Each oceanic region has a different significance in influencing the global climate change scenario with their potential for drawing-down the atmospheric CO2. In this context, the Southern Ocean (SO), being the world’s largest high-nutrient low-chlorophyll (HNLC) regions, plays a significant role as a sink for atmospheric CO2 via its solubility and prevailing biological pumps. It thus plays a pivotal role in the global carbon cycle and climatic regulations through biogeochemical fluxes of carbon, nutrients etc. from the ocean surface to the deep interior. The efficiency of the biological pump depends on a range of environmental and biological factors (such as type of phytoplankton / zooplankton inhabiting), which in turn are influenced by climate change. It is observed that the productivity in SO regions is closely related to the hydrodynamics across the fronts and convergence zones, thereby varying the phytoplankton, the prey-predator relationship and food-web structure and biogeochemical cycle.

Scientific insight gained from physicochemical and biological studies performed during Indian Southern Ocean Expeditions (ISOE) in the last decade highlights some interesting findings and emphasizes India's research activities in the SO region for better understanding of the SO processes, biogeochemical cycles, marine productivity and global climate change scenario. This talk would include some of the salient findings of ISOE which highlights: causal mechanisms of variability in phytoplankton community structure and productivity among frontal regions [i.e., Subtropical Front (STF), Sub-Antarctic Front (SAF) and Polar Front (PF)], patterns of phytoplankton biomass distribution within and among the fronts, role of diatoms in deciphering environmental change, food-web dynamics, bio-optical characterization of water column, response of bacteria and phytoplankton to micronutrient amendments etc. in this lesser-understood region in the SO.