PhD in Sea Level Change (3 years, fully funded)

Project: How predictable are Sea Level Changes in deltaic regions?

La Rochelle University | LIttoral, ENvironment and Societies Lab | La Rochelle | France

Project Description

The future of the deltaic regions was recently cited among major issues raised by the Paris Agreement (United Nations Framework Convention on Climate Change, 2015) and the Sendai Framework for Disaster Risk Reduction (United Nations Office for Disaster Risk Reduction, 2015-2030) where adaptation to climate change and disaster risk reduction have been recognized as a priority worldwide.

Deltas are dynamic systems driven by constantly changing interactions between land-based fluvial and ocean processes. These flat agricultural lands, accounting for less than 2% of Earth's land, are vital for the food security of more than half a billion of people. The relative sea level rise (RSLR) and extreme sea levels (ESL) combined with a rapidly growing population and an increasing impact of human activities, threaten the delta communities. Despite the importance of the RSLR-ESL interactions in the deltaic regions, and particularly in tropical regions, only a handful of studies has been conducted on this subject. The threat of increasing coastal flood risk emerges as a probable consequence of climate change. Yet, to date comprehensive projections of RSLR-ESL, that include mean sea level, vertical land motions, tides, waves, and storm surges do not exist.

The aim of this PhD research is to assess the impact that RSLR-ESL are/will having on Ganges-Brahmaputra (GB) delta.

To effectively explore this topic, there are several key questions to be addressed: i) What is the nature of variability and trends observed in RSLR-ESL in the GB delta and how are they modulated by seasonal changes in sea surface temperature, by the monsoon and the large-scale modes of climate variability (i.e ENSO, IOD)? ii) What is RSLR-ESL impact in term of coastal inundation ?; ii)How will the seasonality and variability of RSLR-ESL change in the future, what processes drive these changes and how will the RSLR-ESL impacts on the delta change?

The PhD student will begin by analyzing the extreme heights of water levels from the tide and water level records (Becker et al., 2020) in the GB delta by applying classical methods of statistical extreme values analysis. The outputs of the tide/surge model developed by the Delta team by (Krien et al., 2017) will be used then to understand the flooding patterns in the GB delta and their evolution in the future taking for account the diverse scenarios of absolute sea level rise. The contribution of the delta subsidence to the future inundation patterns will be estimated by employing the models of vertical land movement (Karpytchev et al., 2018; Krien et al., 2019) driven by sediment loading and compaction (Grall et al., 2018).

Eligibility and Details

We are looking for an enthusiastic student with a strong background in natural sciences and skilled in mathematics, physics, environmental/Earth science, or meteorology, data analysis and programming skills as well as enhanced communication capabilities will be highly appreciated. Basic knowledge in oceanography will be appreciated. We foresee mobility to undertake fieldwork in Asian Deltas (Bangladesh, Vietnam...), as well as to present results at national and international conferences.

This project will commence no later than October 2021. The successful applicant will register as a full-time PhD student based in LIttoral, ENvironment and Societies Lab (https://lienss.univ-larochelle.fr), La Rochelle University, La Rochelle, FRANCE. This PhD project is part of the ANR project DELTA (2018-2022, ANR-17-CE03-0001).

Applications Process

Applications will remain open until a suitable candidate is found.

Candidates should send the following as a single PDF file to Dr M. Becker (melanie.becker@univ-lr.fr) et Dr M. Karpytchev (mikhail.karpytchev@univ-lr):

1. A full curriculum vitae
2. A cover letter stating why you are interested in the project and what makes you an ideal candidate for this PhD position
3. Names and contact details of two academic referees

References

Becker, M., Papa, F., Karpytchev, M., Delebecque, C., Krien, Y., Khan, J. U., Ballu, V., Durand, F., Cozannet, G. L., Islam, A. K. M. S., Calmant, S. and Shum, C. K.: Water level changes, subsidence, and sea level rise in the Ganges–Brahmaputra–Meghna delta, *Proceedings of the National Academy of Sciences*, 117(4), 1867–1876, doi:10.1073/pnas.1912921117, 2020.

Grall, C., Steckler, M. S., Pickering, J. L., Goodbred, S., Sincavage, R., Paola, C., Akhter, S. H. and Spiess, V.: A base-level stratigraphic approach to determining Holocene subsidence of the Ganges–Meghna–Brahmaputra Delta plain, *Earth and Planetary Science Letters,* 499, 23–36, 2018.

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