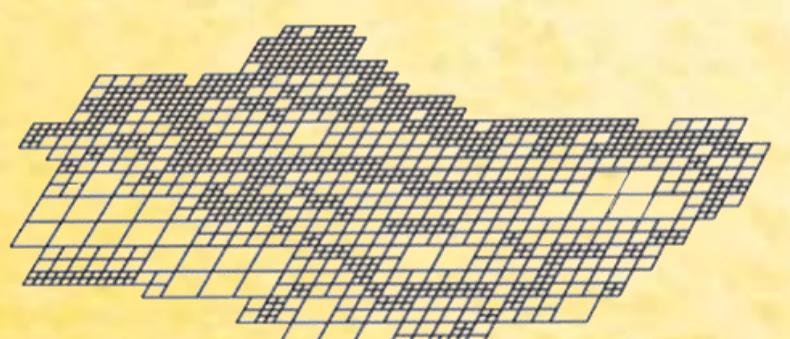


MODELLING LAKE-GROUNDWATER INTERACTIONS IN PREPARATION OF FUTURE SWOT MISSION: THE CASE OF THE GRAVEL PIT LAKES IN THE SEINE RIVER ALLUVIAL PLAIN, FRANCE.

1 Using the CNES large scale simulator, we evaluate the SWOT water level errors on gravel pits in La Bassée alluvial plain.

2 SWOT-like outputs are generated based on in-situ lake level measurements.

3 A modelling tool for gravel pit lake stage simulation, which includes groundwater interaction, is developed within the CaWaQS platform and tested using benchmark experiments.



