



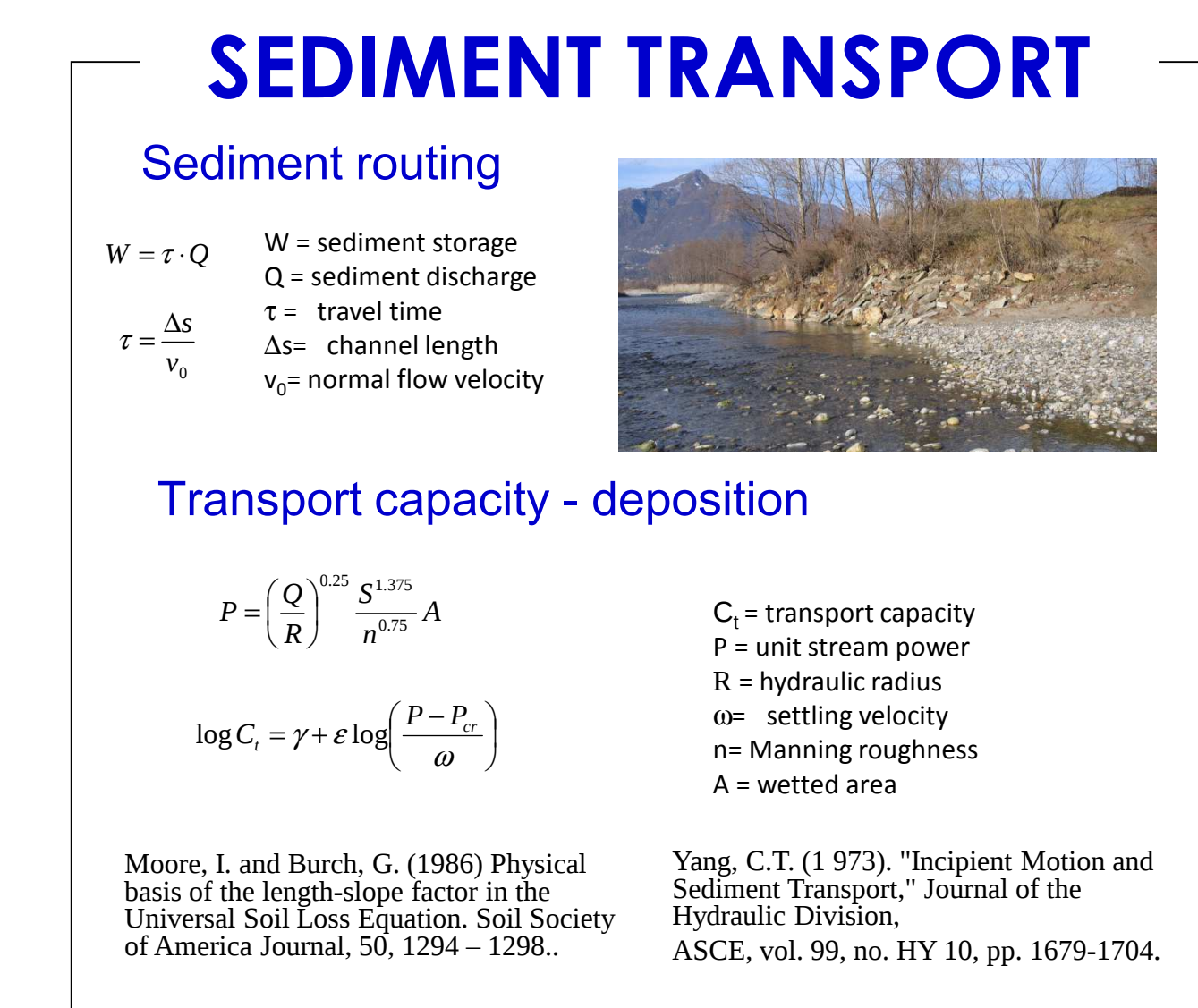
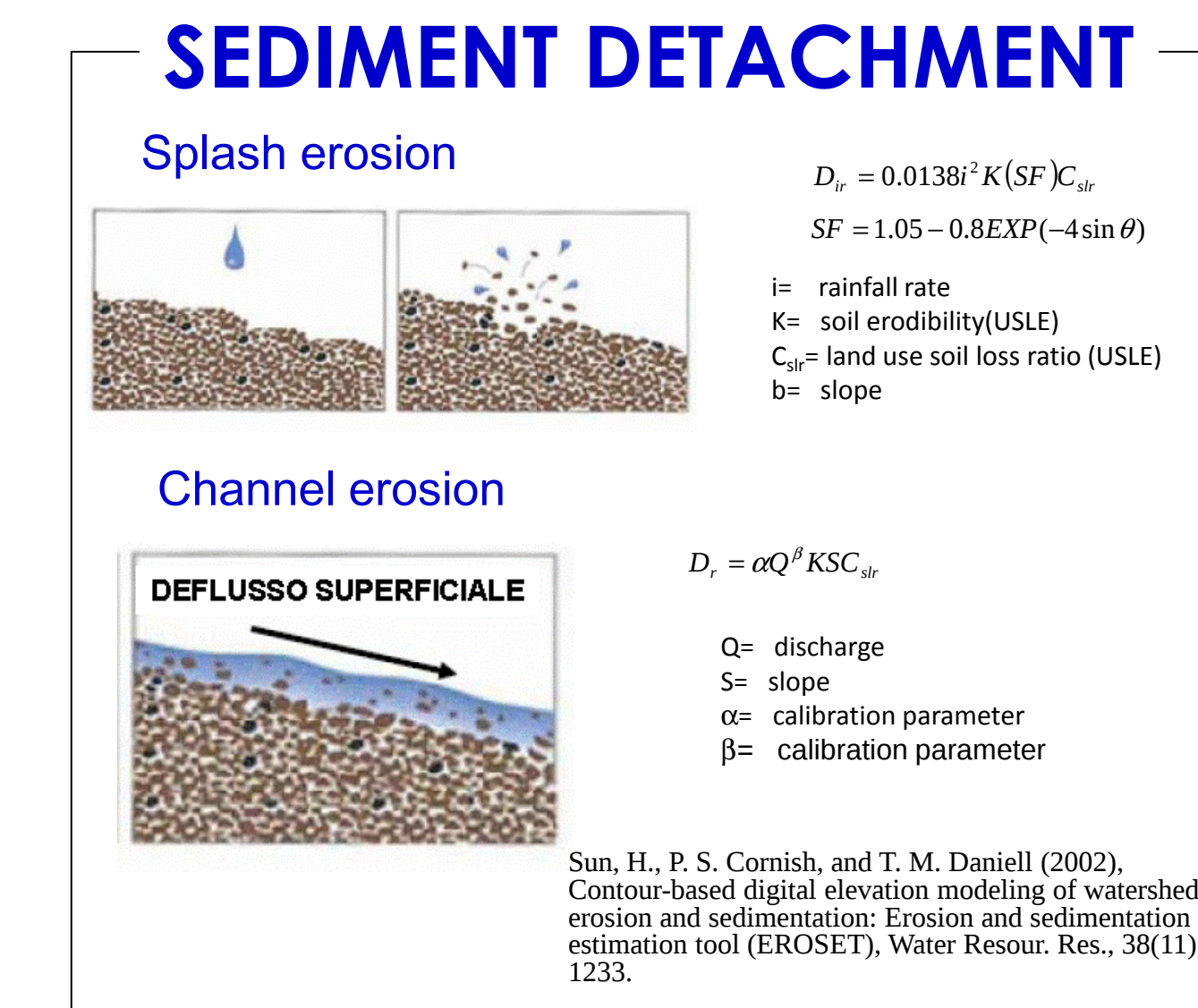
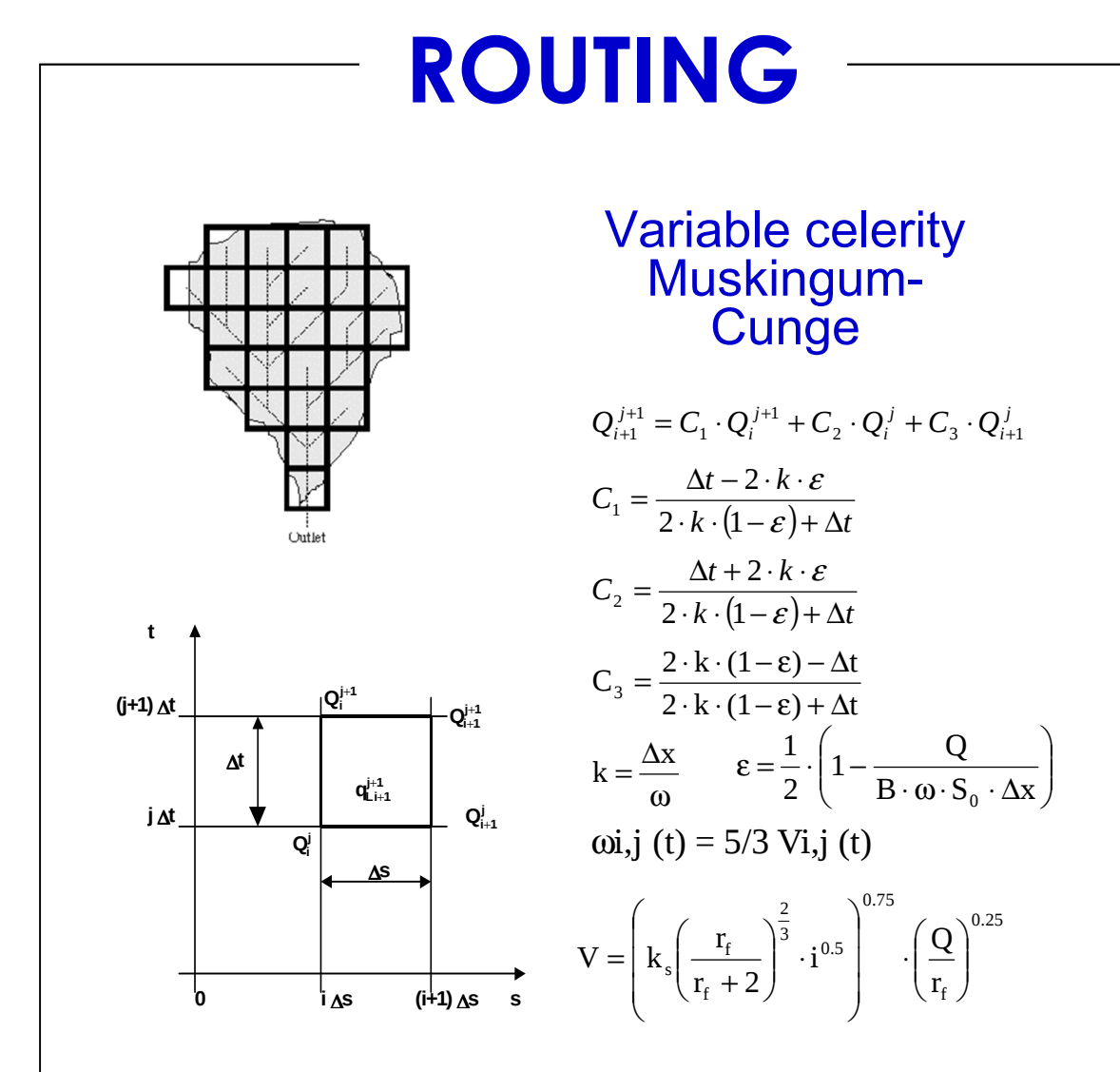
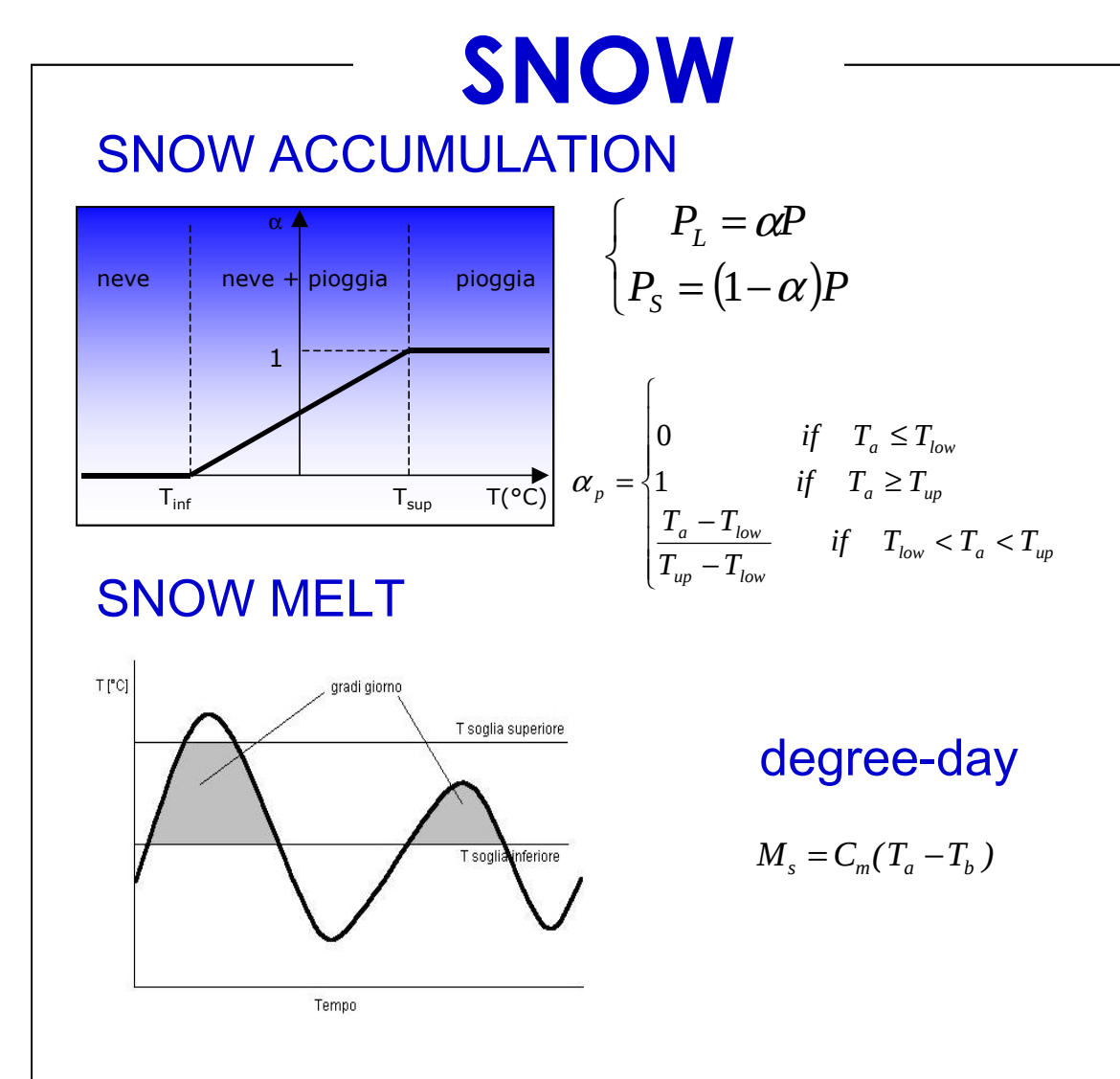
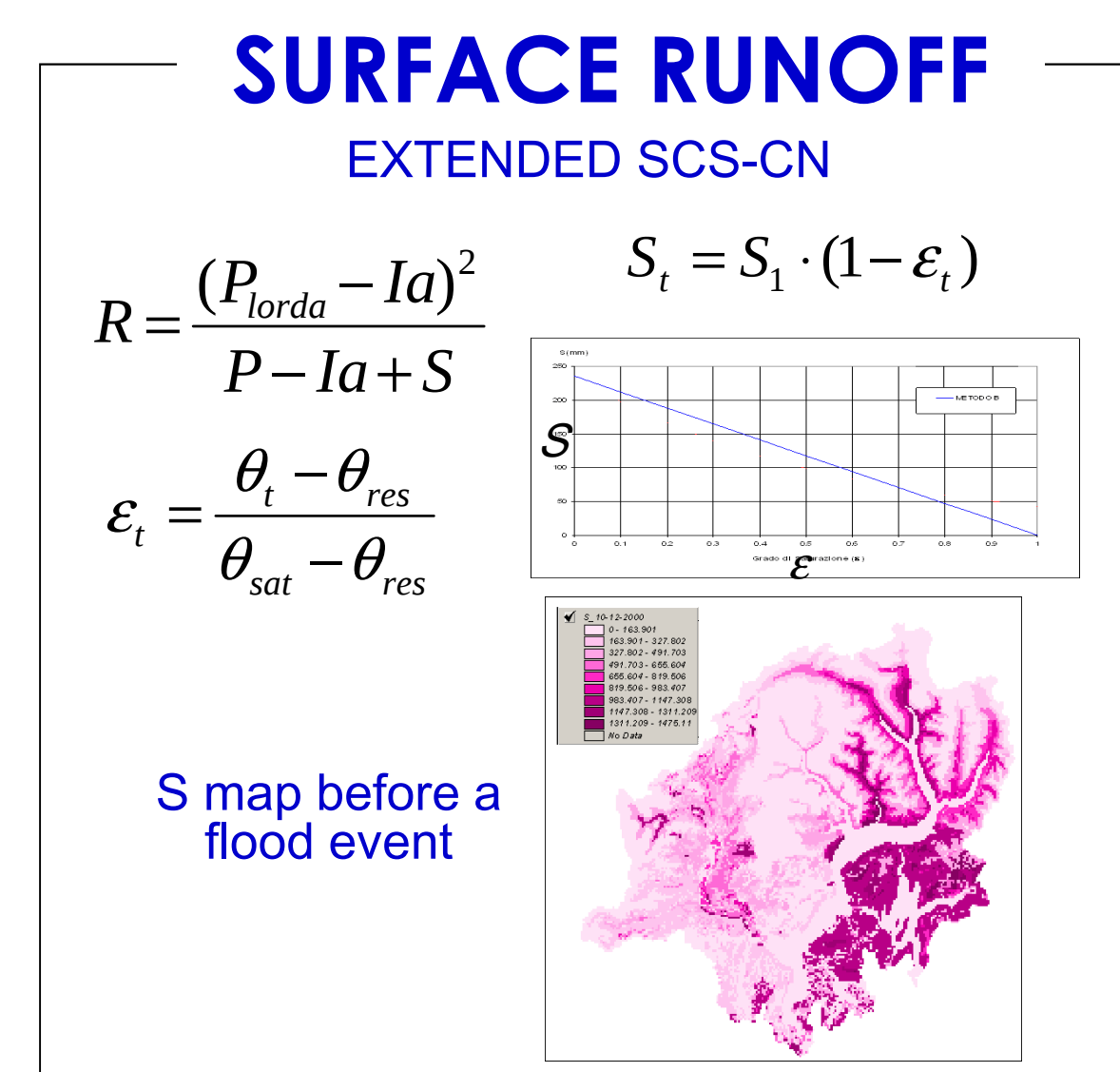
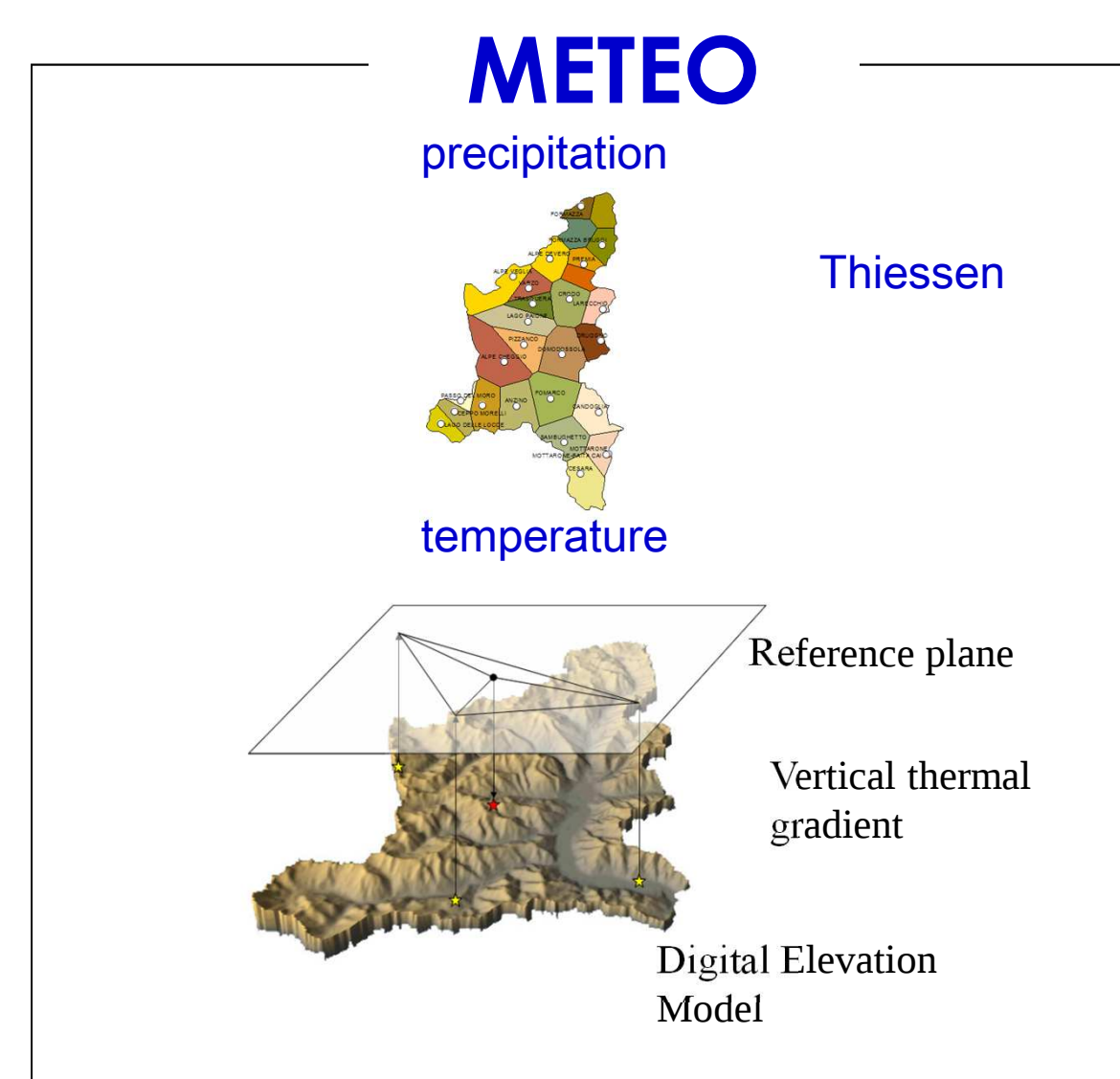
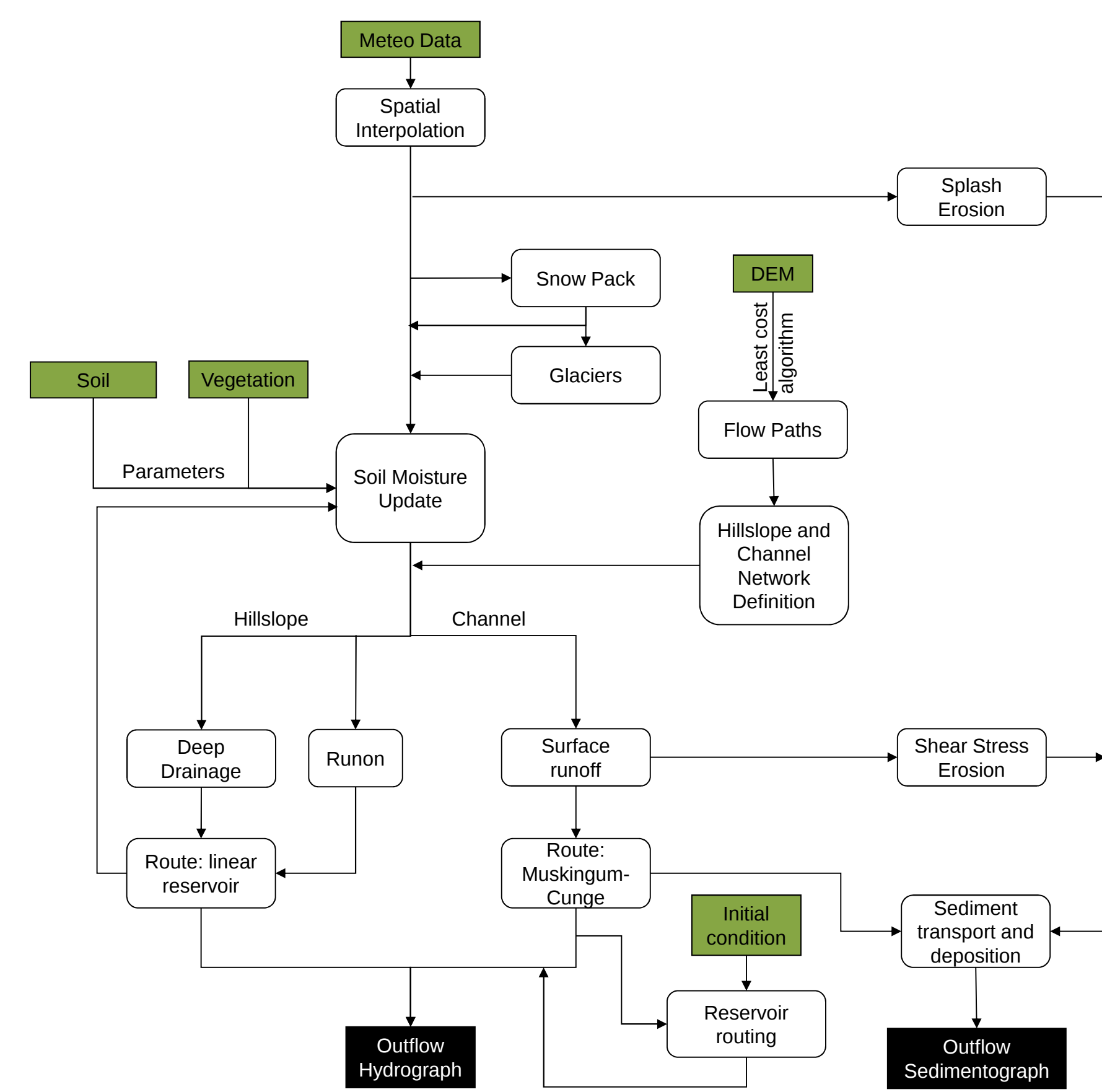
ABSTRACT: Soil erosion and sedimentation assessment is fundamental in both engineering practice and hydrologic research. A wide range of mathematical models have been developed during years; they can be classified in two categories: a) models mainly oriented to hillslope surface erosion that concentrate attention to rill and interrill processes, and b) models developed for simulating in-stream phenomena mainly related to bed-load transport. In order to predict erosion and sedimentation at the river basin scale, all sediment related processes on hillslope and river channel need to be simulated in an integrated model. Moreover, in poorly gauged mountainous river basins, where available measurements and data are generally limited, models need to be kept as simple as possible in order to limit the number of parameters.

