

1D hydraulic modelling of the River Saigon (Vietnam)

Problematic

Tidal rivers are the connecting point at the interface between continental surfaces and the ocean. On the one hand, river discharge is influenced by tidal dynamics, which modulate high and low frequency hydrodynamics and can reshape the river morphology, with feedback loops on hydrodynamics. On the other hand, estuarine and deltaic areas are strongly influenced by freshwater flows (river flood), which are themselves modulated by tidal asymmetry. The River Saigon in Vietnam is a very specific example of a tidal river. Indeed, the Saigon is mostly tidally influenced and the net flow is generally negligible compared to the tidal flow (Camenen et al., 2021). The River Saigon flows through the Ho Chi Minh City megalopolis and understanding its hydrodynamics is crucial in terms of flood risk, saline intrusion or pollution and eutrophication. However, there are few measurements to assess the flow of the River Saigon as well as tidal fluctuations. For example, during the passage of Typhoon Usagi in November 2018, torrential rains (up to 300 mm in a few hours) were observed in the catchment area and Ho Chi Minh City suffered severe flooding. However, water level measurements on the Saigon River only indicate a slight impact of the typhoon, only on the internal part of the river and with a time lag of more than 24 hours. These measurements alone do not allow us to understand the dynamics of the Saigon during this extreme event. Numerical modelling seems important to identify the main factors explaining the behaviour of the Saigon during Typhoon Usagi.

This internship will be carried out in direct collaboration with Francisco Amaral (PhD student at the IGE under the supervision of Nicolas Gratiot and Thierry Pellarin) whose thesis project focuses on the estimation of instantaneous flows of tidal rivers by assimilation of in situ and satellite data.

Main objective of the internship

A better understanding of the River Saigon hydrodynamics thanks to a 1D hydraulic modelling.

Training content

The trainee will have to build a numerical model of the Saigon and Dongnai river system and to calibrate it in order to reproduce the observed fluctuations of water height and flow. Then, it will then be important to test various hypotheses (representation of the canal network, consideration of rainfall, etc.) in order to understand main factors that could explain the paradoxical observations during typhoon Usagi.

Practical details

Desired profile

Master student. The internship requires basic knowledge of free surface hydraulics and numerical modelling. Autonomy, rigour, initiative and teamwork.

Internship duration

6 months

Allowance

Internship allowance of approximately 575 € per month; Any travel will also be covered by INRAE within the general framework of mission expenses.

Location

INRAE, centre de Lyon-Grenoble, RiverLyResearch Unit
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Références

Camenen, B., Gratiot, N., Cohard, J.-A., Gard, F., Nguyen, A.-T., Tran, V. Q., Dramais, G., van Emmerik, T., Némery, J. (2021). Monitoring discharge in a tidal river using water level observations: application to the Saigon River, Vietnam. *Science of the Total Environment*, 761(143195): 1-12, doi: 10.1016/j.scitotenv.2020.143195