

European Space Agency (ESA)

DATA FROM OUTER SPACE

Launched by an Ariane 5 rocket on 14 May 2009, the ESA "Herschel" telescope is delivering image and spectroscopic data from outer space, and the astrophysical world is raving about it.

Telemetry data and information on steering and calibrating scientific on-board instruments is managed in an object database from Versant.

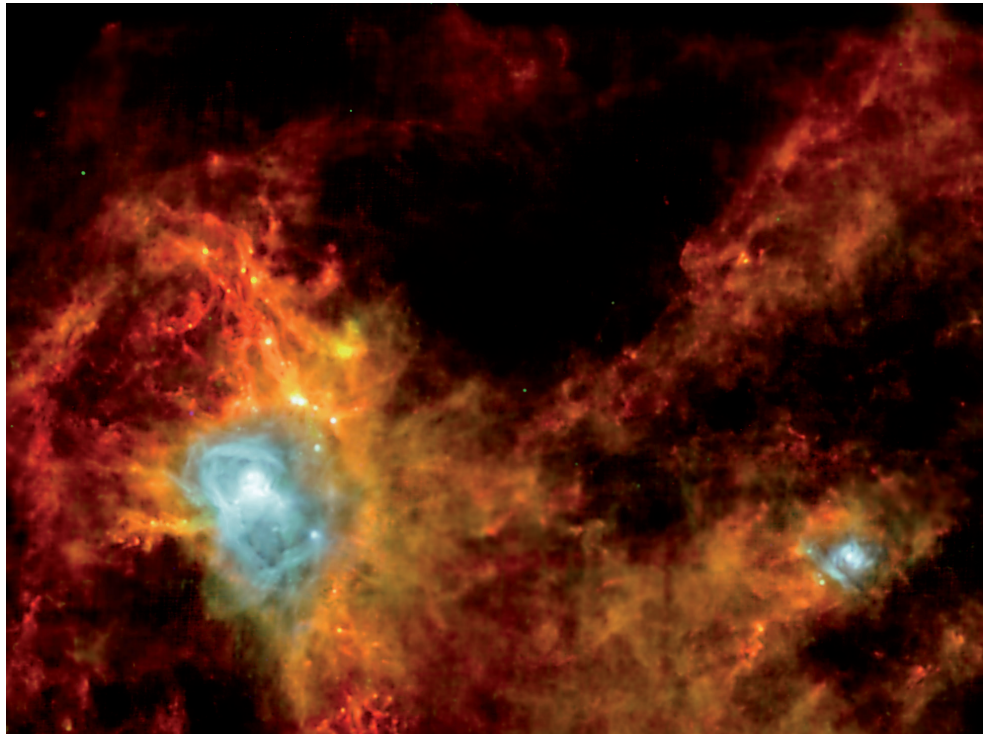


Photo: ESA/NASA - SOHO/LASCO, "Inside the dark heart of the Eagle"

Outer space offers some very tough conditions for the European Space Agency's (ESA) Herschel Telescope. "Infrared radiation, high-energy particles from solar eruptions and other events are constantly bombarding the measurement equipment on board.

Satellite parts which we keep shadowed from the Sun at all times are icy cold while other parts, such as boxes containing electronic equipment, have to be kept at room temperature," describes Dr. Johannes Riedinger, Herschel Mission Manager, stationed at Noordwijk (The Netherlands). "Thus, instruments have to be monitored regularly and re-calibrated as needed by ground personnel."

The satellite, whose orbit is near the Earth-Sun Lagrange point L2, some 1.6 million kilometers from the Earth, is carrying the largest telescope ever flown: 3.5 meters in diameter. On board are three highly sensitive scientific measurement instruments.

"To ensure that the spacecraft and instruments are operated near their optimum settings we need permanent feedback from the Instrument Control Centers," adds Dr. Riedinger. On previous ESA missions, the teams responsible for the

in-flight instruments had to use a multitude of tools to analyze critical instrument data extracted from various files.

EASILY STORE AND RETRIEVE DATA

"With the Versant Object Database, we now have a technology at our fingertips that has significantly simplified our work," tells Dr. Riedinger. "The data obtained from the satellite is available in the Versant database on the same day."

