

Analysis of a possible future degradation in the DORIS geodetic results related to changes in the satellite constellation

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Recently, several improvements were made in the DORIS data processing at the IGN/JPL (Institut Geographique National, France; Jet Propulsion Laboratory, California Institute of Technology, USA): use of GRACE-derived gravity fields, data pre-processing and station discontinuities detection, etc,.. This allowed enhanced performances for ground station geodetic positioning (typically 10 mm using a week of data), as well as for polar motion (0.5 to 1.0 mas for daily determination). However, since the loss of the DORIS receiver on the TOPEX/Poseidon mission, only 4 satellites (SPOT-2, SPOT-4, SPOT-5 and ENVISAT) are equipped with DORIS receivers and most of them are aging and some have exceeded by far their expected lifetime. The goal of this paper is to analyze how the geodetic performances could be degraded in the future if one or more of these satellites would be lost, and to envision which satellites are the most critical in the DORIS geodetic performances. We have re-analyzed 1 year of recent DORIS data (all of 2005), processing quite a large number of limited subsets of these data: from 1 to 3 satellites. We then compared these results (station coordinates and polar motion) with those obtained in past processing when using DORIS data from all 4 satellites in 2005. In particular the key role of the ENVISAT data (all other satellites are SPOTs satellites with similar orbits) will be demonstrated. Furthermore the importance of the SPOT-5 data, equipped with a new type of on-board DORIS receiver will also be shown. Fortunately, new DORIS satellites are also expected in the future (Jason-2 and Alti-K) and could improve current DORIS-derived geodetic results due to their specific type of orbit (different from the SPOT sun-synchronous orbits) and also to enhanced on-board receivers. Discussion will be expanded on future benefits gained from these missions.