



Copernicus Sentinel-1 satellites: Sensitivity of antenna offset estimation to orbit and observation modelling

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The SAR (Synthetic Aperture Radar) Copernicus Sentinel-1 satellites require a high orbit accuracy of 5 cm in 3D. The official orbit products delivered by the Copernicus POD (Precise Orbit Determination) Service fulfil this requirement. Nevertheless, analyses have shown discrepancies in the orbit results for the two satellites Sentinel-1A and Sentinel-1B. Since the satellites are identical in construction differences in the estimated orbit parameters like the scale factor for the radiation pressure are expected to be at the same magnitude, which is not the case.

Estimation of GPS antenna offset coordinates lead to differences between the two satellites, which might explain the discrepancies in the estimated orbit parameters. Such offset estimations are, however, very sensitive to orbit and observation modelling. It has to be assured that the results are not biased by insufficient models.

The Copernicus Sentinel-1 satellites have a very complex shape with the long SAR antenna and the two large solar arrays. A simple box-wing model might not be sufficient for this. Simple assumptions on shadowing effects or a ray-tracing model of the satellite can improve the orbit modelling. Recently also a big improvement step on observation modelling side has been done by making single receiver ambiguity resolution possible.

The impact of both orbit and observation modelling improvements on GPS antenna offset estimation is analysed and presented for the two Copernicus Sentinel-1 satellites.