Factsheet #11

Mapping water with remote sensing data

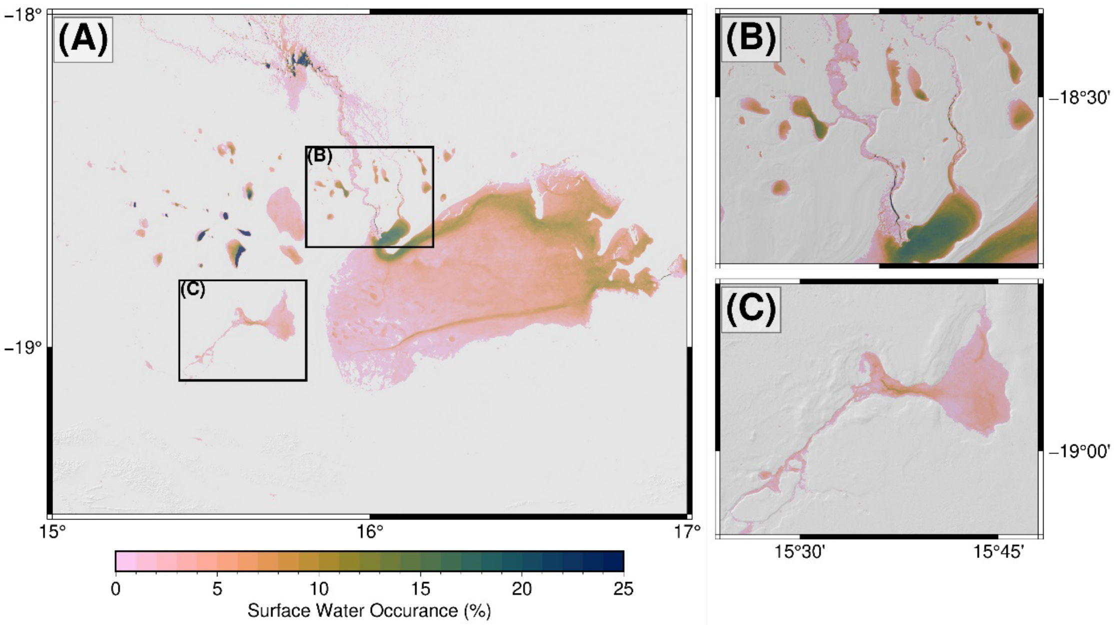
Surface water

Both **optical** and **radar** data are sensitive to surface water. We can use long time records of satellite data to explore long-term patterns in surface water.

The below maps are based on 35 years of **Landsat** data, displaying the number of months in which an area has at least occasional surface water. Some areas – for example, water holes, lakes, and reservoirs – are much more frequently flooded than lake edges, ephemeral streams, and the Etosha Pan which is rarely underwater. Surface water is present in some locations for up to ~80 % of the year, though most areas are wet less than 10 % of the time; these numbers are limited by the size of wet areas visible to the satellite. Small areas – such as water holes – may be undercounted with this technique.

These patterns can be used to help predict **flooding, erosion,** and **water quality** over large areas.

Small water body showing a sandy rim which is only occasionally flooded.

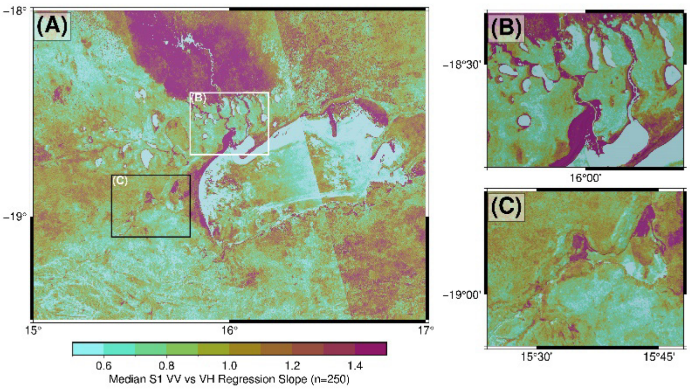


Occurence of surface water throughout the Etosha/Oshana region. Percentages calculated over 35 years (1985–2020) of Landsat data by taking the number of months where surface water was detected in any given location. Color scale weighted towards low surface-water occurence, as the majority of regions have only sporadic surface water. Some regions go far beyond the 25 % maximum of the color bar (up to ~80 %), for example in larger water bodies and in town water-storage facilities.

Cover photo: Robert Hering, other photo: Martin Hipondoka

Sub-surface water

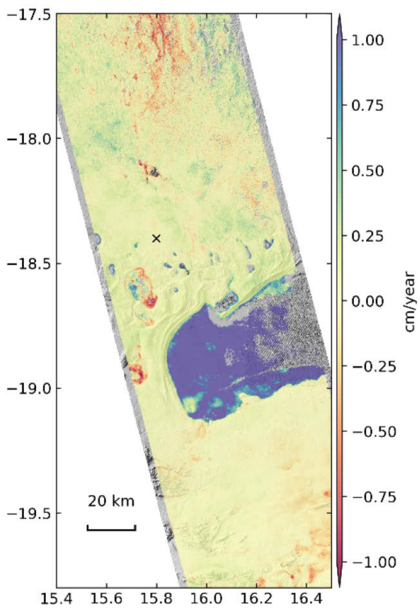
It is much harder to map sub-surface water – most satellite data only covers what you can see on the surface. However, **radar data** is sensitive to the properties of the surface and top few centimeters of soil, and can reveal the presence of soil moisture at or just below the surface.



Sentinel-1 radar data is freely available, and carries two **polarizations.** These two polarizations have slightly different responses to near- and sub-surface water, meaning that they can be compared to estimate **near-surface water availability.** In the above map, red areas indicate high amounts of near-surface water, such as throughout the Oshana region. Conversely, light blue areas represent **surface water,** and show similar patterns to the maps based on optical data (previous page).

Ground deformation

Radar data can also be used to map surface deformation. In dry environments, much of the surface deformation is caused by the movement of wind and water through the landscape.



Blue areas indicate deposition and/or **uplift,** while red areas indicate erosion and/or **subsidence.** Radar data can hence be used to map the extraction of groundwater, erosion patterns, and how water both moves along the surface and underground. Detailed information on surface and subsurface changes can help contextualize studies of water quality and water use throughout the region.

References

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The ORYCS Project

The German-Namibian research project “ORYCS – Options for sustainable land use adaptations in savanna systems” aims to assess the suitability of wildlife management strategies in Namibia as options for adapting land use to climate change in savanna ecosystems.

www.orycs.org

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