

TANGO

Estimating Tipping points in habitability of ANtarctic benthic ecOsystems under future GLObal climate change scenarios

DURATION
15/01/2021 - 15/04/2025

BUDGET
936 636€

PROJECT DESCRIPTION

The West Antarctic Peninsula (WAP) is one of Earth's fastest warming regions, with appreciable variation in the duration of the sea ice season, extensive glacier retreat, ice shelf collapse, warming of surface waters and shifts in local primary producer communities. These climate change-related cryospheric and oceanographic processes are significantly affecting marine ecosystems and their habitability for key-organisms. Furthermore, global warming-related environmental changes are expected for even larger areas of the Southern Ocean in terms of sea ice cover, ocean temperature and glacier melting. The response of marine organisms and ecosystem processes to such environmental changes are not well known until today. Yet the available studies show a high sensitivity of the highly adapted polar species and hint to a vulnerability of the ecological processes that they mediate. As climatic changes intensify in polar regions, dramatic shifts in structure and function of ecosystems may take place and will be difficult, if not impossible, to reverse. Insights on resilience, thresholds and tipping points for species, communities and ecosystems are therefore of paramount importance to the understanding of the ongoing large-scale changes. This project focuses on the interaction between **sea- ice dynamics, food source changes, temperature rise and benthic ecology at different locations along the WAP** in a context of rapid climate change. Since the effects of climatic fluctuations on natural ecosystems remain poorly understood, this project aims **to develop a mechanistic framework to predict tipping points leading to regime shifts in coastal Antarctic ecosystems, with a focus on the benthos (organisms living in contact with the seafloor).**



The project framework consists of the integration of different biological/ecological levels, from (1) **individual metabolic responses**, (2) constraints of environmental changes on **species interactions (trophic ecology and space competition)**, (3) the dynamics of the **communities** and its consequences for **carbon fluxes** and finally (4) responses upscaled to **ecosystem levels**. Regime shifts and threshold dynamics from individuals to ecosystems will be investigated by empirical evidence making use of **long-term datasets, field observations along natural gradients and experimental and modelling approaches** in Antarctic coastal ecosystems. We will focus on **selected taxa representing the main functional traits in a coastal benthic community**. Different size classes (meio- to megafauna), life strategies (pioneer to climax species) as well as different trophic groups will be covered and for which the expertise exists in the consortium.

TANGO

The project consists of 4 interdependent scientific work packages (WP) that will investigate the performance of different ecosystem levels along a latitudinal gradient in environmental change. WP1 will study individual physiological responses of selected species and use Dynamic Energy Budget theory to describe species performance. WP2 will identify and quantify interactions between key taxa (e.g. competition for food and space) by means of food web structure and ROV image analysis. WP3 will investigate the ecosystem responses in terms of carbon cycling (production, export, storage, cycling and burial). WP4 will upscale the findings of WP1-3 to ecosystem level by means of mechanistic ecosystem models. A 5th WP is dedicated to the challenging field work planned for two seasons on the nimble research platform RV Australis and the Peruvian Machu Picchu land-based research station. Two managerial WPs focus on data and project management and finally WP8 is fully dedicated to outreach.

We will mainly perform non-invasive benthic sampling by means of ROV surveys, sampling by scuba diving and ex situ biogeochemical fluxes measurements, making this project, together with sample use optimization, a **low-environmental impact** research project for the Southern Ocean. Organism samples will be shared among all involved researchers. Together with benthic surveys, sea ice coring, seawater sampling, and sediment trap deployment will provide an innovative integrated account of the sea ice–pelagos–benthos vertical continuum.

TANGO is primarily a scientifically oriented research network. The project results are expected to have the largest impact on the scientific community but will also have an important influence on policy makers and society. The scientific outcomes of TANGO will allow a better understanding of the changing metabolic responses and species interactions on the dynamics of near shore communities in different climate change scenarios. This knowledge is essential for developing appropriate conservation measures and to evaluate management efficiency.

Through its engagement with the Antarctic Treaty System (CEP, CCAMLR), the TANGO project will make sure that these insights will have a direct impact on conservation and management of coastal habitats in the WAP. The research of TANGO and the planned outreach will show the precarious state of popular ecosystems and provide a context to the general public for the relevance of its conservation. Via the use of low impact platforms, TANGO will demonstrate how science can be an example in adopting a low impact science. Considerable efforts will be made to make the data and the analytical tools developed in the framework of the project openly available, contributing to open and reproducible science and a stronger scientific impact.



CONTACT INFORMATION

Coordinator

Ann Vanreusel

Universiteit Gent (UGent)
Onderzoeksgroep Mariene Biologie
ann.vanreusel@ugent.be
www.marinebiology.ugent.be

Partners

Bruno Danis

Université Libre de Bruxelles (ULB)
Marine Biology Lab
bdanis@ulb.ac.be
<http://biomar.ulb.ac.be>

Bruno Delille

Université de Liège (ULiège)
Freshwater and Oceanic science Unit of research (FOCUS)
bruno.delille@uliege.be
<https://www.co2.uliege.be/>

Isa Schön

Royal Belgian Institute of Natural Sciences (RBINS)
OD Nature and OD Taxonomy and Phylogeny - ATECO (IS)
ischoen@naturalsciences.be
www.naturalsciences.be/en/science/do/98

LINKS

<https://www.researchgate.net/project/TANGO-Estimating-Tipping-points-in-habitability-of-ANTarctic-benthic-ecOsystems>