Flood task

Notes:

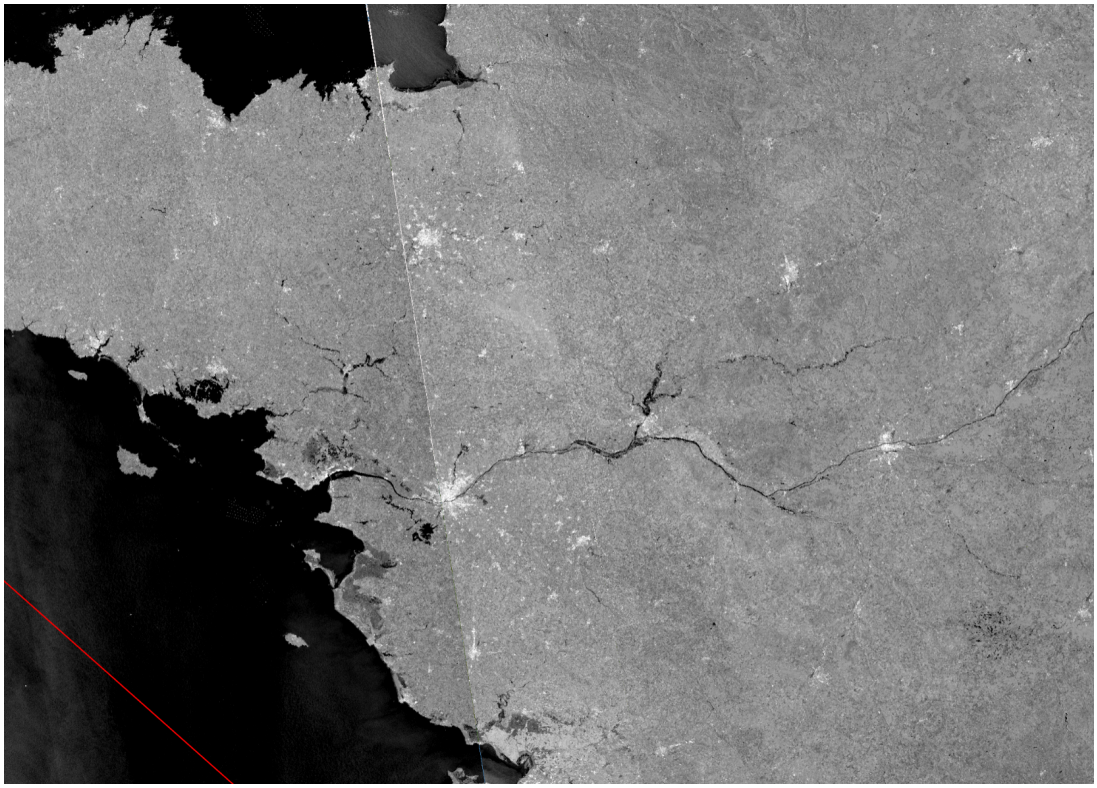
- Please take necessary assumptions where needed, but make sure to comment/defend why an assumption was made.
- We are interested in how you approach problems.
- Be creative and quantitative.
- Attempt all tasks.
- Spend no more than a few hours in total on the tasks.

During a flood event, it is critical to map the maximum extent and depth of a flood in order to assess the impact on individual property or infrastructure. The following tasks are in support of identifying maximum flood extent and depth, preferably in urban environments.

Please spend no more than a few hours in total to execute the following tasks.

Task 1:

Use the Sentinel-1 image captured within a ~100km radius around these coordinates: 47.63677N, -2.09308E. Please look for the Sentinel-1 image between 07-01-2025 and 14-01-2025, there should at least be one as you see in the screenshot below.



