

Basic plots about Sea Ice¹

Jingfan Sun

July 21, 2014

¹All difference plots are represented by ANHA12 minus ANHA4

Table of Content

1 Sea-Ice Concentration Analysis

2 Sea-Ice Thickness Analysis

3 Sea-Ice Thickness Distribution

Sea-Ice Concentration Analysis

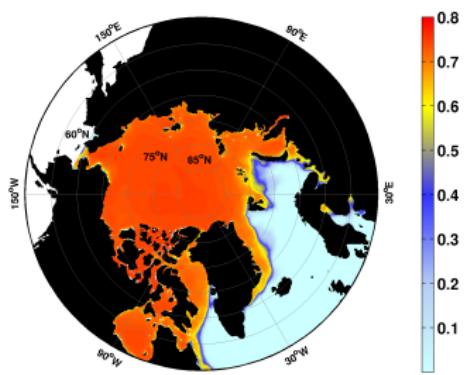
In the region north of 55N:

- Mean Sea-Ice Concentration over 2003-2008 for each run for March and September, with difference plots
- Sea-Ice Concentration Standard Deviation over 2003-2008 for each run for March and September, with difference plots
- Sea-Ice Concentration for September 2007, with difference plots

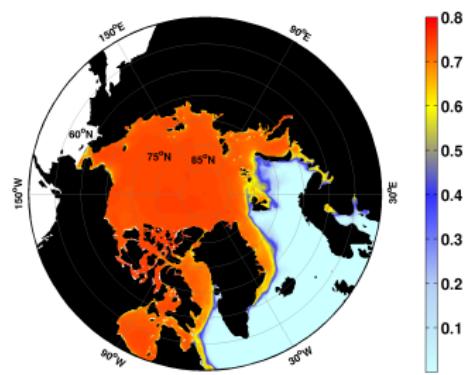
Mean Sea-Ice Concentration

I calculate the mean ice concentration based on the data of every single day in a specific month from 2003-2008.

