

# Triangular Perspectives on Sea ice Change

## Abstract

The polar regions are losing sea ice, and their oceans are changing rapidly. The consequences of this transition extend to the whole planet. These regions will be profoundly different in the future compared with today, and the degree and nature of that difference will depend strongly on the rate and magnitude of global climate change. On this matter, sea ice has a significant addition and different characteristics compared to its freshwater counterparts. This paper will cover the several interaction zones of sea ice that exist in polar regions. While Arctic sea ice reveals an overall declining trend in its extent, thickness, and age during the last decades, the sea-ice cover of the southern hemisphere has expanded on average. Moreover, the Antarctic-wide positive trend is composed of regionally opposing sea-ice changes, especially between East and West Antarctica. Although several studies suggest changes in the large-scale atmospheric and oceanic circulation patterns as the main drivers for the increase in Antarctic sea-ice extent and the strong regional sea-ice variability, the seasonal and inter-annual variability of snow and surface properties and thickness of Antarctic sea ice is rarely studied in this context. Hence, this paper's foci are model agreement with observations using various simple metrics that account for sea ice values and the regional distribution of sea ice. In addition, discussing biases in Antarctic sea ice that are common across multiple models as well as some recorded and research data basis drawbacks allow us to see the gap and form future field campaigns and research routes. An improved understanding of the seasonal cycle of dominant sea-ice in the Arctic and Antarctic is crucial for future investigations retrieving sea-ice variables from recent microwave satellite observations.