

# Making the best use of satellite data in river flood mapping

## Summary

This research investigated different methods of using observations from Synthetic Aperture Radar (SAR) images to improve river inundation forecasts using data assimilation. SAR sensors take images from space over wide areas, during day and night and even through clouds.

## Why?

SAR images of flooded areas can be a good source of information for flood mapping forecasts, particularly in locations where river gauges are scarce. These observations can be used during a flood to predict how it will spread, and also afterwards to understand the flood footprint for insurance loss adjustment and future flood risk management. But different methods of using SAR observations can produce very different corrections to predicted water levels, which impacts the quality of the forecast produced.

## How?

This research compared 3 methods: simple flood-edge assimilation; nearest wet pixel approach (both of which use observations of water levels derived from SAR using image processing and topography data) and backscatter (using values directly observed by SAR instruments). Results showed that the backscatter operator has the potential to improve inundation forecasting in fluvial floods and researchers believe it may have applications in other types of flooding where SAR images are available. Further work is required in a real case study using real SAR data and real topography to further assess the strengths and weaknesses of the different approaches.

## What now?

This research has stimulated further projects with stakeholders, such as engineering consultancy firms looking to use EO to improve flood mapping for the risk / insurance sector and international disaster relief agencies. It could compliment other approaches used by emergency management services in the future.

## Reference

Cooper, E. S., Dance, S. L., García-Pintado, J., Nichols, N. K., and Smith, P. J.: Observation operators for assimilation of satellite observations in fluvial inundation forecasting, *Hydrol. Earth Syst. Sci.*, 23, 2541–2559  
<https://doi.org/10.5194/hess-23-2541-2019>, 2019.



Photo: Sentinel 1 SAR image / Markus Distelrath, Pixabay

**The DARE project aims to produce a step-change in the skill of forecasts of urban natural hazards by combining novel observations with data from state-of-the-art computer models.**

**Our work investigates the best way to include observations in the forecasting process.**

**This is one of a series of accessible summaries translating DARE projects to a wider audience, enabling the take-up and real-world application of the UK's world-leading research. See more at <https://research.reading.ac.uk/dare/whywhatnow/>**



## Further information

Example of a flood inundation mapping system  
<https://www.jbaconsulting.com/floodforesight/>

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