The erosion and sedimentation model (ERODE) developed in this study combines raster USLE parameters to the spatially distributed physically based hydrological model FEST-WB processes with minimal data requirement. In particular, the model takes in account rain splash detachment in overland areas and shear stress erosion in channel areas. Sediment transport and sedimentation are evaluated along the river network by calculating the transport capacity through the unit stream power theory.

The model was applied to an Alpine river basin in Northern Italy and it was validated against measurements of suspended solids and total sediment transport at the basin scale. The results show that the model is able to correctly simulate storm and within-storm erosion and deposition.

ACKNOWLEDGEMENT: This work carried out under the umbrella of the Characterization of Lake Maggiore and Toce River project, funded by Syndial SpA, which also supported the characterization activities. Thanks to ARPA Piemonte for providing temperature and precipitation data from their stations.

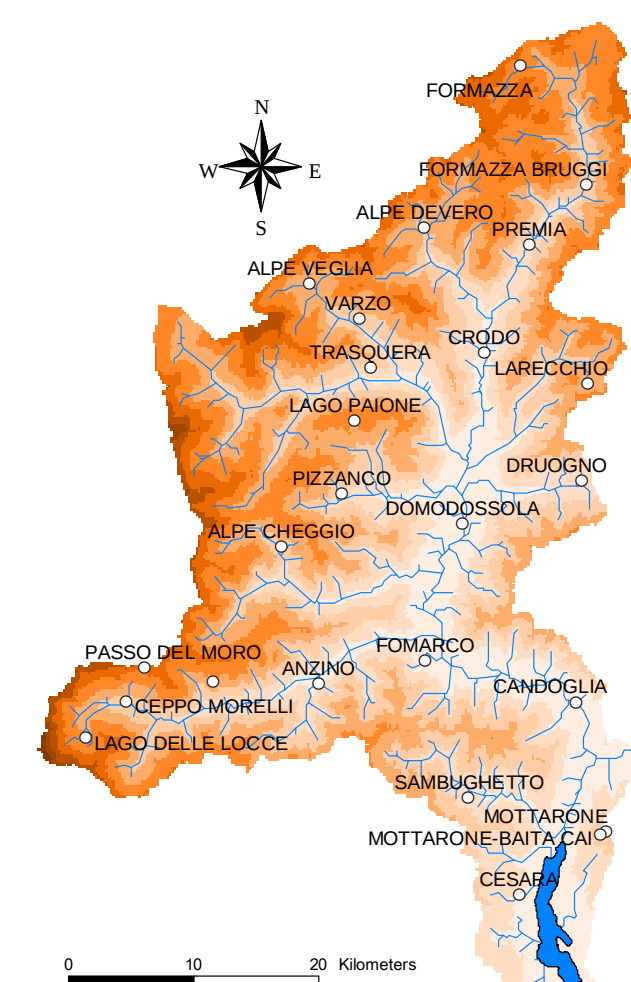
MODEL DESCRIPTION



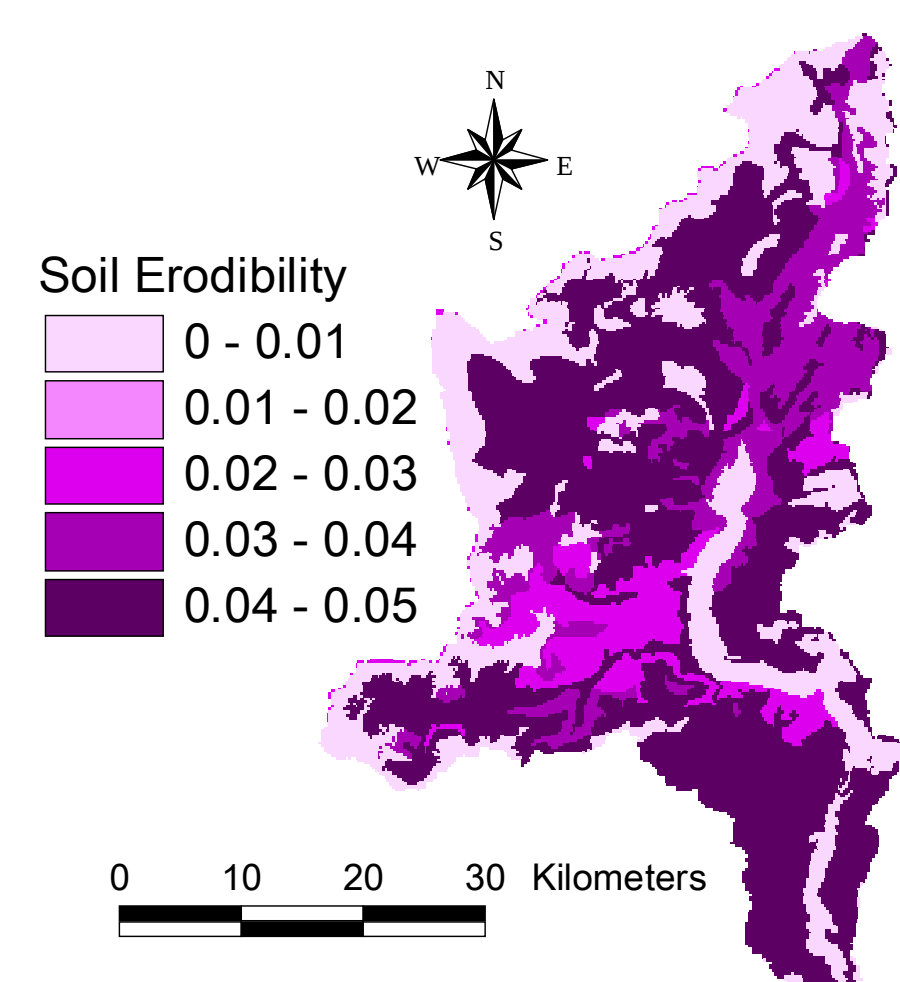
CASE STUDY

River Toce Basin - Italy

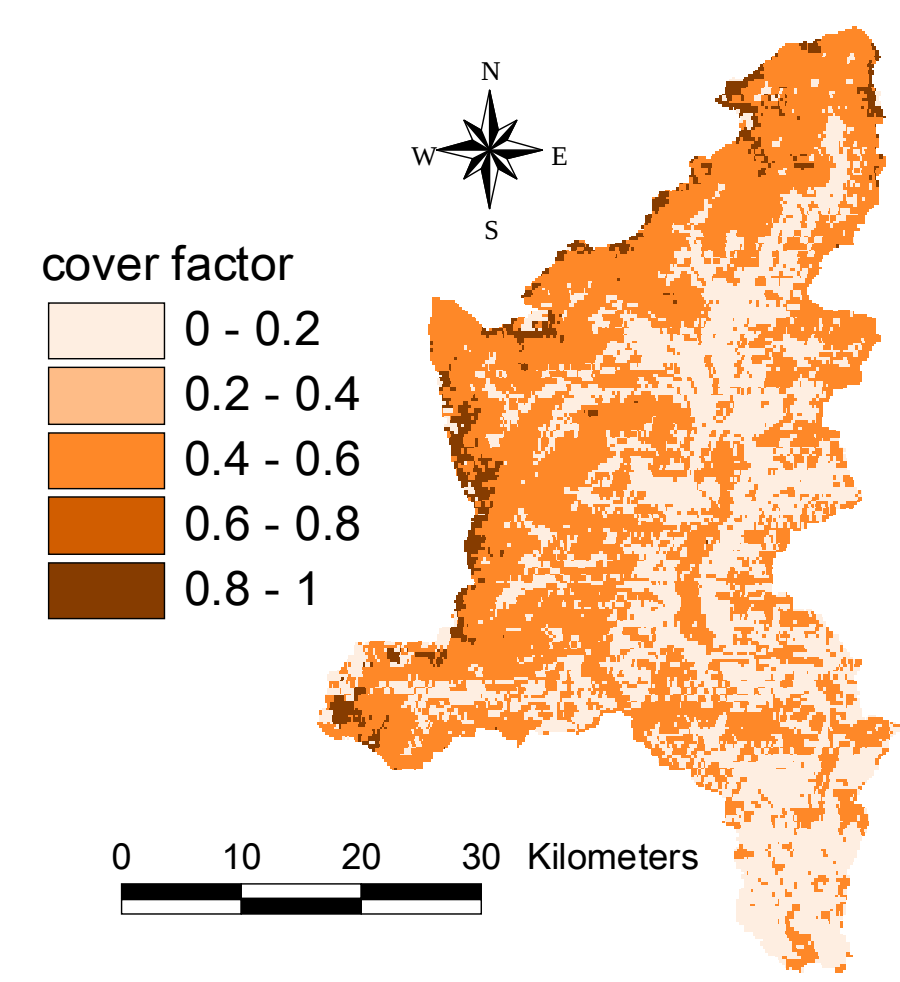
The subject area is the river Toce basin, a typical alpine basin with a total drainage area of about 1700 km², with nearly 32% of the total area above 2000 m a.s.l.. It is located in the north of the Piedmont region in Italy (Fig. 1). Climate conditions are typically humid, characterized by higher precipitations in autumn and spring. The annual average precipitation exceeds 2000 mm. Climatic characteristics, together with morphology and soil texture, frequently induced flood events in the past years. Most of the presented results are related to the Anza river basin, a tributary of the river Toce, with a total drainage area of about 261 km². Available digital cartographic data include: the Digital Elevation Model (DEM) available in raster format at 100 m x 100 m resolution; CORINE land cover maps (CEC, 1994, EEA, 2000) updated in the year 2000 available in vector format; pedologic characteristics for soils available in vector format.



