

National Auronautics and Space Administration

Mapping the Infrared Sky Wide-field Infrared Survey Explorer

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Science Objectives

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What is infrared?



Why Cryogen?



Bonus SCIENCE





Sun Synchonous Orbit?

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Wide-field Infrared Survey Explorer

WISE is a NASA Explorer mission that will produce a catalog of some 500 million objects and images of the sky in four infrared wavelengths. The scientific legacy of the WISE atlas will endure for decades.



Find the most luminous galaxies in the Universe. Find the closest stars to the Sun. Detect most Main Belt asteroids larger than 3 km.

Enable a wide variety of studies ranging from the evolution of planetary debris discs to the history of star formation in normal galaxies.

Provide an important source catalog for the James Webb Space Telescope (JWST).





What is Infrared?

Infrared radiation (IR) is light at colors (or wavelengths) beyond the visible range the human eye perceives. Extremely hot objects like the Sun radiate primarily at visible wavelengths, while warm objects like planets or red stars radiate primarily at IR wavelengths. A well-known application for infrared imaging is "night vision" cameras. IR also lets us see through dust that blocks visible light. WISE will use megapixel IR cameras, while the existing IR all sky survey was done with only

62 pixels.



Here the constellation Orion is shown in visible and infrared light. The bright spots in infrared reveal regions where stars are born. WISE will observe the same region but with far greater resolution and sensitivity.





Optics on ICE

Cryogen, or a substance for producing low temperatures, is essential to the success of the WISE telescope. The cryostat is a vessel, similar in construction to a beverage vacuum flask, used to maintain cold temperatures. In this case, solid hydrogen cools optics and detectors down to near absolute zero. Without it, the detectors would be overwhelmed by IR radiation from the warm telescope and the detectors themselves.

What is a Sun Synchronous Orbit?

WISE will circle the Earth, cart-wheeling once per orbit, always pointing the telescope away from the Earth while aiming its solar panels toward the Sun. WISE will travel along the line separating night and day on the Earth, mapping out a circle of images of the sky. As Earth orbits the Sun, WISE's orbit also rotates to stay over the day/night line, so that the circle of images sweeps around the entire sky in 6 months.

Asteroids

Asteroids are similar in temperature to the Earth and hence radiate primarily in the infrared. WISE will detect roughly a thousand new asteroids each day. Asteroids emit in the infrared even if they have dark surfaces reflecting little visible light, so WISE will provide an unbiased sample. Besides discovering asteroids, the WISE data will help in refining the orbits of known asteroids and determining their sizes. Both pieces of information are critical in assessing

risks from Near Earth Objects, and in understanding how the solar system evolves.

WISE will detect most of the Main Belt asteroids larger than 3 km, providing reliable diameters for them. WISE's Education Program will allow students to conduct research on these asteroids using real data from the mission.

This simulated composite of a WISE image demonstrates how the motion of an asteroid will be easily detected.

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