

Coastline changes due to vertical land motions

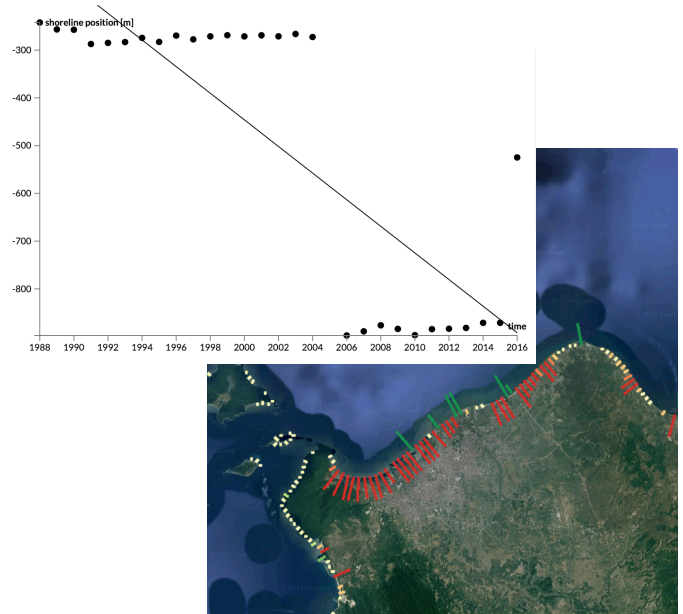
Context

On many locations worldwide coastlines are migrating, especially at sandy beaches. Causes for coastline retreat or advance include erosional processes, human interventions, but also vertical land motions in coastal areas. Vertical motions can be produced episodically by large earthquakes, or come from long term processes as rebound due to ice mass loss or groundwater extraction. The global beach database contains processed satellite optical data that can be used to analyse time series of shoreline migration worldwide. For beaches with low slope angles, vertical deformation of the earth's surface can cause significant shoreline migration. This MSc project will focus on how we can use the global beach database in areas of vertical

Research questions/Topics:

Initial analysis suggests that there are many locations where migration of the coastline is caused by vertical land motions. We have not yet investigated whether the database shows coast migration for all areas where we expect it, and how well the coastline migration data can be used to study vertical land motions. We want to address the following questions:

- Where can we expect the largest effects of vertical land motions to coastline migration?
- Can we attribute observed coastline migration to vertical land motions, based on the spatio-temporal signature of coastline migration?
- Can we estimate vertical land motions from coastline migrations using the global beach database and digital elevation models?
- Next, how well do estimated land motions compare to independent satellite-derived land motion estimates?



Coastline migration in northern Sumatra that is clearly affected by the occurrence of the 2004 Sumatra-Andaman earthquake. Upper left panel shows the extracted yearly change in coast location, with a clear jump between 2005 and 2006 of more than 500 m. The map shows changes in coastline position, with red retreat and green advance.

Student profile

The candidate should have an interest in Earth Observation and deformation processes of the Earth surface.

The work involves working with (processed) data sets and the development of algorithms, which requires some interest in (Python) coding.

Guidance and mentoring on the technical aspects of the work, data analysis and fundamental science will be provided.

This project will be supervised by dr. ir. Taco Broerse and dr. ir. Arjen Luijendijk:

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