CaWaQS integrated platform
for hydrosystems
modelling



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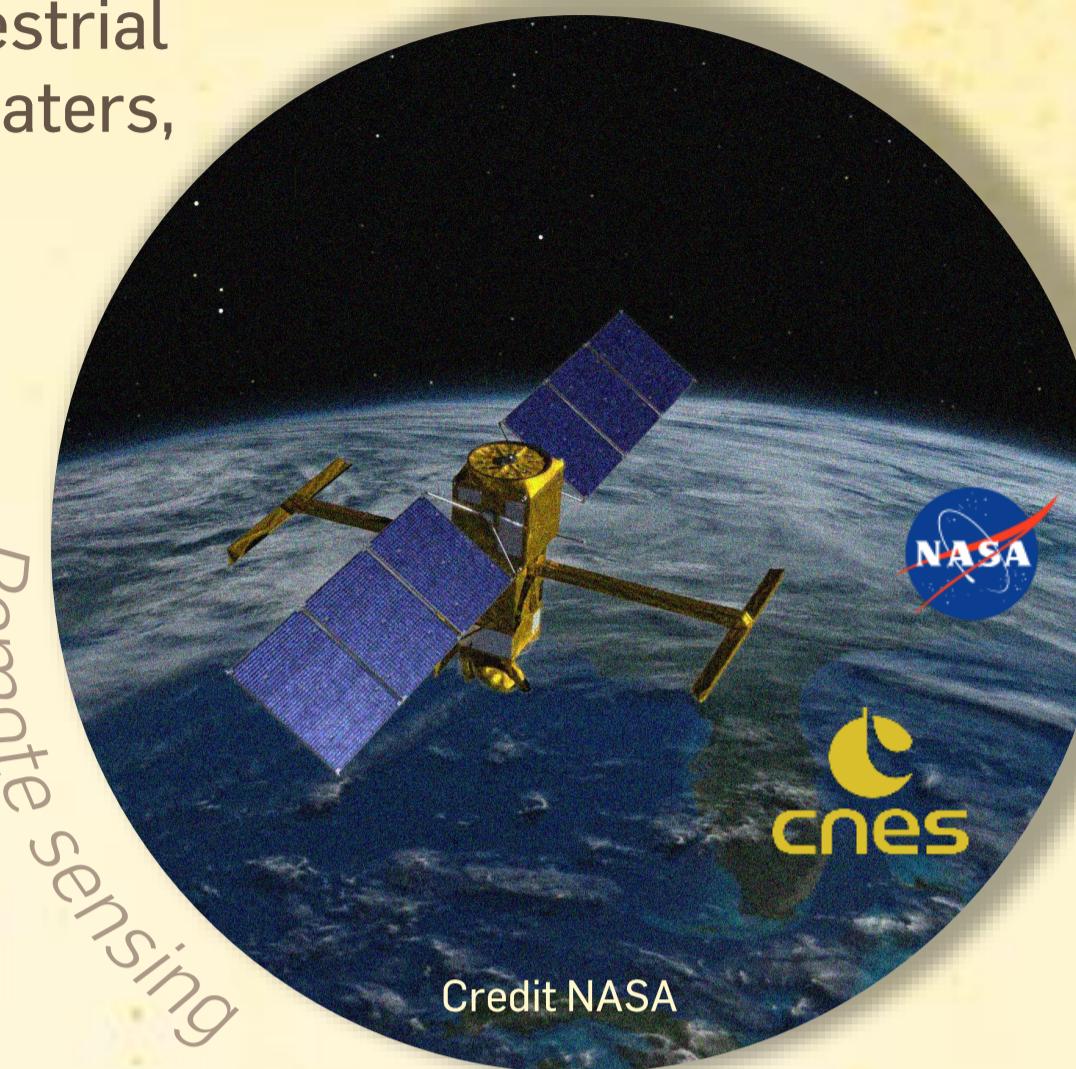
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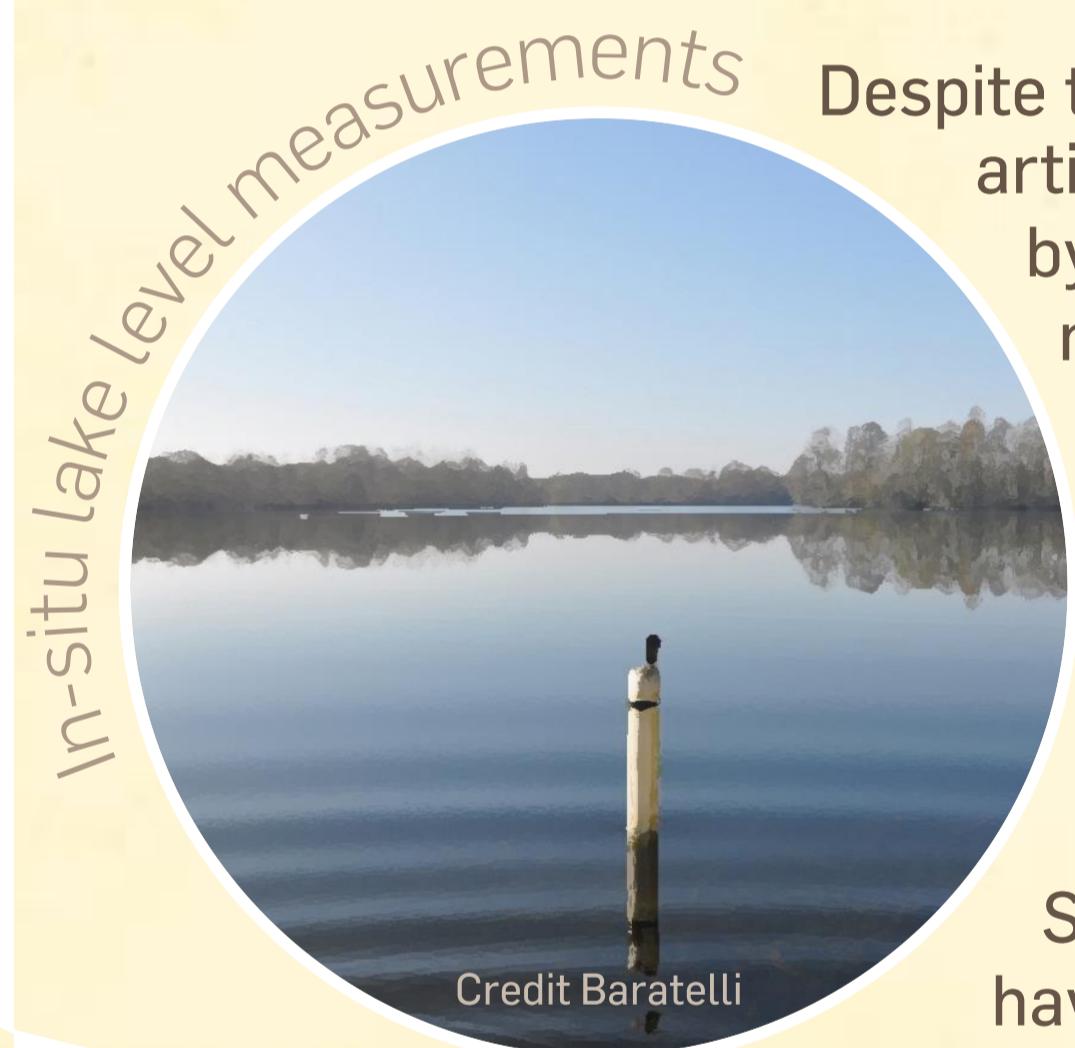
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The Surface Water and Ocean Topography (SWOT) satellite mission, to be launched September 2021, will soon map near weekly the elevation of terrestrial surface waters, including reservoirs.



