

Salinity variability of the stratified Arctic Ocean.

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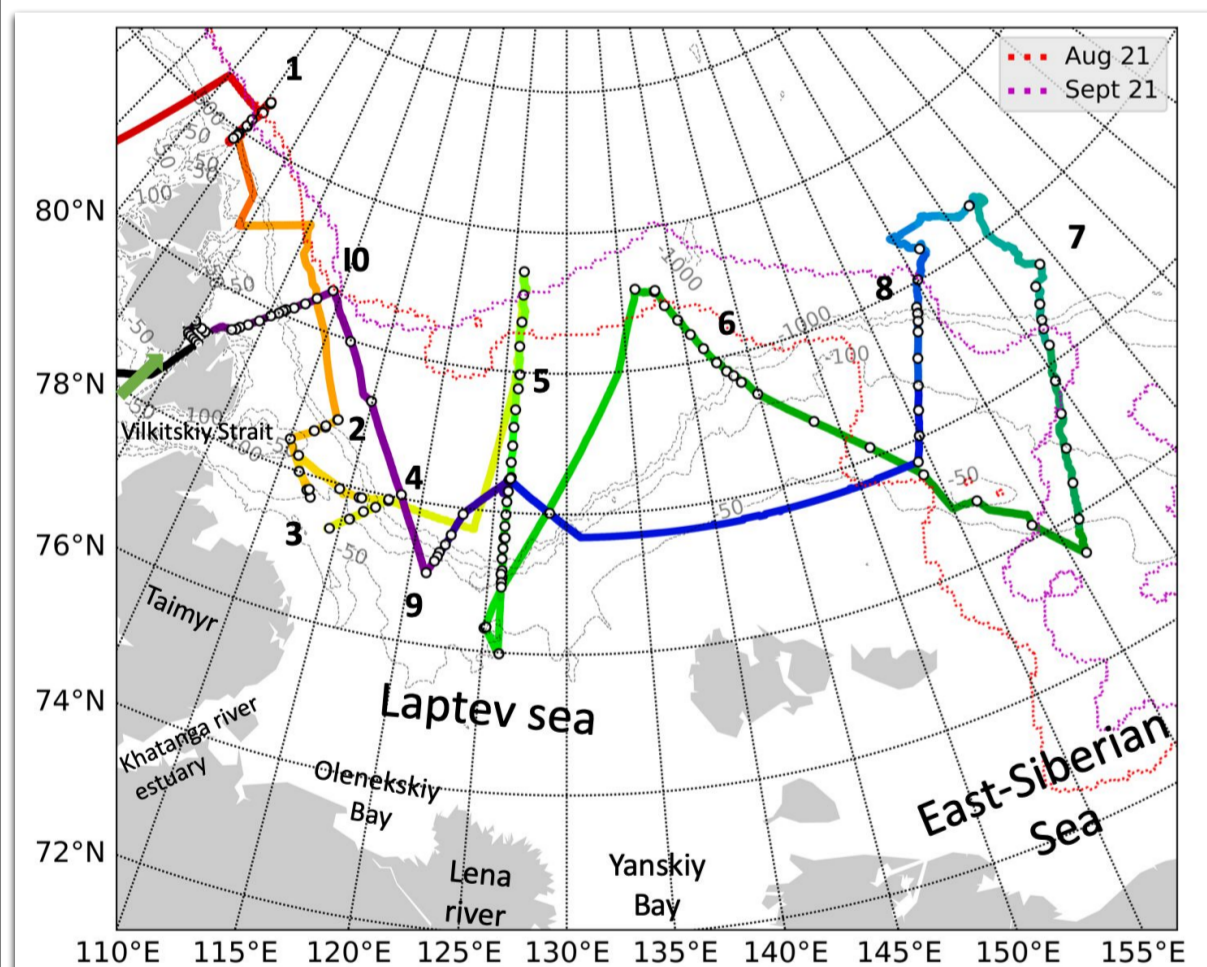
Introduction

- Since 2010, the Soil Moisture and Ocean Salinity (SMOS) satellite mission monitors the earth emission within L-Band, providing the longest time series of Sea Surface Salinity (SSS) from space over the global ocean.
- SMOS has demonstrated its ability to monitor SSS in the Arctic Ocean ocean (Tarasenko et al. 2020, and references herein).
- In this poster, we illustrate SSS variability detected by SMOS using a novel methodology that we developed for better correcting SST and sea ice effects (Supply et al. 2020).

- Tarasenko, A., Supply, A., Kusse-Tiuz, N., Ivanov, V., Makhotin, M., Tournadre, J., Chapron, B., Boutin, J., and Kolodziejczyk, N.: Surface waters properties in the Laptev and the East-Siberian Seas in summer 2018 from in situ and satellite data, *Ocean Sci. Discuss.*, <https://doi.org/10.5194/os-2019-60>, under review, 2020.
- A. Supply, J. Boutin, J-L Vergely, N. Kolodziejczyk, G. Reverdin, N. Reul and A. Tarasenko, *New insights into SMOS Sea Surface Salinity retrievals in the Arctic Ocean*, *RSE*, under review, 2020.

Salinity stratification

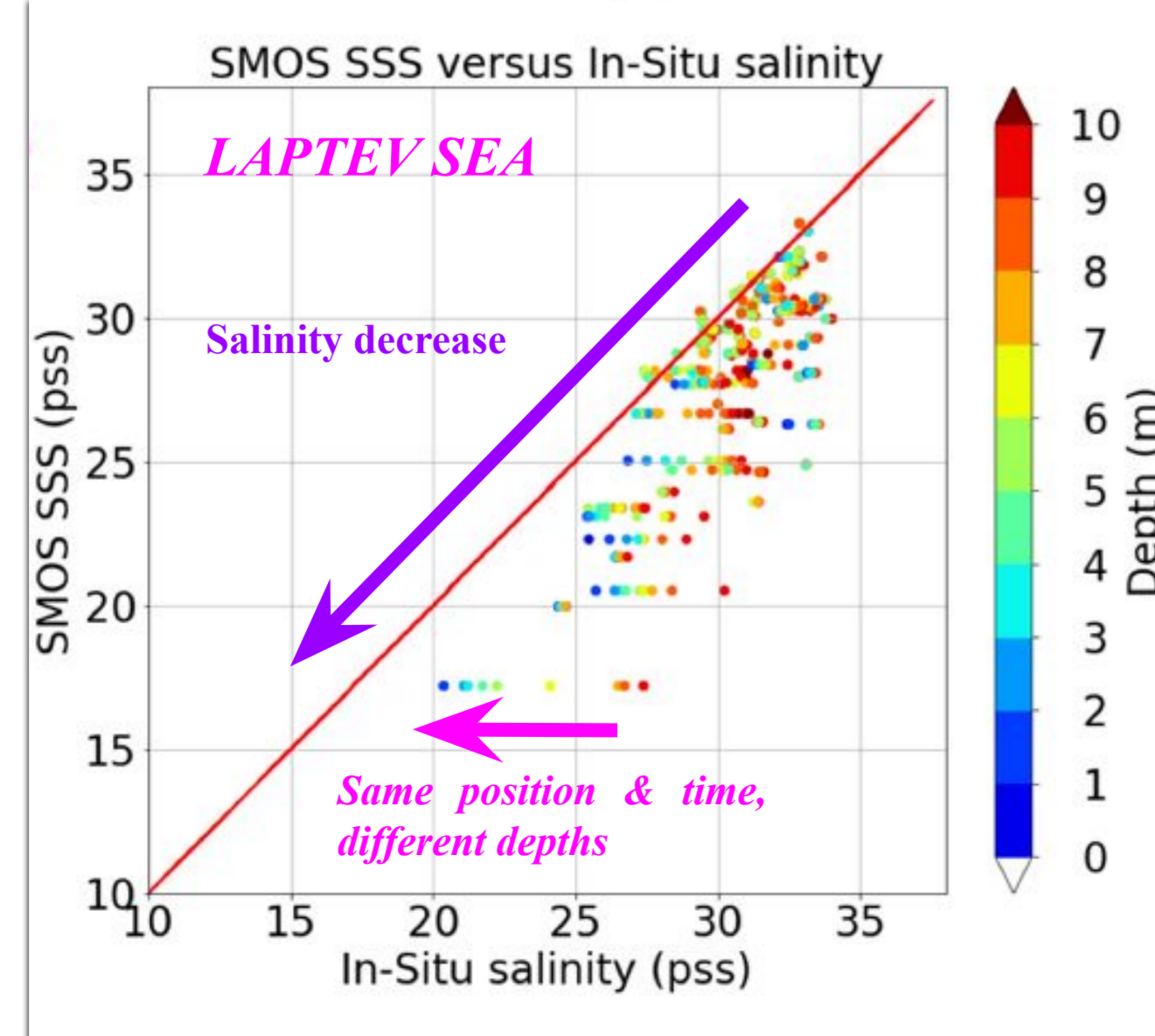
Trajectory of Akademik Tryoshnikov during ARKTIKA 2018 in Laptev and East-Siberian Seas.



