EGU22-5877, updated on 05 Dec 2022
https://doi.org/10.5194/egusphere-egu22-5877
EGU General Assembly 2022

Flood inundation mapping using Sentinel-1 SAR images with Google Earth Engine cloud platform

Qin Wang[1], Lu Zhuo[2], Miguel Rico-Ramirez[1], Dawei Han[1], Jiao Wang[1], Ying Liu[1], and Sichan Du[1]
[1]School of Civil, Aerospace and Mechanical Engineering, University of Bristol, Bristol, BS8 1TR, UK (q.wang@bristol.ac.uk)
[2]School of Geographical Sciences, University of Bristol, Bristol, BS8 1TR, UK (lu.zhuo@bristol.ac.uk)

Flood events are expected to become increasingly common with the global increases in weather extremes. The present state of the technologies for flood risk mapping is typically tested on small geographical regions due to limitation of flood inundation observations, which hinders the implementation of flood risk management activities. Synthetic aperture radar (SAR) sensors represent an indispensable data source for flood disaster planners and responders, given their ability to image the Earth's surface nearly independently of weather conditions and the time of day or night. The decision by the European Space Agency (ESA) Copernicus program to open data from its Sentinel-1 SAR satellites to the public marks the first time of global, operational SAR data freely available. Combined with the emergence of cloud computing platforms like the Google Earth Engine (GEE), this development presents a tremendous opportunity to the disaster response community, for whom rapid access to analysis-ready data is needed to inform effective flood disaster response interventions and management plans. Here, we present an algorithm that exploits all available Sentinel-1 SAR images in combination with historical Landsat and other auxiliary data sources hosted on the GEE to rapidly map surface inundation during flood events. Our algorithm relies on multi-temporal SAR statistics to identify unexpected floods in near real-time. Additionally, historical Landsat-based surface water class probabilities are used to distinguish unexpected floods from permanent or seasonally occurring surface water. The flexibility of our algorithm will allow for the rapid processing of future open-access SAR data, including data from future Sentinel-1 missions.