Comparison of L- and C-Band SAR data in the Saar Mining District, Germany

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The interferometric utilization of Synthetic Aperture Radar data from L-band and C-band has an important role for the monitoring of land surface deformations like former evaluations have proven [1]. Meanwhile several multi-sensor ground-stations are available, equipped with bi-directional artificial corner-reflectors (CR) and permanent GNSS stations, attached to fine leveling baselines. The long wavelength of L-band SAR missions like ALOS-2 (λ = 22.9 cm) provides highly coherent interferograms, but here large-sized CR are required e.g. for absolute motion calibration. SAR missions with shorter wavelengths, like the C-band onboard the Sentinel-1 mission (λ = 5.6 cm) provide, in general, less coherent interferograms, but a smaller CR size is sufficient. In order to assess the capabilities of L- and C-band SAR data the impulse response function will be calculated at corner-reflector sites and the coherence will be estimated in rural areas of the Saar test site.

The test site is located in the Saar-Lorraine coal basin at the French-German border, a nowadays post-mining district with highly urbanized settlements as well as large stretches of forested and rural areas. The area is characterized by century long active deep mining – mainly for hard coal – including extensive groundwater management measures. Here, the active coal mining started in the 18th century and ended in 2006 (Lorraine) and 2012 (Saar) [2]. Meanwhile some of the underground mines got progressively flooded. As a consequence surface uplift occurred and is expected to be ongoing in the near future [3]. For a 12 by 14 km area in the Saar district dense and highly accurate leveling campaigns have been performed bi-annually since 2013. Thus, besides good knowledge of subsurface geology and mining activities also precise in-situ measurements of the ground motion are available. The recent and ongoing surface deformations will be monitored using multiple methods including a network of CR at multi-sensor ground stations [4] and publicly accessible Persistent Scatterer Interferometry datasets from the Sentinel-1 based Ground Motion Service Germany [5].

In late 2020 first ALOS-2 acquisitions of the Saar area from the ESA-JAXA cooperation were made available to the authors. The ALOS-2 data are evaluated and placed in relation to Sentinel-1 acquisitions. Finally, an outlook on the possible complementary use of geodetic and C- and L-band data in the Saar district as well as for other mining areas in Germany is given.

interferometry. IGARSS 2005; DOI: 10.1109/IGARSS.2005.1526447


