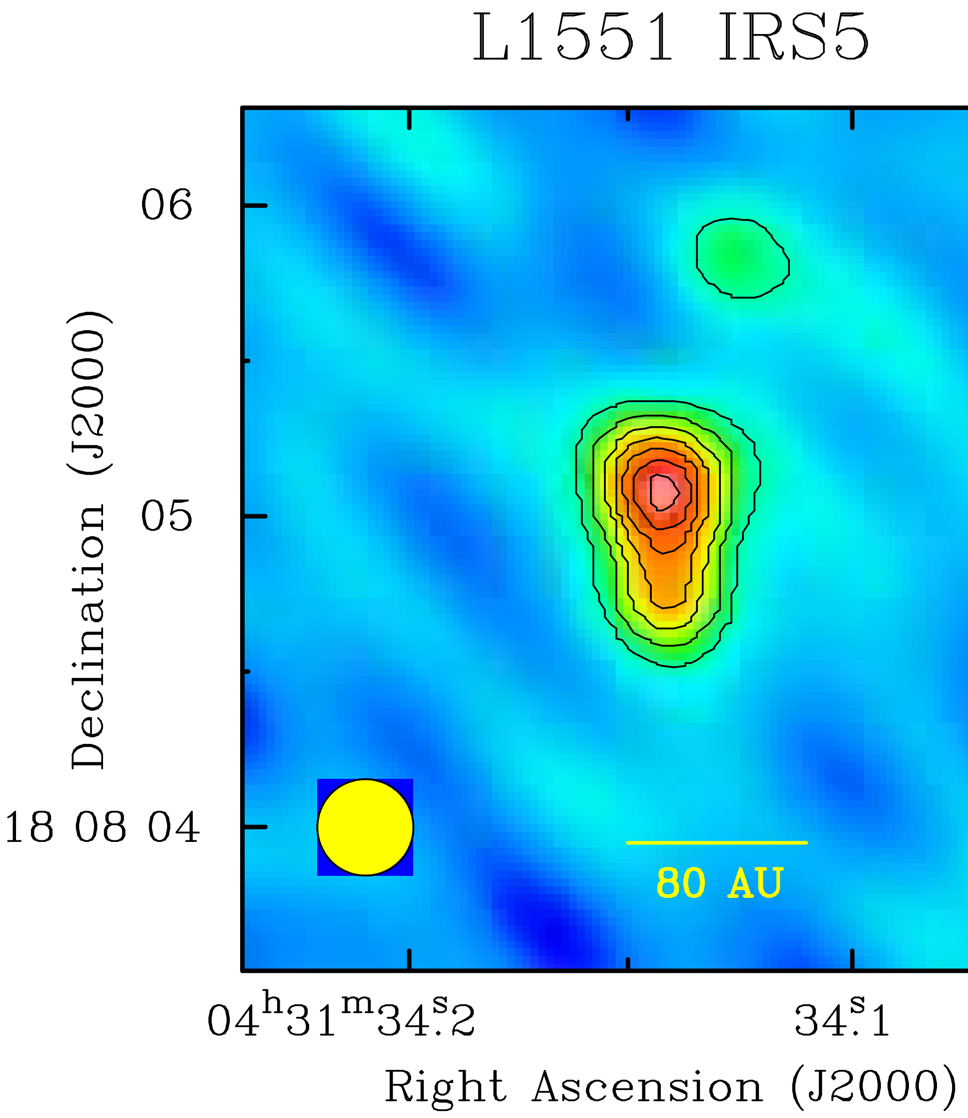

Fig. 1.— Image of the thermal emission from dust in the circumstellar disks around the young binary system L1551-IRS5 as seen at millimeter radio wavelengths. The bar at the lower right corresponds to roughly the size of Pluto's orbit as viewed at the distance of L1551 IRS5; the shaded circle in the lower left indicates the resolution of the image. This image was made with the Berkeley-Maryland-Illinois Array and was presented to the American Astronomical Society meeting in Toronto, Canada January 14, 1997.