SMOS detects salinity at 1cm depth. Measurements from various research cruises conducted in the Arctic Ocean (as recently ARKTIKA 2018 and Transarktika 2019 [AARI]) may be used to validate SMOS SSS.

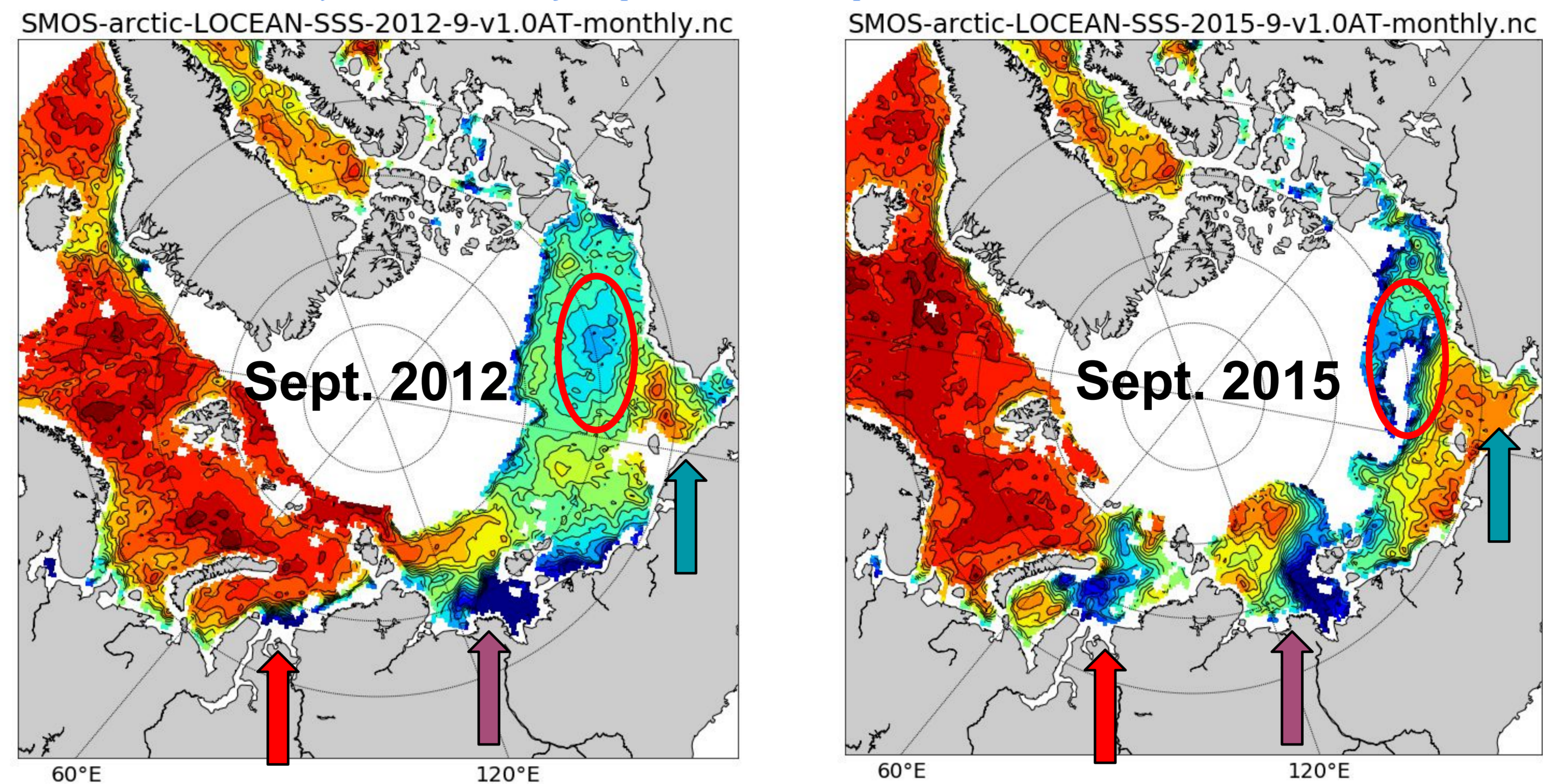
SMOS SSS validation using in-situ salinity measurements largely depends of the measurement depth, especially in stratified areas such as river plumes and ice retreat zones.

SSS_{SMOS} versus in-situ salinity measurements from CTD casts from 2011 to 2018 in the Laptev Sea with each depth of in-situ measurement coded in color.



SMOS SSS interannual variability in the Arctic Ocean

SMOS SSS interannual variability in the Arctic ocean for September 2012 and September 2015.



SMOS SSS allows to monitor interannual variability in areas of large variability.

Monitoring of the variability of the Beaufort Gyre during ice free periods.

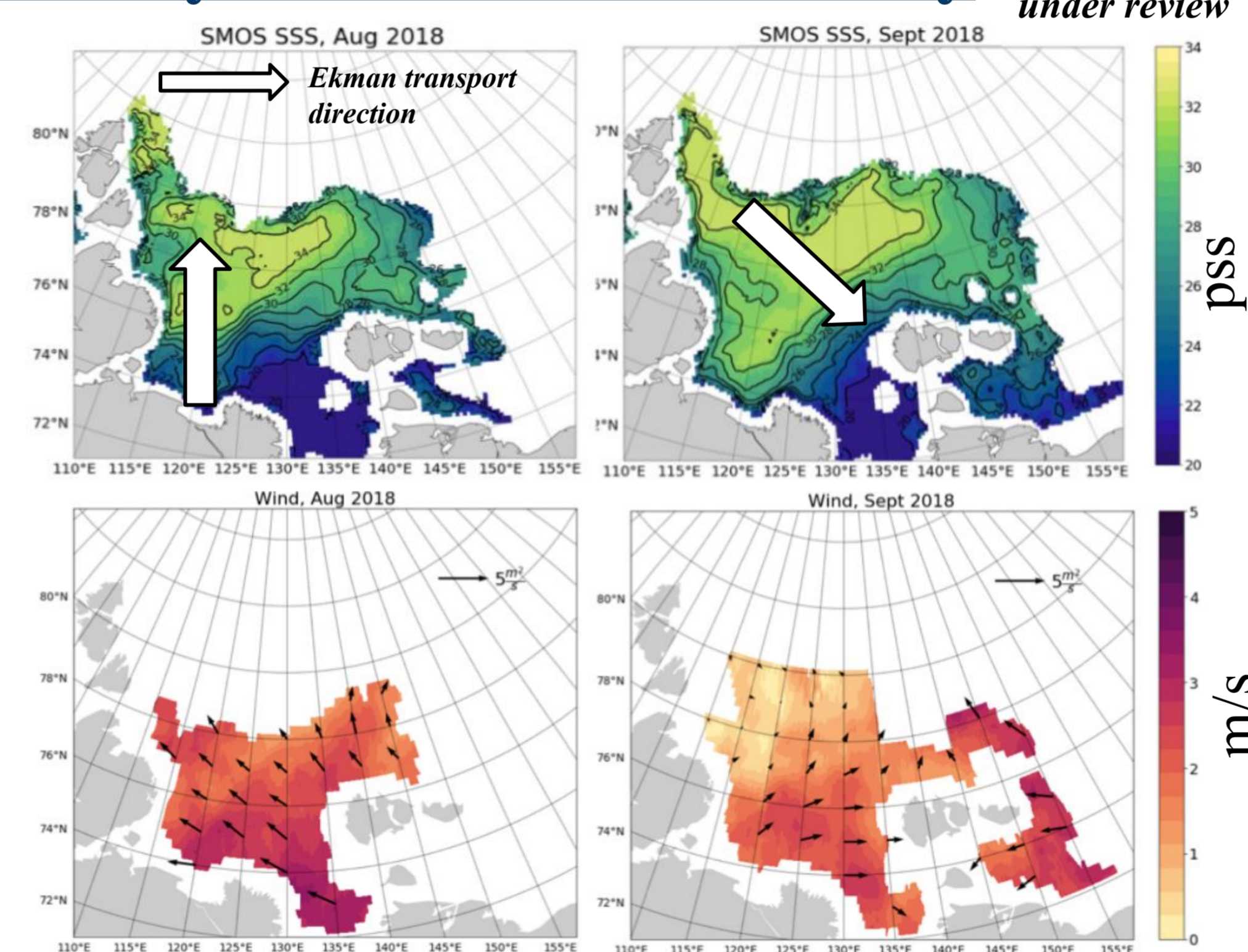
Variability of Pacific Waters entry in the Arctic Ocean: a large difference of salinity is recorded in the Chukchi and East-Siberian sea between 2012 and 2015.

Monitoring river runoff: Laptev Sea and Lena river plume.

Monitoring river runoff: Kara Sea and Ob'+Yenisei river plumes.

