

ASSESSING AND IMPROVING FLUVIAL FLOOD FORECAST PERFORMANCE USING SENTINEL-1 DERIVED FLOOD EXTENT MAPS

H44E-05

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16 DECEMBER 2021

AGU FALL
MEETING



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CHALLENGES IN HYDRODYNAMICS

Operational issue

How to predict river discharge for flood forecasting and water balance estimation?



Observations

- in-situ : high frequency but sparse
- remote sensing : spatial coverage (SWOT) but low temporal coverage
- Various nature of errors

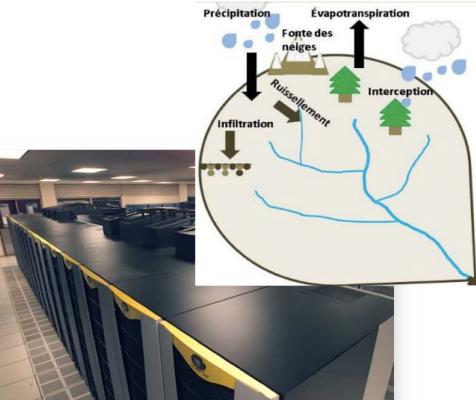


Data assimilation



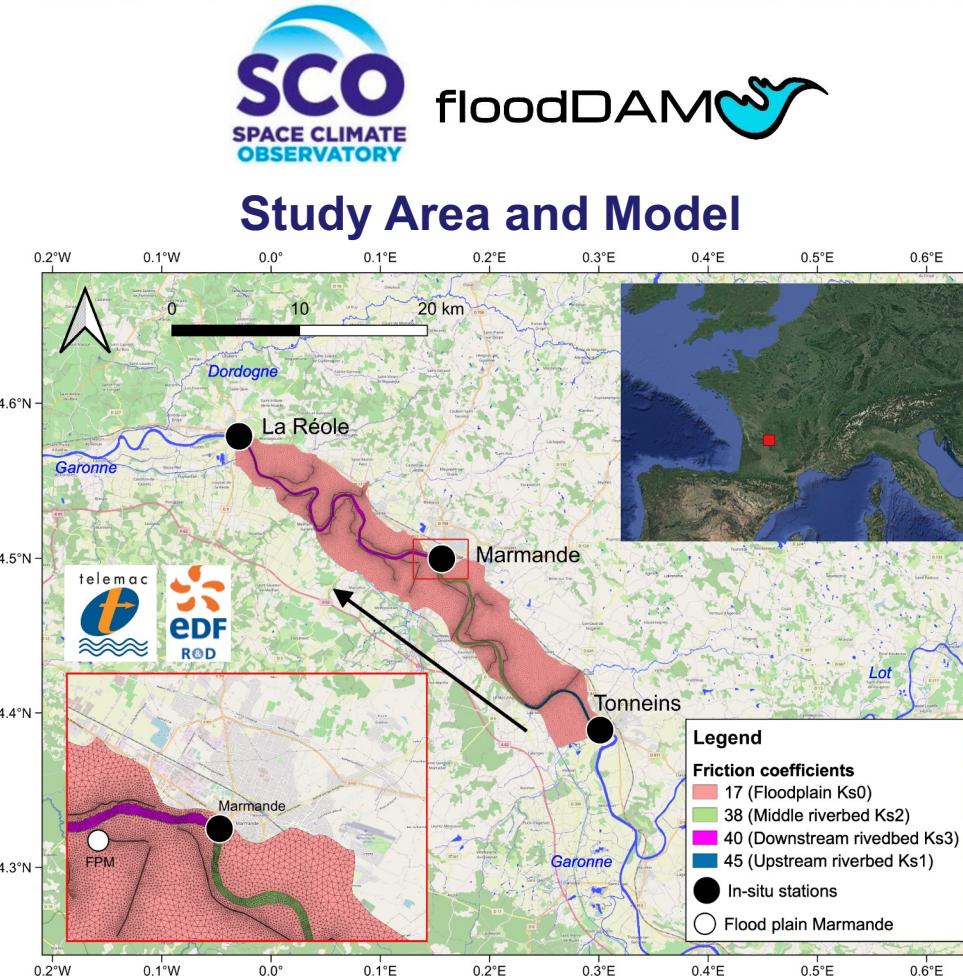
Numerical simulations

- Simplified Navier Stokes equations 1D, 2D, 3D
- Limited information on bathymetry, topography, friction, hydrology, rainfall and maritime forcing



Scientific issue

How to apply data assimilation to predict discharge and water level in rivers, estuaries and lakes ?



OBJECTIVE: MERITS OF USING REMOTE SENSING-DERIVED FLOOD OBSERVATIONS TO OVERCOME LIMITATIONS OF CAL/VAL PROCESSES RELYING ON IN-SITU DATA.

