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# DORIS - Doppler Orbitography and Radiopositioning Integrated by Satellite

DORIS is a Doppler satellite tracking system developed for precise orbit determination and precise ground location.

The DORIS system, designed and developed by the CNES (the French Space Agency), in collaboration with GRGS (Space Geodesy Research Group) and IGN (French Geographic Institute), has a dual purpose.

This dual capability has enabled DORIS to be used in numerous applications since 1990. The system is used in ocean or ice field altimetry missions such as Topex/Poseidon, studies of the shape and movements of the Earth, as well as many location services where different satellites are equipped with the DORIS receiver. Operational since the launch of the remote sensing satellite SPOT-2, this system is used to determine the position of the satellite to within 10 cm in realtime, and about 1 cm after ground processing. The sys-

tem also measures and calculates the ionospheric correction. Accurate knowledge of satellites' orbits is essential for altimetry missions that measure sea level. This monitoring of the oceans is a major objective for the scientific community. Rises in sea level due to the potential effects of global warming could have disastrous consequences for many areas in the world.

## Reference point stations

To be able to accomplish these measurements, the DORIS system is using a network of about 60 ground stations as reference points on Earth. Each of these reference point stations is equipped with the Vaisala Combined Pressure, Humidity and Temperature Transmitter PTU200, providing accurate local reference data on

all of these parameters at the installation site. On the satellite, an antenna pointed towards Earth receives radio waves emitted by ground stations in the DORIS network. An electronic receiver measures the frequency shift caused by the Doppler effect.

During 2000-2002, Vaisala has delivered approximately 70 PTU200 transmitters to the Toulouse-based company S.M.P., a major international provider of satellite communication systems, data transmission, data processing (Telecommand, Telemetry and control) and microwave products. S.M.P. has integrated the transmitters into their own aforementioned reference stations.

## Three-in-one measurement

The PTU200 transmitter is a mature, well field-proven product,

which combines three measurement parameters: pressure, temperature and humidity. The applications of the PTU200 range from calibration laboratory environmental condition monitoring, to laser interferometer active wavelength compensation, and GPS meteorological measurements. The PTU200 transmitters are available with one or two pressure transducers. Three different kinds of sensor heads can be used with the PTU200. The transmitters use a RS232 or RS485 serial interface and they are also available with a local display. In outdoor applications, it is recommended to use the PTU-200MIK Outdoor Installation Kit. In addition, a mounting tripod is available for temporary field installations. ●

Vaisala Combined Pressure, Humidity and Temperature Transmitter PTU200.



The DORIS system.

