

2022 IDS Workshop

DORIS APPLICATIONS IN GEODETIC PROBLEMS

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DORIS APPLICATIONS

- The main application for which DORIS has been employed is for the precise determination of orbit.
- Other main societal applications include the prediction of earthquakes, monitoring of the ocean, climatology, etc.
- Can be considered an important tool for disaster management.



Source: <https://spaceflight101.com/jason-3/jason-3-spacecraft-and-instruments/>

DORIS APPLICATIONS

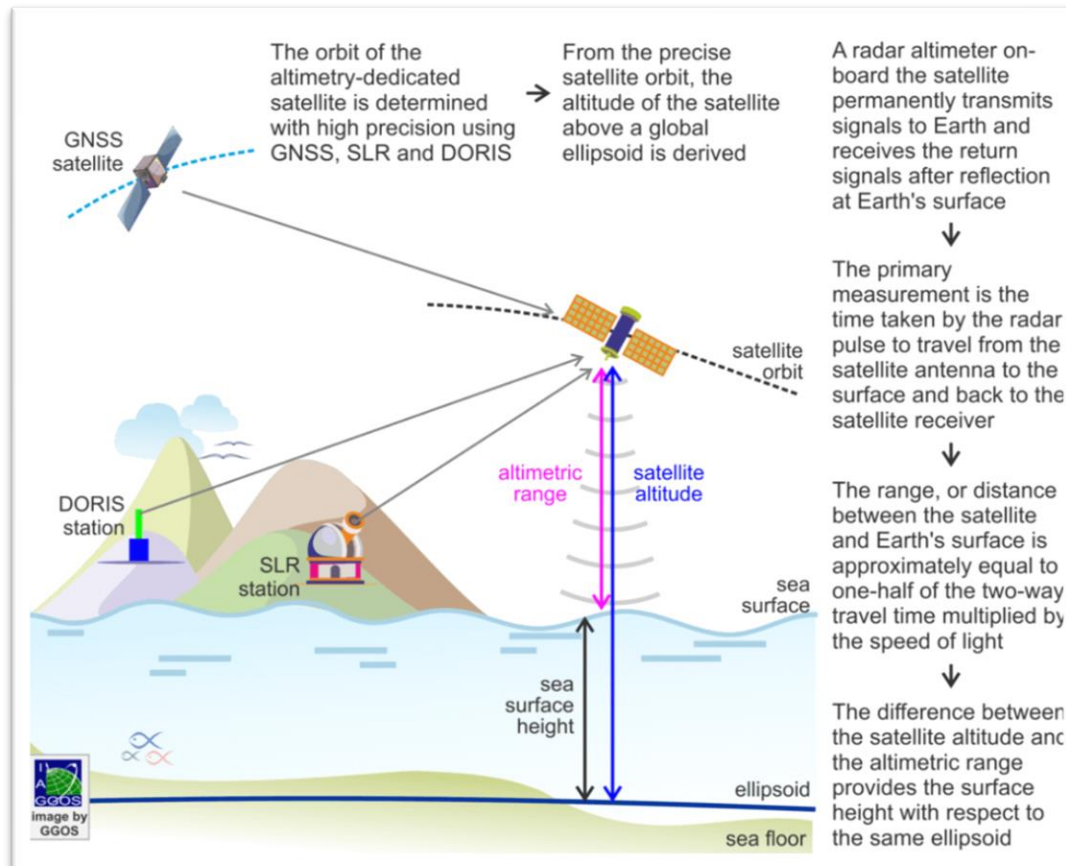
□ Precise Point Positioning

- DORIS provides fast data on ground beacons positions,
- The CLS company provides data services on an operational, commercial basis :
 - Precise point coordinates at remote locations: islands, platforms, secondary reference points, etc.
 - Long-term measurement of geodynamic drifts,
 - Remote monitoring of natural hazard areas (e.g., seismic zones, volcanoes, landslides).

DORIS APPLICATIONS

- DORIS is an excellent satellite tracking system supporting the precise orbit determination of satellites.
- The gravity field variations can also be determined more precisely.
- The DORIS data observations can be combined with GNSS data observations to study plate tectonics movements and earthquake predictions more effectively.
- DORIS measurement residue helps us to better understand and model what occurs in between the layers of the atmosphere which can be used for precise tropospheric modeling.