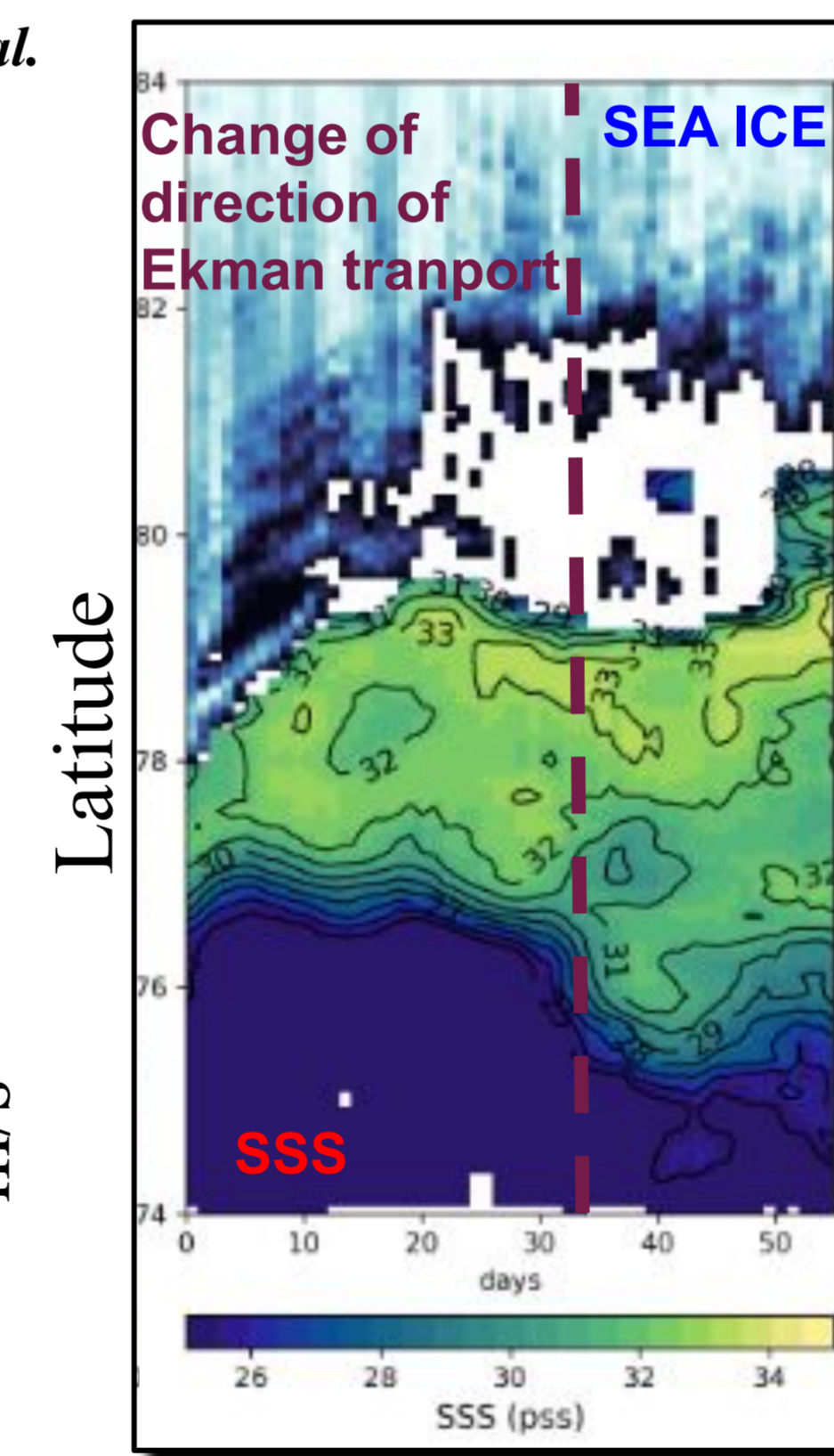
Weekly time scales variability

Tarasenko et al. under review



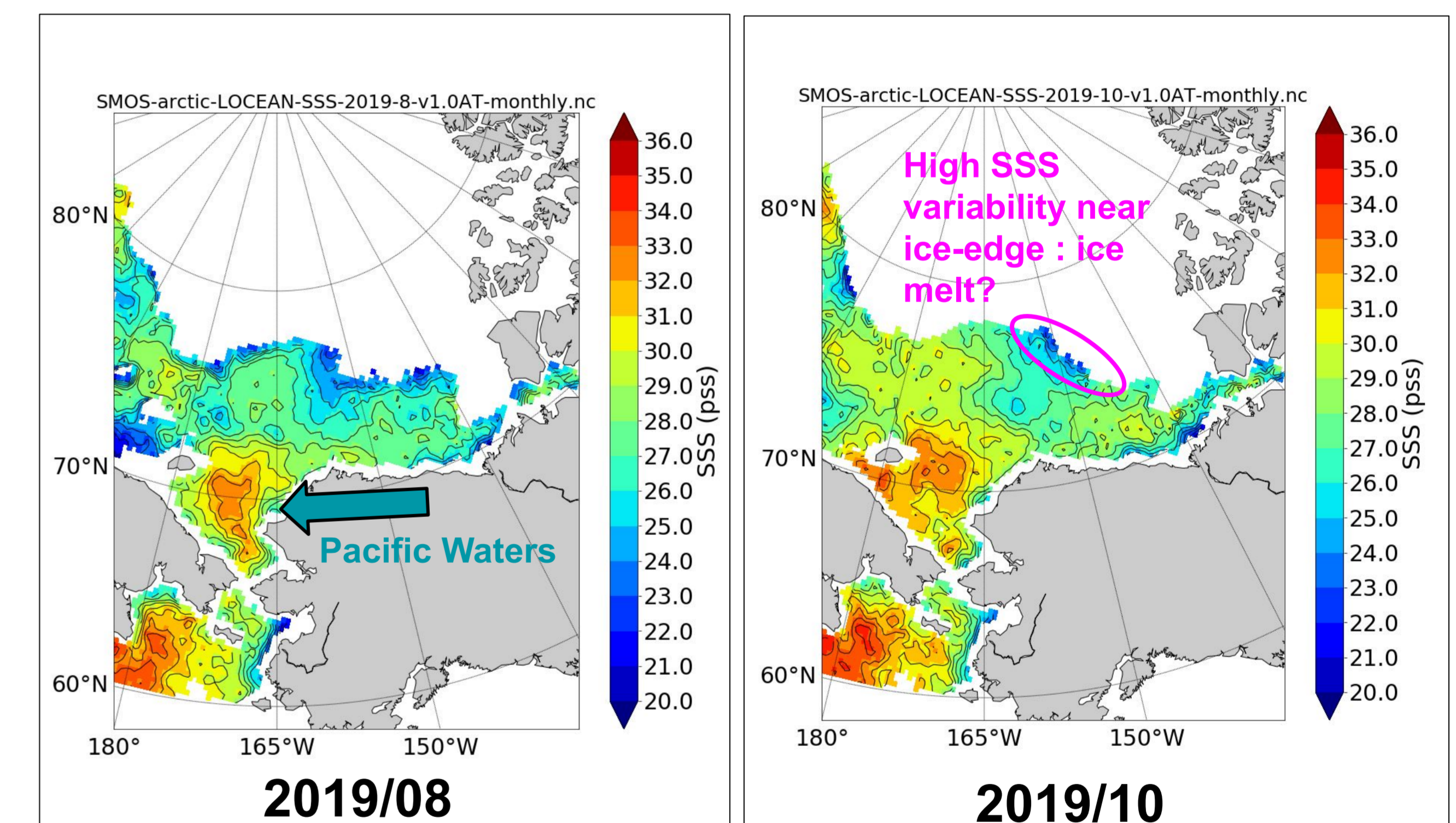
Monthly averages for August (left) and September (right): (above) SSS, (bottom) Wind speed and direction

Weekly SMOS SSS product derived daily allows to describe short scale variability (as Lena river plume extension driven by Ekman Transport in the Laptev Sea).



Latitude-time diagram of SSS at 126°E during August and September 2018.

Seasonal time scales variability



SMOS SSS variability in the Beaufort Sea; for August and October for 2019.

- SMOS SSS allows seasonal monitoring of SSS in areas with large SSS variability and seasonal sea ice retreat (as higher SSS from Pacific Ocean).
- Open question : assessment of SMOS SSS freshening linked to sea ice melt.

Conclusions & perspectives

- SMOS provides a synoptic SSS monitoring over Arctic Ocean during more than 10 years, from weekly to interannual scales.
- In the context of satellite SSS validation, in-situ monitoring of upper ocean stratification and time and space variability are key informations.
- Future salinity missions : SMOS-High-Resolution (Rodríguez-Fernández et al. 2019) aims at monitoring SSS at a spatial resolution of 10km (instead of 50km with SMOS) including regions closer from the sea ice margin and from the land. CIMR (Copernicus Image Microwave Radiometer) aims at retrieving simultaneously SST and SSS but at a spatial resolution not better than SMOS.