Object databases are particularly suitable for managing complex and networked data structures. Once stored, the data is more easily and quickly retrieved compared to conventional database systems. For example, cross-references and pointers are directly mapped in the database and greatly simplify data navigation and queries. "The object database permits much more direct data access," says Dr. Riedinger.

FASTER ANALYSIS – MORE SCIENCE

"Faster and better understanding of the instrument data results in more efficient operation of the satellite, which ultimately means more and better scientific information."

"The object database permits direct and navigational access to the data."

We expect this to be reflected in faster and better understanding of the instruments and to result in more efficient operation of the satellite, which ultimately means more scientific information."

Dr. Johannes Riedinger
Mission Manager
Herschel Science Center

Faster and better analysis of instrument data is a significant improvement over previous projects. The new system reduces the time it takes to feed the improved parameter settings to Herschel's on-board instruments for upcoming observations. It also reduces the time required for the requested information from observations to reach the astronomers. Ultimately, this will improve the scientific return from the mission.

SEARCHING FOR HIDDEN STARS

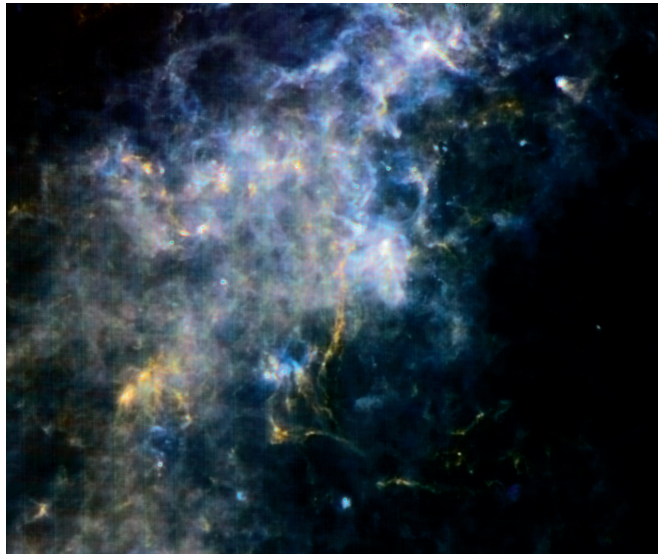
The Herschel team uses Versant's object database to manage telemetry data and observation programs recommended by astronomers. After the May 2009 launch Herschel started transmitting measurement data to the ground operations centers, providing the scientific community with many years' worth of research data.

The telescope collects far infrared and sub-millimeter light and is able to discover extremely cold objects which radiate

Herschel infrared image of a reservoir of cold gas in the constellation of the Southern Cross.

That a dark, cool area such as this would be bustling with activity, was unexpected. The images reveal a surprising amount of turmoil: the interstellar material is condensing into continuous and interconnected filaments glowing from the light emitted by new-born stars.

*Photo:
(c) ESA / SPIRE consortium*



no visible light and previously invisible objects that have been hidden by clouds of dust and gas.

"The data enables astrophysicists all over the world to draw conclusions about the creation of stars and galaxies and will tell them more about the molecular composition of the universe," explains Dr. Riedinger.

MAGNITUDE: GIGABIT AND TERABYTE

Every day, the Herschel telescope collects an average of six to seven gigabit raw telemetry data and manages the data in an on-board storage facility. The data is downloaded during a daily three hour window to one of two satellite stations on the ground, one being located north of Perth, Australia, the other north of Madrid, Spain. From here the data is transmitted to the ESA satellite control center in Darmstadt, Germany, and forwarded to the scientific control center in Madrid, Spain.

Once having been decompressed, data is stored in a Versant Object Database and replicated for use in the national Instrument Control Centers (ICCs) in Groningen (The Netherlands), Garching (Germany) and Oxfordshire (UK).

By the end of Herschel's useful life of about 48 months, the Herschel Science Archive will contain a minimum of 50 terabyte of data, which will be available

VERSANT - HIGHLIGHTS

- Versant Object Database
- object-oriented
- Java interface
- direct access to data
- supports complex, networked data
- server queries
- distributed databases
- terabyte databases



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to the scientific community – astronomers and other interested parties - for analysis for another 20 years.

INFORMATION FOR EVERYONE

ESA will be able to supply any kind of data, for example images in different "colors" in the infrared range or simply raw data.

See more at:

<http://www.esa.int/SPECIALS/Herschel/index.html>

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