Satellite Images Potentiality for Calibration of Hydrodynamic Model in Estuaries and Coastal Areas

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AIM OF WORK

Study of a of river plume events

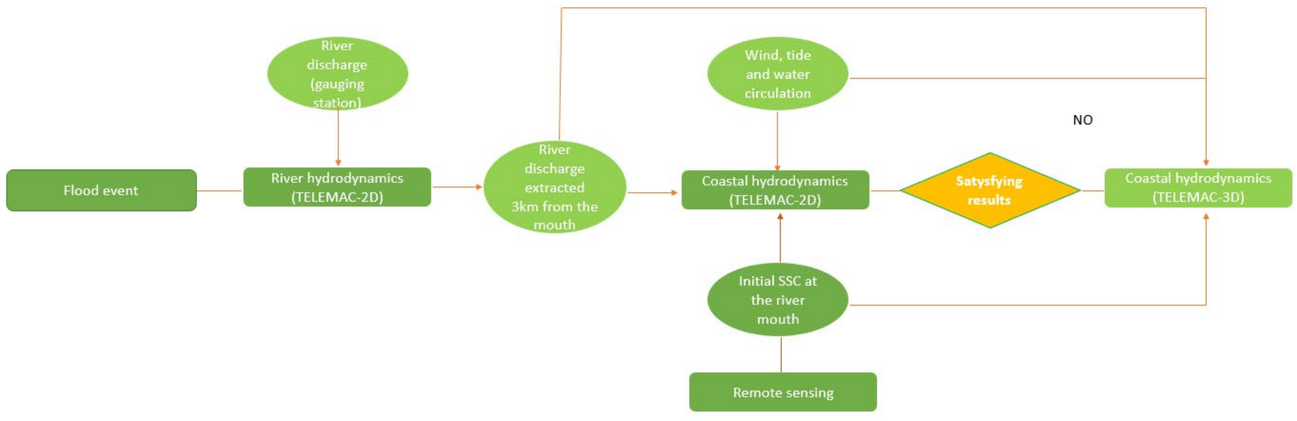
Computational finite element hydrodynamic models capable of replicating river plume events

Calibrate the model with the Remote Sensing images

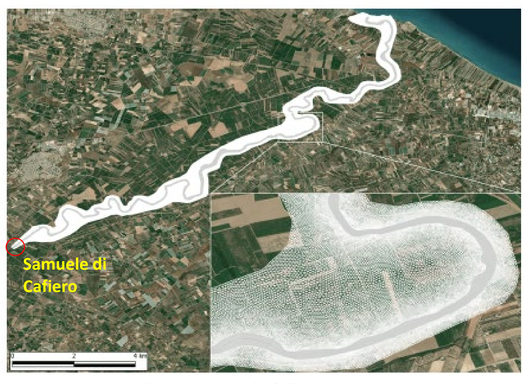
INTRODUCTION AND CASE STUDY

The application is dedicated to the Ofanto River, located in the South of the Adriatic Sea, Italy. This area is largely anthropized due to its proximity to some of the main cities of the Puglia region. The aim of the study was to recreate the sediment dispersion occurring during an extreme flood event using numerical modelling for the simulation of the hydrodynamic and morphodynamical process, and remote sensing for the validation and calibration of the model.
The event simulated occurred on March 11th, 2021, and was characterized by extreme precipitations and strong winds, causing a big dispersion of a mixture of suspended sediments, nutrients and pollutants of anthropic origin into the sea and along the coast.

