

IS 02 Eco-Tools-Coast: Advanced Skills on Coastal Environments

Sedimentary Coasts: A Dynamic and Crucial Environment

One of the most utilized environments on Earth is the sedimentary coast, which includes beaches, coastal dunes, and wetlands. Studies suggest that by the decade between 2020 and 2030, three-quarters of the global population could be living within 60 km of the coastline, with human activities such as tourism and residential use primarily concentrated in sandy coastal sections. However, sedimentary coasts are highly dynamic habitats and among the most challenging to model. Despite their societal significance, a large portion of our coastline is subject to improper coastal management, which can lead to socio-economic and environmental consequences in both the short and long term.

The International Summer School ECT: A Scientific Approach to Coastal Monitoring

The team organizing the International Summer School ECT is actively working on developing approaches to study and monitor coastal environments, including nearshore areas, beaches, dunes, and salt marshes. This international initiative includes representatives from diverse climatic bioregions, each with different types of sedimentary coasts. Despite significant advances in coastal research, the team has identified the need to incorporate the fundamental relationship between specific coastal systems and surrounding habitats while addressing key scaling challenges.

For example, coastal dunes are intrinsically linked to the beach and nearshore areas in front of them. Their evolution cannot be separated from large-scale coastal processes such as sea-level changes and longshore drift (Walker et al., 2017). Similarly, salt marshes, which grow behind barrier systems, are shaped by storm action, sea-level changes, sediment characteristics, vegetation types, and many other variables operating at different spatial and temporal scales. With climate change, rising sea levels, and other pressing global concerns such as human impacts on ecosystems and biodiversity loss, there is a growing need for tools that provide updated and comprehensive information about our coastal habitats.

Objectives and Methodology

The International Summer School ECT will introduce students to the necessity of employing state-of-the-art monitoring techniques that facilitate data acquisition at different scales, ranging from specific beach or salt marsh systems to larger coastal areas. A multidisciplinary team of researchers specializing in various coastal sub-disciplines will integrate knowledge about the ecology, geomorphology, and management of coastal environments, as well as their interconnections. Students will learn to use in situ remote sensing systems, such as drones, and large-scale spatial data from multiple sources, including the European Space Agency. Working across different spatial scales will enable students to develop essential skills and a deep understanding of how to apply this knowledge to their own research.

Additionally, students will be exposed to various perspectives and approaches for tackling transversal issues within Horizon 2030, including climate change and its effects on coastal areas.

Course Content and Structure

The course features contributions from experts in beach morphodynamics, coastal dune evolution, salt marshes and wetlands, coastal processes, numerical modeling, remote sensing, and coastal conservation and management. Our approach is both practical and interdisciplinary, emphasizing problem-based fieldwork. The Cádiz region provides proximity to a diverse range of coastal environments, including salt marshes, beaches, and dunes, along with varying tidal ranges along the Atlantic Ocean–Mediterranean Sea gradient and significant human influences throughout history and in the present day. Participants will conduct fieldwork not only around the Bay of Cádiz but will also have the opportunity to visit a variety of sites along the stunning Andalusian coastline.

The course is structured as follows:

- Two days of theoretical sessions and guest lectures.
- One full day dedicated to field data collection.
- 1.5 days of computer-based numerical modeling exercises.
- 0.5 days of workshops and seminars.
- A final day reserved for an organized excursion by the Vice-Rectorate for Internationalization.

Transferable Skills and Career Prospects

The International Summer School ECT will provide a set of transferable research skills and competencies that will enhance:

- **Employability and career prospects** of PhD students both within and outside academia.
- **New approaches to R&D&I**, fostered through interdisciplinary and international experiences.
- **Networking and communication skills**, enabling students to establish professional connections.

With a strong emphasis on practical training in emerging techniques, the course is expected to have a positive impact on participants' future careers. Additionally, doctoral students will engage with internationally renowned researchers, expanding their global professional networks beyond the course itself. The program will also enhance the visibility and reputation of the University of Cádiz and the participating organizations.