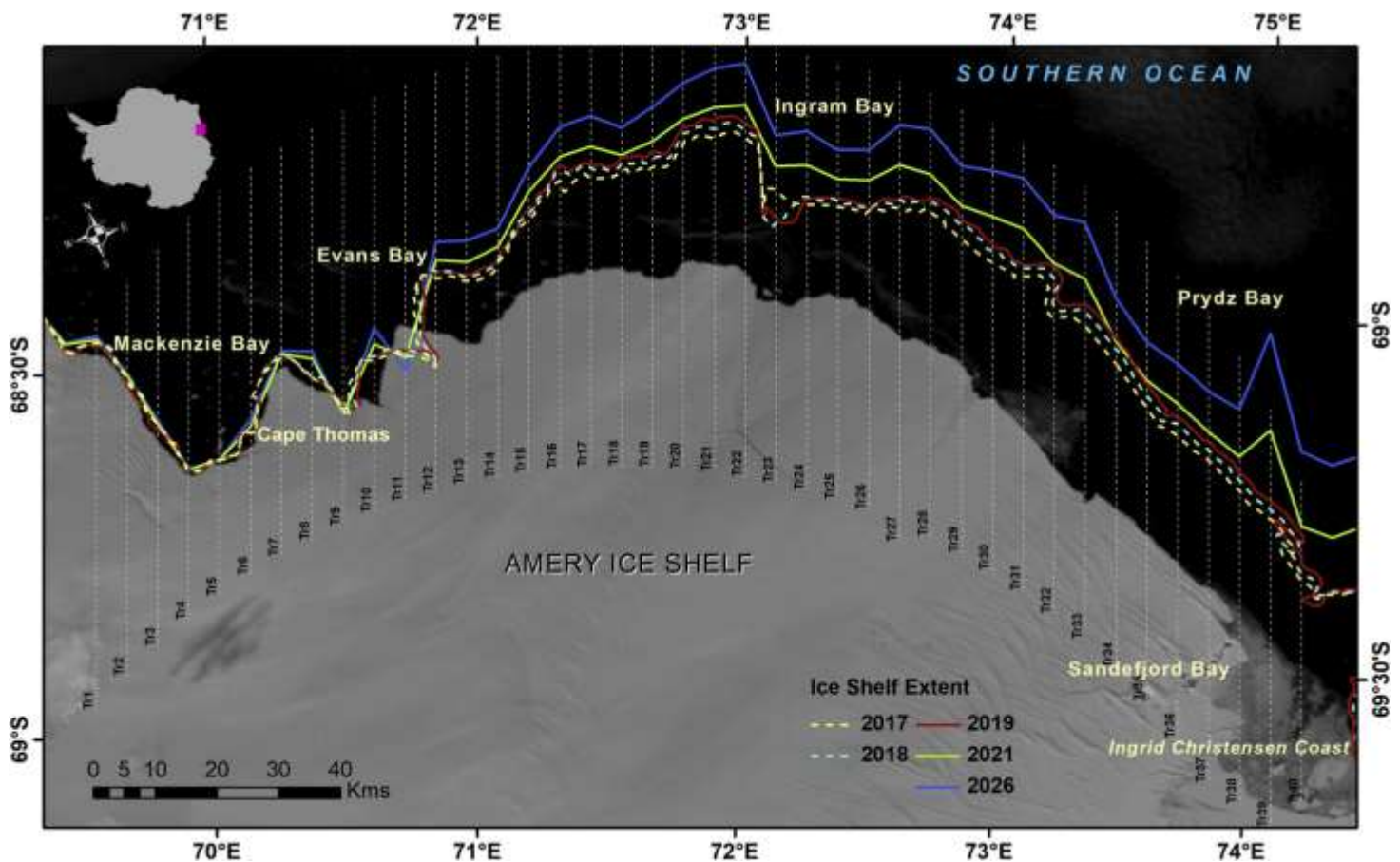


Major Impact on climate due to extension of Amery Ice Shelf (AIS), NCPOR study reveals

Mohammad Faiyaz Anwar

The floating sheets of ice called the ice shelves play a multi-faceted role in maintaining the stability of a glacier. Ice shelves connect a glacier to the landmass. The ice sheet mass balance, sea stratification, and bottom water formation are important parameters for the balancing of a glacier. Latent and sensible heat processes do play important roles here.

Amery Ice Shelf (AIS) is one of the largest glacier drainage basins in the world, located on the east coast of Antarctica, at about 70°S Latitude, 70°E Longitude. The AIS dynamics and mass balance help in understanding the changes in the global climate scenario.



The National Centre for Polar and Ocean Research (NCPOR) predicts that there would be a 24% increase in the expansion of AIS boundaries by 2021 and another 24% expansion by 2026 from its 2016 positions. The prediction made by NCPOR is based on a 16-year-long satellite-based observation that covered an area of 60,000 sq. km across the AIS. This study would help understand the ongoing changes in the ocean and atmospheric forcing better.

The insulation of ice shelves from atmospheric forcing is dependent on a temperature gradient that the ocean cavity beneath the ice shelves provides. It is the pressure exerted by the ice shelves upon the ocean cavity that determines this temperature gradient.

There is always a stress on the sea ice and ice sheets itself play an indirect role in reducing the amplitude of the ocean swell. This is assisted by the freezing atmospheric temperature, which is capable of promoting a change in the morphology of ice shelves.

NCPOR carried out this study based on the satellite data collected from 2001 to 2016. The data were collected during the austral summer months of January to March to understand the advancement of AIS extension and the influence of ocean atmospheric forcing in East Antarctica. The NCPOR scientists observed a spatio-temporal change in the ice shelf as reflected by the extension of the Pridze and Mackenzie and the extension of a 200-km stretch between Mackenzie Bay (68.5°S Latitude; 70.2°E Longitude) and the Sandefjord Bay (69.65°S Latitude; 74.3°E Longitude), which is a part of the AIS.

It becomes clear from the study that the AIS is losing its stability owing to the impact of a downstream giant glacial drainage system over the past 19 years, thereby advancing the ice shelf boundaries due to higher freezing rates than basal melting.

NCPOR has also estimated the rate at which ice shelves have extended for the last three years (2017-2019). The AIS extended by about 550m in 2017, 1470m in 2018, and 2200m in 2019. If this continues, it is entirely possible that in the next six years (2021 to 2026), the positions of the ice shelf would closely co-inside with the actual boundary conditions.

NCPOR observations also revealed a critical cooling of the sea surface temperature (SST), resulting in an advancement of the ice shelf by 88% in the past 15 years. These changes would contribute in a major way to climate variability.