Flood monitoring in remote areas: integration of multi-frequency SAR data

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The monitoring of inundation phenomena through synthetic aperture radar (SAR) data on vegetated areas can be improved through an integrated analysis of different spectral bands. The combination of data with different penetration depths beneath the vegetated canopy can help determine the response of flooded areas with distinct types of vegetation cover to the microwave signal. This is useful especially in cases, which actually constitute the majority, where ground data are scarce or not available.

The present study concerns the application of multi-temporal, multi-frequency, and multi-polarization SAR images, specifically data from the Sentinel-1 and PALSAR 2 SAR sensors, operating in C band, VV polarization, and L band, HH and HV polarizations, respectively, in synergy with globally-available land cover data, for improving flood mapping in densely vegetated areas, such as the Zambezi-Shire basin, Mozambique [1], characterized by wetlands, open and closed forest, cropland, grassland (herbaceous and shrubs), and a few urban areas.

We show how the combination of various data processing techniques and the simultaneous availability of data with different frequencies and polarizations can help to monitor floodwater evolution over various land cover classes. They also enable detection of different scattering mechanisms, such as double bounce interaction of vegetation stems and trunks with underlying floodwater, giving precious information about the distribution of flooded areas among the different ground cover types present on the site.

This kind of studies are expected to assume increasing importance as the availability of multi-frequency data from SAR satellite constellations will increase in the future, thanks to initiatives such as the EU Copernicus program L-band satellite mission ROSE-L [2], and their tight integration with Sentinel-1 as well as with other national constellations such as ALOS 2, or SAOCOM.

References