Ocean acidification affects both pH and aragonite saturation state (Omega), which impact biological and physical processes such as photosynthesis, nitrogen fixation, phytoplankton growth, calcification rate, trace metal availability and low-frequency sound adsorption. The changes in these processes throughout the Pacific are expected to affect biodiversity, tourism, fisheries and coastal protection, and are a serious environmental threat to the social and economic fabric of many Pacific Island nations.

We conducted the first research on the acidification of surface waters in the Pacific Island region (120E:220E, 35S:30N) by utilising observations and models to determine the seasonal variability of sea surface pH and Omega. Values of pH and Omega are derived using the 4° x 5° seasonal gridded pCO$_2$ product of Takahashi et al (2010) and reconstructed total alkalinity (TA).

We present the sensitivity of pH and Omega to sea surface temperature, salinity, TA and TCO$_2$. The temporal and spatial changes in surface carbonate chemistry hence ocean acidification can be attributed to vertical mixing in the sub-tropical gyres and the West Pacific Warm Pool, biological activity (calcification/production) in the sub-tropical gyres, and horizontal advection with the seasonal variability in surface currents. The results of this project can be used to predict how the regional waters will acidify, and will provide a foundation for detailed assessments of the vulnerability of individual reefs to acidification.