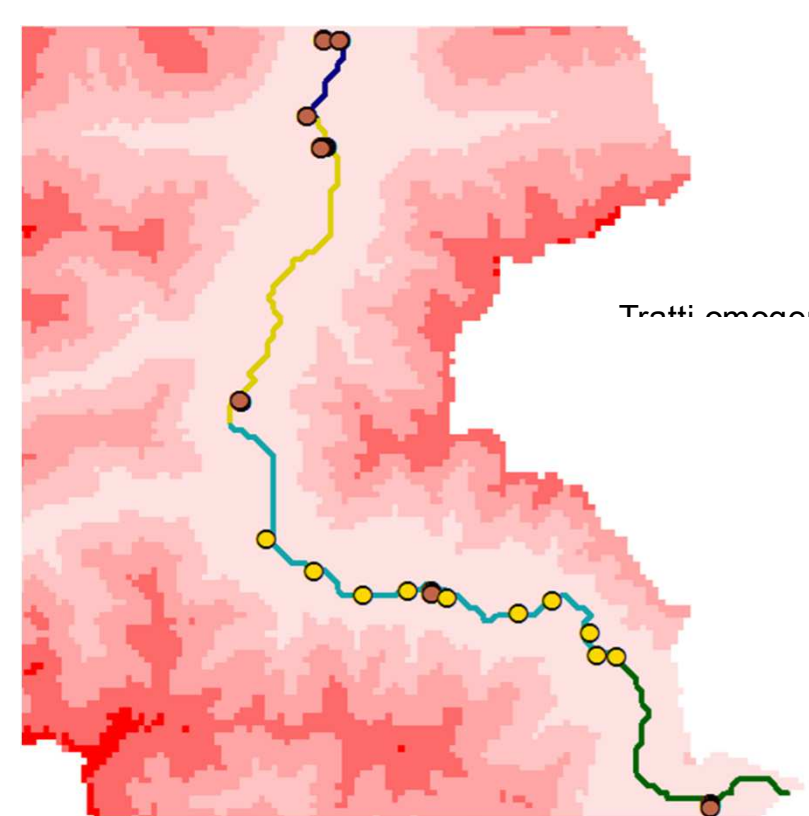
The Toce watershed extracted from the digital elevation model showing locations of the 25 rain gauges



Soil erodibility factor (kg/h / N/m²)



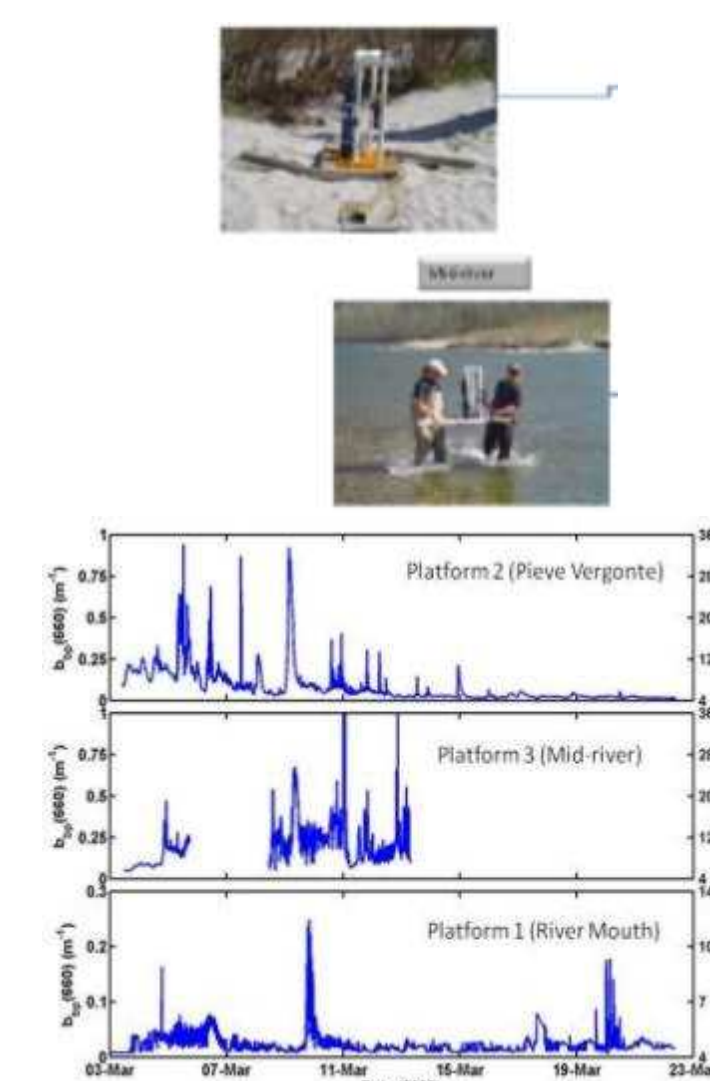
Cover and management factor



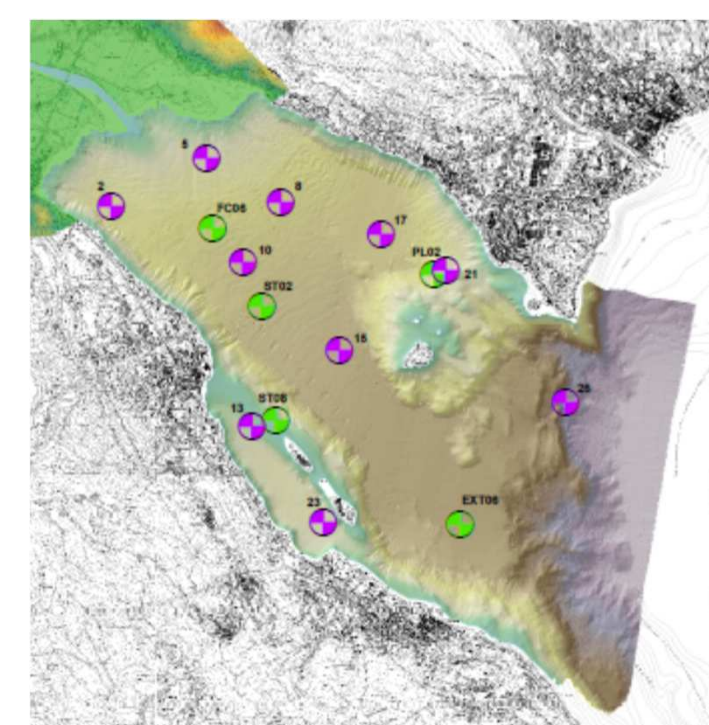
Available bed sediment laboratory analysis



