2018 AGU Fall Meeting
Paper Number: C51D-1101

Temporal Variability of Arctic Sea Ice Melt and Freeze Season Climate Indicators Using a Satellite Passive Microwave Climate Data Record

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Available at figshare.com
doi:10.6084/m9.figshare.7303985

Abstract

Information on the timing of Arctic snow and ice melt onset, sea ice opening, retreat, advance, and closing can be beneficial to a variety of stakeholders. Sea ice modelers can use information on the evolution of the ice cover through the rest of the summer to improve their seasonal sea ice forecasts. The length of the open water season (as derived from retreat and advance dates) is important for human activities and for wildlife. Long-term averages and variability of these dates as climate indicators are beneficial to business strategic planning and climate monitoring. In this presentation, basic characteristics of temporal means and variability of Arctic sea ice climate indicators derived from a satellite passive microwave climate data record from March 1979 to February 2017 melt and freeze seasons, based on Peng et al. (2018), are described.

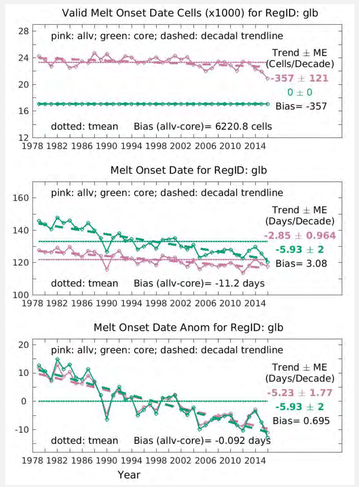


Diagram showing the sensitivity of decadal trends of snow melt onset dates due to the spatial variability of long-term means. Case allv: regional average in each year over the full area valid for that parameter in that year. Case core: average in each year only over the area for which a parameter is valid for all years (i.e., the minimal intersection of all years).

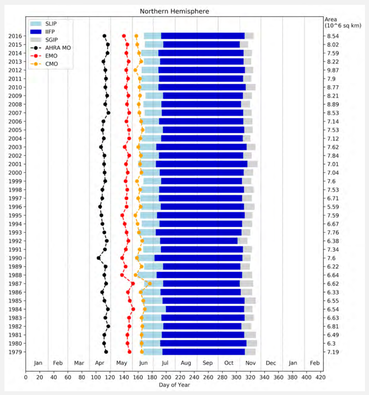
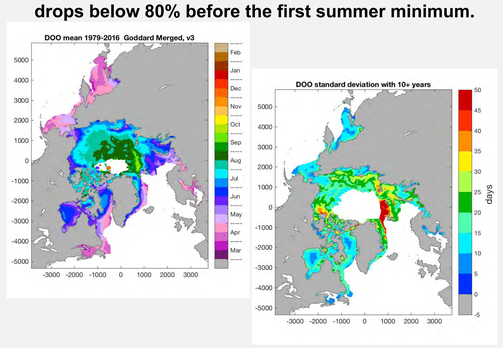
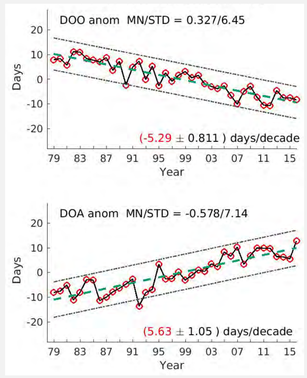


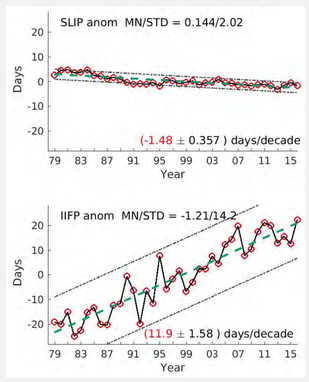
Diagram showing the mean annual evolution of the sea ice melt seasons for the Northern Hemisphere (March 1979–February 2017).

Ice Opening

Day of opening (DOO), last day sea ice concentration drops below 80% before the first summer minimum.

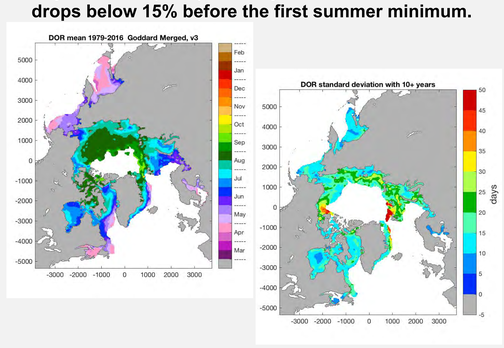






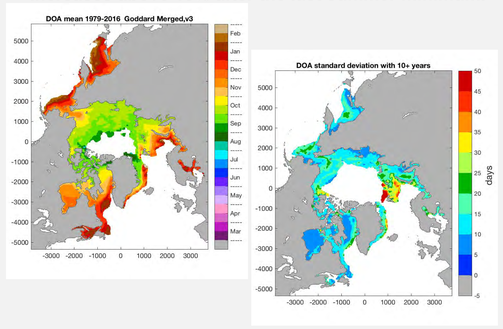
Ice Retreat

Day of retreat (DOR), last day sea ice concentration drops below 15% before the first summer minimum.



