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Variability in Sea Ice Melt Onset in the Arctic Northeast Passage: Seesaw of the Laptev Sea vs. the East Siberian Sea

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The ice/snow melt onset (MO) is a critical triggering signal for ice-albedo positive feedback in the Arctic. Concerning the Northeast Passage (NEP), for 1979-1998, the MO in the East Siberian Sea (ESS) occurred generally earlier than that in the Laptev Sea (LS). However, for 1999-2018, the LS experienced significantly earlier MO than did the ESS in several years. This phenomenon is identified as the MO Seesaw (MOS), i.e., the MO difference between the LS and ESS. For the positive MOS, storm tracks in May tend to cover the ESS rather than the LS and easterly wind prevails and shifts slightly to a northerly wind in the ESS, resulting in higher surface air temperature (SAT) and total-column water vapor (TWV) and earlier MO in the ESS. For the negative MOS, storm tracks are much stronger in the LS than in the ESS and prominent southerly/southwesterly wind brings warm air from coastal land towards the LS. The effect of the Barents Oscillation (BO) on the MOS could be dated back to April. When the Barents Sea is centered with a low SLP in April, sea ice in the LS would be driven away from the coasts, leading to a lower sea ice area (SIA), which increases the surface latent heat flux and humidifies the overlying atmosphere. Along with an enhanced downward sensible heat flux, earlier regional average MO occurs in the LS. For 1999-2018, the MOS was more closely related to both the local variables and the large-scale atmospheric circulation indices.