

Flood volume estimation

- Test case Ganges-Brahmaputra basin -

WP6 – T6.1

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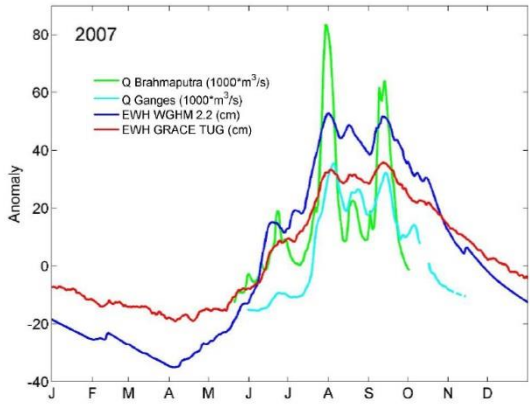
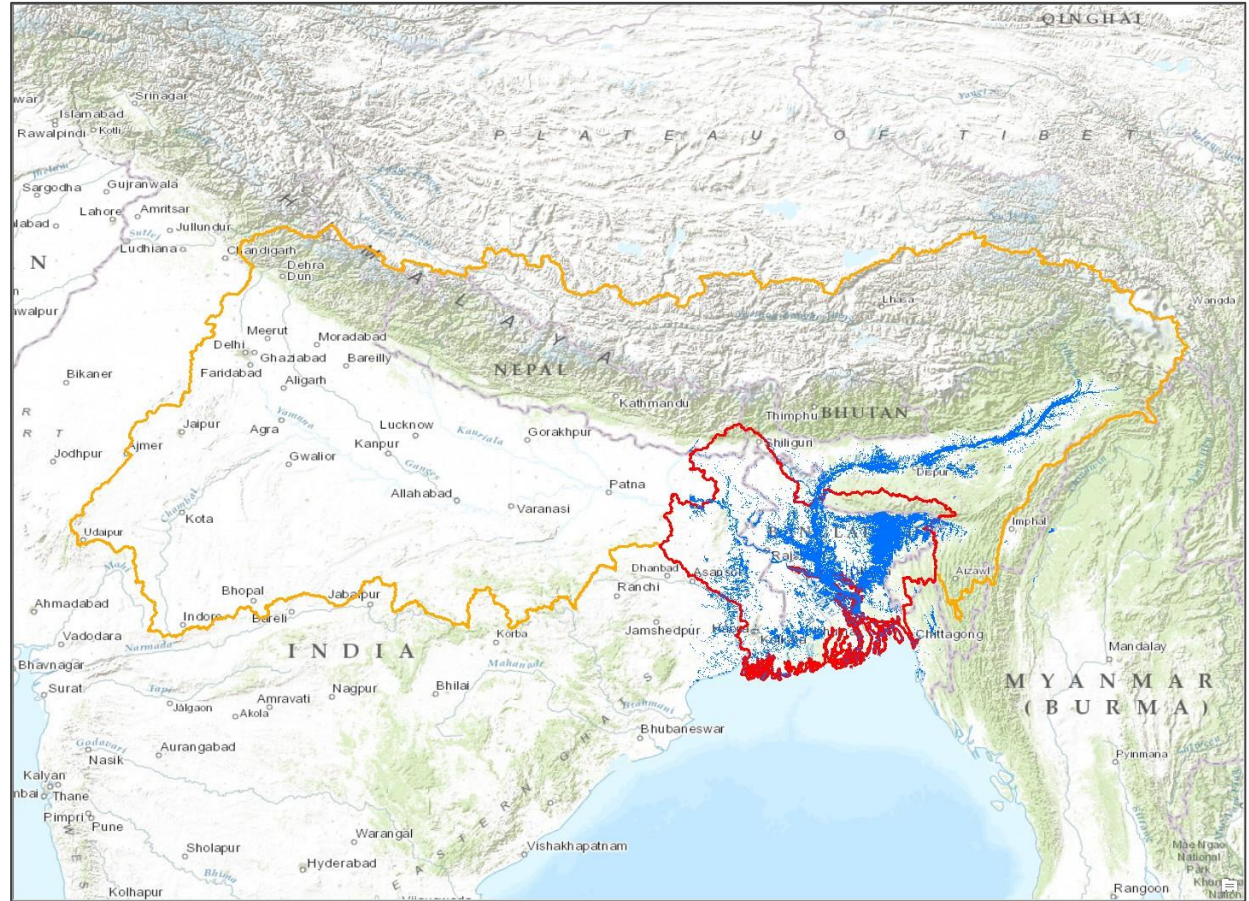
Objectives

- Compare gravity measurements from space with flood information derived from EO satellites
- 2D flood mask → 3D flood information
 - Integration of a DEM
 - Absolute **height of water surface** is required for each pixel
 - Water depth (water level – terrain elevation)
 - Flood volume

