Mapping river dynamics using Google Earth Engine

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Dynamics of rivers are governed by a variety of climatological, hydrological and geological processes, and are also increasingly affected by human interference. Data from Earth observation can now provide long enough time-series to identify and quantify variability on seasonal and decadal time-scales, which allows us to better understand drivers in river dynamics. We show that 30-year coverage of satellite imagery, supplementary datasets and the freely available software in Google Earth Engine can now provide valuable insight in pattern dynamics between rivers and within rivers. Key concepts that we extract from the images are river envelopes, defining the area that the river has occupied within the observed time frame, and river occupancy density maps, showing regions with high degree of wetting variability and river plan form changes. These maps can be valuable tools for practical applications such as identifying suitable locations for infrastructure development and identifying hazard areas for floods and bank erosion. We also reflect on how these maps can be supplemented with datasets on geology, land cover, land elevation, infrastructures and population densities to get deeper understanding in the dynamics of the river and its past and potential future impacts.