

---

# Satellite based oceanic monitoring around Reunion Island for the years 2003 to 2017

Alexandre Wiefels\*<sup>†1,2</sup>, Jan Christopher Fischer\*<sup>3</sup>, Olivier Flores<sup>4</sup>, and Erwann Lagabrielle<sup>1,2</sup>

<sup>1</sup>Université de la Réunion (UR) – 15, avenue René Cassin - CS92003 -97744 Saint Denis Cedex 9, Réunion

<sup>2</sup>Espace pour le développement (UMR 228 ESPACE DEV (IRD-UR-UM2-UG-UA)) – Université de la Réunion – Parc Technologique Universitaire, 2 rue Joseph Wetzell, F-97492 Sainte-Clotilde, La Réunion,, France

<sup>3</sup>Universität Bayreuth – 95440 Bayreuth, Germany

<sup>4</sup>UMR Peuplement Végétaux et Bioagresseurs en Milieu Tropical (UMR PVBMT) – Université de la Réunion – 97410 St-Pierre, France

## Abstract

Coastal waters are structurally and functionally diverse hotspots of marine biodiversity. In La Reunion Island those ecosystems are characterized by frequent disturbances. Severe cyclonic storms, increasing human activity and land-use change cause multiple effects including chemical and biological pollution as well as physical destruction along the coast line. In addition, ongoing climatic changes affects marine ecosystems. In order to characterize the spatial and temporal evolution of the coastal waters around La Reunion Island we investigated optical characteristics of several sea water quality parameters. Those include the diffuse attenuation coefficient at 490 nm (Kd490), particulate organic and inorganic carbon (POC, PIC), chlorophyll *a* concentration and night time as well as day sea surface temperature (NSST, SST). In this study, water quality indicators were derived from daily satellite imagery data from the Moderate Resolution Imaging Spectroradiometer (MODIS) in a spatial resolution of  $\sim 2$  km for the years 2003 to 2017. SST around La Reunion increased reaching +1°C in the south of the research area in 14 years. Water turbidity (Kd490), POC and chlorophyll *a* show high intercorrelations and indicate the presence of living material (phyto- and zooplankton, bacteria). They exhibit decreasing trends over the course of our investigation. The absolute concentrations as well as the coefficients of variation are elevated along the island's rainy eastern coastline which indicates the presence of a dynamic oceanic ecosystem. CaCO<sub>3</sub> (PIC) concentrations are highest in the shallow waters of the western lagoons where it's concentration decreased by an average of 0,00009 mol m<sup>-3</sup> in the marine reserve. Potential underlying reasons are coral bleaching or macrophytic algae decrease. The ocean productivity is highest in an area of 18 km in diameter around the island. For the years 2003 to 2017, it decreased at the eastern coast while the temperature rose. This phenomenon may influence fishing rates as well as the behavior and migrations of marine megafauna. Future conditions might promote biological invasions. The coastal ecosystems are changing with the climate. It is important to assess and improve the monitoring of the following stages of this phenomenon to help preserve human life quality and native biodiversity.

---

\*Speaker

<sup>†</sup>Corresponding author: alexandre.wiefels@univ-reunion.fr

**Keywords:** ocean, coastal ecosystems, remote sensing, climate change