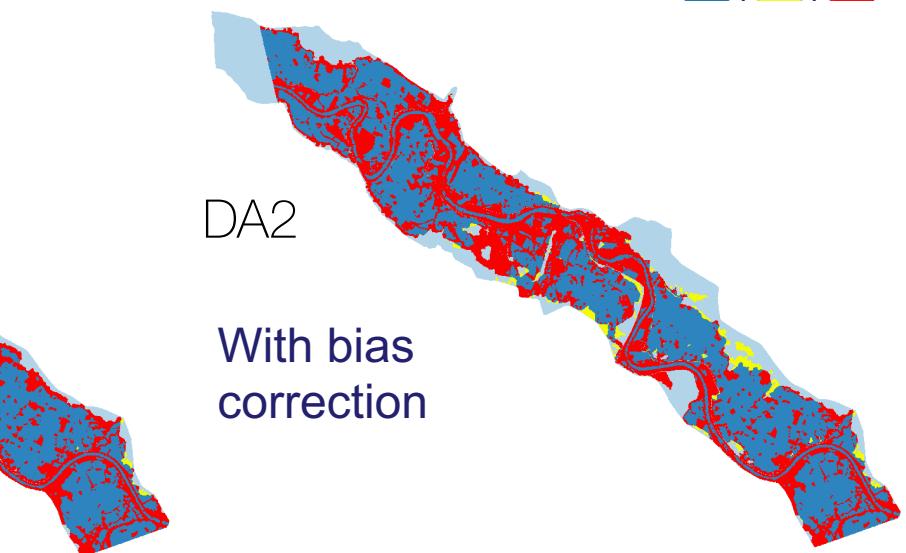
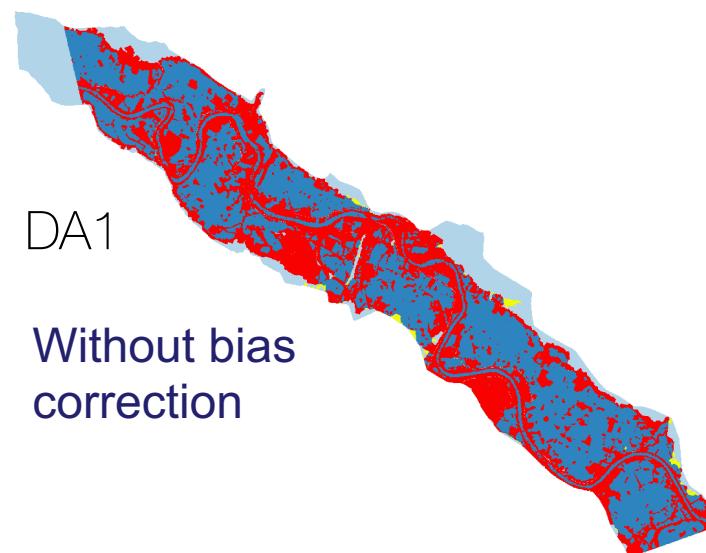
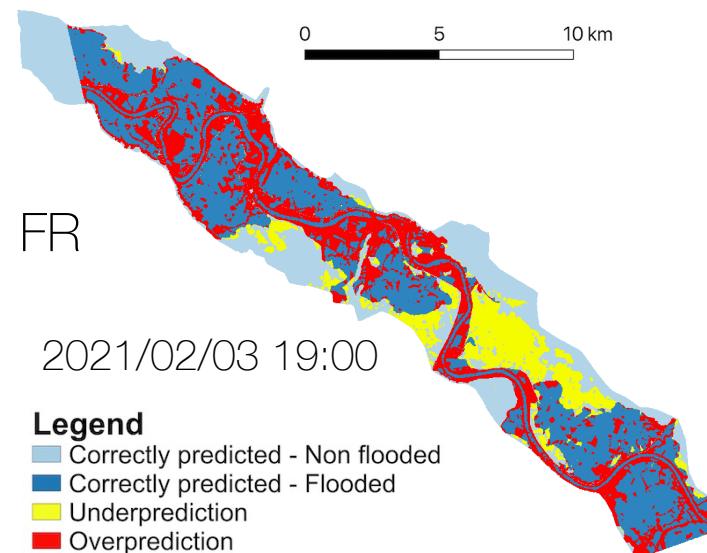
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VALIDATING FLOOD EXTENTS W.R.T. SENTINEL-1 DATA

ENSEMBLE-BASED DATA ASSIMILATION ALLOWS TIME-VARYING CORRECTION OF FRICTION COEFFICIENTS AND INFLOW DISCHARGE

→ IMPROVED SIMULATION AND FORECAST IN THE RIVERBED AND FLOODPLAIN



Exp. name	1D Water level RMSE [m]			2D CSI [%]
	Tonneins	Marmande	La Réole	
FR1	0.756	0.625	0.409	55.86
FR2	0.102	0.338	0.505	
DA1	0.090	0.059	0.148	61.97
DA2	0.084	0.104	0.138	63.84



CONCLUSIONS

2D INDEPENDENT OBSERVATIONS OFFER VALUABLE TOOLS FOR VALIDATION.

EXTENSIVE ASSESSMENTS USING IN-SITU AND RS-DERIVED FLOOD EXTENT OBSERVATIONS.

- EVALUATION OF SIMULATED WATER LEVEL TIME-SERIES
- GLOBAL ASSESSMENT OVER THE WHOLE CATCHMENT
- HIGH WATER MARKS WITHIN THE FLOODPLAIN

<https://doi.org/10.1109/TGRS.2022.3147429>

<https://www.spaceclimateobservatory.org/flooddam-way-2nd-stage>

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