Jason-3

DOPPLER ORBITOGRAPHY AND RADIOPOSITIONING INTEGRATED BY SATELLITE (DORIS)

Background

The Doppler Orbitography and Radiopositioning Integrated by Satellite (DORIS) provides real-time location and precise orbit determination.

DORIS instrument is identical to its predecessor onboard Jason-2. DORIS measurements are also used for geophysical studies, in particular through the International DORIS Service (IDS). DORIS is a dual-frequency system able to determine atmospheric electron content.

Benefits

The location and orbit information is essential for providing altimetry data in real time or near-real time.

DORIS is also a terrestrial positioning system that has many applications in geodesy and geophysics.

Key Measurements

The Diode onboard navigator locates the satellite on orbit in real time. DORIS uses an up-link radiometric system based upon precise Doppler measurements. DORIS orbitography beacons transmit signals to the satellite at two frequencies, 2 GHz and 400 MHz, well-suited to compensate ionospheric effects. The receiver onboard the satellite analyzes the received signal frequencies to calculate its velocity relative to Earth. This velocity is used to feed orbit determination models in order to derive the satellite's position on orbit to within two centimeters on the radial component.

DORIS Instrument-at-a-Glance

Purpose: To provide precise orbit determination for Jason-3.

Instrument Contractor:
Thales Systèmes Aeroportés
under CNES contract

Key specs:
Velocity: 0.3 mm/s
Phase noise: 2 to 3 mm
Orbit radial component: better than 3cm rms in real time on board; better than 1cm rms off line on ground
Mass: 20kg
Average Power: 23W
Average Data Rate: 1.5kb/s

Websites:
http://ids-doris.org/
http://www.aviso.altimetry.fr/en/doris/index.html
http://www.nesdis.noaa.gov/jason-3/spacecraft.html

Unlike other navigation systems such as GPS or GLONASS, DORIS is a centralized system. Line-of-sight velocity measurements between the network transmitting stations and the space-borne receivers are currently collected and pre-processed by one unique control center located in Toulouse (Mission center). This allows a permanent health and integrity check of the system.

DORIS also measures ionospheric electron content. By measuring and comparing the path delay of signals transmitted at two separate frequencies, DORIS is able to calculate the electron content in the atmosphere.