PhD Opportunity: Assessing the impacts of relative sea level rise and sediment delivery on New Zealand's estuaries.

We are seeking a highly motivated PhD candidate to investigate the geomorphic response of estuaries to sea level rise (SLR) in tectonically active settings. **The project will determine how estuaries experiencing different rates of vertical land movement and sediment supply will be impacted by SLR.** New Zealand is a fantastic natural laboratory for this work, with a suite of estuaries in different catchment and tectonic settings. **This exciting project combines aspects of coastal and fluvial geomorphology and a variety of methods, including analysis of geospatial data, field work, and modelling.** The findings will yield new insights into how estuaries in tectonically active areas will respond to SLR and inform future estuary management.

In New Zealand, rates of land subsidence and uplift can exceed current rates of eustatic sea level rise. Changes in relative (local) sea level therefore control the timing and magnitude of estuary inundation. Estuary sediment supply and storage can further modulate the impacts of relative SLR. Estuaries which are rapidly subsiding and with limited sediment storage will theoretically see the impacts of SLR fastest. Despite this, these processes are often overlooked and only eustatic SLR is considered when predicting future change. This hinders our ability to make accurate predictions about the impacts of SLR on individual systems and the specific changes in morphodynamic processes that may occur (e.g. tidal asymmetry and currents, hypsometry, and sediment transport).

This project aims to integrate new data on relative sea level change and estuary sediment delivery to: (1) classify NZ's estuaries across a spectrum of vulnerability to future SLR; (2) assess past, observable changes in morphology; and (3) predict changes to morphodynamic processes for select case study sites. The project will take a 'whole of catchment' approach focusing on quantifying connections between catchment, estuarine, and coastal processes, and assessing decadal-scale estuary evolution through to changes in processes occurring over tidal cycles.

The PhD is a jointly supervised project between the **School of Earth and Environment** and **Waterways Centre for Freshwater Management** at the **University of Canterbury (UC)** in Christchurch, New Zealand. You will work in a collaborative team with expertise in geomorphology, hydrology, and Earth observation. UC is equipped with a wide range of land and water-based survey equipment (including multiple GPS, ADCP) and state-of-the-art airborne topobathy Lidar, MBES, manned and remote controlled survey platforms. We have specialist equipment to quantify a variety of physical processes in estuarine, fluvial, and coastal environments (e.g. multiple Sofar Spotter wave buoys, RBR probes, S4 current meter).

Support for the project includes: A stipend of NZ$32,000 per annum (excluding fees) for three years, tuition fees, and some funding for field work and travel expenses (e.g. to facilitate academic and professional development through conference attendance). The candidate will be co-supervised by Dr. Sarah McSweeney and Prof. James Brasington.

How to apply: To apply, please submit a 1–2-page cover letter outlining your background and interest in the project, CV, academic transcripts, and the names of two referees to Dr. Sarah McSweeney (sarah.mcsweeney@canterbury.ac.nz).

Supervisors: Dr. Sarah McSweeney and Prof. James Brasington.

Key qualifications and skills: Suitable candidates must hold a BSc Hons (first class) or MSc (preferred) with a substantive research thesis component. The ideal candidate must provide evidence of the following skills and attributes:

- A strong theoretical background in fluvial, coastal or estuarine geomorphology (or similar fields).
- Experience conducting field work in estuarine, coastal, or fluvial environments (please give specific examples in your application).
- A team-player with an ability to communicate professionally and effectively with others.
- A track record of completing projects to deadlines and producing high quality outputs.
- Experience in the geospatial analysis of topographic and/or bathymetric data.
- Experience in complex data analysis using python, Matlab or advanced spreadsheet methods.
- Experience using process-based models (e.g. HEC-RAS, Delft-3D, MIKE) for simulating sediment transport and hydrodynamic processes is desirable, but not essential.

Does the project come with funding: Yes - Annual stipend of NZ$32,000, tuition fees, and some travel and field expenses.

Final date for receiving applications: 15th January 2024.

Keywords: Geomorphology; estuaries; sea level rise; coasts; rivers; sediment transport; modelling.