Degradation of the SPOT-5 DORIS measurements due to the South Atlantic Anomaly

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The South Atlantic Anomaly (SAA) refers to the area where the Earth's inner Van Allen radiation belt comes closest to the Earth's surface, leading to increased levels of cosmic radiation at lower altitudes than elsewhere over the surface. A strong effect of the SAA on the quality of Jason-1 DORIS (Doppler Orbitography and radiopositioning Integrated by Satellite) observations is well known and several relevant analyses has been published. However, the significant effect of SAA on the other DORIS satellites has not been known for a long time. Current analyses developed at the Geodetic Observatory Pecny (GOP) found the relation between SPOT-5 data bias and the SAA, explaining the offset of the estimated parameters derived from the SPOT-5 individual solutions. The most affected parameters are the beacon frequency offset, the station height and the troposphere zenithal delay . The SAA effects mainly the SPOT-5 observations of the three stations in South America, i.e. Cachoeira Paulista (Brasil), Arequipa (Peru) and Santiago (Chile). The offset of the estimated station height achieves 27 cm for the SPOT-5 individual solution and the most biased station Cachoeira Paulista. The multi-satellite solution is affected as well and the inclusion of the SPOT-5 observations leads to the station height offset over 6 cm for Cachoeira Paulista. Since the general quality of the SPOT-5 measurements is very good, the complete exclusion of the satellite from the combination is not a kind of the rational approach. One way how to solve the problem is the elimination of the observations from the geographically determined SAA region. Another possibility is based on the application of the data corrective model.