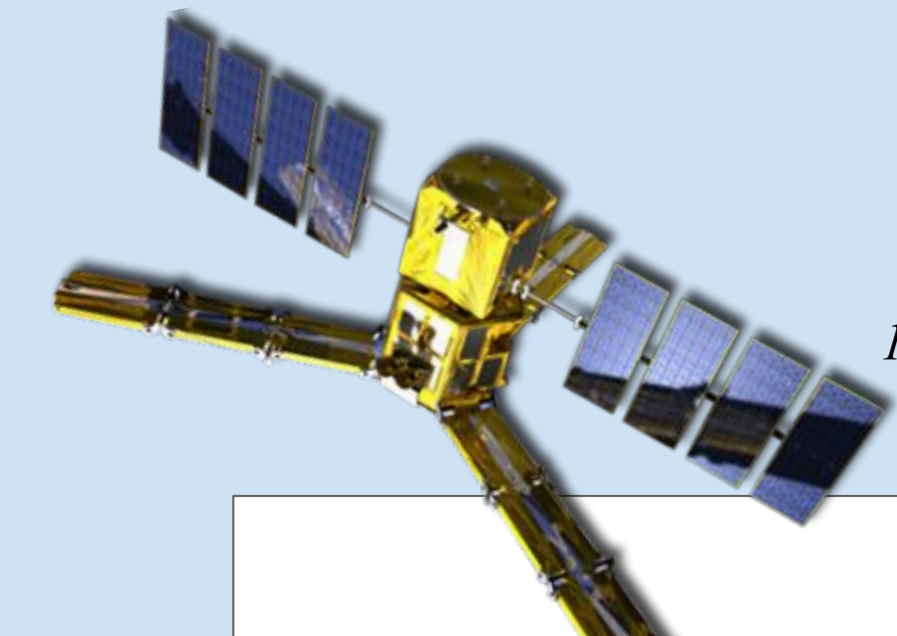


SMOS Arctic SSS, weekly and monthly, soon available on the CATDS website <https://www.catds.fr/>