Mean Sea-Ice Concentration

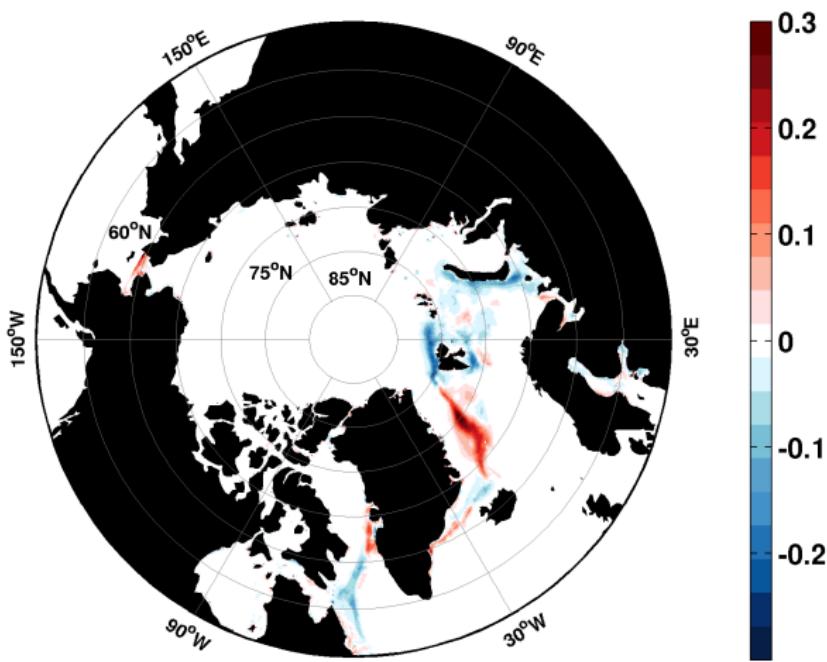


Ice Concentration Mean on 2003-2008 March 4th Degree

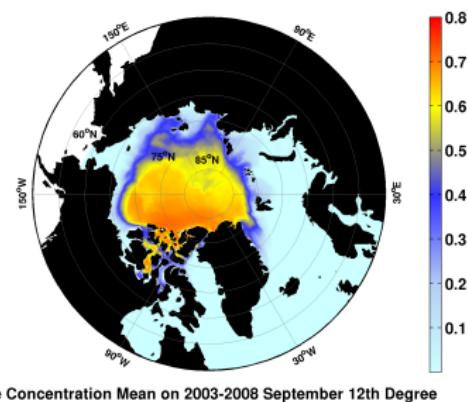
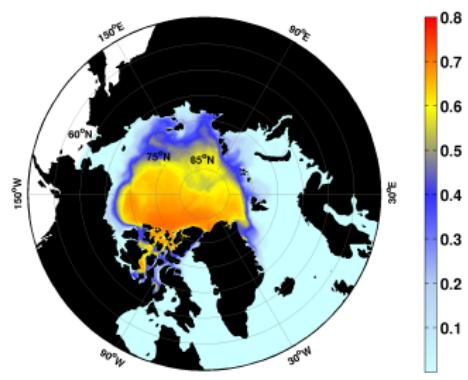


Ice Concentration Mean on 2003-2008 March 12th Degree

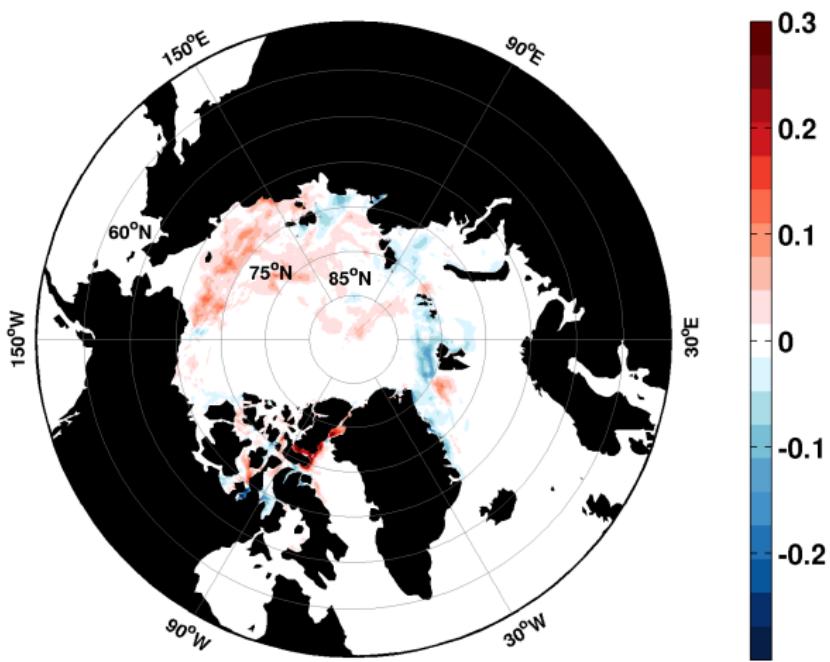
Mean Sea-Ice Concentration Difference(ANHA12-ANHA4)



Mean Sea-Ice Concentration



Mean Sea-Ice Concentration Difference(ANHA12-ANHA4)



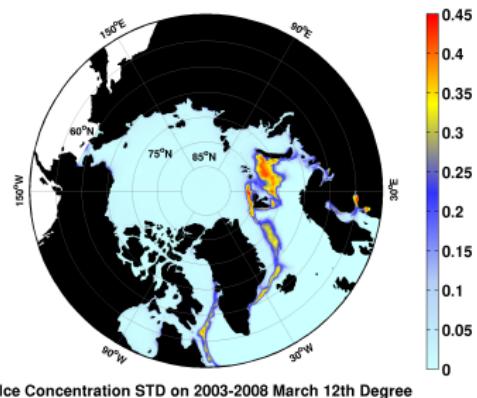
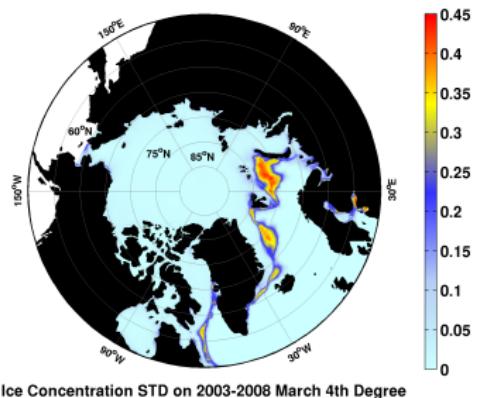
Sea-Ice Concentration Standard Deviation

I calculate the standard deviation on each grid point from 2003-2008 with following equation:

