

AMAZOMIX campaign: Impact of physical processes on the marine ecosystem at the mouth of the Amazon

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A multidisciplinary team of 17 French and Brazilian scientists will embark from August the 28th to October the 8th on board of the ANTEA, an oceanographic vessel of the French Oceanographic Fleet operated by Ifremer. From Cayenne, the ship will head to Brazilian waters and explore the mouth of the Amazon over more than 6,000 km to study the impacts of currents, the Amazon plume and turbulent processes on the functioning of the marine ecosystem.

The campaign is organized by the French Institute for Development (IRD), CNRS and CNES in France, Federal Rural University of Pernambuco (UFRPE), Federal University of Pernambuco (UFPE), Federal University of Pará (UFPA) and Federal Rural University of the Amazon (UFRA) for Brazil, and benefits from the structuring role of the International Joint Laboratory (LMI) TAPIOCA (IRD, UFPE, UFRPE). Technical services, research units and universities are associated to AMAZOMIX, of which : UMR MARBEC (IRD, Ifremer, University of Montpellier, CNRS), UMR LEGOS (CNES, CNRS, IRD, University Paul Sabatier), UMR LEMAR (UBO, CNRS, IRD, Ifremer), DT-INSU (CNRS), US IMAGO (IRD), UMR LOG (CNRS, IRD, University of Lille, ULCO), UMR MIO (University of Aix-Marseille, University of Toulon, IRD, CNRS), Federal University of Rio de Janeiro (UFRJ, Brazil), the National Brazilian Institute for Spatial research (INPE, Brazil) and the University of Porto (Portugal). The Rockland Scientific firm is also participating in the campaign as an industrial organization.

Entitled AMAZOMIX, this campaign will travel over the Amazonian shelf break and continental slope to study the impact of currents, the Amazon plume¹ and turbulent processes² on the structure and functioning of marine ecosystems from a physical, biogeochemical and biological point of view. The expedition will also trace the origin and distribution of pollutants, such as heavy metals and microplastics, and determine their role in the food chain.

What is the biodiversity at the mouth of the river? What is the influence of tidal waves on this ecosystem? For, if the Amazon brings a considerable load of water and sediments to the oceans, its mouth is little studied and many aspects remain to be discovered: biodiversity, from bacteria to predators, is poorly known; despite the turbidity of the waters, coral reefs are found in the area and the mechanisms at work have not been precisely identified; in addition to the impact of the Amazon, the effects of tides, that generate very energetic waves, and the consequences on the ecosystem are not properly described. The connectivity of species in the tropical Atlantic is not well understood: The Caribbean region is the most bio-diverse, and one of the hypotheses is that the Amazon plume, which can extend up to 3,000 km off the mouth, would constitute a barrier for some organisms.

To answer these questions, scientists from more than twenty disciplines in physics, biogeochemistry, and biology, led by Ariane Koch-Larrouy (UMR LEGOS) on land and Arnaud Bertrand (UMR MARBEC) at sea, will travel more than 6,000 km on the French vessel N/O ANTEA to collect data on abiotic – physical and

¹ Large volumes of fresh, turbid, nutrient-rich water of continental origin that are brought to the coastal strip. It is a place of high phytoplankton production that has beneficial effects on the entire food chain.

² Turbulent processes are the result of internal waves formed in the ocean; these movements lead to an irreversible mixing of waters and their properties. If turbulences are of the order of a few millimeters/centimeters, the currents that cause them concern scales of up to several thousand kilometers. These waves appear at the surface and propagate in the water column.