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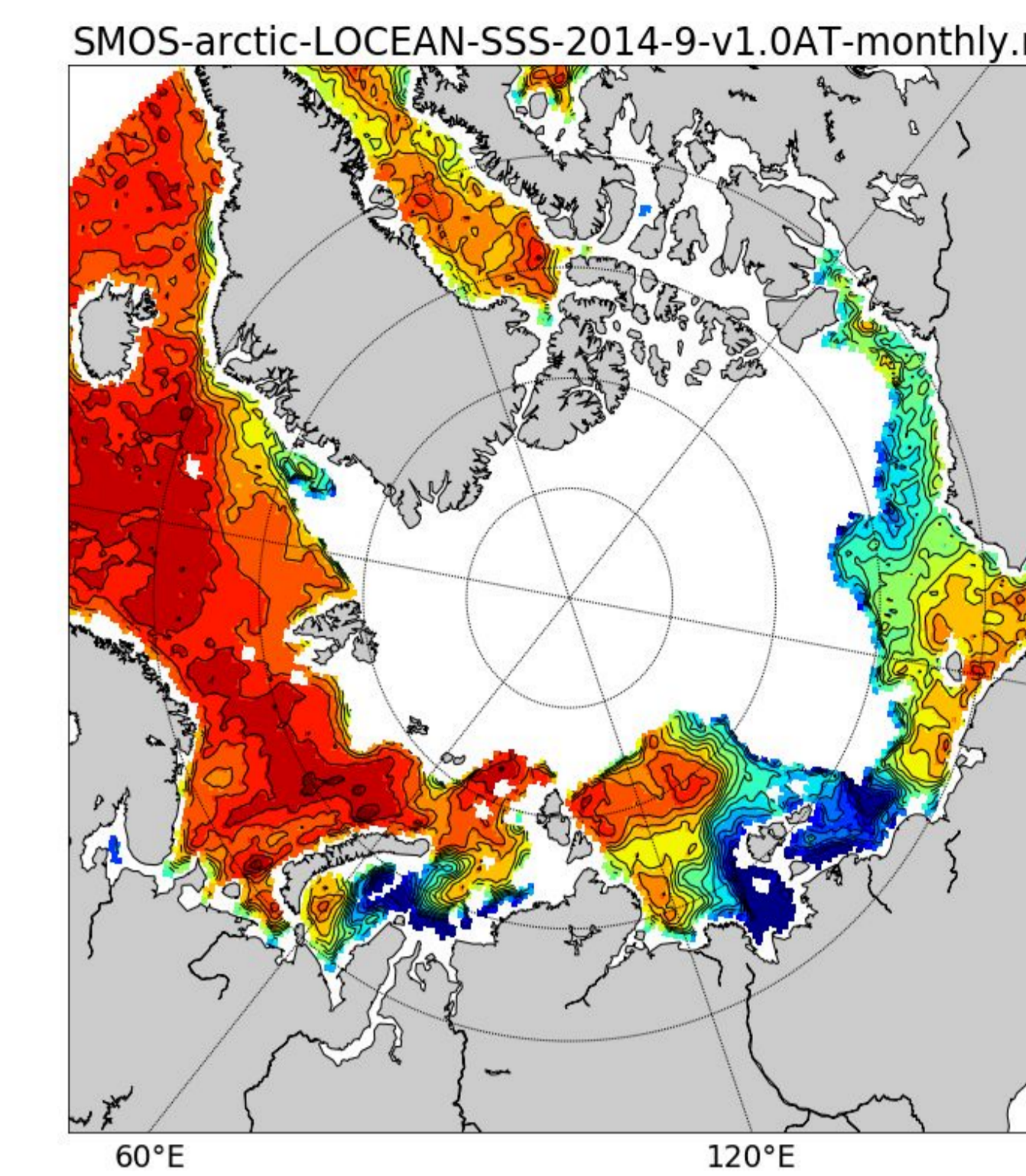
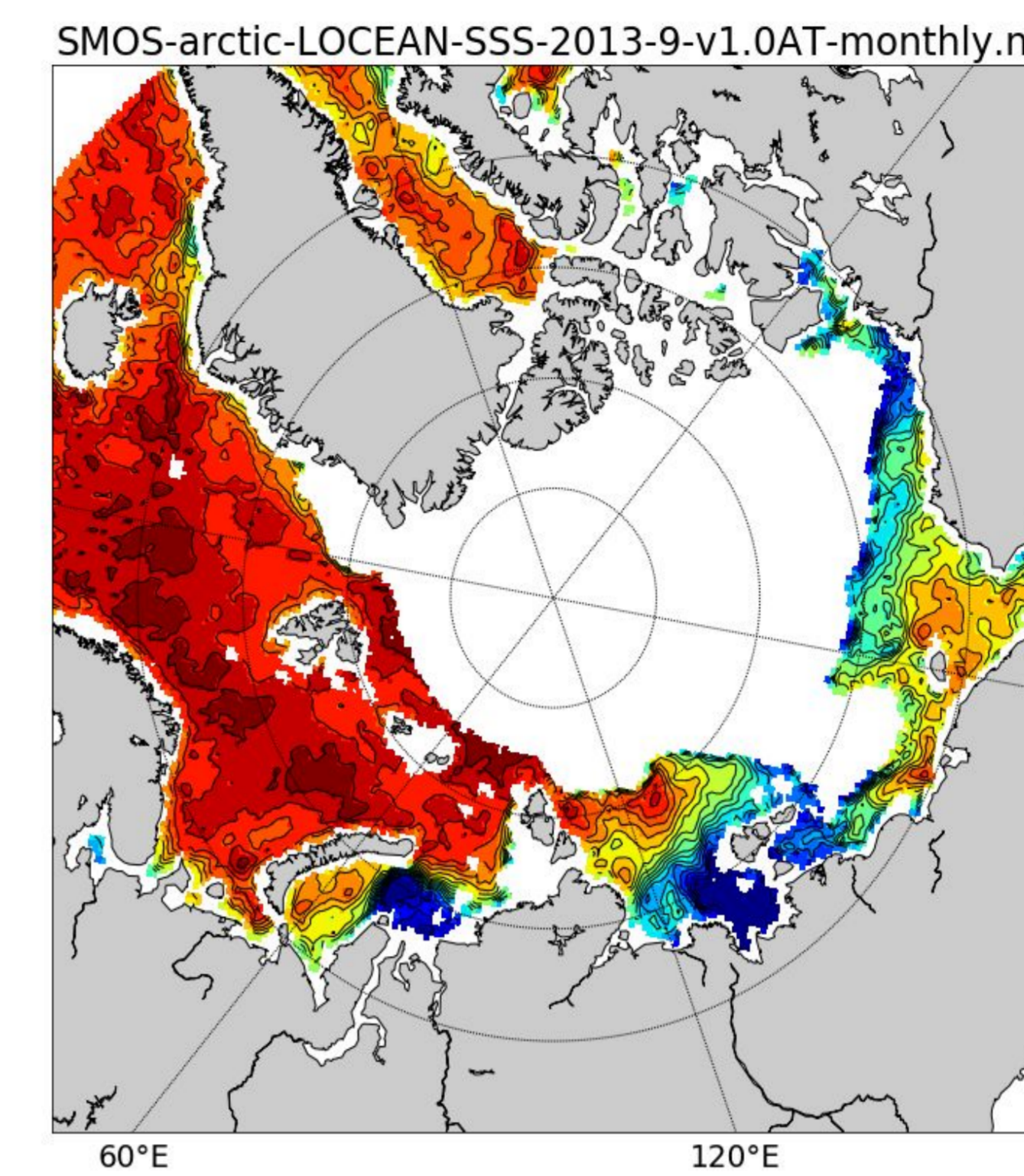
