EGU23-16517, updated on 14 Apr 2024
https://doi.org/10.5194/egusphere-egu23-16517
EGU General Assembly 2023

Forcing Mechanisms of the Interannual Sea Level Variability in the Midlatitude South Pacific during 2004-2020

Cyril Germineaud[1,2,3], Denis Volkov[1,2], Sophie Cravatte[4], and William Llovel[5]
[1]Cooperative Institute for Marine and Atmospheric Studies, University of Miami, Miami, USA
[2]NOAA, Atlantic Oceanographic and Meteorological Laboratory, Physical Oceanography Division, Miami, USA
[3]Centre National d'Etudes Spatiales (CNES), Toulouse, France
[4]LEGOS, Université de Toulouse, CNES, CNRS, IRD, UPS, Toulouse, France
[5]LOPS, CNRS, University of Brest, IFREMER, IRD, Plouzané, France

Over the past few decades, the global mean sea level rise and superimposed regional fluctuations of sea level have exerted considerable stress on coastal communities, especially in low-elevation regions such as the Pacific Islands in the western South Pacific Ocean. This made it necessary to have the most comprehensive understanding of the forcing mechanisms that are responsible for the increasing rates of extreme sea level events. In this study, we explore the causes of the observed sea level variability in the midlatitude South Pacific on interannual time scales using observations and atmospheric reanalyses combined with a 1.5 layer reduced-gravity model. We focus on the 2004–2020 period, during which the Argo's global array allowed us to assess year-to-year changes in steric sea level caused by thermohaline changes in different depth ranges (from the surface down to 2000 m). We find that during the 2015–2016 El Niño and the following 2017–2018 La Niña, large variations in thermosteric sea level occurred due to temperature changes within the 100–500 dbar layer in the midlatitude southwest Pacific. In the western boundary region (from 30°S to 40°S), the variations in halosteric sea level between 100 and 500 dbar were significant and could have partially balanced the corresponding changes in thermosteric sea level. We show that around 35°S, baroclinic Rossby waves forced by the open-ocean wind-stress forcing account for 40 to 75% of the interannual sea level variance between 100°W and 180°, while the influence of remote sea level signals generated near the Chilean coast is limited to the region east of 100°W. The contribution of surface heat fluxes on interannual time scales is also considered and shown to be negligible.