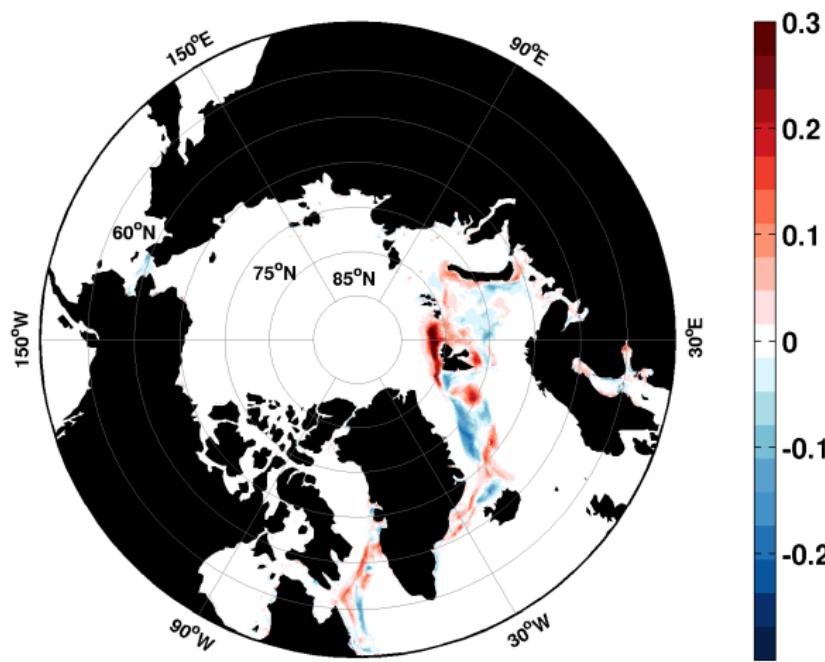
$$STD = \sqrt{\frac{1}{N-1} \sum_{i=1}^N (x_i - \mu)^2}$$

The sample for each grid point is a vector of 6 numbers.

Sea-Ice Concentration Standard Deviation

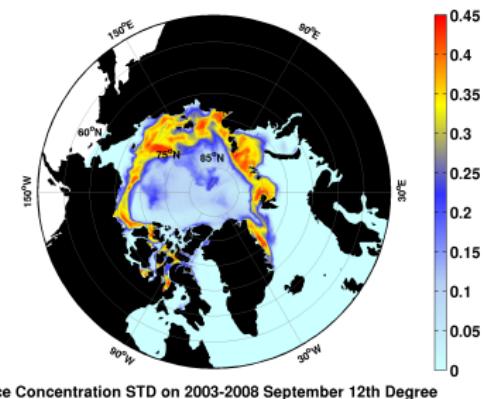
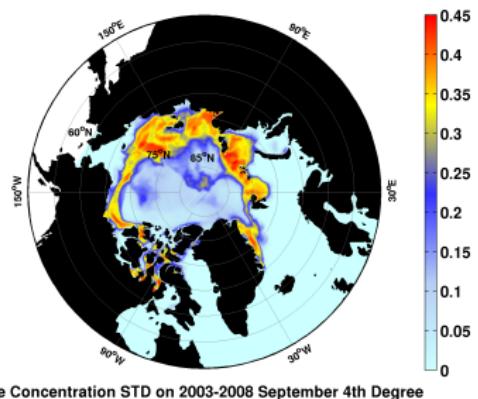


Sea-Ice Concentration Standard Deviation Difference(ANHA12-ANHA4)