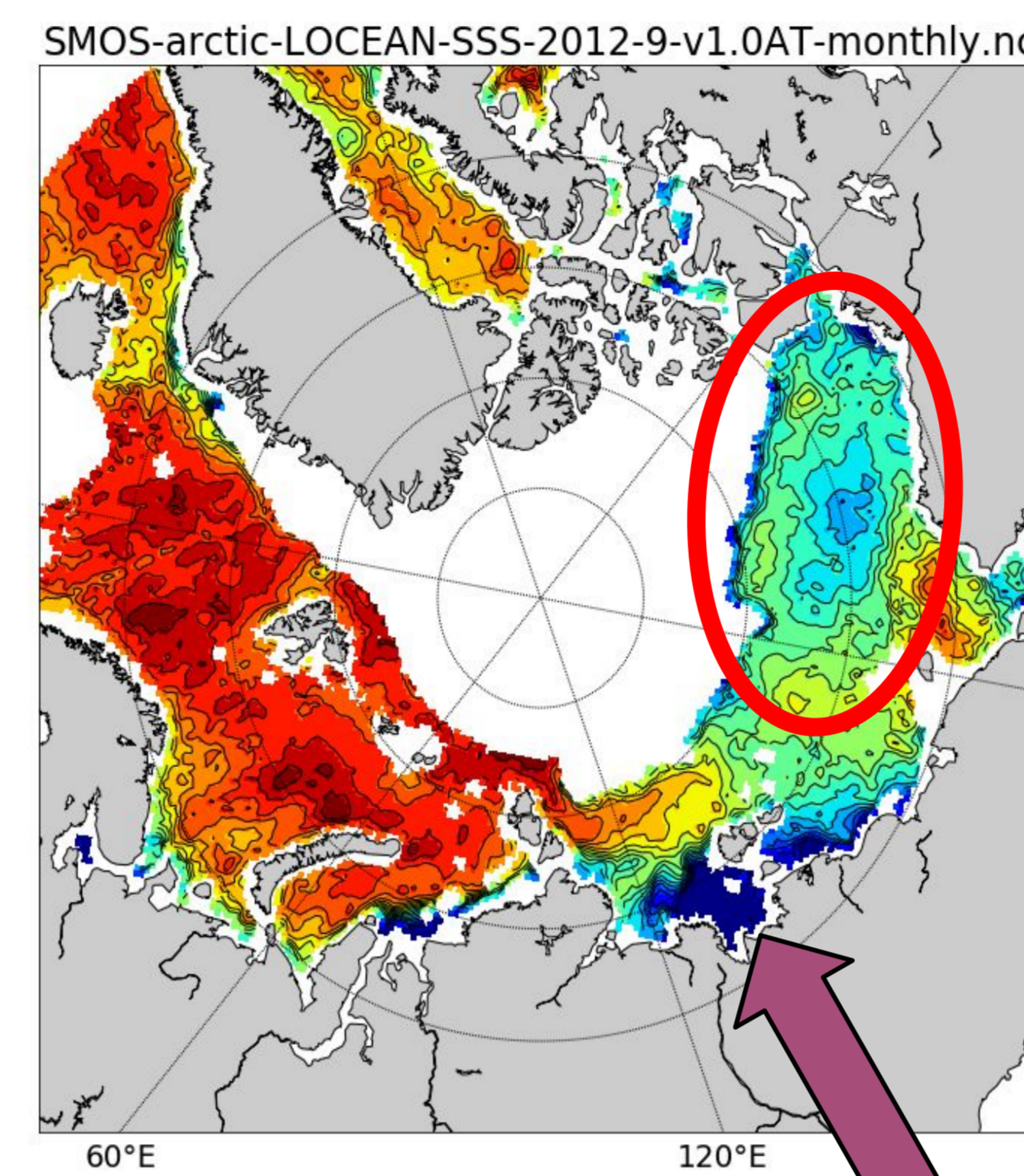
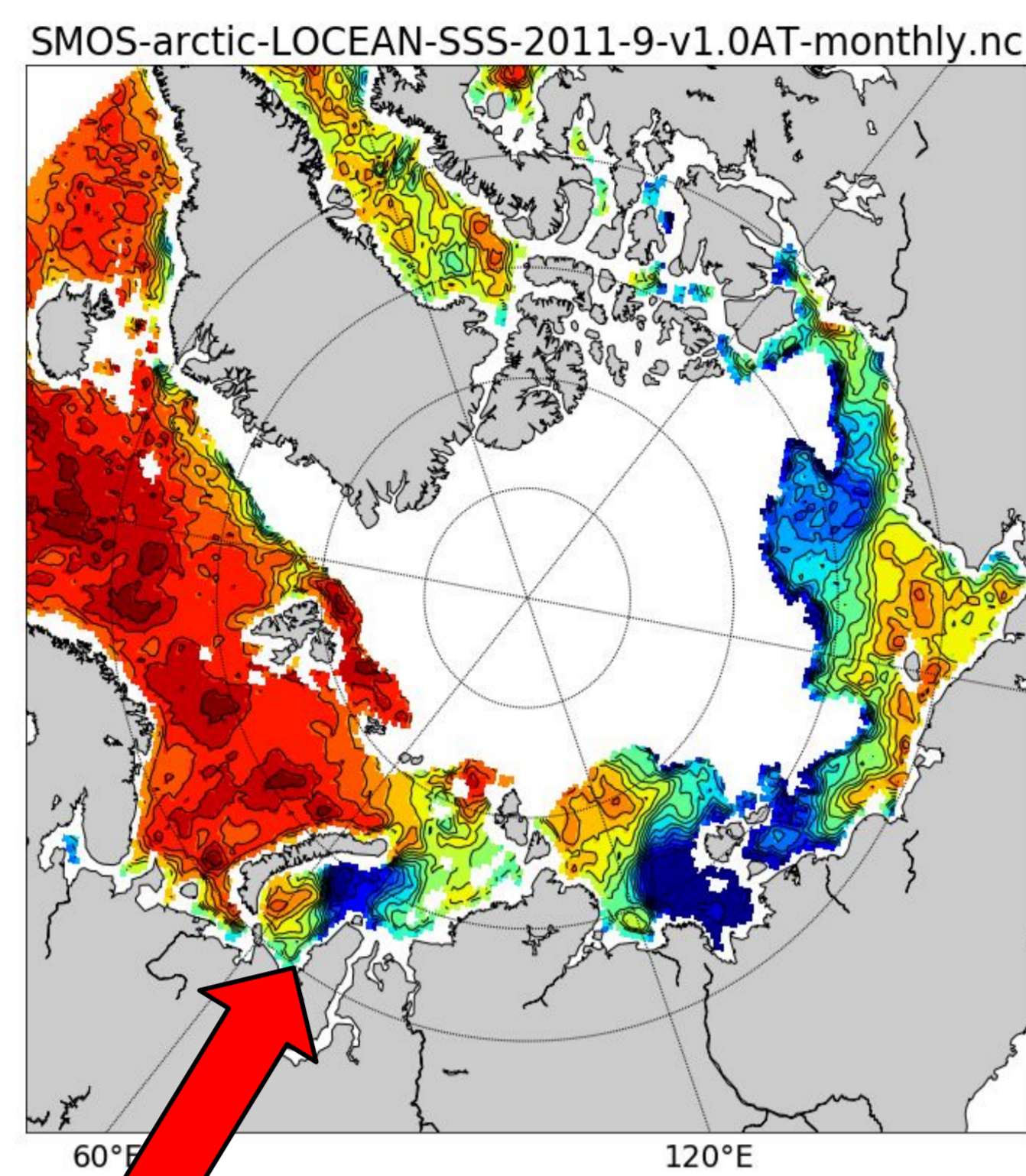
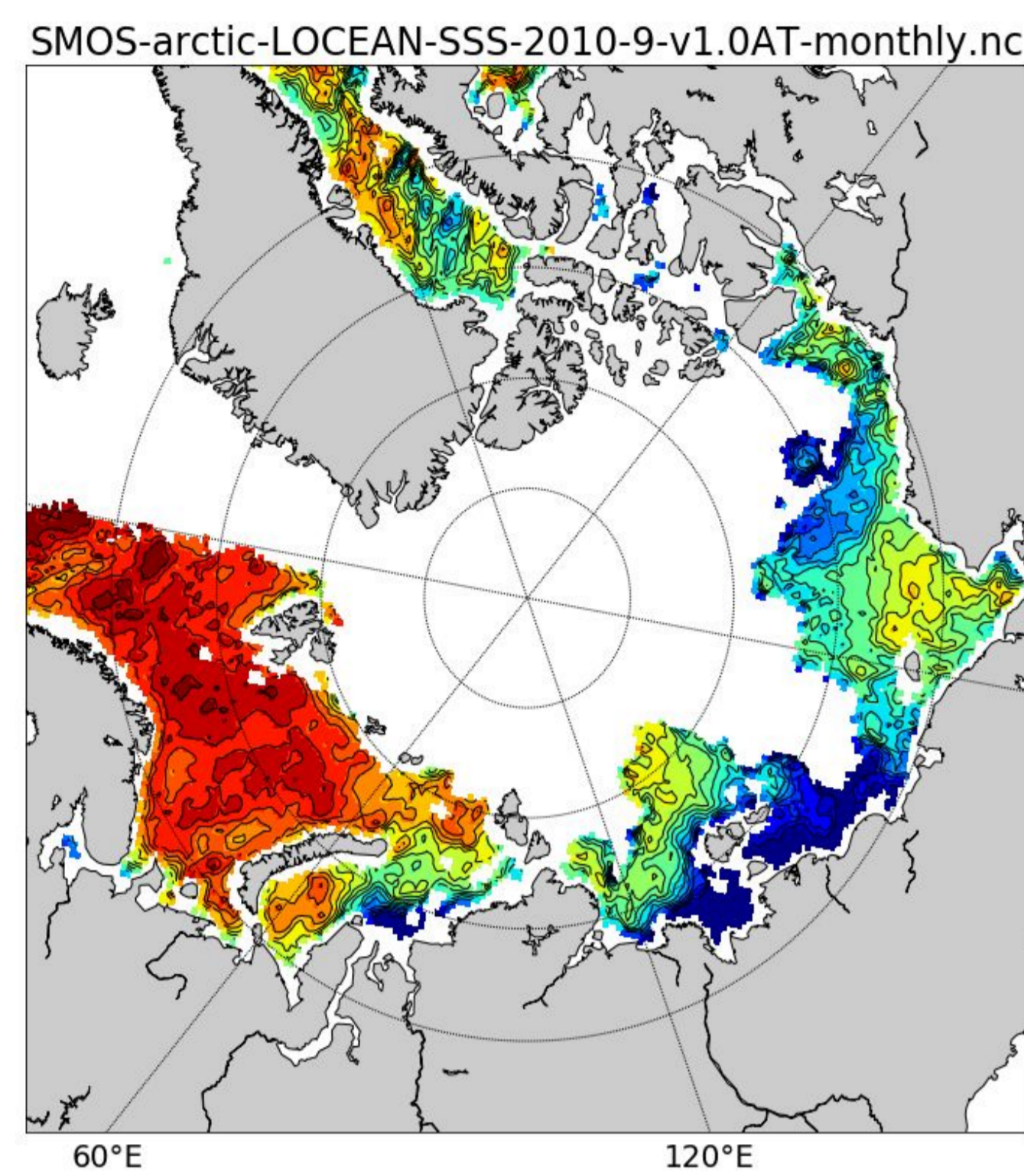
Sept. 2010

