Mutual interferences between C-Band SAR: Prediction of occurrences identification of sources

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Abstract

The efficient operations of SAR systems rely on the availability of the radio frequency spectrum. The current C-Band SAR operate in a frequency band that is not open to telecommunication usage [1] so as to avoid degradation of the SAR derived services (for instance ground motion analysis [2]). Despite the protection of the radio frequency spectrum, Radio Frequency Interferences (RFI) can be frequently observed on SAR images and originating from various sources either from the ground, from planes or even from other spacecrafts operating radars. As part of operational quality control, it is interesting to monitor the evolutions of occurrences and intensity of such RFI and if possible, to identify their sources: If the occurrences increase significantly with large degradation of image quality, mitigations will have to be put in place.

Methods to detect C-Band RFI from the SAR data are proposed in [3]. They allow to derive global maps of RFI power. However, this method does not consider occurrences of RFI originating from other spacecrafts. Strong long duration RFI originating from other spacecraft where observed on Sentinel-1 imagery and were documented [4]. Such strong occurrences can be observed at “orbit crossings” when the two interacting radars are at the shortest distance from one to another. Knowing the orbit parameters of each spacecraft it is possible to predict such situation. This allows both deriving temporal and geographic patterns of such future potential RFI and to pinpoint past configurations that can be reassessed.

In this talk we will present the patterns of potential RFI between Sentinel-1 constellation and other missions (including Radarsat-2, RCM, and Gaofen-3). The increase of operated units induces an increase of the number of potential conflicts on radio frequency spectrum usage. Configurations of proximity between each spacecraft were reanalyzed providing some evidences that short duration RFI originally attributed to ground emitters could as well be produced by other spaceborne radar operating short transmissions. The orbit analysis method is extended to inspect specific occurrences of RFI and to check if a non-documented C-Band emitter is present near the Sentinel-1 units.

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