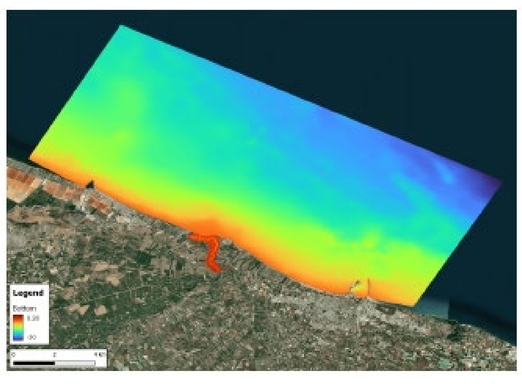
METODOLOGY



Model domains



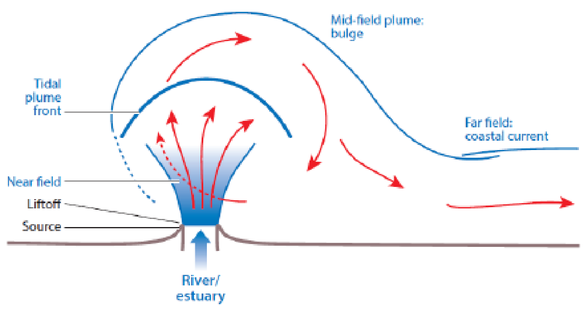
River model Domain



Coastal model domain

Remote sensing images

Satalite imgae on March 11,2021



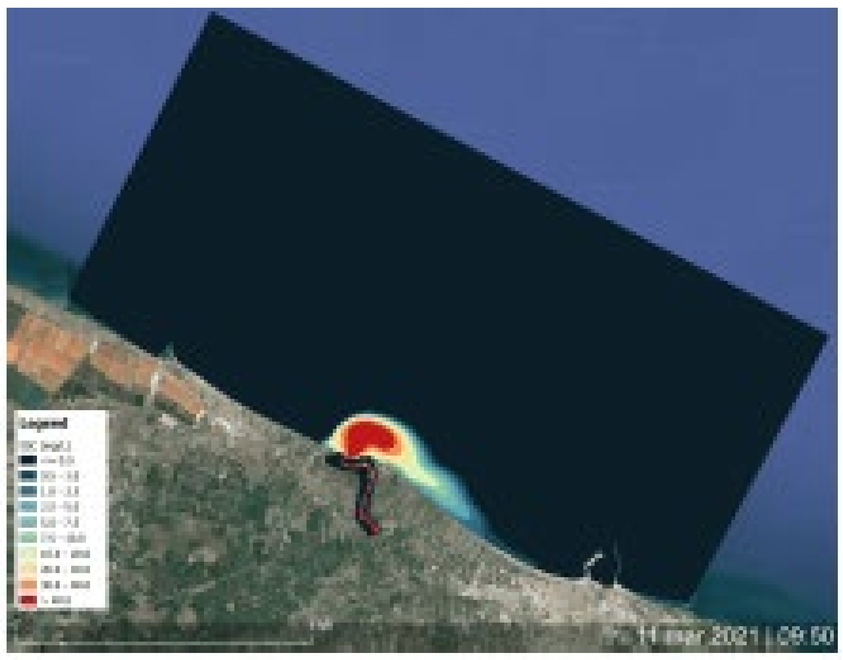
Schematic representation of the prototypical plume comprising all dynamical regions. Image and description from (Horner-Devine et al., 2015)