Credit NASA



Credit Baratelli

Despite their rather small size, artificial lakes created by sand and gravel mining are promising candidates for remote sensing. Numerous of them shape La Bassée alluvial landscape, middle reach of the Seine River. Some have been continuously monitored for over a few years.



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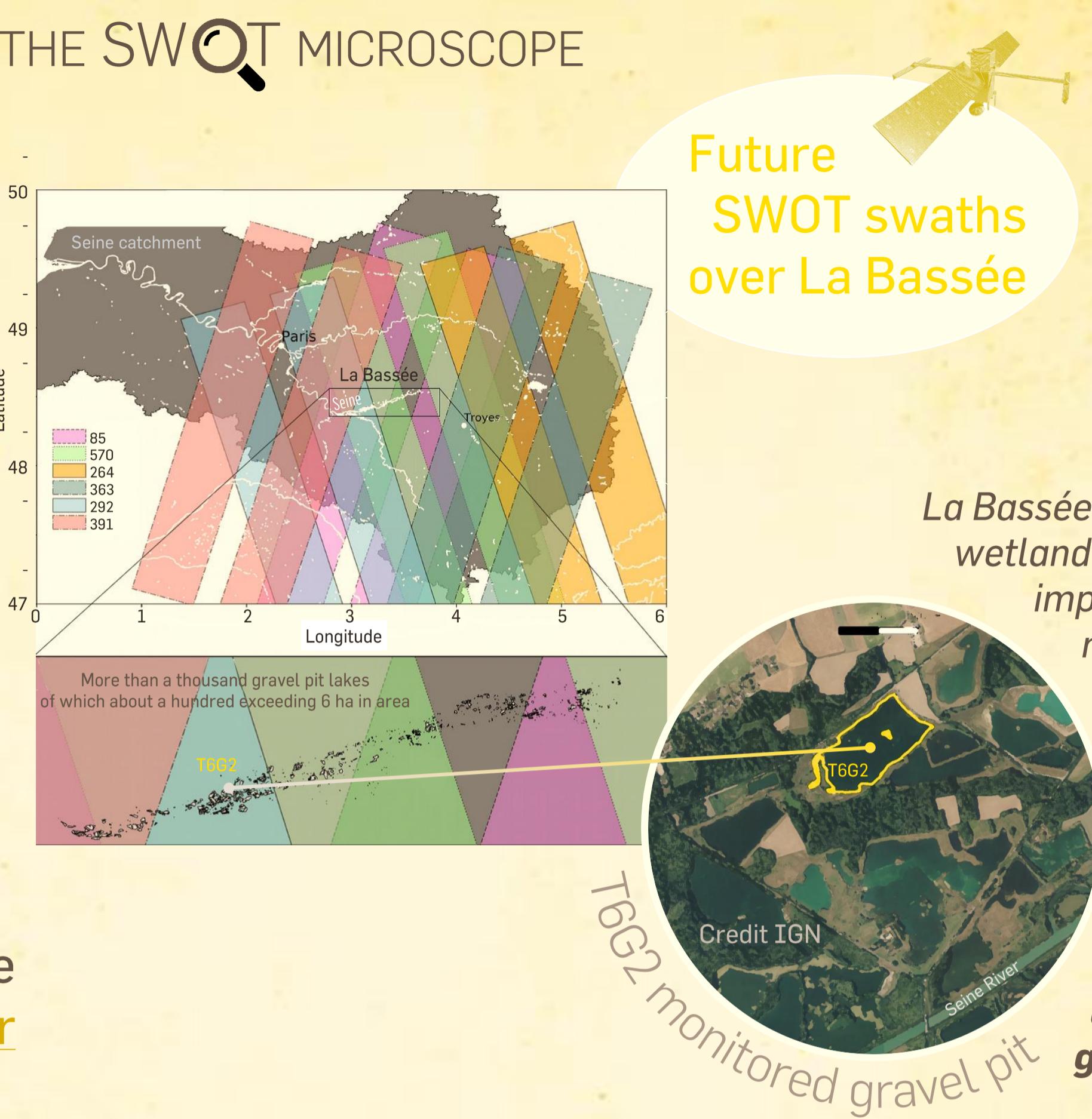
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Credit Jost

