

# Supporting Information for "Sea Ice Meltwater in the Beaufort Gyre: A Comprehensive Analysis Using SMOS SSS Data from 2011 to 2019"

Eva De Andrés<sup>1,2</sup>, Marta Umbert<sup>2</sup>, María Sánchez-Urrea<sup>2</sup>, Verónica

González-Gambau<sup>2</sup>, Estrella Olmedo<sup>2</sup>, Carolina Gabarró<sup>2</sup>, and Pedro

Elosegui<sup>2</sup>

<sup>1</sup>Department of Applied Mathematics, Universidad Politécnica de Madrid, ETSIT-UPM, Madrid, Spain

<sup>2</sup>Barcelona Expert Center, Institute of Marine Sciences, ICM-CSIC, Barcelona, Spain

## Contents of this file

1. Figures S1 to S3

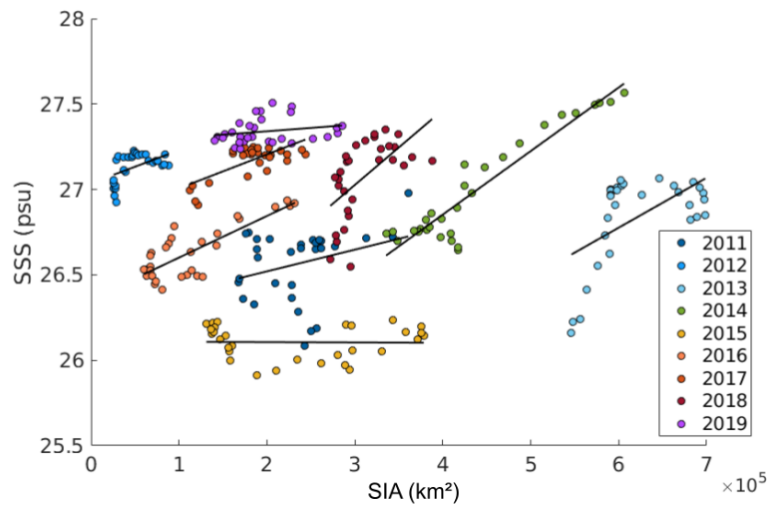
## Additional Supporting Information (Files uploaded separately)

