Scientists to make stellar observations with airborne observatory

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NASA's SOFIA aircraft is slated to take off this week and use an on-board telescope to peer at distant star-forming regions. Credit: NASA

A University of Colorado at Boulder faculty member is one of two scientists who will use data gathered by a world-class telescope flying aboard a modified Boeing 747 to peer at a distant star-forming region during its inaugural science flight this week.

Known as the Stratospheric Observatory for Infrared Astronomy, or SOFIA, the jet was significantly modified in order to mount a 2.5-meter reflecting telescope in the rear fuselage, said Senior Research Associate Paul Harvey of CU-Boulder's Center for Astrophysics and Space Astronomy, one of the scientists involved in the mission.

The jet will fly at 40,000 to 45,000 feet in altitude, putting it above more than 99 percent of the water vapor in the atmosphere -- which blocks infrared light from reaching the ground -- and will allow scientists to observe stellar targets in wavelengths of light that can't be observed by ground-based telescopes, said Harvey.

The aircraft and telescope were successfully tested in the summer of 2009. SOFIA's Faint Object InfraRed Camera, known as FORCAST, is a versatile camera that collects light from the visible, infrared and sub-millimeter portions of the electromagnetic spectrum, Harvey said.

Harvey will be observing and analyzing the distribution of dust and gas in a young, star-forming cluster known as Sharpless 140 that is roughly 3,000 light-years from Earth in the constellation Cepheus. One light-year is equal to about 6 trillion miles.

"Observing the birth of stars in our own galaxy is critical because planetary systems form at the same time that a central star is formed," said Harvey. "In addition, some of the most luminous galaxies in the universe appear to be powered by extreme bursts of star formation."

Harvey flew on several hundred flights of SOFIA's predecessor, the Kuiper Airborne Observatory, but will not be aboard the first science flight of SOFIA. The second set of observations on this week's SOFIA science flight will be led by Mark Morris of UCLA, who will be targeting star-forming regions in the Orion nebula.

Harvey said the FORCAST camera on the telescope has large, two-dimensional array detectors that are similar to charge-coupled devices found in digital cameras. The goal is to obtain a sequence of images of the star cluster with the telescope, which will move almost imperceptibly between each image in order to sample "sub-pixels."

One advantage of the SOFIA observatory is that scientists can make changes and improvements to the craft's instruments between flights as well as change observing techniques, said Harvey. "These are impossible tasks for orbiting telescopes that have very fixed procedures for the instruments and observations."

He also is working with the FORCAST team to interpret data gathered during the first science flight in order to carefully characterize SOFIA's imaging capabilities for future users.

Harvey said he hopes to build a long-term program of specialized observations on SOFIA that eventually will involve data analysis by CU-Boulder students.

NASA hopes SOFIA will continue to fly astronomical science observations for the next two decades, with research flights expected to ramp up to two or three flights a week by 2015. SOFIA's suite of instruments are expected to gather new information on a wide variety of astronomical targets, including black holes, distant galaxies, the formation of stars and planets, and up close views of comets and asteroids.

Provided by University of Colorado at Boulder