Mapping Blue-Ice areas using multiple indices approach: A case of Polar Record glacier, Antarctica

Blue Ice Area (BIA) are characterized by hard ice in a cryospheric environ which appears blue due to net ablation dominated by sublimation and wind scouring exceeds the accumulation by precipitation and snowdrift deposition. BIAs is characterized by negative surface mass balance. They are scattered widely over the Antarctic continent and cover only 1% of surface area, but the ice is of great interest for paleoclimatic studies and they are sensitive to climate change. Antarctic BIAs acts as meteorite traps: meteorites that fall in the surface in accumulation zone are transported to and concentrated in the BIAs by ice flow, so these are popular among glaciologist, meteorologist, geologist, environmentalist and climatologist. For the research stations in the Antarctic, BIAs is the main source for drinking water and serves as airplanes runway. This research has attempted to map the BIA of Polar Record Glacier, East Antarctica using spectral band indices approach derived from satellite-based remote sensing data. This study estimated that more than 30% of the total surface area of the Polar Record Glacier is covered with BIAs, and multiple factors are influencing the variation of BIAs. The total area is also depending upon the climatic and season changes, while the reliable knowledge of parameters like katabatic wind direction, the rate of sublimation and ablation, wind pattern and surface temperature, etc. can increase the accuracy of the result. This study also found that there is a high impact of surface albedo on the BIAs, causing significant variation in the spatial extent and total surface area of BIAs.