The Southern Ocean – globally important, surprisingly unknown

Anna Wåhlin (anna.wahlin@marine.gu.se)
Department of Marine Sciences, University of Gothenburg, Sweden

The Southern Ocean is fundamental to global climate, marine biomass, and sea-level change. Its storage of heat and carbon and its redistribution of physical and biogeochemical properties affects all oceans. It is also one of the least known sectors of planet Earth with large unexplored areas. The fate of the West Antarctic Ice Sheet is considered the greatest remaining unsolved problem when predicting future global sea level. This giant ice sheet is drained by glaciers that terminate in the ocean, where they form floating ice shelves overlying vast sub-ice cavities. Physical processes in these cavities are key for the melting and break-up of the ice sheet. However, due to the lack of data for boundary conditions, forcing, and validation of theories and models, these environments are still very poorly understood. Another main knowledge gap is the seasonally sea-ice covered parts of the Southern Ocean, an area larger than the South American continent. The Southern Ocean accounts for about 50% of the oceans uptake of CO2. Observations of the ice-covered regions remain mostly non-existent because of its remoteness and harsh environment. The ice prevents satellite-based remote sensing of the sea, available in other regions. Data is obtained at great logistical cost and elevated risk, and it is vital that the international community work together to create sustainable and efficient observing systems in this area. Without a clear understanding and long-term observations of the air-sea-ice fluxes, we are unable to supply climate models with correct process descriptions and validation. As a result, we currently hold a poor understanding of the key ocean processes. This presentation will outline major knowledge gaps existing in the Southern Ocean and recent advances addressing them within the Southern Ocean Observing System (SOOS).