1. Captions for Movies S1 to S4

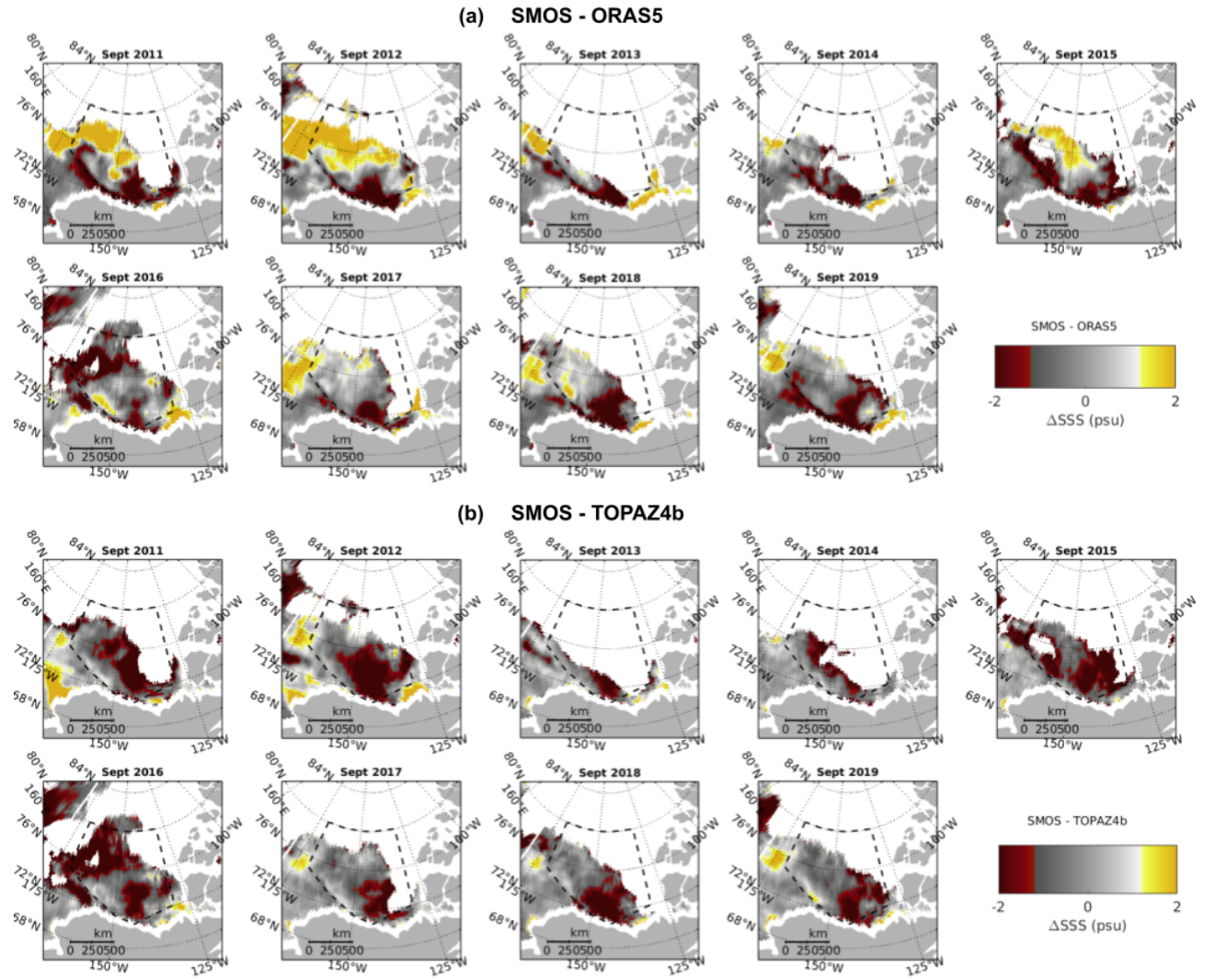
## Introduction

The information included in this set of files aims to give supplementary support to the main manuscript. We have included here the SIA-SSS relationship for every September from 2011 to 2019 in the BG. Also included are a set of September maps of the different variables assessed in the study for the whole study period: 2011 to 2019. These variables are the SMOS SSS, the number of SI days with OSISAF SIC <10%, and the pixel-by-pixel differences between SMOS SSS and modeled SSS (ORAS5 and TOPAZ4b). Videos can also be found on how MWLs are formed after sea ice melting, as well as different patterns observed on sea ice growth in different years.

