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Sentinel-1 time-series for the detection of temporary flooded vegetation

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Flood events affect society, the economy and ecosystems worldwide and can have devastating effects. Precise and timely information on the extent of the flood in the affected areas is therefore needed to provide aid workers, decision-makers from crisis management authorities or even insurance companies with an important basis for their actions.
In addition to the open water areas, the detection of flooded vegetation areas is essential for a complete coverage of the flood extent. These are vegetation areas that are temporary flooded by inundations. The mapping of large-scale floods is difficult and sometimes impossible to perform by ground based observations or unmanned aircraft. However, rapid and nationwide provision of information on the spread of floods is extremely relevant for local aid and decision-makers. Remote sensing data can be used to record large-scale flood areas. Synthetic Aperture Radar (SAR) is particularly suitable for this purpose, as this tool allows recording of the affected area regardless of time of day or weather conditions. The decisive advantage, however, lies in the fact that it is able to detect not only open water areas but also submerged vegetation.
Since October 2014, the satellite constellation Sentinel-1 has been continuously capturing the Earth's surface at short revisit times using C-band SAR data, thus enabling the provision of SAR time series that can be used to perform change-detection analysis.
Based on this time series data and selected additional information, an automatic classification procedure for the extraction of temporary floodplains and submerged vegetation areas was developed. The validation of this unsupervised classification method was carried out on a flood event in Namibia in 2017 using 25 images from the Sentinel-1 system. The results show that the flooded vegetation areas can be successfully derived by the developed classification approach. In addition, it was possible to increase the accuracy of flood distribution by supplementing open water areas by adding flooded vegetation areas.