Ganges/Brahmaputra

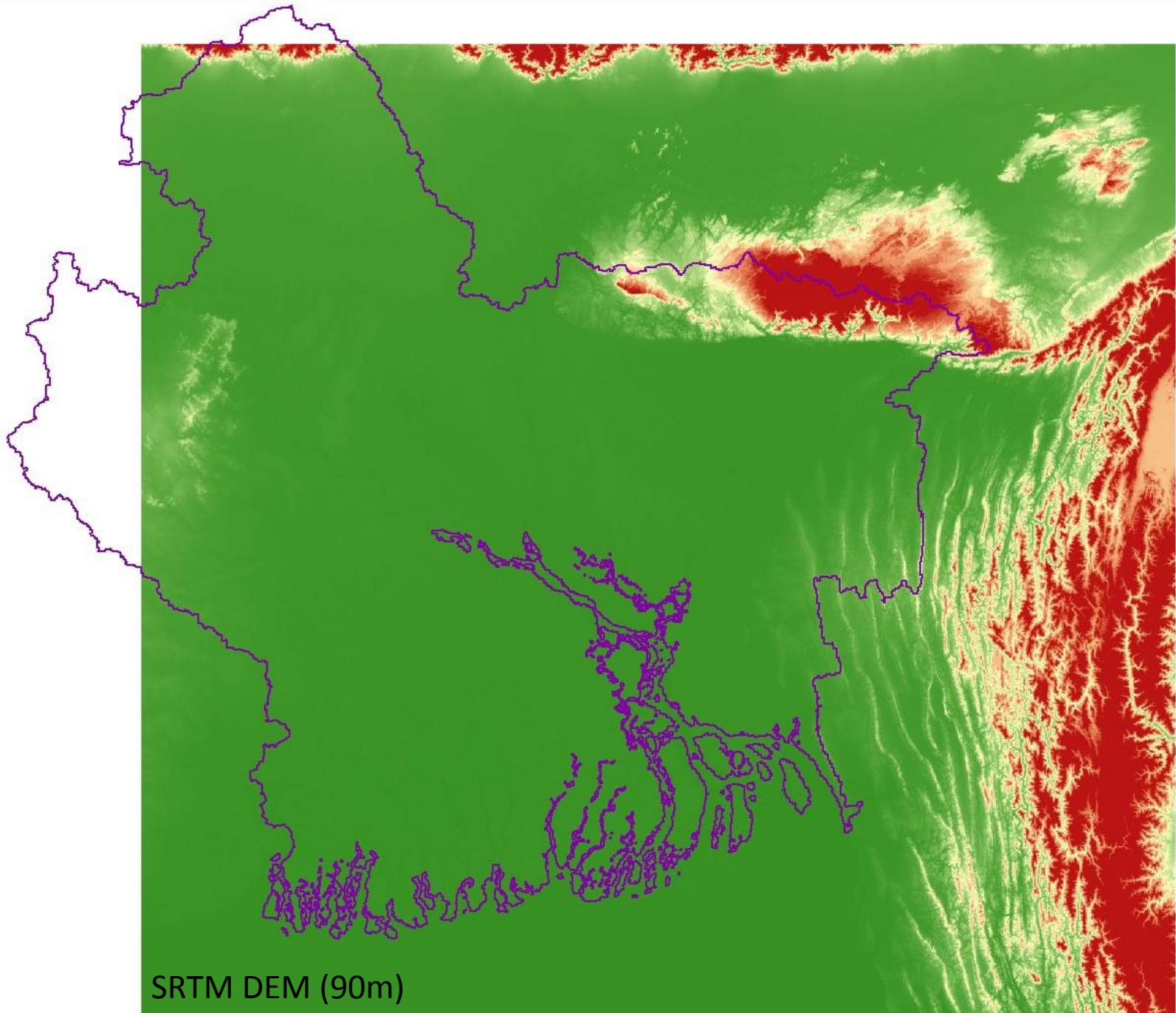
MODIS flood mask (250m)
from 2007-08-20

Ganges: 42.811 m³/s
Brahmaputra: 48.012 m³/s

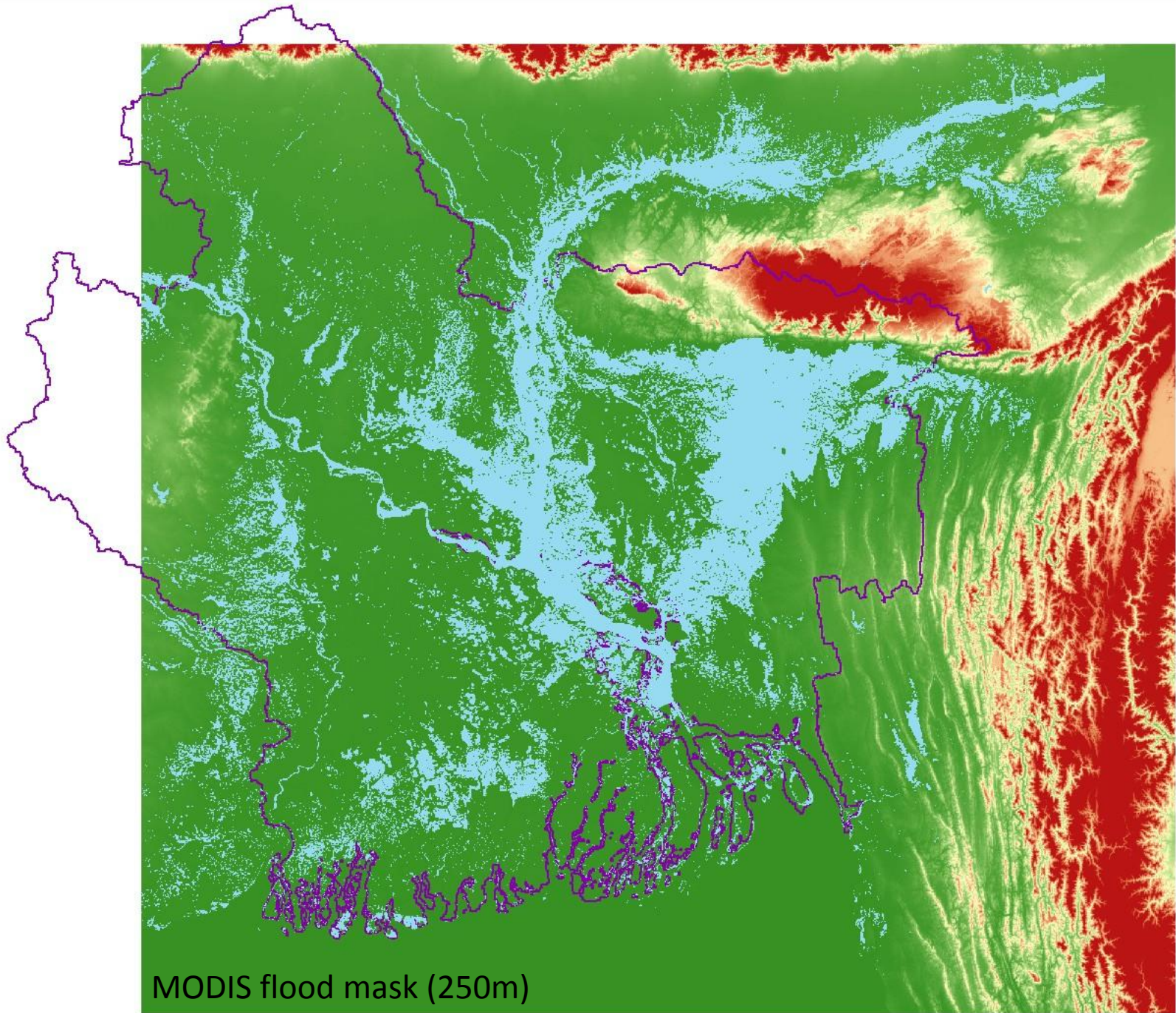




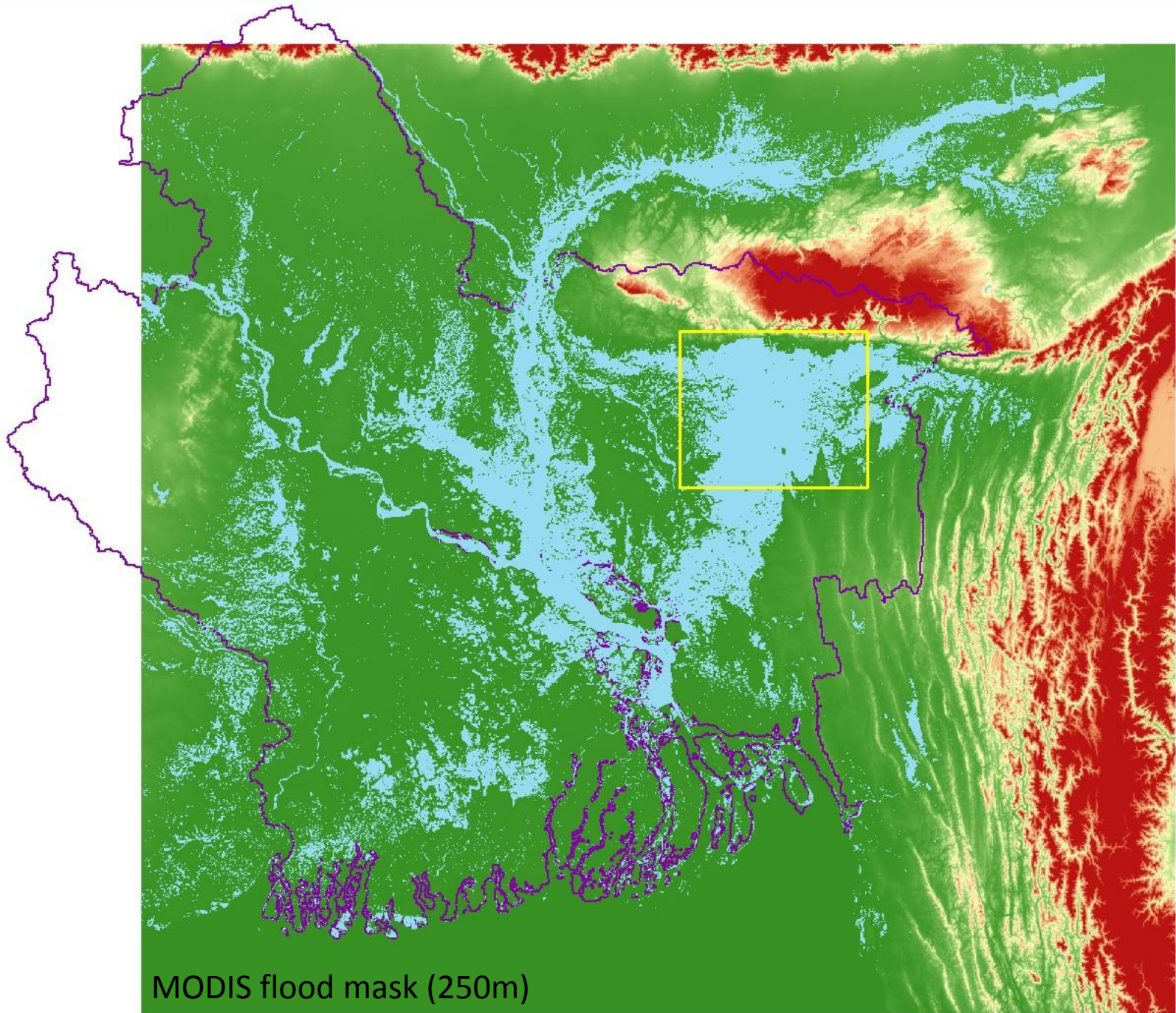