DORIS APPLICATIONS

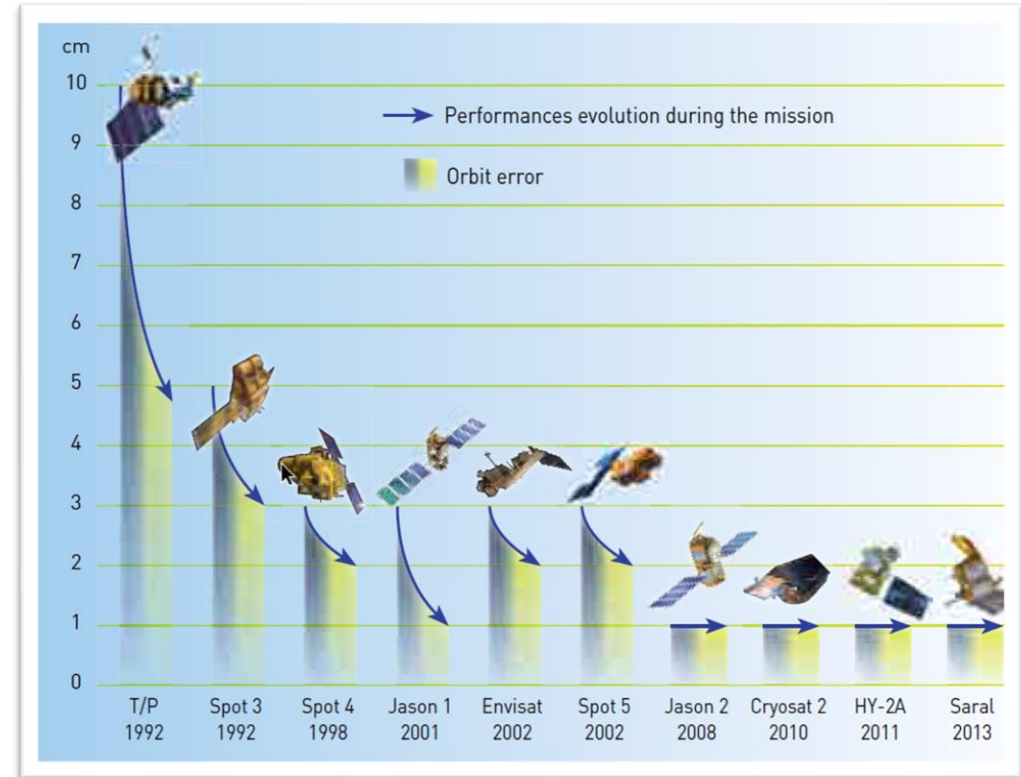


Source: <https://ggos.org/item/satellite-altimetry/>

- SSH = Ellipsoid - Range
- 1) Estimating mean sea surface
 - 2) Marine geoid
 - 3) Vertical and land motion
 - 4) Derive vertical of deflection
 - 5) Mean dynamic topography

