

DORIS - DIODE / JASON-1, ENVISAT, SPOT5 : THREE AT ONCE !

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Jason-1, ENVISAT and SPOT5 have been successfully launched during the last six months. Those three satellites are equipped with DORIS receivers, including a DIODE navigation function.

There was already one DIODE “navigator” on-board of SPOT4, flown in 1998 as a probatory experiment. This preliminary software only included the routine filter (there was no self-initialisation, no self-programming mode, and no time-tag function at this time). But it keeps on working today after four years in space, providing in real-time an estimation of SPOT4 position/velocity, with an accuracy of a few meters. Its Mean Time Between Failure is about one year, and it is used as the nominal source for image rectification.

The three new DIODE versions in space have been dramatically improved with respect to their “grand-father” :

- Accuracy of the on-board orbit has been highly improved to reach better than 30 cm orbits on Jason-1 radial component, and 1meter in 3D for SPOT5 and ENVISAT.
- A self-initialisation of the navigation function has been added and tested in space, so that there is no need anymore for an initial position upload to start the navigation process.
- A self-programming mode has been designed, and now DIODE decides which is the next beacon to be tracked by the receiver. This new tool frees the Control Center from the burden of daily programming uploads, and has been permanently active for six months on-board of Jason-1.
- Last but not least, a precise Time-Tagging function has been added to the DORIS receivers, based on DIODE synchronisation results : this allow the satellite to use the DORIS receiver as an on-board clock, providing TAI time with a 1-2 microseconds accuracy.

Detailed analysis of the on-board results will be presented in the paper. On-board operations, during these flights, have shown us new directions to reinforce DIODE’s autonomy and accuracy. And as the new three versions are similar, each improvement may be a benefit for the three satellites, since we are able to upload new versions of the software.

On-board of SPOT5, DIODE will keep on working for the image processings. DIODE/JASON-1 position estimations are ready to be used for quick-look processing of the altimetric data (they are part of the O.S.D.R.) : the requests are met. We hope that our work will be helpful, for instance, to implement short-term predictions of the sea surface. And we will try our best to help our users, in case of any doubt on the orbits.

Next customers of DORIS/DIODE will be CRYOSAT, Jason-2 and Pléiades : we are still preparing improvements for the future !..