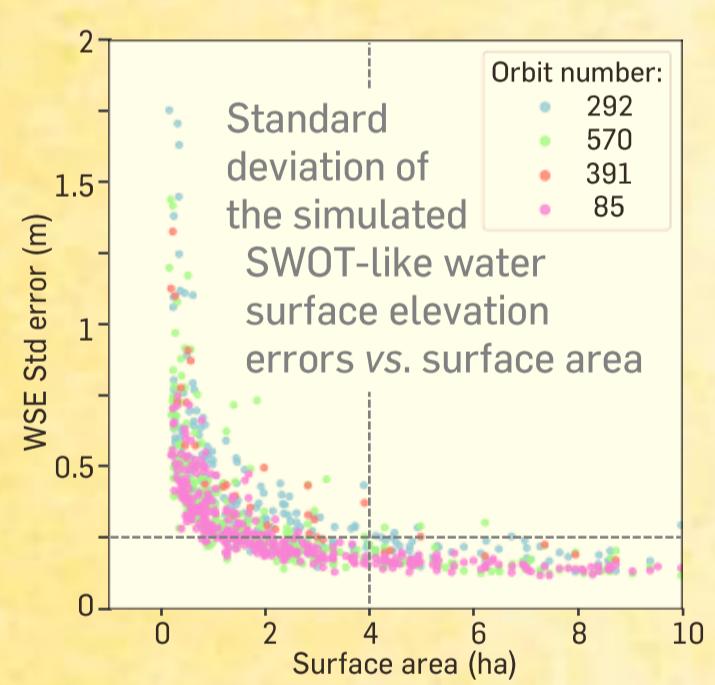
LA BASSÉE GRAVEL PIT LAKES UNDER THE SWOT MICROSCOPE

Key parameters

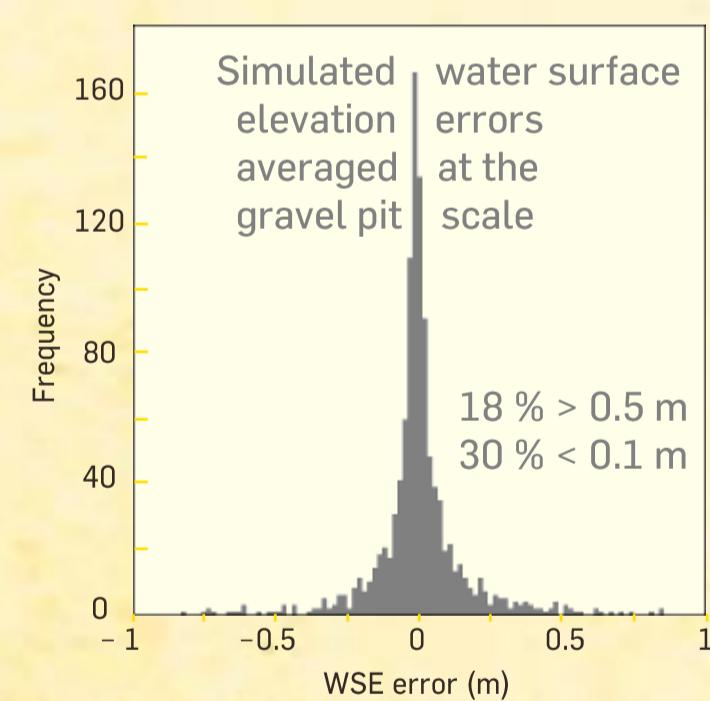
Gravel pit lakes	La Bassée	T6G2
Area (km ²) (% plain)	28 (8%)	0.22
Lakes > 6 ha	19 (5%)	
Maximal depth (m)	12	6
SWOT observation days	3, 10, 14, 20	3, 10, 20
Orbit numbers	85, 292, 391, 570	85, 292, 570
Maximal and standard deviation SWOT-like water surface elevation error (m)	Max Std	
Orbit 85	0.32	0.12
Orbit 292	0.26	0.11
Orbit 570	0.28	0.14



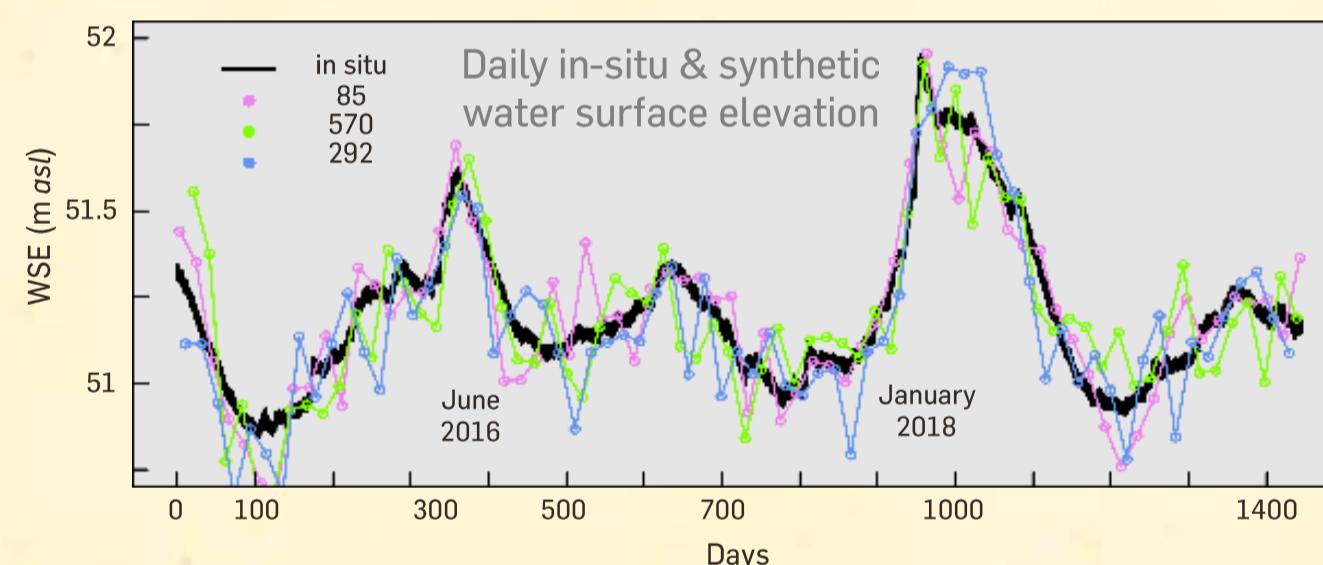
Using the CNES Large-Scale SWOT Hydrology Simulator



