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# Introduction: Special Issue on Coastal Evolution under Climate Change along the Tropical Overseas and Temperate Metropolitan France



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## ABSTRACT

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This paper presents how major French science-oriented public institutions and Ministry of Higher Education, Research, and Innovation (MESRI) have developed and structured coastal observatories along metropolitan and overseas coastlines in order to better understand the metropolitan and overseas French coastal evolution on a wide range of temporal and spatial scales. Scientific results presented in this special Issue have been obtained in the framework of the resulting DYNALIT / ILICO observatory network.

**ADDITIONAL INDEX WORDS:** *DYNALIT, long-term coastal evolution, French network.*

## INTRODUCTION

The metropolitan and overseas French coastal landscape is highly diverse owing to the presence of rocky and depositional coasts exposed to a wide range of (i) wave energy exposure (from low energy to storm dominated and from open to sheltered coasts), (ii) tidal settings (from micro- to mega-tidal) and (iii) climate (from temperate to tropical). As a result, coastal evolution is highly variable in both time and space, challenging our understanding and predictive ability of past, present and future coastal changes. In 2006, a report of the French Institute for Environment (IFEN) indicated that 25% of the French metropolitan coasts are eroding (1720 km out of 5500 km), 44 km are stable and 10% are prograding (Colas, 2006). A better understanding of coastal evolution on a wide range of timescales requires extensive data collection (e.g. topography, bathymetry, turbidity) together with accurate forcing (e.g. wave, tide, weather) over a reasonably long period (decade(s)) to capture the natural range of variability (from storm-driven to chronic).

### CREATION OF FRENCH COASTAL OBSERVATORIES

In the 80's, major French science-oriented public institutions (CNRS-INSU: National Center for Scientific Research – National Institute for Earth Sciences and Astronomy / French Marine Universities / Ifremer: French Research Institute for Exploitation of the sea / IRD: National Research Institute for Sustainable Development / Shom: Naval Hydrographic and Oceanographic Service) have created, developed, and structured coastal observatories along metropolitan and overseas coastlines. During

the 2000's, CNRS-INSU designed multi-year National Observation Services (SNO) accreditations to federate thematically observation facilities (tools, resources, services) dedicated to earth observation. Such accredited services aim at documenting the long-term changes and variability of terrestrial systems, and to advance knowledge in these areas. In this respect, the accredited SNO DYNALIT, was established in 2014 to collect and provide the scientific community and stakeholders, long-term, and accurate data on the physical evolution of the coast. Overall DYNALIT aims to increase our understanding and predictive capability of coastal dynamics, in the context of increased anthropogenic pressures and threats posed by global change, through the combination of coastal monitoring and development of innovative numerical models. An overarching goal of DYNALIT is to support evidence-based policies and contribute to sustainable coastal risk management in the regions threatened by erosion and submersion hazards. Developing inter-site collaborations, fostering education at several levels (from school to University), homogenizing monitoring strategies and tools in order to perform more comprehensive studies on coastal response are additional objectives.

In 2016, in order to foster the structuration of the landscape of resources dedicated to research of a national scope, French Ministry of Higher Education, Research, and Innovation (MESRI) has created a national research infrastructure named ILICO (Infrastructure de recherche Littorale et Côtière [www.ir-ilico.fr](http://www.ir-ilico.fr), Cocquempot et al. 2019) federating the 8 (including DYNALIT) coastal, nearshore, and littoral observation services and research communities.

### DYNALIT CONTRIBUTION

At the time of writing this introduction, DYNALIT includes more than 120 researchers from 20 laboratories and 22 universities collecting data at 35 coastal sites in metropolitan and

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oversea France. Observed parameters are primarily Digital Elevation Models (DEMs) on sandy and rocky coasts, and turbidity in estuarine environments. DEM data are collected through various means, including differential global positioning system measurements, video monitoring, structure from motion using unmanned aerial vehicles, and Lidar, while turbidity is typically measured in situ using turbidity meters. DYNALIT also collects additional environmental in situ and remotely-sensed data such as shoreline position and links them with forcing factors such as incident waves, tide, and wind conditions. The 13 original contributions presented in this Special Issue of *Journal of Coastal* entitled « Coastal Evolution under Climate Change along the Tropical Overseas and Temperate Metropolitan France »,

together with a summarizing paper, were all performed by teams involved in DYNALIT.

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