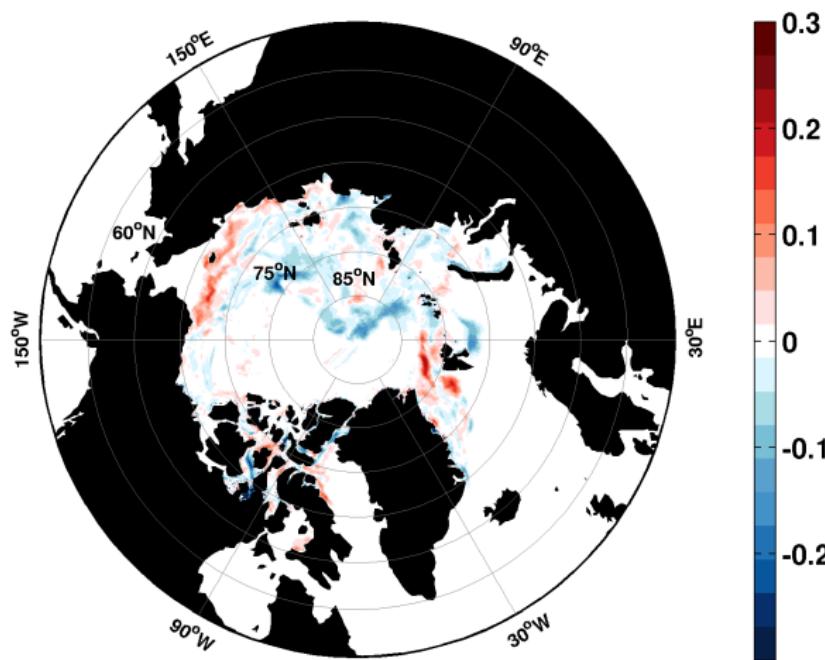


Ice Concentration STD Diff on 2003-2008 March

Sea-Ice Concentration Standard Deviation



Sea-Ice Concentration Standard Deviation Difference(ANHA12-ANHA4)

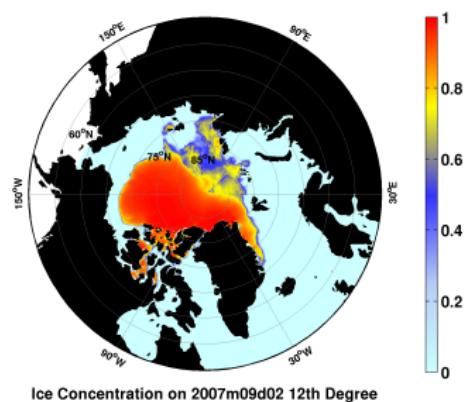
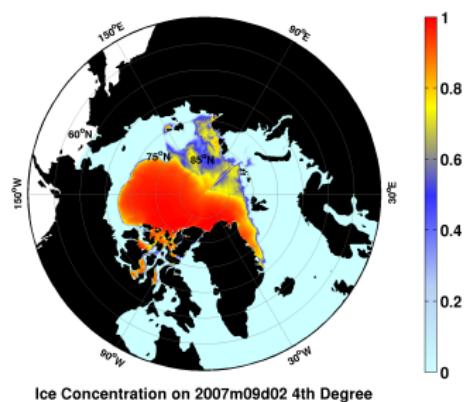


Ice Concentration STD Diff on 2003-2008 September

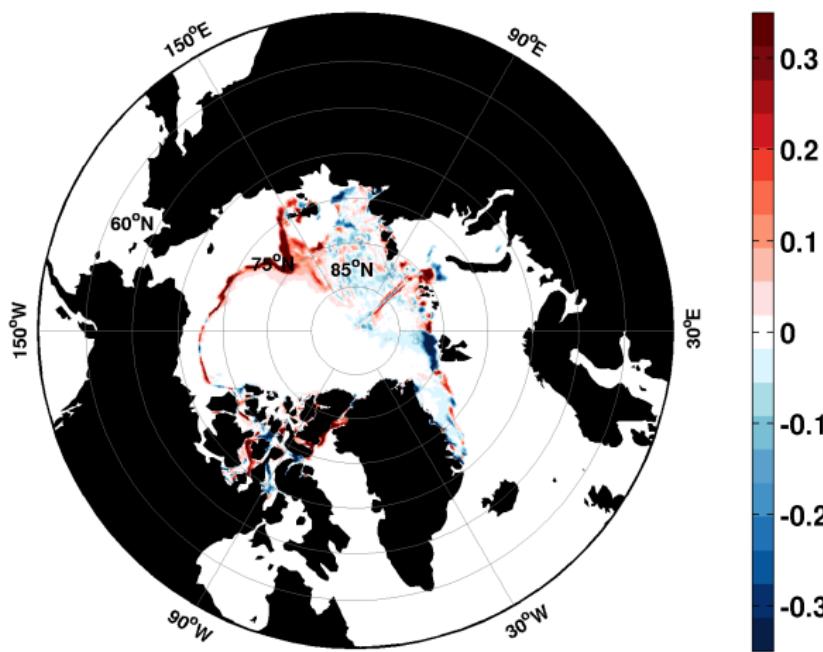
Sea-Ice Concentration September 2007

Simply plot Sea-Ice Concentration on each day in September 2007 along with difference plots of different configuration.