Ganges – Brahmaputra delta



SRTM DEM (90m)



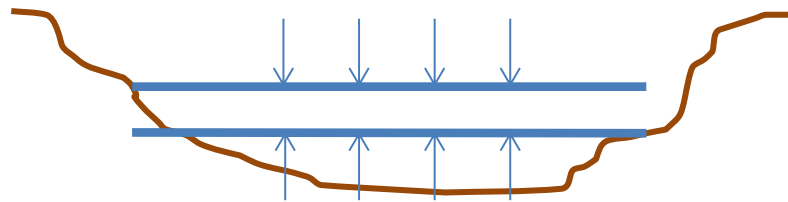
MODIS flood mask (250m)



MODIS flood mask (250m)

Data integration

- Combination of flood mask and DEM (both datasets resampled to 100m)

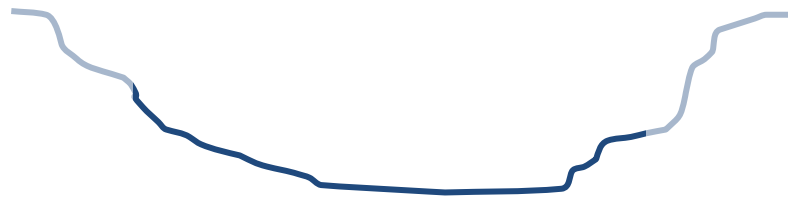


Plain water surface is assumed (no slope)

- Coarse resolution and inconsistencies between both datasets do not allow for accurate determination of vertical water profile