Sept. 2011

Sept. 2012

Sept. 2013

Sept. 2014



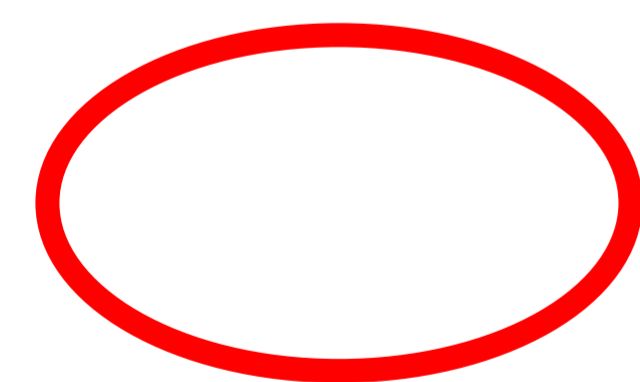
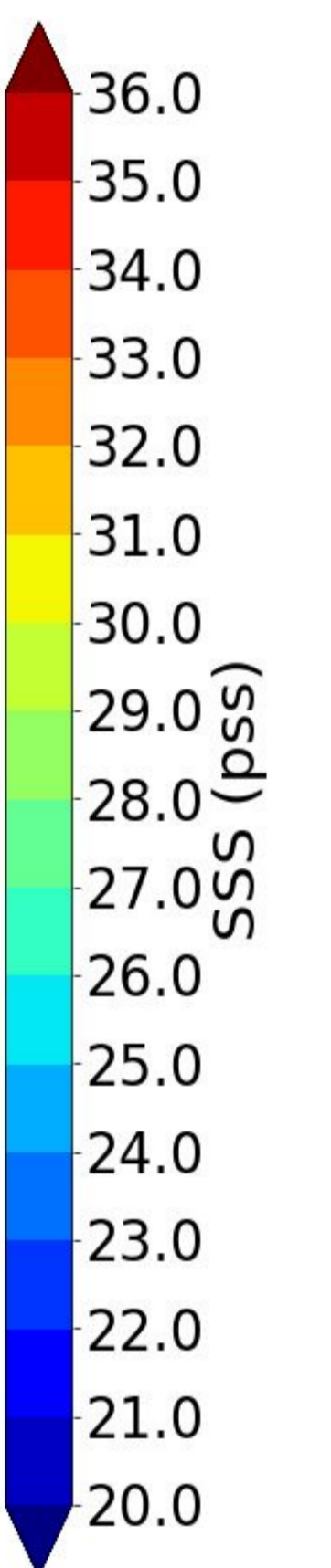
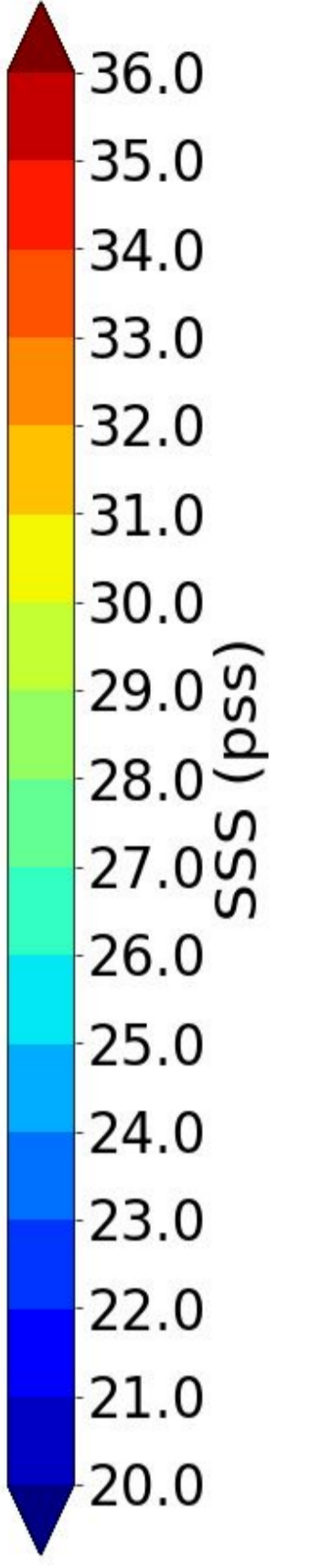
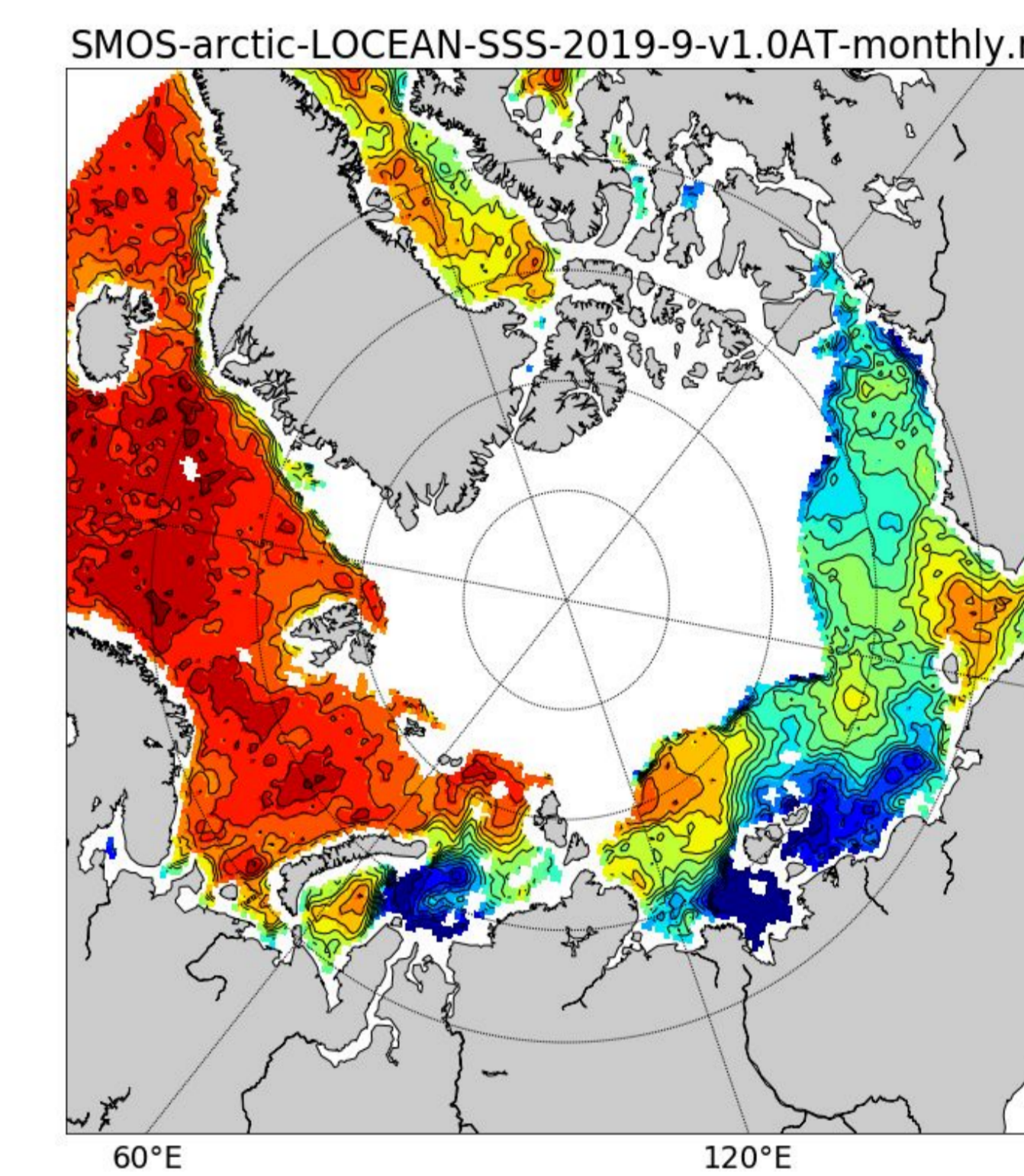
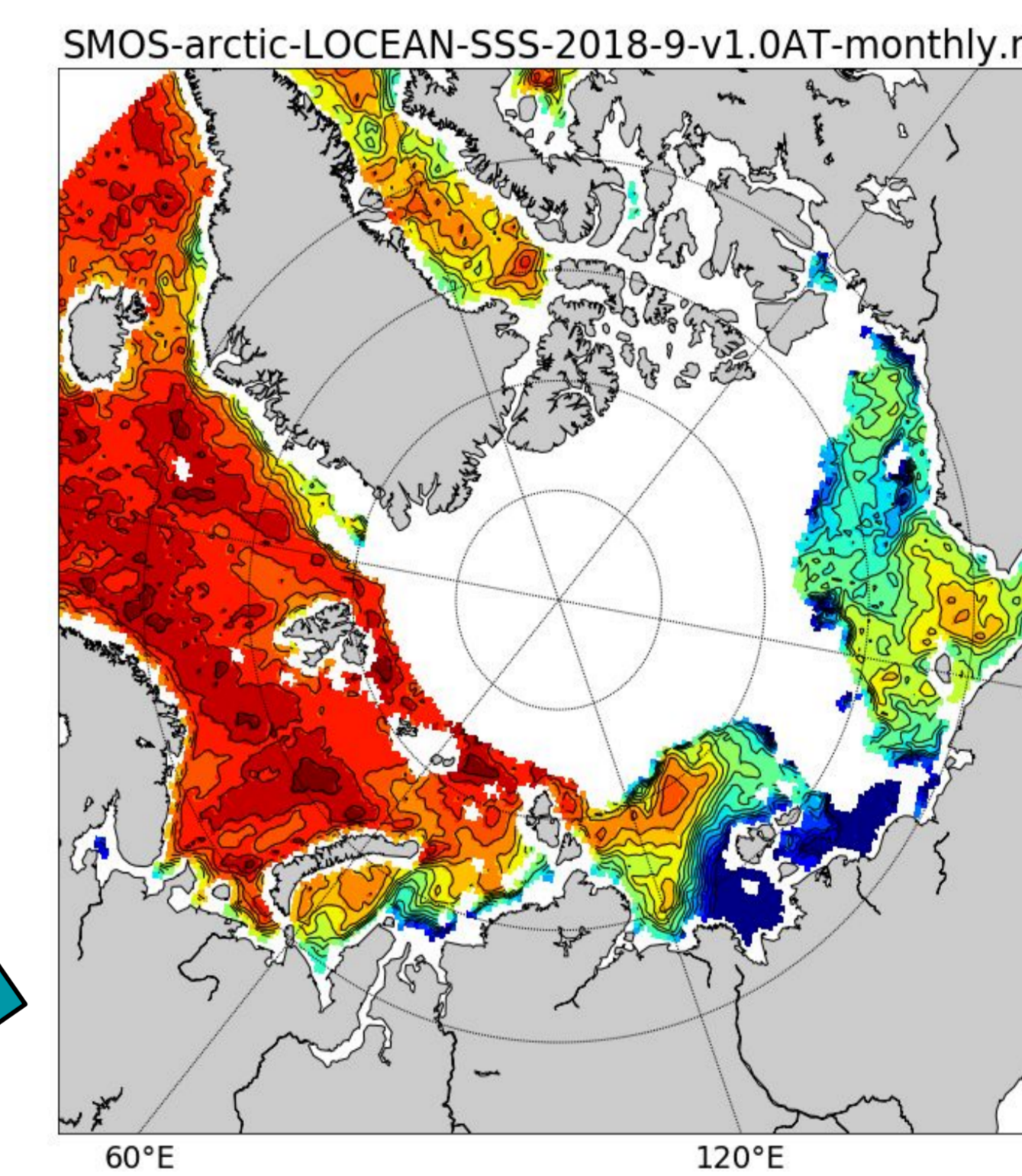
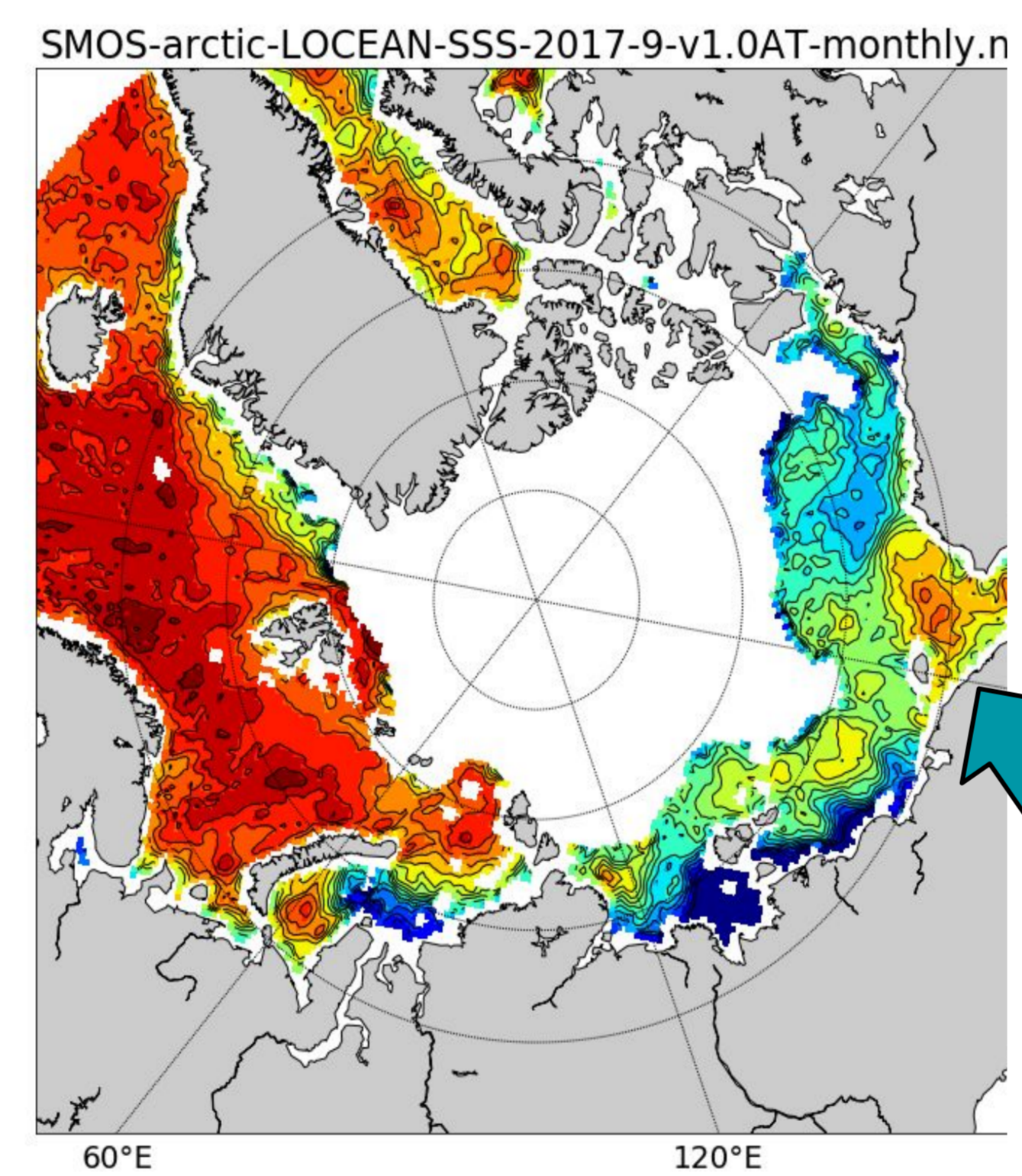
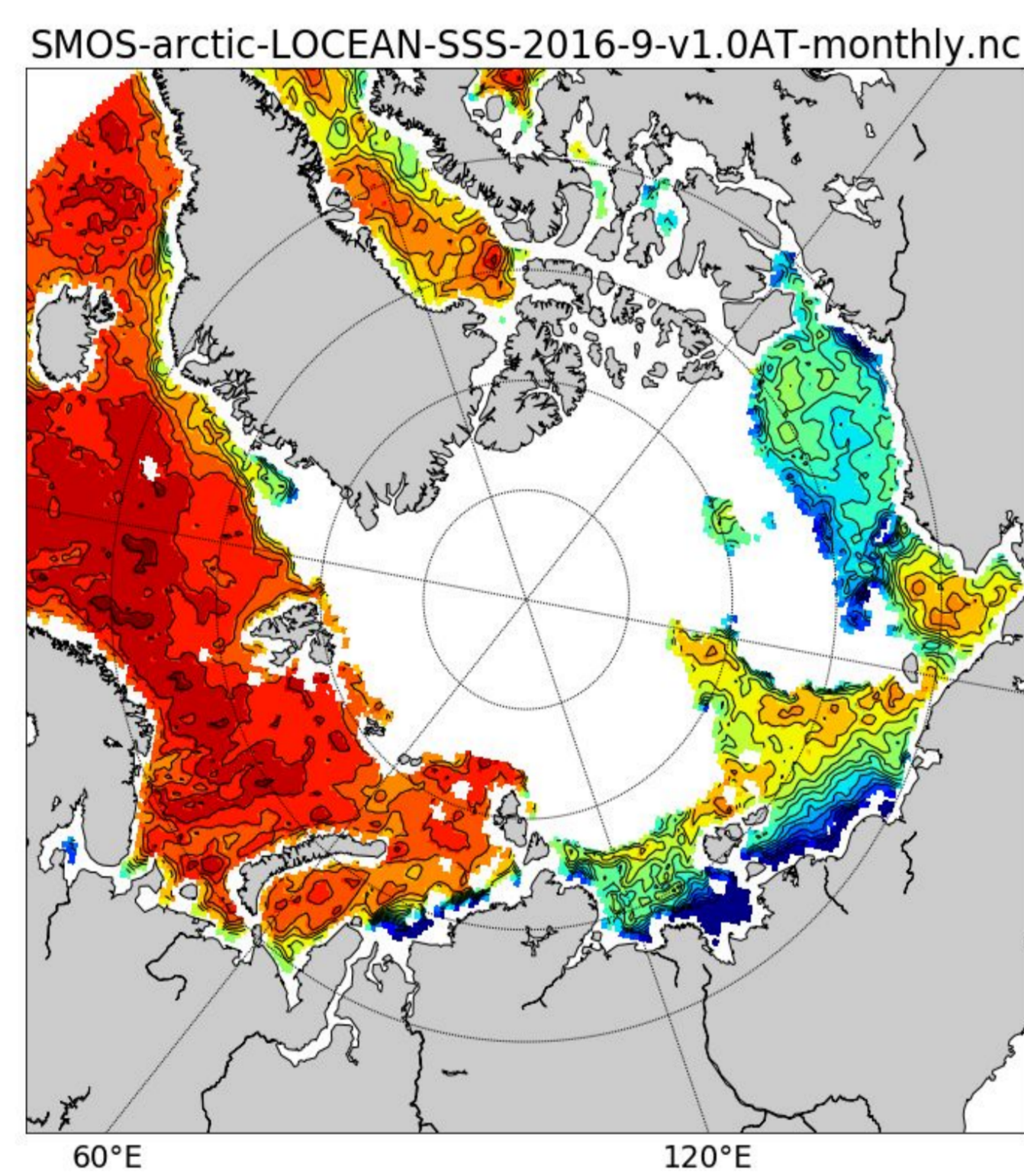
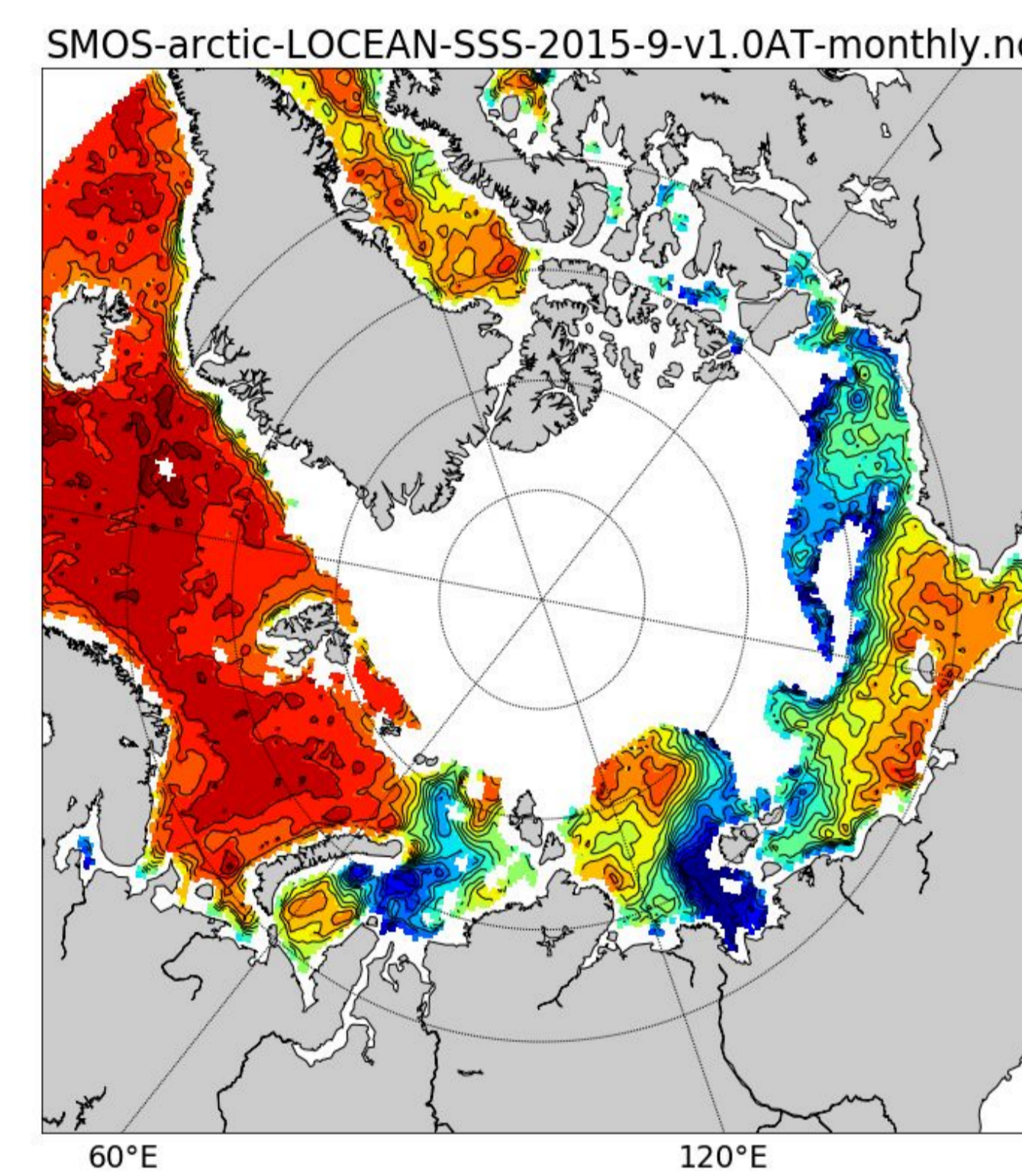
Sept. 2015

Sept. 2016

Sept. 2017

Sept. 2018

Sept. 2019



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Supply et al, under review to RSE



SMOS Arctic SSS, weekly and monthly, soon available on the CATDS website <https://www.catds.fr/> and SEANOE: Supply Alexandre, Boutin Jacqueline, Vergely Jean-Luc, Kolodziejczyk Nicolas, Reverdin Gilles, Reul Nicolas, Tarasenko Anastasiia (2020). SMOS ARCTIC SSS L3 V1.0 maps produced by CATDS CEC LOCEAN. SEANOE. <https://doi.org/10.17882/71909>