River model results used as input for the coastal model

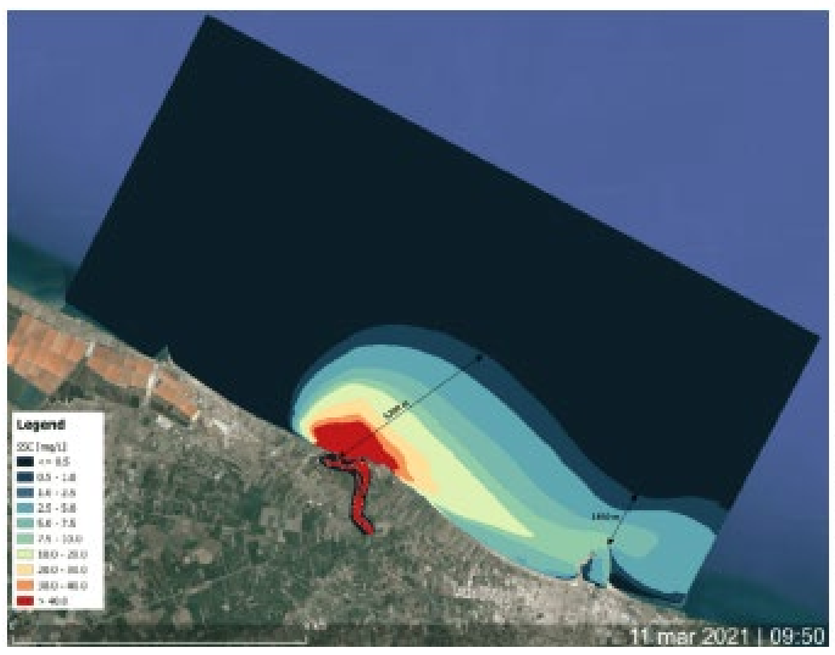
Flooded area from Satallite image

Flooded area simulated in the river model

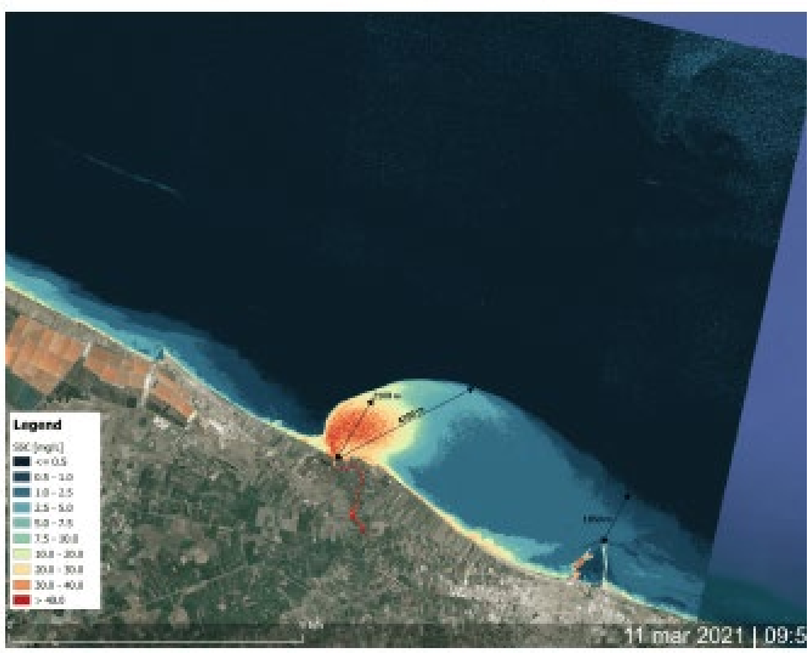
RESULTS



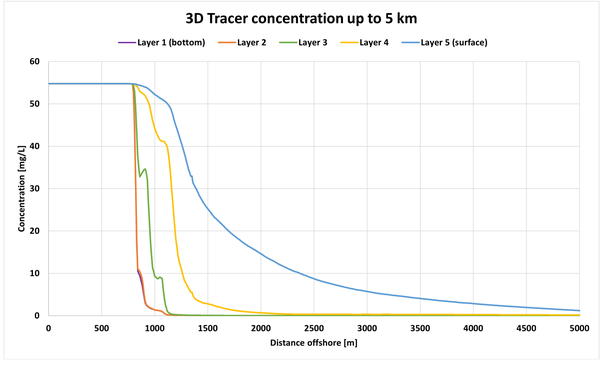
2D simulation of the plume on March 11,2021



3D simulation of the plume on March 11,2021



Satalite data applying a spectral band-based formula on March 11,2021



	SSC (satellite)	3D Model
Offshore plume distance	4700 m	5200 m
Offshore plume distance (near Barletta harbour)	1850 m	1500 m
Alongshore plume distance (beyond Barletta harbour)	>12 km	>12 km
Near-field tracer concentrations	$\geq$ 40 mg/L	$\geq$ 40 mg/L
Far-field tracer concentrations (near Barletta harbour)	1 - 2.5 mg/L	2.5 - 5 mg/L
Far-field tracer concentrations (beyond Barletta harbour)	0.5 - 2.5 mg/L	0.5 - 2.5 mg/L