Data integration

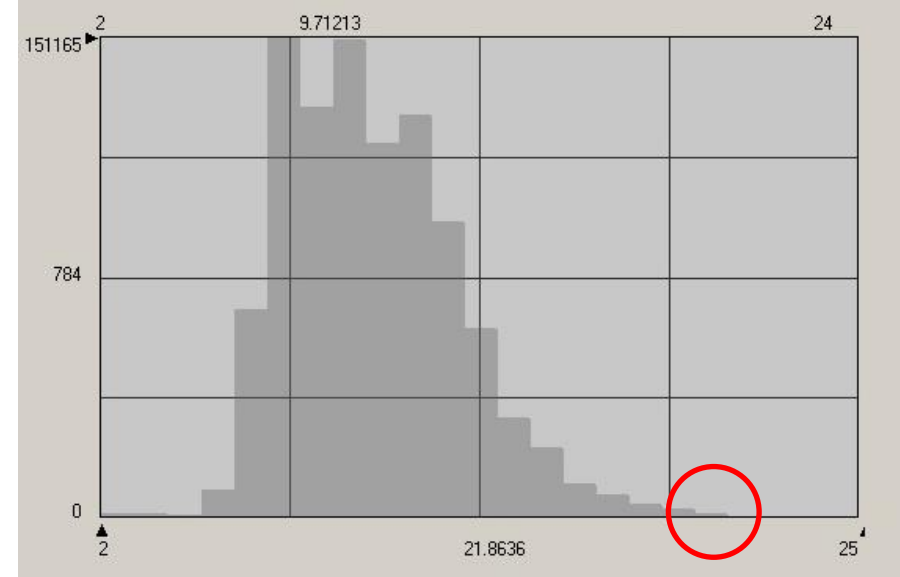
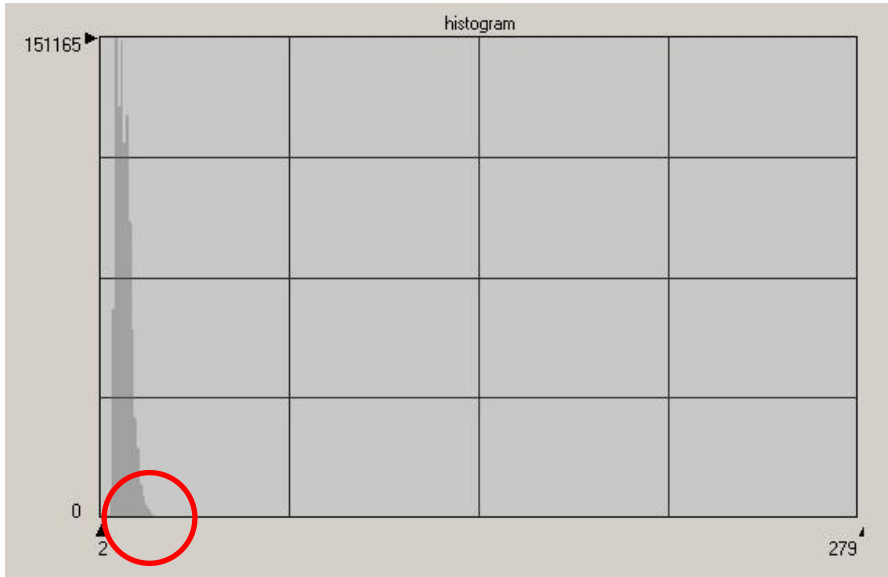
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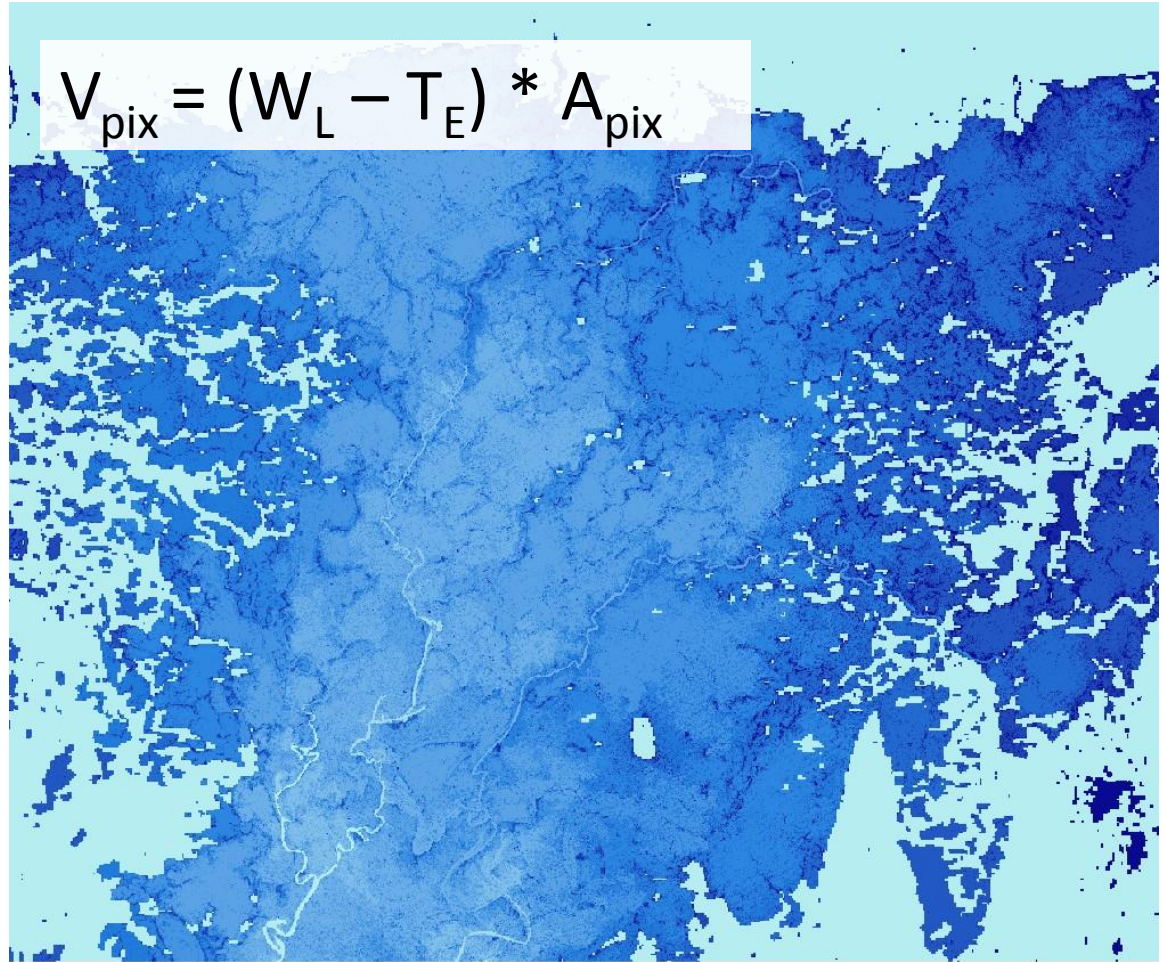
Histogram