Sea-Ice Concentration September 2007

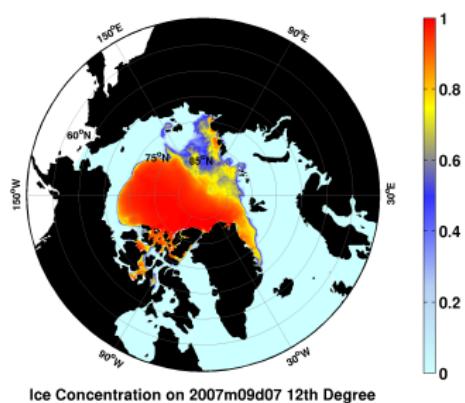
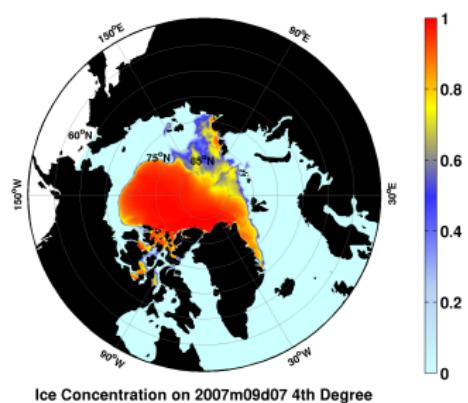


Sea-Ice Concentration September 2007 Difference(ANHA12-ANHA4)

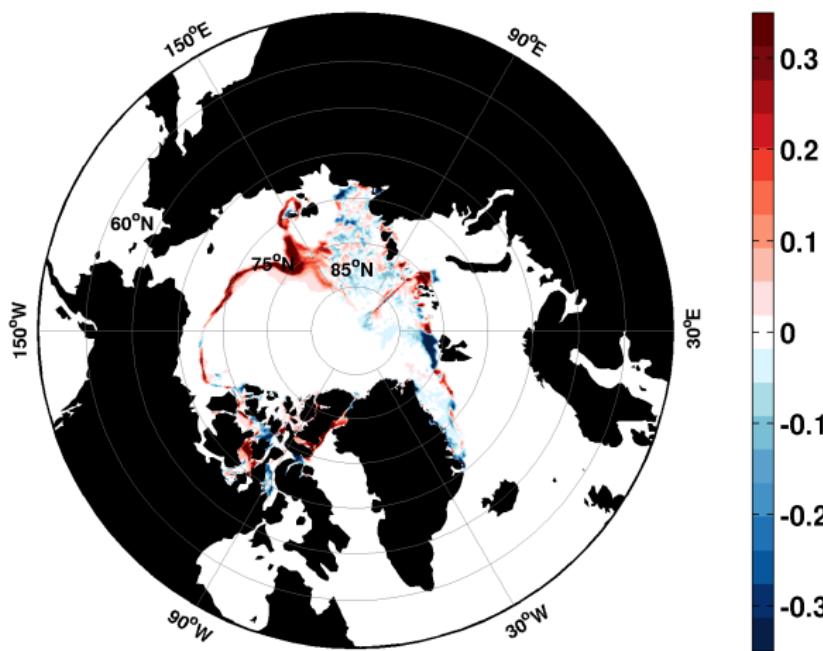


Ice Concentration Diff on 2007m09d02

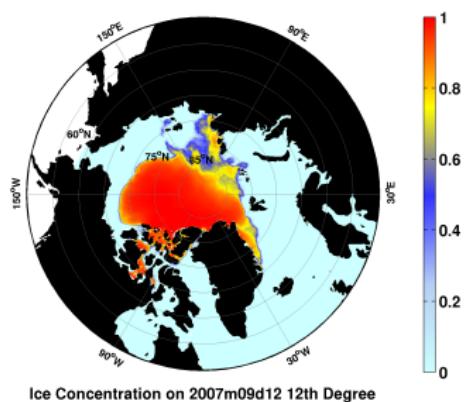
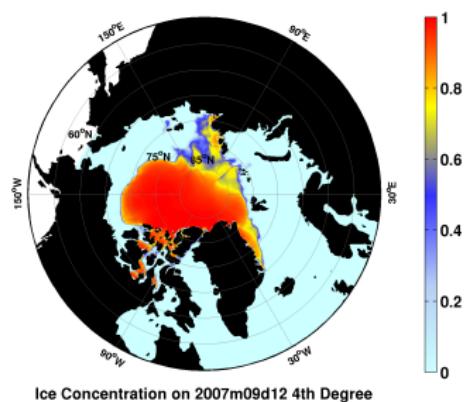
Sea-Ice Concentration September 2007



