



Relative impact of sea level rise, wave climate and anthropogenic actions on the recent shoreline changes of the Pacific Islands

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Sea level rise is nowadays one of a major concern for many low-lying and highly populated areas in the world. However, it is difficult to forecast the consequences of sea levels rise in terms of erosion, due to the interactions with many forcing factors of the evolution of coastline mobility. Indeed, climatic factors such as sea level rise are combined with internal and external geodynamic processes, biological factors, wave forcing and anthropogenic actions which can also play an important role in coastline mobility. Understanding the whole system and its past evolutions is necessary to anticipate future changes.

Within the on-going CECILE project, our goal is to evaluate the impact of future sea level change on some emblematic coasts located in different part of the world in order to assess their sensitivity and the variability of their response to different change rise rates. This work presents the study conducted on coastlines of two regions of the Pacific: French Polynesia (SW Pacific) and New Caledonia.

In order to evaluate the sensitivity of the coastlines to sea level rise, we firstly analysed the response of each coastline during the sea level rise of the past 50 years, using a diachronic analysis of ancient and recent remote sensing images. Then we also took into account the evolution of anthropogenic actions contributing to modifications of the sedimentary budget at the coast, and finally, sea level variations, using the sea level reconstruction of Becker et al. (2012) of the 2nd half of the XXth century.

Two atolls of French Polynesia (Manihi and Scilly) and six coastal stretches of New Caledonia have been studied. Although Manihi and Scilly experienced a sea level rise rate twice as important as the global mean according to Becker et al. (2012), wave forcing was, during the last 50 years, the dominant factor controlling the shoreline evolution and aggradation/erosion processes on the atolls. On the contrary, on the main island of New Caledonia, the creation of bare soils by mining (exploitation of nickel) has modified erosion processes on watersheds and has increased the fine sediments charge of the rivers. Sediments transported by the rivers to the coast have changed the sediment budgets in the coastal areas concerned. Over the last 50 years, studies have shown that the rate of human impact on watersheds has conditioned the evolution of the coastline (aggradation / erosion) around the estuarine areas while the sea level rise and other factors appeared to play a more secondary role at multi-decadal timescales. This study highlights the complexity of interactions of physical processes that drive coastal mobility in Pacific high and low-lying islands. In this context, sea level rise is not the most important factor currently driving coastal mobility, but this could change with future increased sea level rise rates.

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