**Daily accumulated area of snow melt onset on Arctic sea ice**

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**Introduction**

This work investigates the atmospheric conditions initiating melting of the snow cover atop the Arctic sea ice at the daily scale and the regional and temporal changes in spring seawater temperatures over the 1979-2011 record. The focus is on the Arctic region, where the sea ice cover begins to melt during the spring and during snowmelt events, the ice gains mass, allowing for the absorption of more solar radiation into the ice-ocean system at a time when the sun angle is high, the effects of which can be compounded through the remainder of the melt season, leading to a September sea ice extent minimum.

The date of melt onset for the entire Arctic sea ice is determined using passive microwave brightness temperatures from the NASA Nimbus-7 SMMR and the Defense Meteorological Satellite Program SSM/I (F08-F13) and SSMIS (F17) platforms. The melt onset dates used for this study are obtained from the NASA MEaSUREs ESDR snow melt onset dates. The melt onset dates used for this study are obtained from the Advanced High-resolution Search Algorithm (AHSRA). The AHSRA-era is the same brightness temperatures from the 19 GHz (18 GHz for SMMR) and 37 GHz channels and a 15 day window to calculate the date of melt onset. Melt onset occurs by a distinctive jump in brightness temperature that occurs when liquid water first appears in the snowpack. Figure 1 illustrates the melt onset dates for 2011 in the Eastern Arctic.

For this work, the annual melt onset dates (e.g., Figure 2) are partitioned into a daily accumulation of area melted for each year. Changes in the temporal pattern of melt onset accumulation for the 1979-2011 record are further examined. Variation in the onset of melting in the Arctic is attributed to spring weather conditions. Here, we compare the atmospheric conditions present on days with large areas of each occurring. The temporal patterns of melt onset accumulation for days with large areas of each occurring are examined. The early years of the ESDR record (1979-1987), the SMMR years, tend to be later than the 1979-2011 areal melt accumulation mean. This implies that the melt area tends to accumulate later in the season than during more recent years. The late SMMR and SSMIS years (2000-2011), melt onset tends to accumulate earlier in the year, indicative of the melt accumulations being later in the season than the 1979-2011 mean. The shift in the timing of melt area accumulation indicates that melt on-set is occurring later in time than the Arctic sea ice.