- Histogram shows distribution of elevation of flood pixels
- Optimal threshold for water surface level has to be found

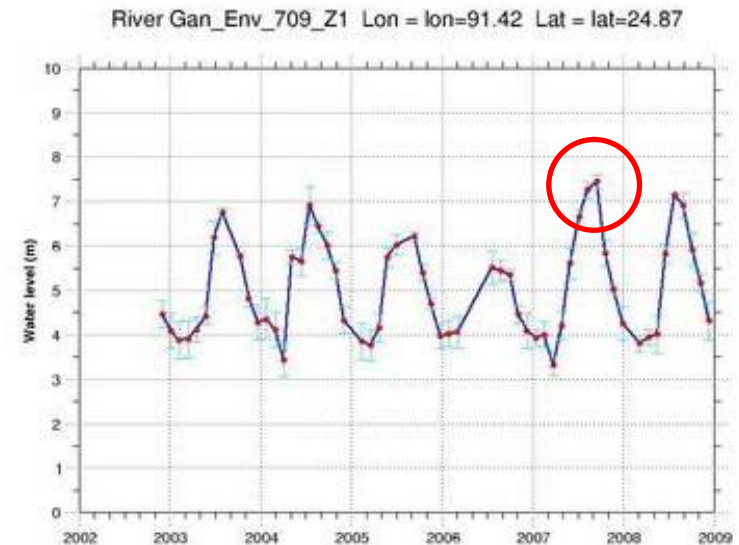
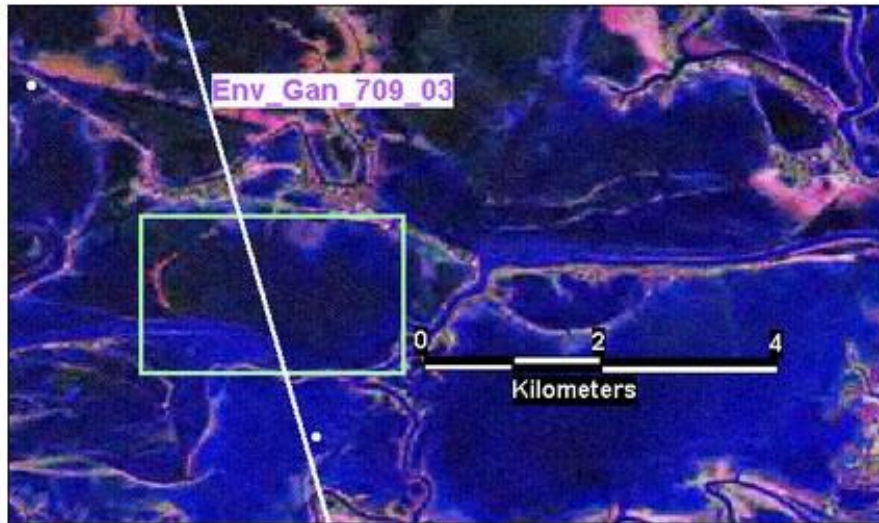
Ganges/Brahmaputra

