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Single pass bistatic interferometry for sea ice build-up around offshore structures

Lang, Oliver - Astrium GEO-Information Services, Infoterra GmbH

Anderssohn, Jan - Astrium GEO-Information Services, Infoterra GmbH

Lumsdon, Parivash - Astrium GEO-Information Services, Infoterra GmbH

Partington, Kim - Polar Imaging Limited

Interferometry of single pass bi-static SAR data has been applied to generate digital elevation models (DEMs) of sea ice topography in areas where deformed ice is building up against fixed structures or against the sea bed or coastline. The latter is a common problem for offshore exploration activities in areas affected by sea-ice. Deformed sea-ice can generate pressure on artificial structures, like drilling rigs. Grounded sea ice can furthermore result in rupturing pipelines and threaten vessel traffic. Using data from the TanDEM-X mission, DEMs were generated using single pass bi-static interferometry in the North-Eastern Caspian Sea during mid-winter 2012. In addition to the DEM generation the sea ice status and its temporal variation has been analyzed on the basis of SAR amplitude and coherence information. Our interferometric analysis is complemented by a polarimetric analysis based on dual polarisation data. It is shown, that the approach can, in principle, be used to detect and profile stamukhi and stacked ice around fixed structures during the freezing season. Limitations of the analyzed approach are discussed, as well. The significance of the results varies with the geometric conditions, i.e. baseline and incidence angle.