

# SLC0de: an open-access Python Library for modelling subsidence and Relative Sea Level in Deltas

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**Keywords:** Relative Sea Level, Sediment isostasy, Last Glacial Maximum, Coastal Hazards

## **Abstract:**

The relative sea level (RSL) i.e., the balance in between the moving sea and earth, is crucial in assessing the risks of submersion, salinization, and erosion of coastal areas. However, resolving the Vertical Ground Movement (VGM) on the Sea Level Equation and the interplay in between the Earth's displacement, the stratigraphy and the RSL remains a critical challenge.

We here present an open access python library, named SLC0de that resolves the Sea level Equation on a radially symmetric, self-gravitating Earth. The SLC0de resolves the RSL using the approach proposed by Dalca et al. (2013) and calculates the induced effects (geoid perturbations and vertical ground movements) from surface load variations (water, ice, and sediment isostasy). This library is particularly well designed for deltas as it allows to consider efficiently shoreline migration and sediment loading. Also, it allows to compute present day subsidence and RSL as well as reconstructing the RSL through time, which is a key parameter on understanding delta stratigraphy.

The computation is based on a convergence toward the present-day topography, starting on a forecasted past topography and computing the new topography by forward modeling the sea level. The computation needs as input a present-day topography, an history of sediment and ice loadings and the Earth reaction to surface loading under the form of Love numbers, both Tidal and Load numbers.

The SLC0de is designed to be used with the ALMA library that allows to compute Love numbers over a large set of earth's structure and mechanical behaviors. This allows to consider regional earth's structure efficiently on resolving the RSL and allows to compute a first order estimation of local and regional sea level with a fast computation time. This is particularly important for considering local earth's structure on the Sea Level equation, as a 3D and fine scale (25km resolution) approach involves computational time challenge.