

IAF EARTH OBSERVATION SYMPOSIUM (B1)  
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EstoniaADDING DIMENSIONS TO SENTINEL-1 DATA: CONSTELLATION OF BISTATIC PASSIVE  
RECEIVER SATELLITES FOR OPERATIONAL APPLICATIONS**Abstract**

Sentinel-1 is a powerful data factory. No other current SAR mission produces data with systematic global coverage in such a large quantity. However, its information content is relatively limited – dual-polarisation backscatter and repeat-pass interferometry data. Across-track interferometry is not feasible with Sentinel-1 due to temporal decorrelation (6 or 12 days) and short interferometric baselines (<100 m). The limited information content of Sentinel-1 sets an inherent limit to applications built on Sentinel-1.

There is a way for increasing the value of the Sentinel-1 mission significantly with an additional investment constituting just a fraction of what a new SAR constellation would cost. Currently, Sentinel-1 produces two-dimensional imagery about the Earth's surface. By adding relatively small and simple passive receiver satellites to the mission, it is possible to add the height dimension to the Sentinel-1 data by performing across-track SAR interferometry. Providing height information about the terrain, vegetation, and ice sheets at 12-day intervals would be unprecedented, all while cleverly augmenting the existing Copernicus program infrastructure and data.

The innovation risk of the proposed companion mission is considered relatively low due to the comprehensive research heritage of the German Aerospace Center (DLR) and the rest of the scientific community. The success of TanDEM-X mission proved many of the technology necessary for implementing the mission we propose and the applications of its data. The applied research carried out to facilitate the planned TanDEM-L mission is also, to a large extent, reusable. Significant synergies could be established with the planned ESA Harmony mission, which has been recently approved as Earth Explorer-10. While Harmony is purely a cutting-edge EO science experiment, the goal of our proposed mission is to become a systematic data factory for operational applications for decades to come.

The specifications of the planned data products will be largely defined by the specifications of the Sentinel-1 main mission and the planned Sentinel-1 Next Generation (S1-NG).

**Applications**

The Phase-0 study of the bistatic passive receiver mission is ongoing under the ESA Estonian Industry Incentive Scheme (IIS) programme and scheduled to be completed by June 2024. The presentation will outline the Phase-0 findings: the technical concept formulated along with critical technologies and key trade-offs to be undertaken in later phases, and a detailed roadmap based on the findings.