Temporal and spatial variations of melting and Rain-On-Snow event on the sheets detected by Microwave observation

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The Arctic is experiencing rapid environmental change due to climate warming, resulting in snow condition changes [1]. Melting of ice sheets has been observed, and recently Rain-on-snow has become a new focus as it indicates evidence of warming and causes disaster in the snow-covered region [2] [3]. Chages in the Antarctica has been occurig, however systematic moitorings are few.

This study presents the temporal and spatial variation of ice sheet melting on the slopes of Antarctic and Greenland ice sheets, based on satellite microwave observations. The research in Antarctica focused on the coastal marginal zone and inland traverse route near Syowa Station, Antarctica, from the S17 site (608 m a.s.l.) to the H128 site (1376 m a.s.l.). Melting was detected using diurnal amplitude variation (DAV). Data from AMSR-E, for 2002–2012, and AMSR2, for 2012–2017, showed a variation in DAV over time. The greatest extent of melting was estimated to have occurred during the 2003/2004 summer. DAV rose inland, until the H92 site (1268 m a.s.l). In contrast, DAV decreased in the case of rain, which was reported by the Japanese Antarctic Research Expedition in 2004 and 2012. This is due to the rise of nighttime brightness temperature (TB). The signal from rain was limited to the area between the S17 and H24 sites (832 m a.s.l.). Coastal zones showed a low TB locally around S17. The refrozen ice lenses under the coastal snow layers seem to have caused the low coastal emissions. The DAV can be significant as daytime and nighttime contrast increase from this low TB.

This study compares the research in the Greenland Ice Sheet [4]. We set the transect from the coast to ridge area in the northen region and the central regions of the Greenland ice sheet.

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