SMAP provides new capacity for effective flood monitoring and forecasts over Africa

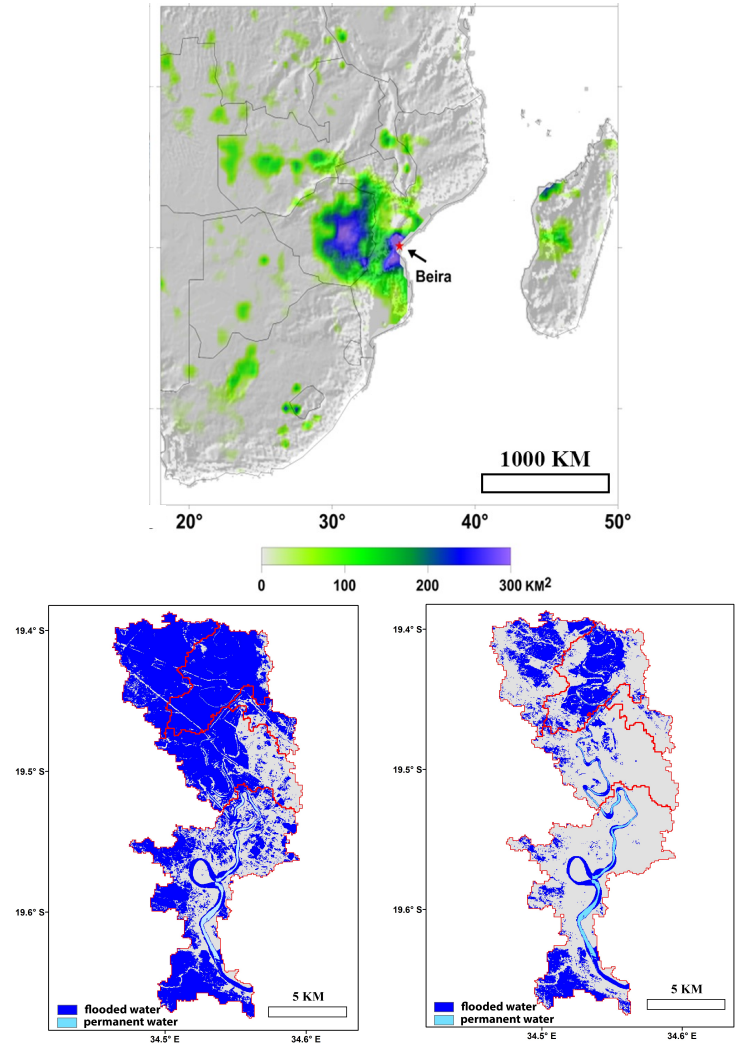
Du, Kimball, Sheffield, et al., 2021. *JSTARS*, https://doi.org/10.1109/JSTARS.2021.3092340

Motivation: Satellites are crucial for monitoring flood risk in many regions, but can miss dynamic flooding due to cloud contamination and infrequent sampling. SMAP provides all-weather microwave (L-band) sensitivity to surface water with global 1-3 day repeat sampling for optimal flood monitoring.

Methods: SMAP fractional water (FW) observations used to monitor and forecast major flooding in southeast Africa from Cyclone Idai; where FW is the areal fraction of standing water within the satellite footprint. The 36km FW grids were downscaled to 30m flood maps using ancillary water metrics from Landsat. Machine learning models trained on the 30m flood maps were used with NOAA Global Forecast System (GFS) rainfall to predict flooding 1-3 days in advance. The flood forecasts were validated using independent flood maps from Landsat and Sentinel-1.

Findings: The SMAP-GFS 24-h flood forecasts were consistent with independent flood maps (R=0.87, RMSD=0.87%) and had less but meaningful agreement (R=0.53) for longer (72-h) lead times.

Impact: New capacity for all-weather flood monitoring and flood forecasts enabled from SMAP.



SMAP FW increase from Mar 17-19 2019, following Cyclone Idai landfall near Beira, Mozambique (**top**). Downscaled 30m 24-h flood forecasts for Mar 19th (**left**) and 23rd (**right**) in the lower Pungwe basin near Beira.