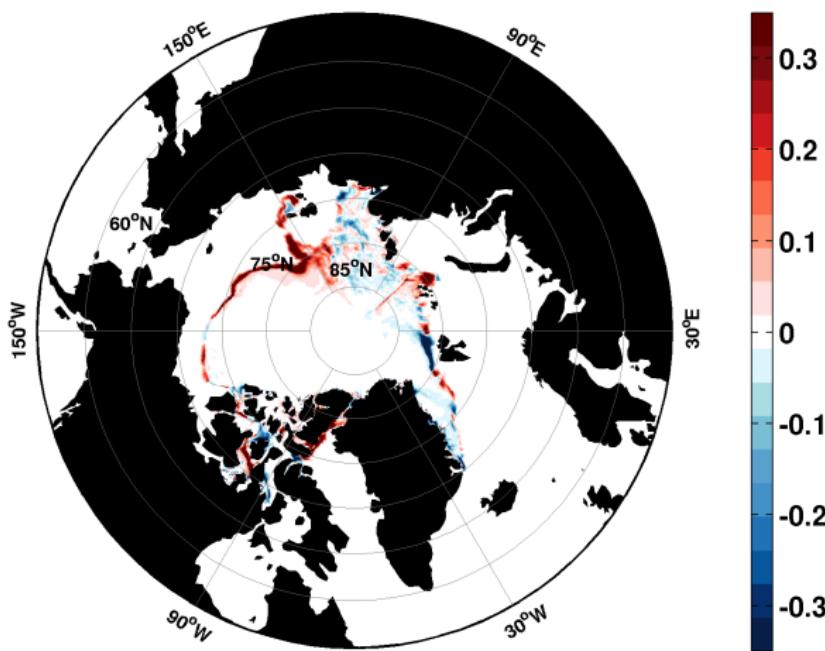
Sea-Ice Concentration September 2007 Difference(ANHA12-ANHA4)



Sea-Ice Concentration September 2007

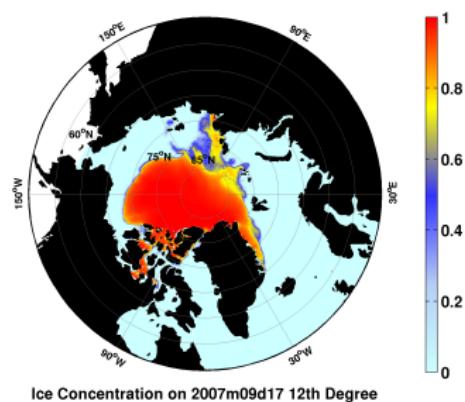
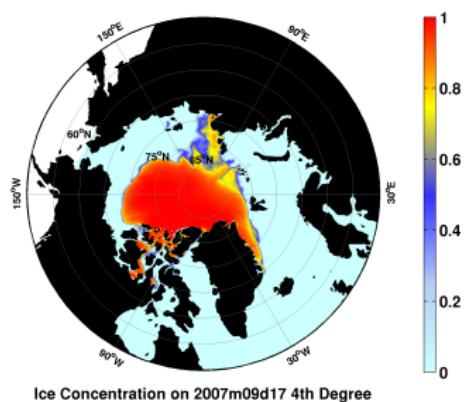


Sea-Ice Concentration September 2007 Difference(ANHA12-ANHA4)

