EGU22-8000
https://doi.org/10.5194/egusphere-egu22-8000
EGU General Assembly 2022

The hierarchy of factors controlling long-term coastal erosion: a statistical approach from topographic reconstruction of volcanic islands.

Rémi Bossis, Vincent Regard, and Sébastien Carretier
GET, Université Paul Sabatier, Toulouse, France (remi.bossis@get.omp.eu)

In global geochemical cycles, the solid flux from the continent to the ocean is usually reduced to the input of sediments from rivers [1]. However, regional studies have shown that the input of sediments from rocky coast erosion may be a significant part of this flux [2]. So, it is important to consider this input into global cycles and to quantify it over different timescales.

On short-term timescales, from the year to the century, coastal erosion is currently quantified with direct measurement of the coastline recession, between successive time intervals [3]. Extrapolating on timescales longer than a thousand years is difficult. This leads to a lack of data and therefore a gap in knowledge in longer term coastal erosion [4].

A solution to quantify long-term erosion of rocky coast is to reconstruct the initial geometry of the coastline and to know the age of its formation. Volcanic islands are suitable objects for this method. Indeed, their initial shape is simple and can be easily reconstructed, and their maximum extension can be dated [5,6,7], although this age can be difficult to estimate. Thus, the topographic reconstruction of a volcanic island allows, by comparison with its current topography, the quantification of volumes lost by erosion. In turn, it becomes possible to obtain values of the rocky coast total recession on timescales from thousands to hundreds of thousands of years [8]. Moreover, the wide geographic distribution of volcanic islands provides a diversity of climatic and geodynamic settings allowing to analyze the effects of various factors on long-term coastal erosion.

Here we propose an improvement of this erosion quantification by accounting for the submarine morphology. Applying this approach for different volcanic islands, we carried out a statistical analysis of the impact of several factors that control long-term coastal erosion. This analysis allows us hierarchize these factors. This is the first step towards the formulation of long-term coastal erosion universal laws and towards the quantification of rocky coast sediment influx in global cycles.

[1] Milliman and Farnsworth (2013). Cambridge University Press.

[2] Regard et al. (in press).

[3] Bird (2011). John Wiley & Sons.

[4] Prémaillon et al. (2018). Earth Surface Dynamics 6, 651-668.

[5] Lahitte et al. (2012). Geomorphology 136, 148-164.

[6] Ramalho et al. (2013). Earth-Science Reviews 127, 140-170.

[7] Karátson et al. (2016). Geomorphology 253, 123-134.

[8] Bossis et al. (in press).