1. Use the image to create a raster mask of the flood extent. If you complete your analysis using other remote sensing or vector data, please report it. Discuss your choices and limitations. Provide visualizations of your outputs in the form of images or slides.
2. Create a flood depth map. You may focus your analysis of depth on a small region of the flood (e.g., around these coordinates: 47.63677N, -2.09308E). Denser urban areas are preferred. Address errors and uncertainties. How good are the flood extent and depth outputs?
3. Deliverables for this task are: (1) flood extent raster/vector mask, (2) flood depth map, (3) supplemental discussion/analysis in slide or document form, (4) any code or scripts created for processing the data.

Task 2:

Crowdsourced data from social network sites provides a good indication of where flooding occurs; sometimes, it is even possible to estimate flood depth. Similar to Sentinel images, social network points are hard to capture for peak flood levels. Although SAR provides a synoptic view over a wide area, it has limitations in detecting floods in dense urban areas—do you agree? For your reference, please find a time-series water-level plot (Fig. 1) of a nearby gauge station below.

a. How would you interpret the flood's peak from the time-series plot and adjust for the difference in acquisition time between the social network site data and the gauge data? Describe the model or approach you would use to adjust/ interpret the peak flood depth for social network sites data.
b. Use the provided data from social network sites and the Sentinel image from Task 1 to derive the peak flood extent and depth in dense urban areas around the provided coordinates. Describe your approach.
c. What needs to be considered when mapping floods in dense urban areas?

Social network sites point data (flood_task_point_data.geojson) has attribute “PublishedTime”, which can be considered as the acquisition time of the data. “waterDepth” represents the estimated flood depth at the “PublishedTime”, the unit is meters.

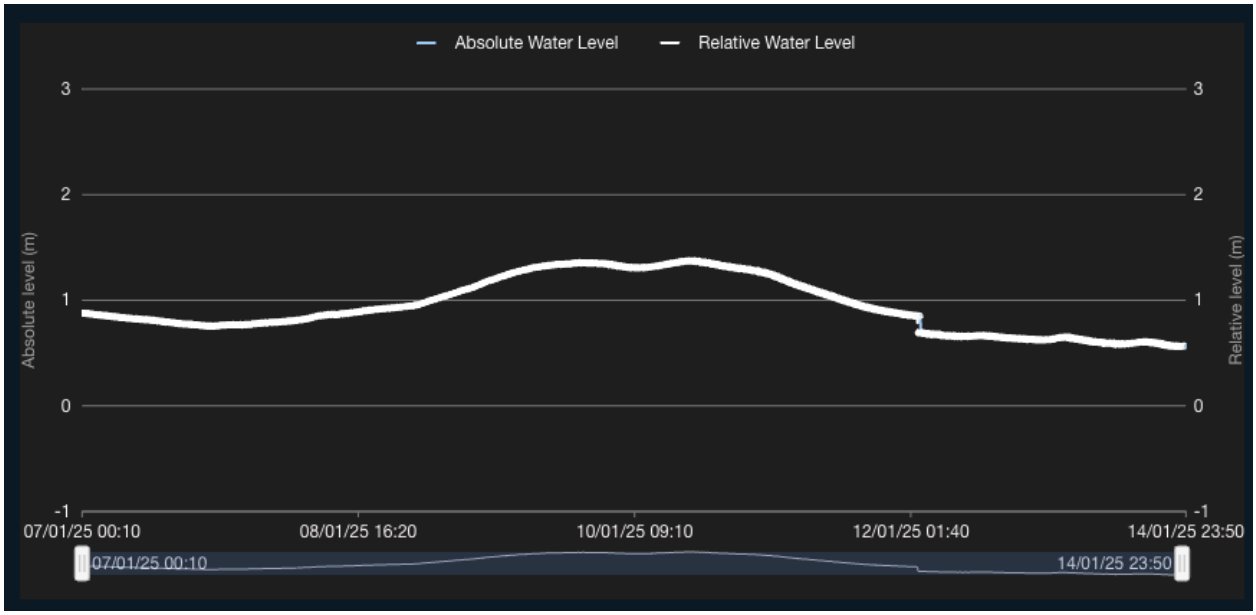


Fig 1. Timeseries plot of water level (m) for a gauge close to the provided coordinates