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Long-term rocky coast erosion: the influence of structural pattern and lithological context, as evidenced in the chalk (NW Normandy) and granitic (SW Brittany) rocks, NW France

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During the EC2CO/DRIL/CROCODYL project, high-resolution land-sea DEM have been produced in NW Normandy and SW Brittany rocky coastal zone, using high-resolution bathymetry from shallow-water cruises CROCOLIT-1,-2,-3 (Duperret, 2013), SPLASHALIOT-3 (Maillet, 2014), THAPENFROM-1 (Duperret, 2015) and aerial topographic LiDAR data from the Litto3D project. Two study sites were selected to map detailed geomorphology of shore platforms in order to better understand rock coast evolution processes through time and long-term rates of rocky coastal erosion versus geological context.

The eastern English Channel is made of coastal chalk cliffs that currently eroding with fast mean rates of the order of a few dm/year. In Normandy coast (NW France), this results to the generation of roughly linear coastal segments of about 20-30km long each. On coastal segments only made of Upper Cretaceous Chalk, erosion occurs by present-day sudden and repeated vertical failures and cliff collapses. Cliff collapse process is shaping vertical chalk cliffs in association with resulting roughly flat shore platforms. Even if shore platforms width are short and homogeneous (a few hundred meters in width), the detailed morphology observed on high-resolution bathymetry evidenced two main submarine geomorphological types. One is linear and regular and associated with linear coastal sections. This corresponds to homogeneous Chalk Formation and the lack of large-scale tectonic features. Coastal sections with chalk lithology variations, local folding, large-scale fractures transverse-oriented to the coastline and onshore valleys incision evidence chaotic shore platforms morphologies. They conduct to variations in coastline orientation and to meter-scale shoreline indentations

The southwestern part of Brittany is made of low-lying granitic headland and indented bay cut into meta/granitic rocks. Erosion rates are poorly known, due to slow coastal evolutions through contemporary times. Land-Sea DEM evidence similar onshore and offshore morphologies, with flat and wide superposed plains, limited each one by 10m high scarps. In this case, shore platform extension reaches a few km in width and appears as superposed paleo-shore platforms generated since Pleistocene (Raimbault et al, in press). The erosive process is thus link to a long-term alteration of granitic rocks since Cenozoic, mainly clear and etched during recent past high sea levels. Coastal areas with large bays appear locally to be guided by large-scale Cenozoic fractures. In some places, km-scale fractures favor a spatial concentration of erosion. They are shaping coastline orientation and shore platform ending at km-scale.