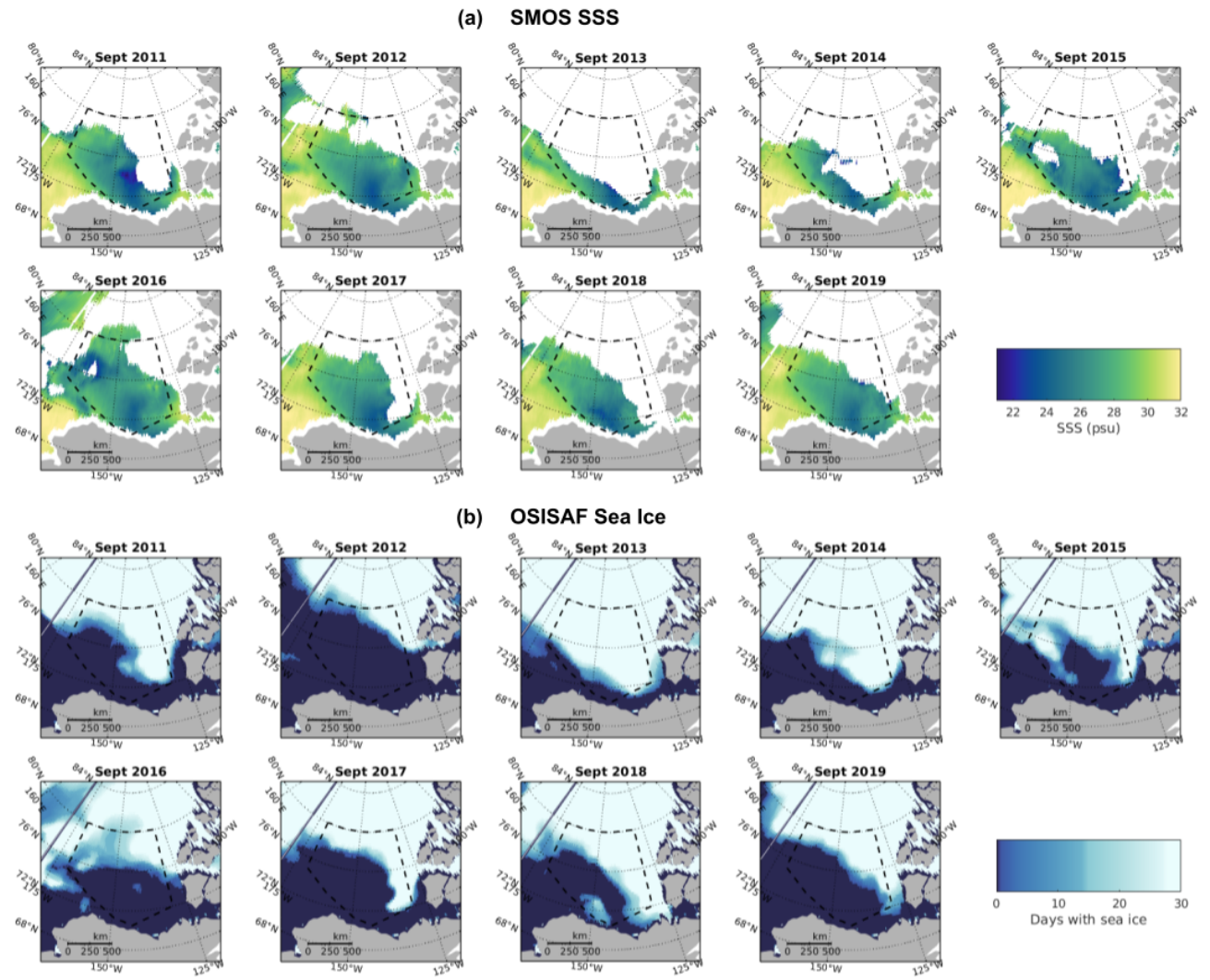
## Figures



**Figure S1.** Relationship between sea ice area (SIA) and sea surface salinity (SSS) throughout September grouped by year, from 2011 to 2019.



**Figure S2.** Spatial distribution of residuals: observed (SMOS) minus modeled SSS: a) SMOS-ORAS5 and b) SMOS-TOPAZ4b. Dashed black line delimits the Beaufort Gyre region. Truncated colorbar (see Fig. 4 in the main text).



**Figure S3.** Spatial distribution of a) SMOS-observed SSS, and b) number of days covered by sea ice in September (OSISAF SIC > 10%). Dashed black line delimits the Beaufort Gyre region.

### Additional Supporting Information

**Movie S1.** Daily evolution of SSS retrieved by SMOS in September 2011. Note that the ocean areas covered by sea ice are blanked (no data = white color). Therefore, more ocean surface is measured as sea ice melts. Sea surface freshening is observed after sea ice melting, specially in the center of the MWL, where a large piece of sea ice was present at the begining of the month.

**Movie S2.** Daily evolution of SSS retrieved by SMOS in September 2012. Note that the ocean areas covered by sea ice are blanked (no data = white color). At the beginning of September the sea ice cover was already near its minimum, causing low monthly budget of  $V_{fw}$  released from sea ice melting.

**Movie S3.** Daily evolution of SSS retrieved by SMOS in September 2013. Note that the ocean areas covered by sea ice are blanked (no data = white color). Sea ice does not retreat, but growths, leaving null  $V_{fw}$  released from sea ice melting.

**Movie S4.** Daily evolution of SSS retrieved by SMOS in September 2016. Note that the ocean areas covered by sea ice are blanked (no data = white color). As for 2012, at the beginning of September the sea ice cover was already near its minimum, causing low monthly budget of  $V_{fw}$  released from sea ice melting. Sea ice starts growing on September 5 from the northwest quadrant, likely driven by cold north winds.