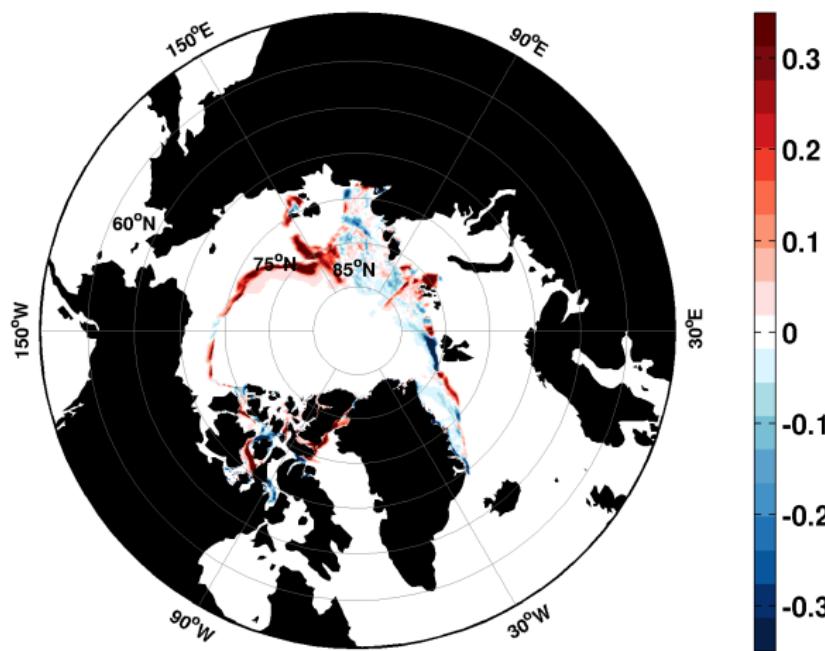


Ice Concentration Diff on 2007m09d12

Sea-Ice Concentration September 2007

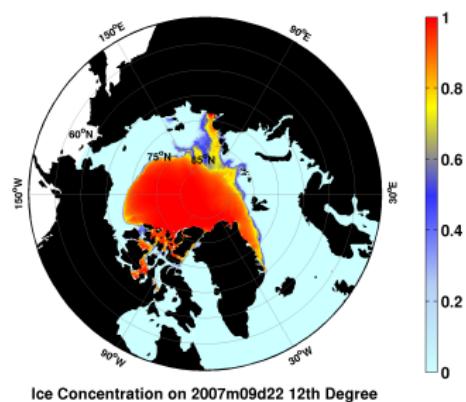
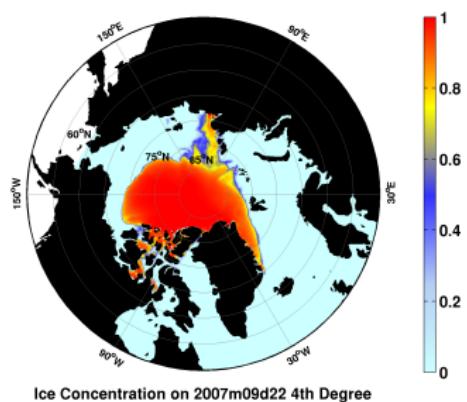


Sea-Ice Concentration September 2007 Difference(ANHA12-ANHA4)