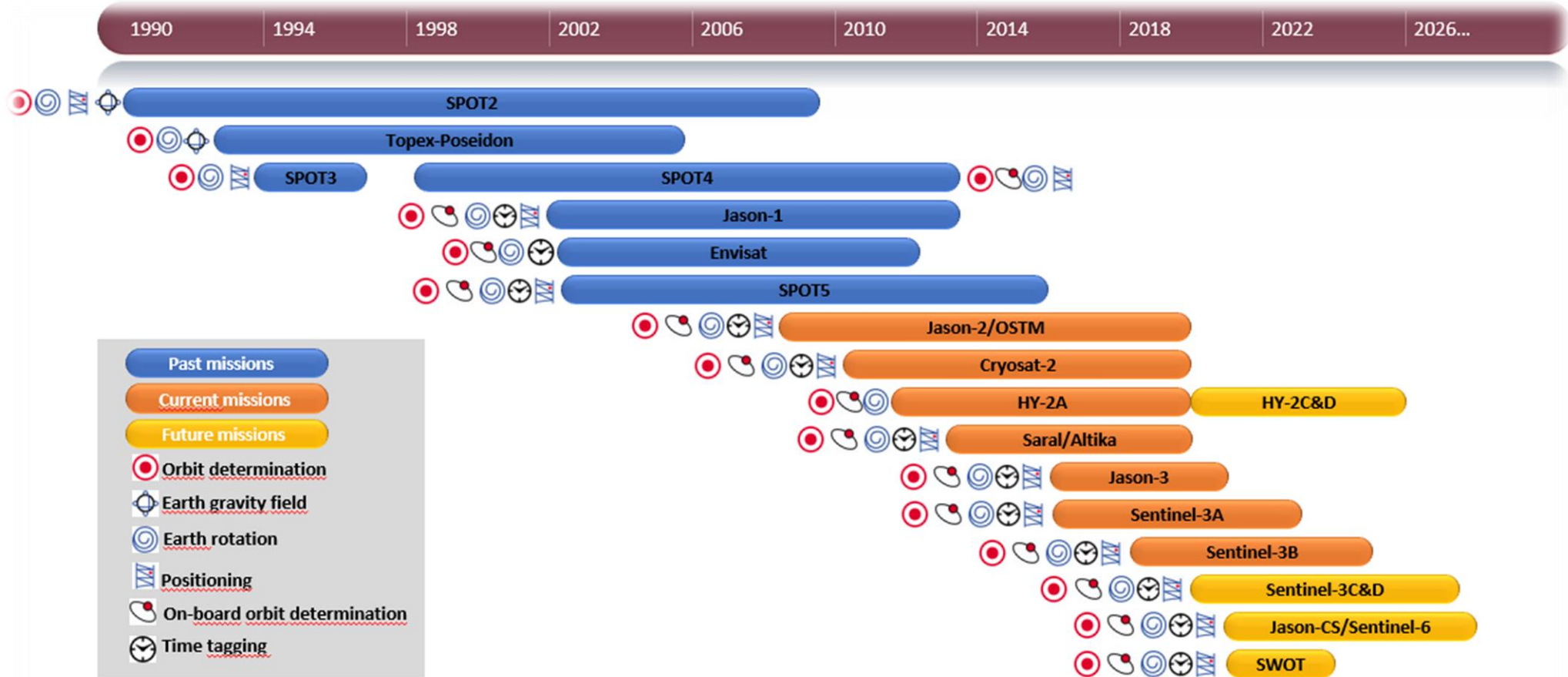
DORIS APPLICATIONS

- DORIS observations are used in Earth systems for defining ITRF which will help in predicting earth movements and can be used effectively in earthquake precursor studies.
- In oceanography, it will help in ocean circulation and climatology studies leading to predicting the changing climate which is of prior concern.