Total Suspended Solid sample acquisition

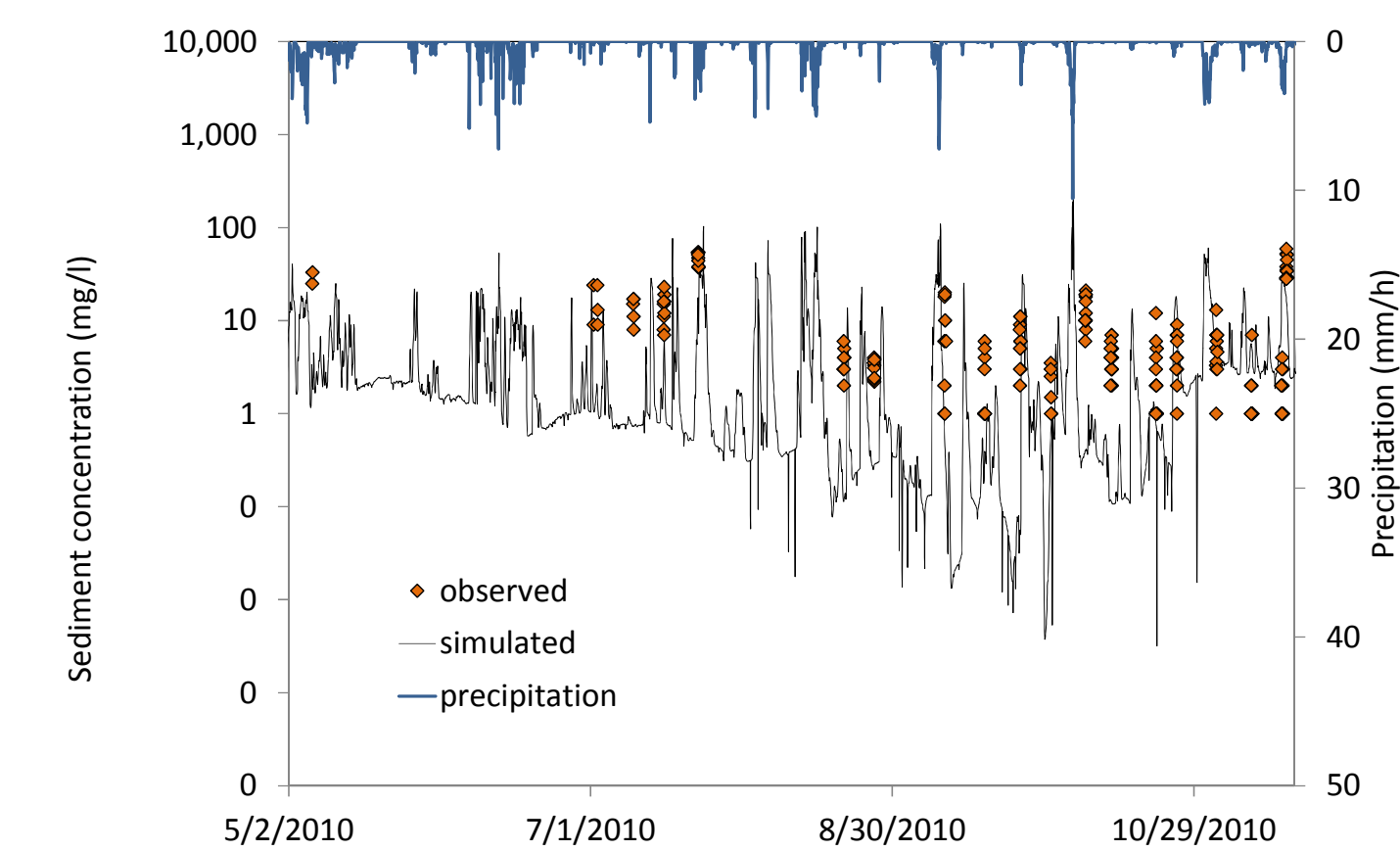
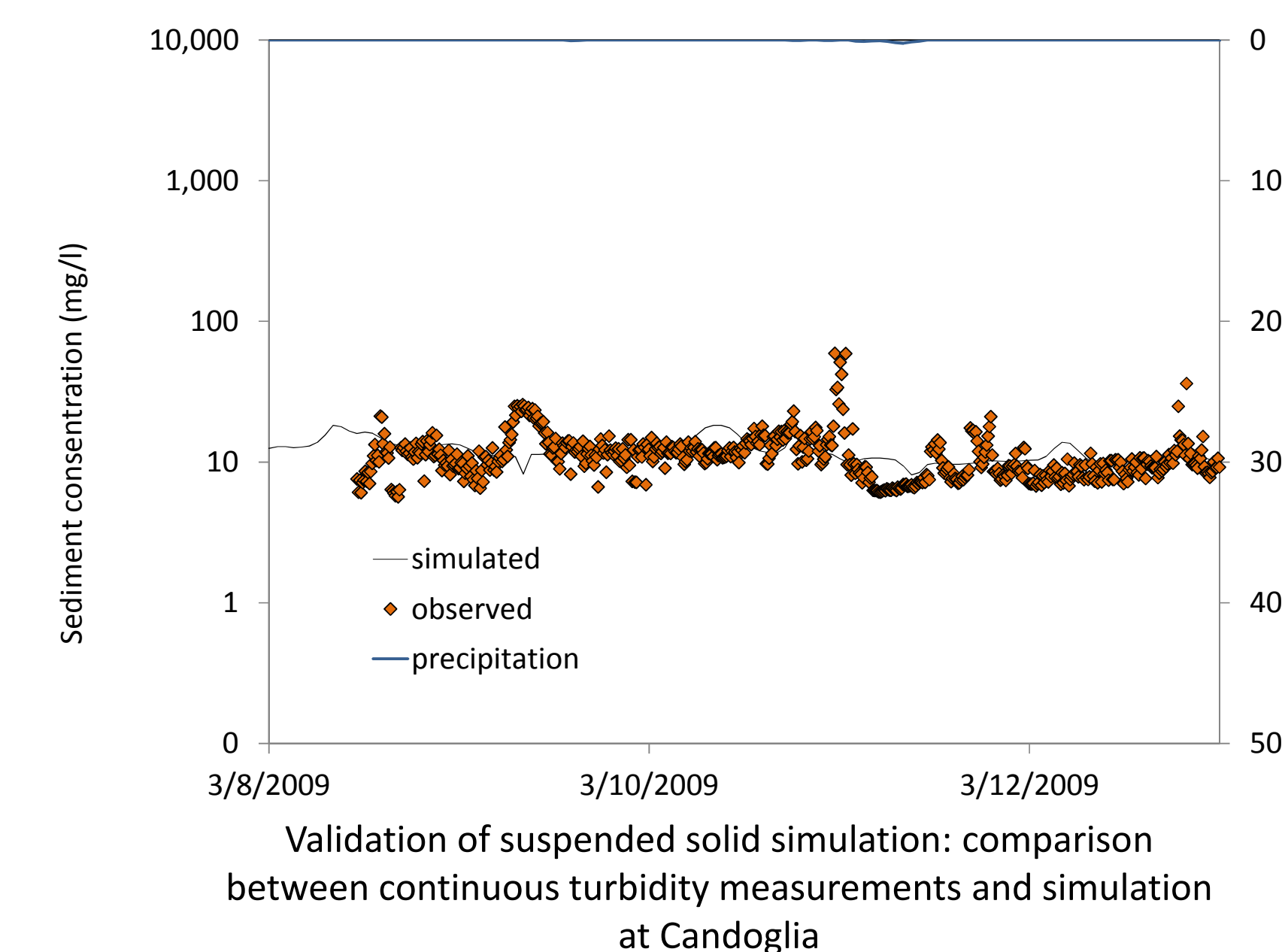


