Topics (T)
Climate Change Impacts and Challenges (Biodiversity, Forests and Land, Ocean/Marine Ecosystems, the Artic and beyond) [1] (2A)

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SPACE BASED MONITORING OF SNOW MELT DISTRIBUTION, ITS RELATION WITH ENSO AND AI/ML BASED PREDICTION OVER ANTARCTICA

Abstract

The global atmospheric and oceanic temperature gradients have rapidly changed since the industrial revolution due to the emission of carbon dioxide and other greenhouse gases into the atmosphere because of various anthropogenic activities. Understanding global climatic changes resulting from global warming and their impact on polar snowmelt and ocean biogeochemistry requires an assessment of the spatio-temporal variability of surface ice melt over the Antarctica region. Space based long-term time series (2002-2021) analysis was carried out using the Sea Winds on-board QuikSCAT and OSCAT onboard Oceansat-2 and SCATSAT-1 over Antarctica. A variable threshold method based on winter mean and standard deviation of backscatter values from scatterometer, resulted in identification of daily snow melt areas. Significant changes in the snowmelt area are observed in the time series analysis over most of the Antarctic ice shelves, as consequence substantial changes in chlorophyll-a concentration and sea surface temperature are also observed in the water near these ice shelves. The snowmelt area over the Antarctic region during strong El Niño or La Niña years is compared to the non-ENSO year average. The present study attempted to compute the snowmelt area trend over the different shelf regions of Antarctica and implemented the Mann-Kendall test-based Sen's slope to evaluate the significance of the linear fit. Results of the linear regression (MK test) based linear fit reported increasing trend in most of the major shelf. The MK-based statistical test shows no trend over Shackleton, Nickerson, Abbott, Dotson and Ronne Filchner shelf. Amery, Fimbul, LarsenC and many other shelf show significant positive trend. Melt days and melt index was also studied for the shelf during ElNino and LaNina years. Study also revealed that the ENSO has a significant amount of impact on the snowmelt area over the Antarctic region, with various ice shelves getting affected differently during the El Nino and the La Nina years. Further this study is attempting to understand the natural climatic events ENSO role in modulating the observed trends using the Long Short-Term Memory (LSTM) based neural network model. AI/ML based prediction over the shelf using past data and trend is attempted in the study.