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Flood hotspot mapping using static and dynamic data: A case study of the European Floods in 2021

Nikolai Skuppin[1], Nina Maria Gottschling[1], Sébastien Dujardin[3], Andrés Camero[1], Sandro Martinis[2], Benjamin Palmaerts[4], and Hannes Taubenböck[2]

[1]German Aerospace Center (DLR), Remote Sensing Technology Institute (IMF), Weßling-Oberpfaffenhofen, Germany
[2]German Aerospace Center (DLR), German Remote Sensing Data Center (DFD), Weßling-Oberpfaffenhofen, Germany
[3]ILEE - Institute of Life, Earth and Environment, University of Namur, Namur, Belgium
[4]Scientific Institute of Public Service (ISSeP), Liège, Belgium

Floods are increasing in frequency and severity. Flood forecasting is ever improving and is already of high quality at national to regional level. However, there are fundamental limits in flood forecasting, especially at sub-regional to building level, making observations indispensable. Unfortunately, observations are often hampered by limitations in frequency, accuracy and the covered area. It is crucial to bridge the gap between modeling and observations to obtain situational awareness and to guide rescue forces and further data acquisitions. One possible approach is the use of focus maps, which combine multiple proxy layers into one common proxy of risk. These have been successfully applied to identify hotspots of areas affected by earthquakes or floods. This work uses the concept of focus maps and applies it to Ahr valley and Vesdre valley, two of the main affected areas of the European floods in July 2021. The work presents a thorough survey of static and observational proxy layers, such as flood hazard maps, satellite derived flood maps and Facebook user activity data, with various coverage (global, European, national). It tests how well individual layers and their combinations approximate the areas affected by the floods and finds that already few data layers suffice to obtain a strong approximation. Furthermore, it shows that Facebook user activity data provides a valuable source to identify the onset time of the flood event and to identify the affected regions. However, the user activity data is too coarse and noisy to obtain accurate predictions. By combining the dynamic data with readily available static proxy layers of higher spatial resolution a risk proxy is obtained, which could potentially scale to other areas of interest.