Continuous turbidity measurement: 20 Days in April 2009

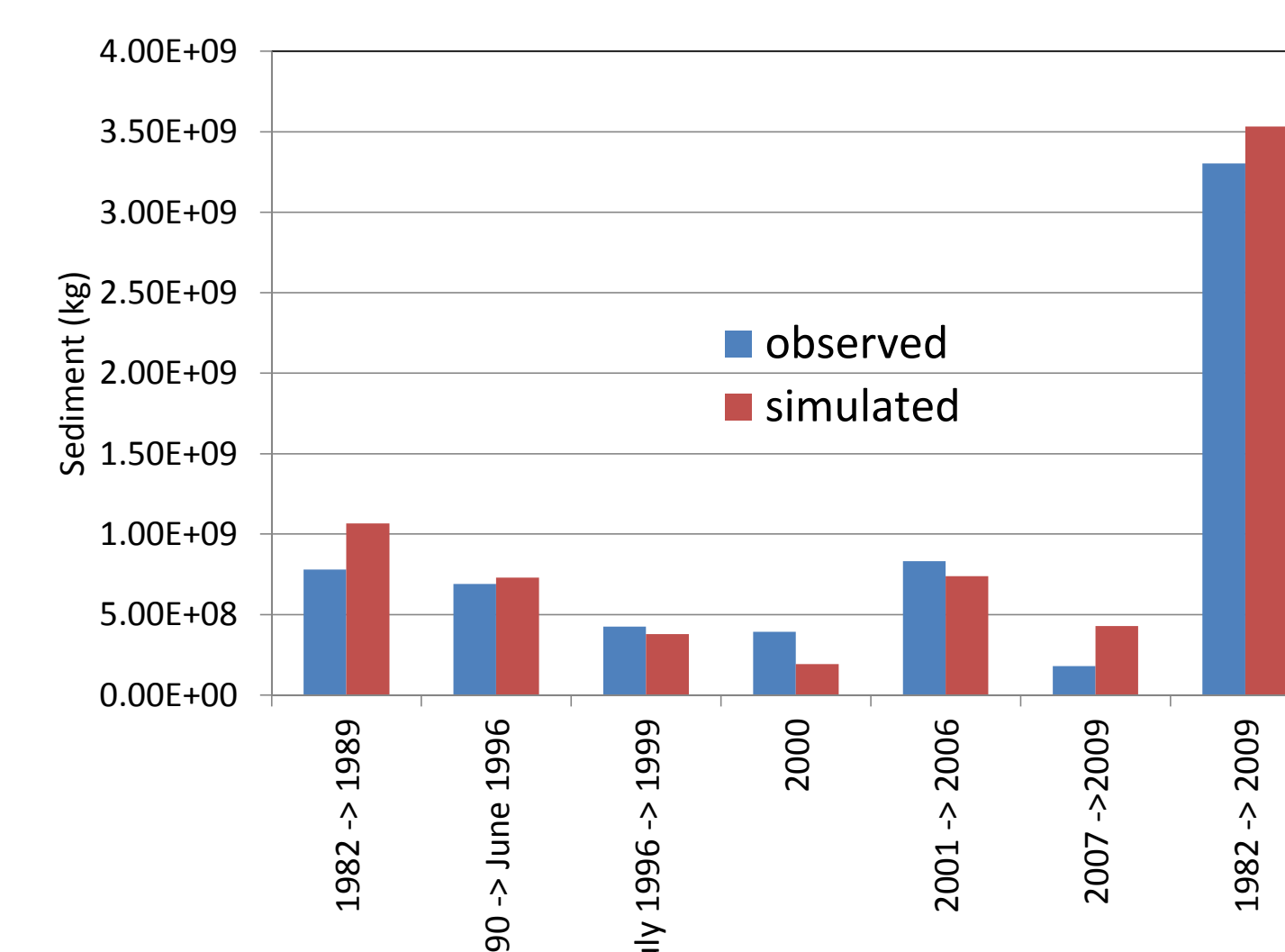


Position of samples for sediment deposition rate estimation in the bay

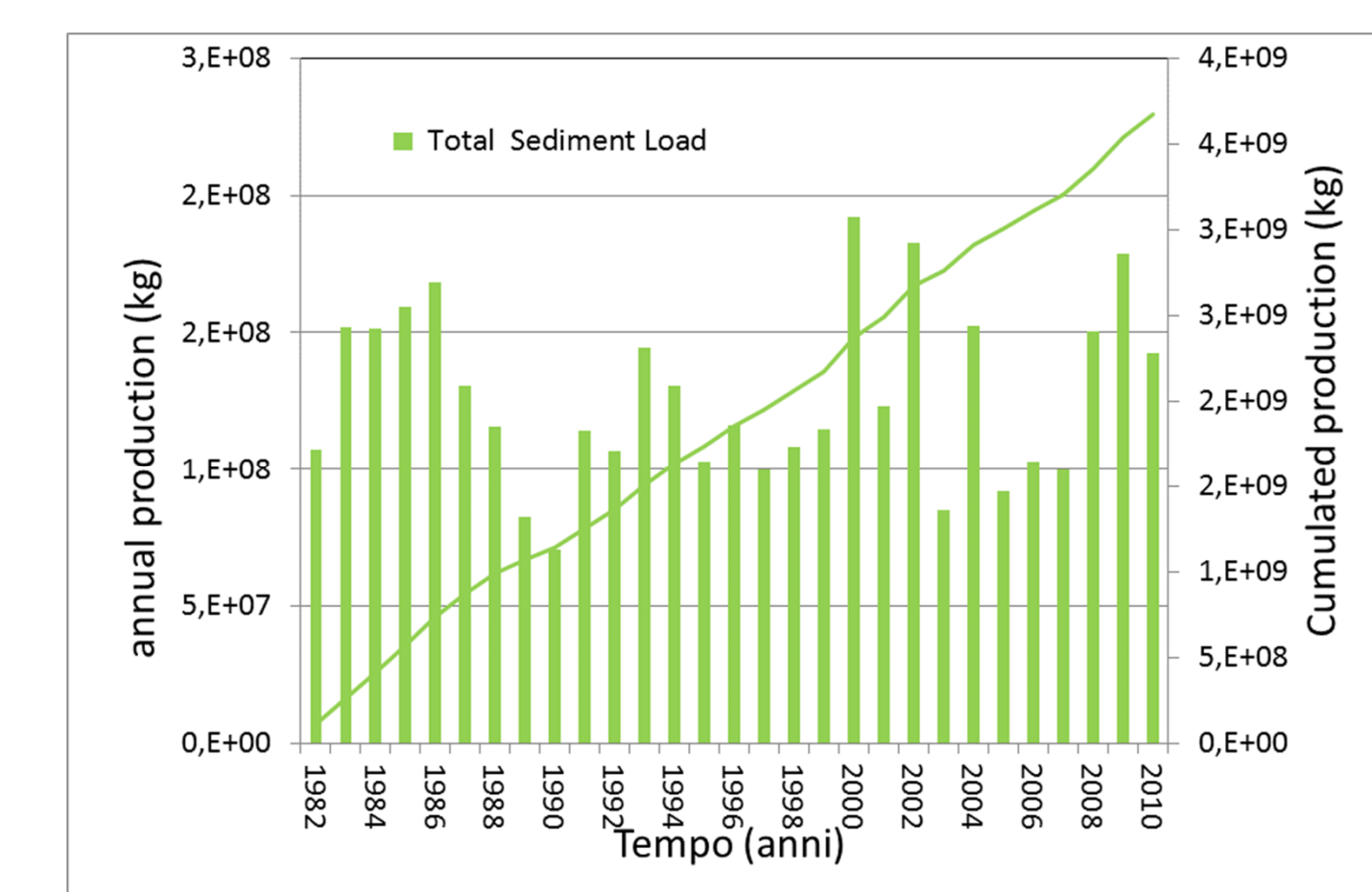
SIMULATION RESULTS



Validation of suspended solid simulation: comparison between sampled TSS and simulation at Candoglia



Validation of total (suspended + bedload) sediment simulation: comparison between measured sediment deposition in the bay and simulation at basin outlet



Simulated annual sediment inflow into lake