Flood modelling hydrologist tasks

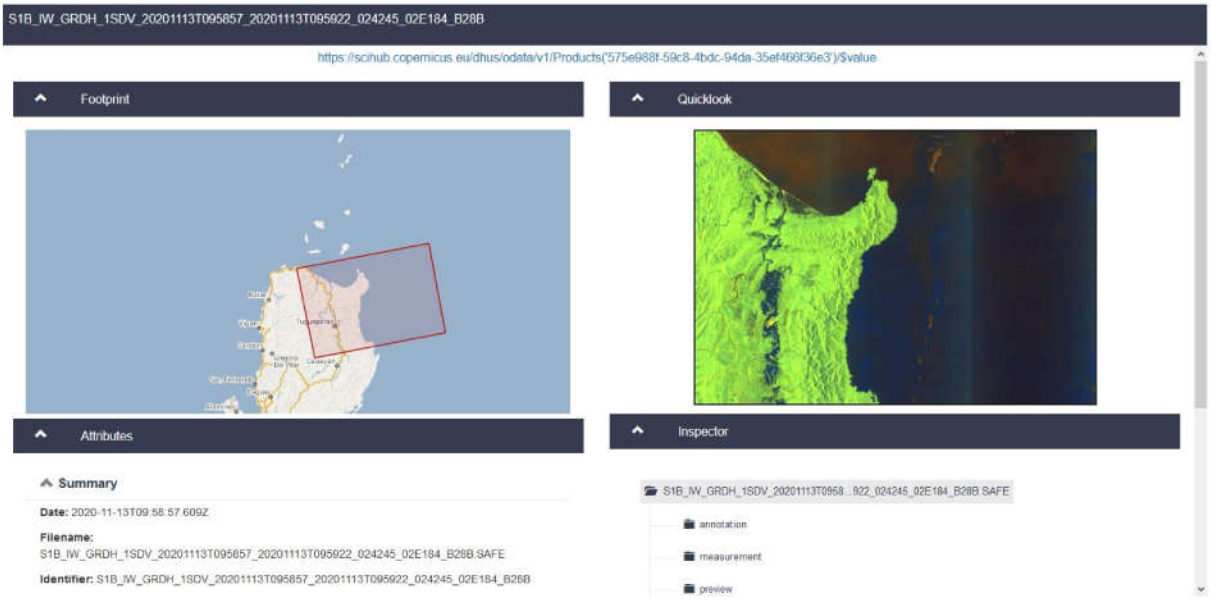
Notes

- 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 & quantitative.
- Attempt all tasks.
- Spend no more than a few hours in total on the tasks.

Tasks

During a flood event, it is critical to map the maximum 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 depth. Please spend no more than a few hours in total to execute the task.

1. Using the Sentinel-1 flood event image captured over the Philippines assess the rural and urban area impacted by flood. The Sentinel image id is provided in the screenshot below.



Sentinel-1 Data Description
Date: 2020-11-13T09:58:57.609Z
Identifier: S1B_IW_GRDH_1SDV_20201113T095857_20201113T095922_024245_02E184_B28B
Instrument: SAR-C
Mode: IW
Satellite: Sentinel-1

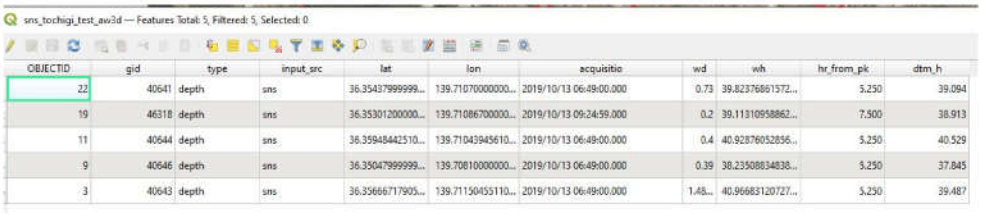
a. Use the Sentinel 1 data to create a raster mask of flood extent using the indicated SAR images. If you complete your analysis using other remote sensing or vector data, please report. Discuss your choices & limitations. Provide visualizations of your outputs in the form of images or slides.
b. Create a flood depth map. You may focus your analysis of depth on a small region of the flood (e.g. a village, town, or neighborhood). Manmade, denser areas are preferred. Address errors and uncertainties. How good is this map?
c. 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.

2. Social media provides a clear indication of flood depth at a given time. However, images shared on social media often represent the situation after the flood peak and therefore depth measurements derived from them are underestimated.

   Given the data below, derive a flood depth adjustment for ground-based observations gathered from social media. Each of the following 5 in-situ data were extracted based on visually reviewing social media posts. Since the acquisition time may be different from the peak flood time, the depth must be adjusted to compensate for the time gap between acquisition and the maximum flood peak. Create a table with the adjustment range & adjustment depth value for each image. Describe the model or approach used to adjust the data.

   - 5 in-situ locations of geolocated data with observed time stamps and water depth estimations are presented in the table below. Variables include 'gid' = deodatabase id (use this field to find the corresponding image in the provided pdf), 'wh' = water height above sea level, 'wd'= estimated water depth at time of image acquisition, 'hr_from_pk' hrs from peak flood, 'dtm_h'= terrain height, 'lat, lon' = latitude and longitude of the point, 'hr_from_peak' = time

gap between between acquisition and flood peak


sns_tochigi_test_aw3d — Features Total: 5, Filtered: 5, Selected: 0

OBJECTID	gid	type	input_src	lat	lon	acquisitio	wd	wh	hr_from_pk	dtm_h
22	40641	depth	sns	36.35437999999...	139.71070000000...	2019/10/13 06:49:00.000	0.73	39.82376861572...	5.250	39.094
19	46318	depth	sns	36.35301200000...	139.71086700000...	2019/10/13 09:24:59.000	0.2	39.11310958862...	7.500	38.913
11	40644	depth	sns	36.35948442510...	139.71043945610...	2019/10/13 06:49:00.000	0.4	40.92876052856...	5.250	40.529
9	40646	depth	sns	36.35047999999...	139.70810000000...	2019/10/13 06:49:00.000	0.39	38.23508834838...	5.250	37.845
3	40643	depth	sns	36.35666717905...	139.71150455110...	2019/10/13 06:49:00.000	1.48...	40.96683120727...	5.250	39.487

- a water gauge profile for a nearby river,

Provided data

- Shapefile of points and photographs documenting the points here [sns.zip]
- Slides of social media points [link].
- Gauge data (gauge_data_20201023.csv)
- DTM of the area (aw3d_gsi_merge_2.5m.tif)