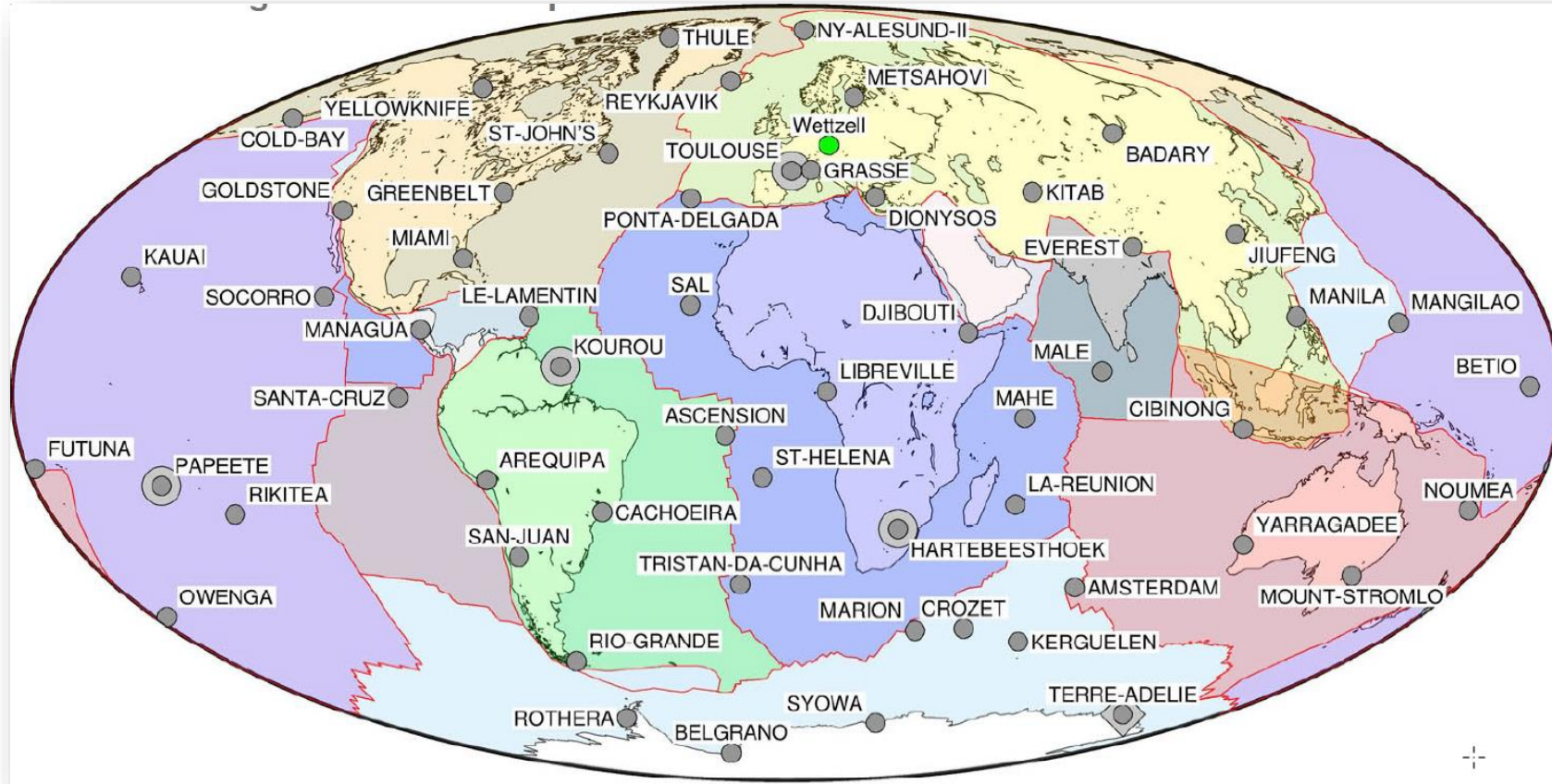
Source: <https://ids-doris.org/images/documents/2015-Leaflet-DORIStheSpaceSurveyor.pdf>

DORIS APPLICATIONS



Source: <https://www.aviso.altimetry.fr/en/techniques/doris/doris-applications.html>

DORIS Network Distribution



Source: EGU General Assembly Conference (2020, May)

DORIS APPLICATIONS

- Presently, the only MALE station is situated on the Indian plate. The proposed station will be used in studying tectonic plate movement and will also be used to explore the combination of IDS and GNSS data to study the same.
- We are submitting a proposal for establishing space geodetic techniques observatories in India (Project Saptarishi) which is a multi-institutional project and includes collaboration between NCG, Indian Space Research Organisation (ISRO), National Physical Laboratory (NPL) and National Centre for Radio Astrophysics (NCRA).
- At NCG-IIT Kanpur, the proposed geodetic techniques are VLBI, SLR, GNSS, absolute gravimeter, InSAR corner reflectors and WVR. The observatory can be used for applications, e.g., colocation surveys and contribution to ITRF (geocentre and scale).

DORIS APPLICATIONS

- ❑ To explore its usage in studying/validating groundwater depletion and its relation to sea-level rise and to investigate the use of orbit perturbations to augment a tailored geopotential model over India.
- ❑ Data from the proposed station can be used to study, augment, and/or validate the EOPs using various space geodetic techniques.
- ❑ To study the tropospheric zenith delays with a combination of space geodetic techniques, including DORIS, and a water vapour radiometer.
- ❑ To explore the utility of IDS in combination with InSAR and GNSS to develop a precise regional plate motion model for defining the horizontal datum for India, which is one of the components of our project on the Indian Geodetic Reference Frame (InGReF).