Water level fluctuations on a rocky platform beach (Dieppe, France)
(Pluriannual wave setup observations on cliff coast)

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Nowadays, our society become increasingly vulnerable to extreme water level events as our cities and our patterns of coastal development become more intricate and populated. Many research have dealt with extreme still water levels caused by storm surge and tide. These research aims at help population to protect their nearshore equipment from flooding according to a predicted water level. It is more tricky to determine and to predict is the instantaneous water level, leading to huge erosion, or wave overtopping over hard structures. Instantaneous water level is a sum of several components fluctuating at frequencies higher than the tidal or storm surge components : low frequency waves such as seiche or infragravity waves and gravity waves causing wave runup/setup when reaching the coastline. Risk coastal mapping is done according to level in harbour which does not measure these not negligible components.

To predict the instantaneous water level is thus of primordial interest. That means to be able to predict the runup. However, the runup is not easy to measure itself and its averaged compoenent is easier to measure (setup). According to previous study (Stockdon et al., 2006), the setup/runup are proportional to the beach slope. On a flat rocky platform, these levels should be close to zero. However, common formulas have been calibrated on sandy beaches leading to a possible under-estimation over rocky platform where the bottom dissipation might be smaller. The generation mechanisms and propagation of infragravity waves have been widely studied during the decades. Recent research has shown that infragravity waves significant height can be related to wave power (Inch et al., 2016) offering the possibility of calibrating an empiricial formula depending on the study site.

In this study, the question of instantaneous water level at Quiberville and Pourville (near Dieppe, France) is addressed. Only few studies deal with flat rocky platform. However, strong wave overtopping are observed in that region. **Gravity and infragravity waves will be studied according to pressure sensors data of several weeks acquired during three winters. The setup will be as well extracted from these data.** A peer-review articles is already submitted on one year data. The aim of this study is to perform the same study over the two other years of measurement in order to improve interpretation.

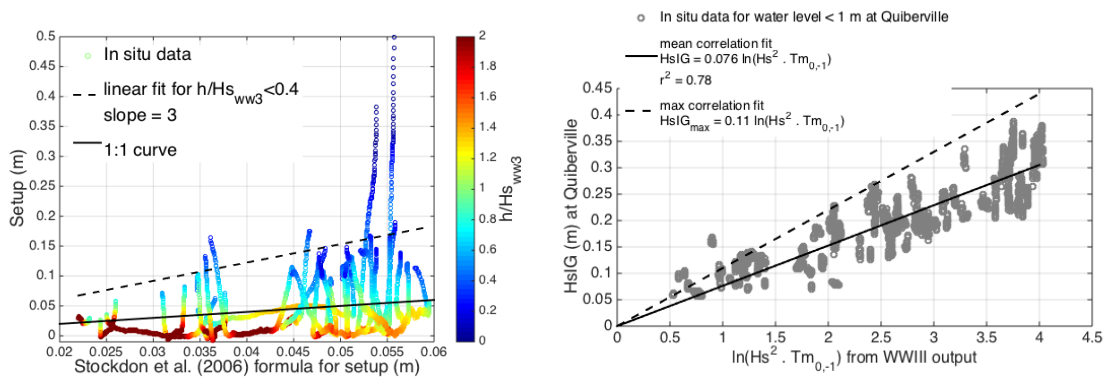

Figure : *Left* Measured setup vs Stockdon predicted setup according to the ratio still water depth and offshore significant wave heigth, measured setup at h/Hs_WWIII is about three times the predicted setup ; *Right* Significant infragravity wave height vs formula depending on a proxi of the offshore wave power, trials of empirical calibration

Stockdon, H. F., Holman, R. A., Howd, P. A., & Sallenger, A. H. (2006). Empirical parameterization of setup, swash, and runup. *Coastal engineering*, *53*(7), 573-588.
Inch, K., Davidson, M., Masselink, G., & Russell, P. (2017). Observations of nearshore infragravity wave dynamics under high energy swell and wind-wave conditions. *Continental Shelf Research*, *138*, 19-31.