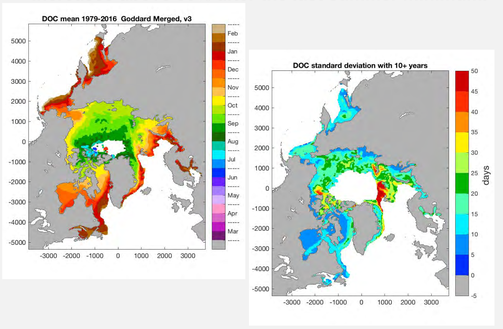
Ice Advance

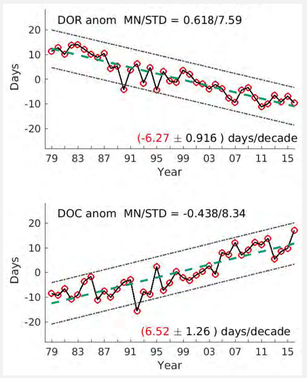
Day of advance (DOA), first day sea ice concentration increases above 15% after the last summer minimum.

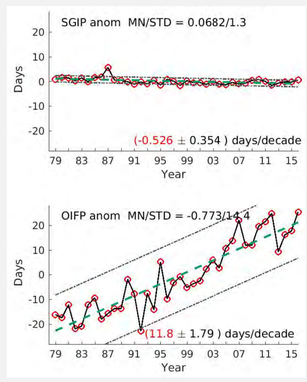


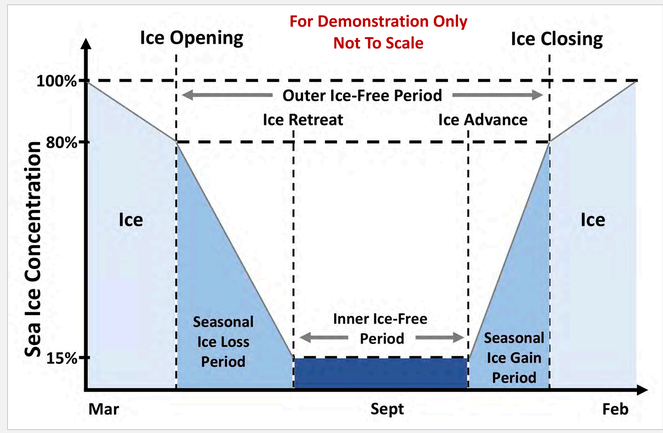
Ice Closing

Day of closing (DOC), first day sea ice concentration increases above 80% after the last summer minimum.



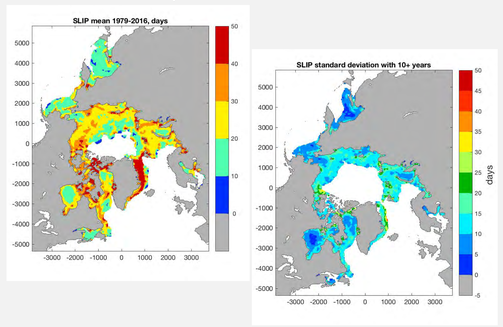






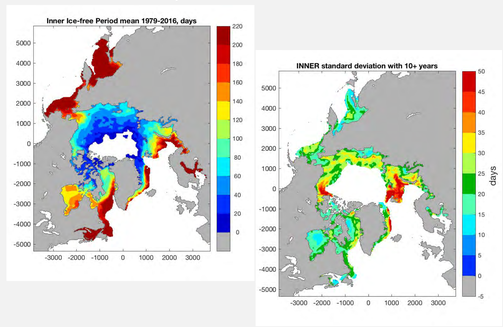
Seasonal Loss of Ice Period

SLIP, defined as DOR–DOO



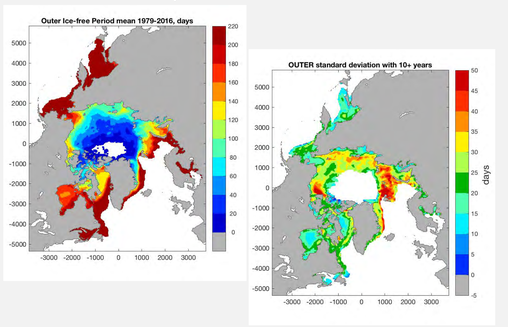
Inner Ice-Free Period

IIFP, defined as DOA–DOR



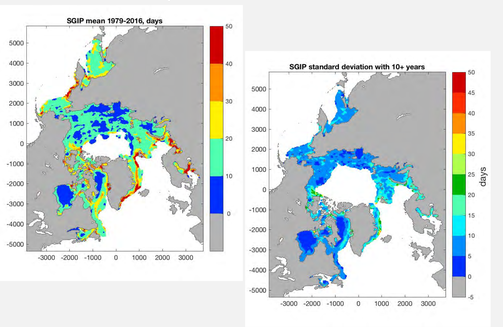
Outer Ice-Free Period

OIFP, defined as DOC–DOO



Seasonal Gain of Ice Period

SGIP, defined as DOC–DOA



Acknowledgement

This work is supported by National Centers for Environmental Information (NCEI) of the National Oceanic and Atmospheric Administration (NOAA) under Cooperative Agreement NA14NES432003 and by the National Aeronautics and Space Administration (NASA) under the grant NNX16AK43G.

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NOAA National Centers for Environmental Information
www.ncei.noaa.gov

Cooperative Institute for Climate and Satellites
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