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Sea level rise and coastal morphological changes on tropical islands: examples from New Caledonia and French Polynesia (SW Pacific)

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Coastal mobility can be expressed as the response of a specific coastline to different forcing factors: (1) Climate change and more specifically the sea level change which is a response to the temperature increase of ocean (steric effect) and to the melting of ice caps, (2) Internal geodynamic processes like tectonics, which can lead to movements along faults and to the flexure of the lithosphere, (3) External geodynamic processes like coastal erosion, accretion, and sediment transport. These processes are linked both to the marine environment (current, wave climate etc.) and to continental processes (sedimentary supplies by rivers, continental erosion...). (4) Anthropogenic actions like sea defences, sea walls and other structures participating in the "holding the line" strategy. Anthropogenic actions within watersheds and in coastal areas can also play an important role in coastline mobility: mining activities, gravel extraction in rivers, drastic modification of land use, etc.

Within the on-going project CECILE (Le Cozannet & al. this session, our goal is to evaluate the impact of future sea level change on some emblematic coasts located at different locations in order to assess their sensitivity and in order to assess the variability of the response of the coast to different change rise rates. In order to evaluate this sensitivity, we firstly analyse the past response of each coastline during the sea level rise of the past 50 years. We used both monitoring of the sea level and analysing evolution of the coastline by comparison of historical aerial photographs and present day satellite images. We also take into account the evolution of anthropogenic actions like buildings, construction of sea defence works (groynes, sea wall etc.) and other actions (damming, mining, gravel extractions etc.) contributing to modifications of the sedimentary budget at the coast. After a complete analysis of the past events and their effects on the coastline, an assessment of the plausible future effects of the next 100 years of sea level rise will be attempted. Two areas of the SW Pacific are currently studied: French Polynesia and New Caledonia. The archipelago of French Polynesia is composed of atolls and High Islands both of volcanic origin. The high islands are constituted by volcanic rocks (mainly basalt) and protected from ocean waves by barrier reefs. New Caledonia is an old shield largely faulted with long term alteration, affected by differential vertical movement and largely influenced by mining activities. A barrier reef is also present near New Caledonia but it is located far from the coast with a different impact on the wave climate at the coast. This work presents some preliminary results obtained with the analysis of the evolution of some regions of the coastline of French Polynesia and New Caledonia.

The analysis of the impact of the sea level rise on the coastline in various contexts within the same oceanic region will be useful for understanding and anticipating the future impact of sea level rise in the SW Pacific and is complementary to the work completed by Webb & Kench (2010) in the Central Pacific.

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