DEM value	Number of pixels	Water depth	Volume per pixel
0	1740	22	38280
1	1468	21	30828
2	1013	20	20260
3	8339	19	158441
4	59922	18	1078596
5	151165	17	2569805
6	117605	16	1881680
7	136905	15	2053575
8	107278	14	1501892
9	115144	13	1496872
10	84677	12	1016124
11	54211	11	596321
12	28983	10	289830
13	20357	9	183213
14	10165	8	81320
15	7016	7	49112
16	4288	6	25728
17	3034	5	15170
18	1479	4	5916
19	784	3	2352
20	355	2	710
21	183	1	183
22	424	0	0
	sum		130,96 km³

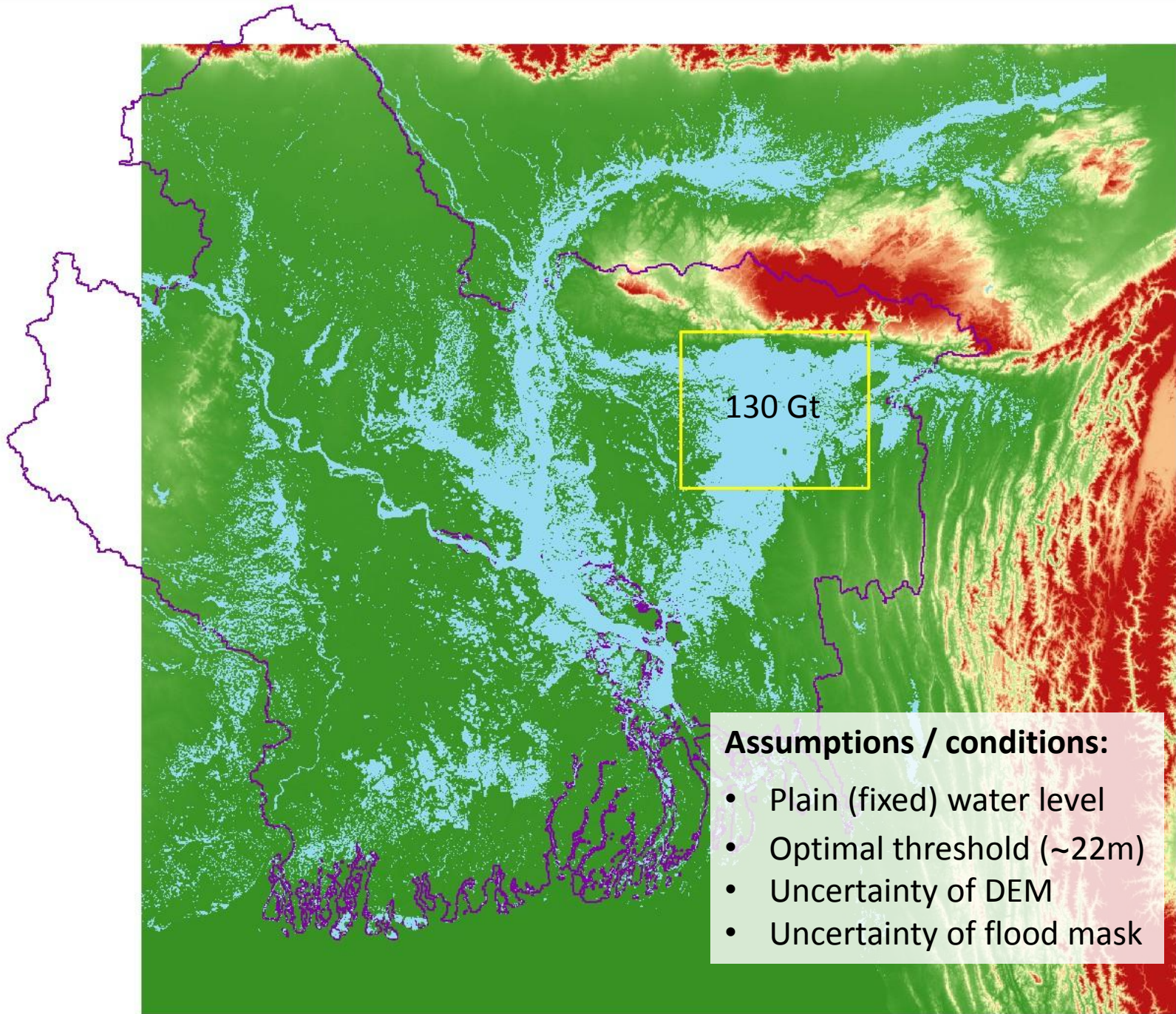


Ganges/Brahmaputra

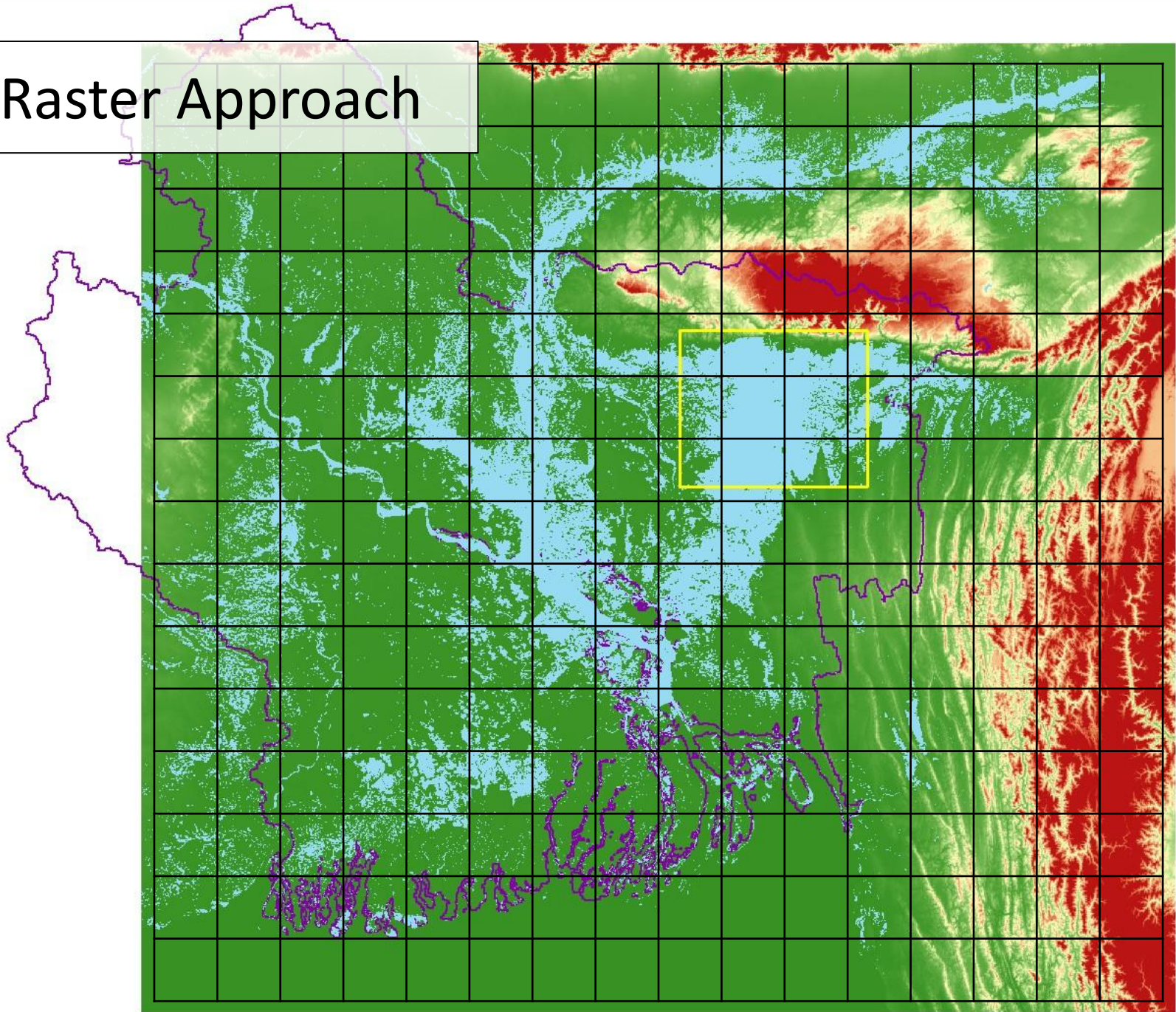
Virtual stations computed under the Envisat ground tracks
(*) using the standard processing



http://www.legos.obs-mip.fr/en/soa/hydrologie/hydroweb/Page_2.html



Raster Approach



Next steps

- Assess accuracy of derived water levels (threshold)
 - compare with altimetry data and water gauge data
- Define optimal raster size for the flood volume estimation based on
 - the spatial resolution of the flood mask
 - flood shape
 - topography of the basin

Next steps

- Analysis of ENVISAT-ASAR time series for pre-defined flood events (Ganges-Brahmaputra, Danube, Mekong)
- Validation / improvement of derived flood volumes
 - Compare with hydraulic model results
 - Tests with higher resolution DEMs and flood masks