Simulations performed on a five-year period for 800 gravel pit lakes

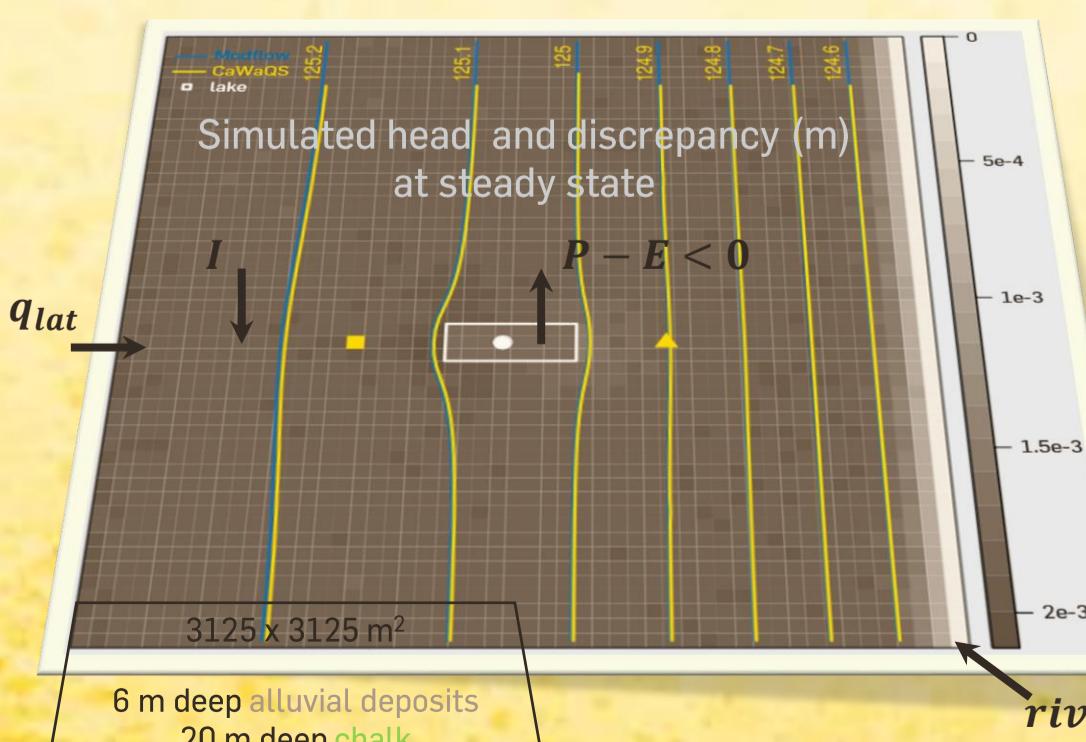


over 2015-2019 for T6G2



Validation on benchmark experiments

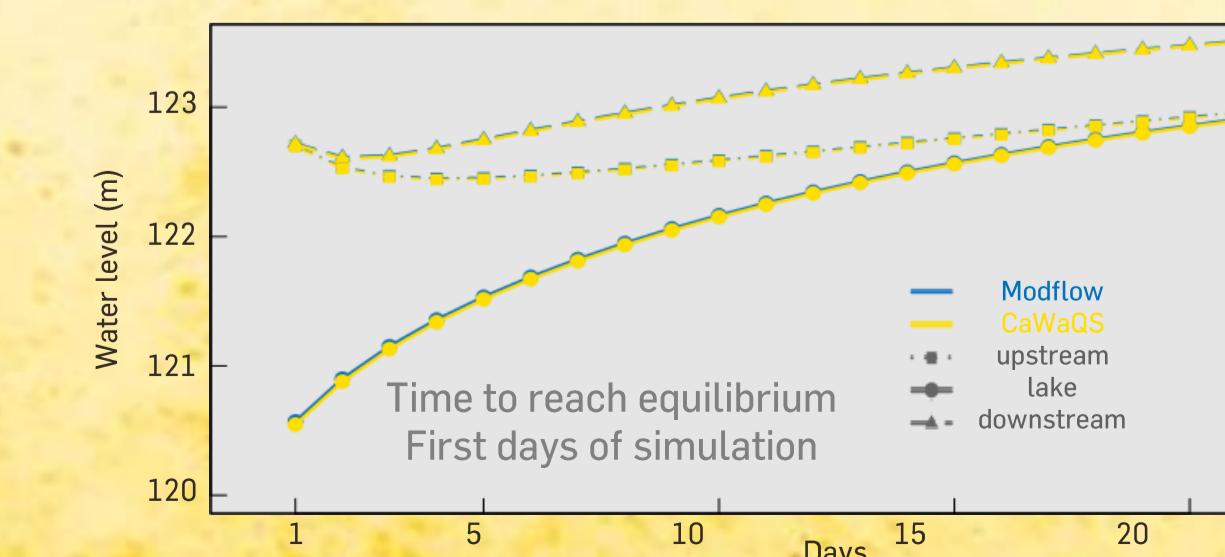
Case design



In progress

Coupling Remote Sensing,
In-situ and Models
for water resources
management

CaWaQS vs. Modflow

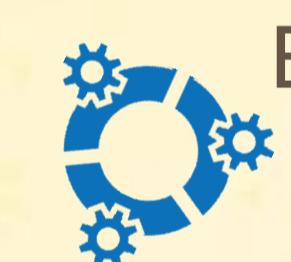


1 Hundreds of small water bodies will be sampled 1 to 3 times in a 21-day cycle by the four SWOT orbits covering La Bassée alluvial plain.

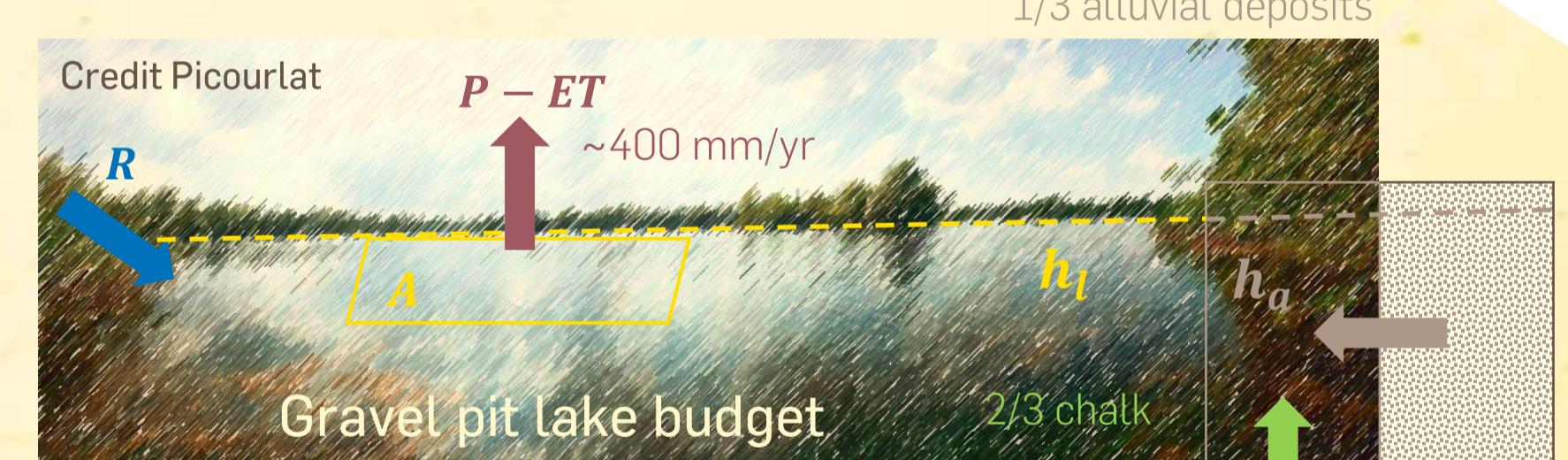
2 Water level retrieval with a vertical resolution better than 0.25 m on gravel pit lakes larger than 6 ha.

3 A validated and operational module to simulate lake stage fluctuations, offering performance equivalent to Modflow Lak package.

4 Toward an operational tool at the satellite launch:
Assimilation of in situ and satellite remote sensing data to La Bassée 3D hydrodynamic model.



Building a lake module in the CaWaQS platform



$$Q = \sum_m^M C_m (h_{am}^t - h_l^{t-1})$$

C_m conductance [L^2T^{-1}]

Gravel pit lake/aquifer interactions