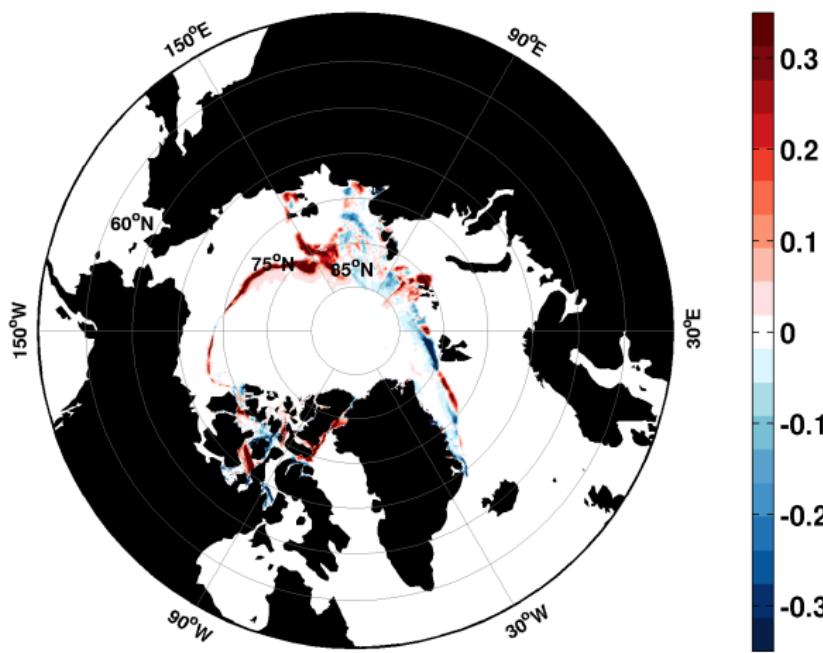


Ice Concentration Diff on 2007m09d17

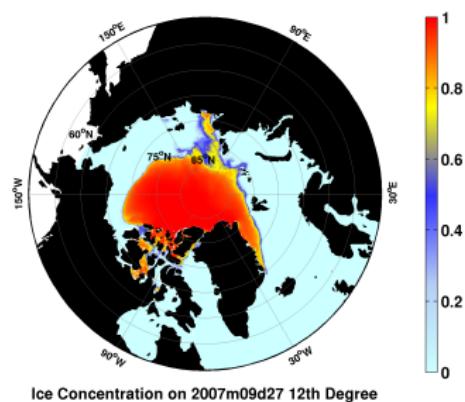
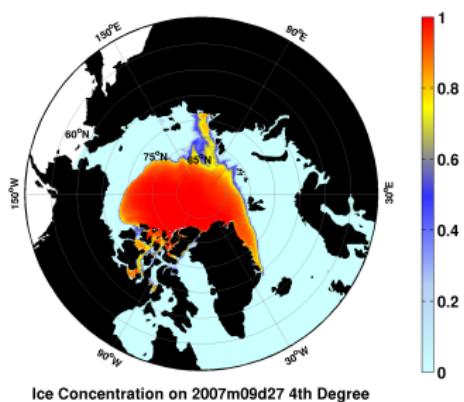
Sea-Ice Concentration September 2007



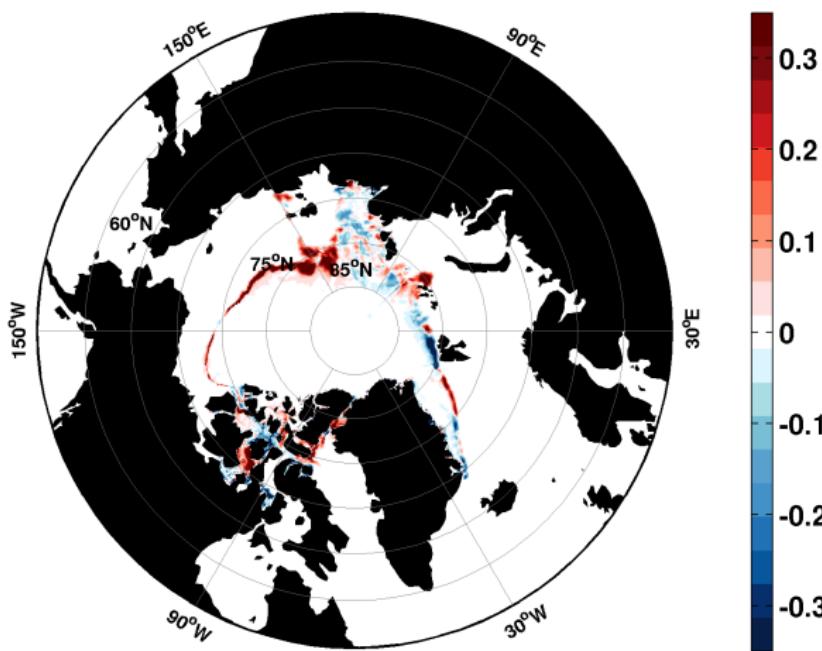
Sea-Ice Concentration September 2007 Difference(ANHA12-ANHA4)



Sea-Ice Concentration September 2007



Sea-Ice Concentration September 2007 Difference(ANHA12-ANHA4)



Sea-Ice Thickness Analysis

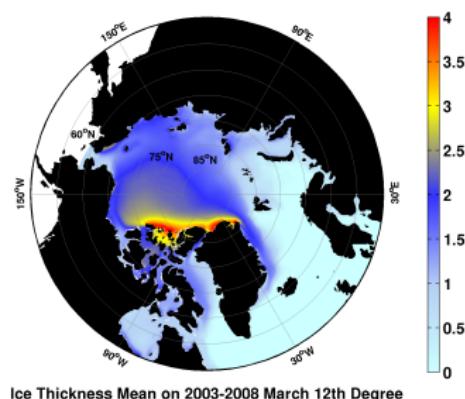
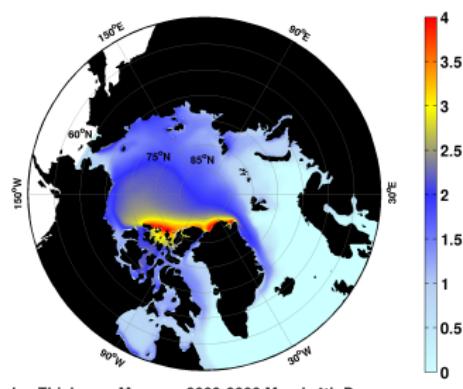
In the region north of 55N:

- Mean Sea-Ice Thickness over 2003-2008 for each run for March and September, with difference plots
- Sea-Ice Thickness Standard Deviation over 2003-2008 for each run for March and September, with difference plots
- Sea-Ice Thickness for September 2007, with difference plots

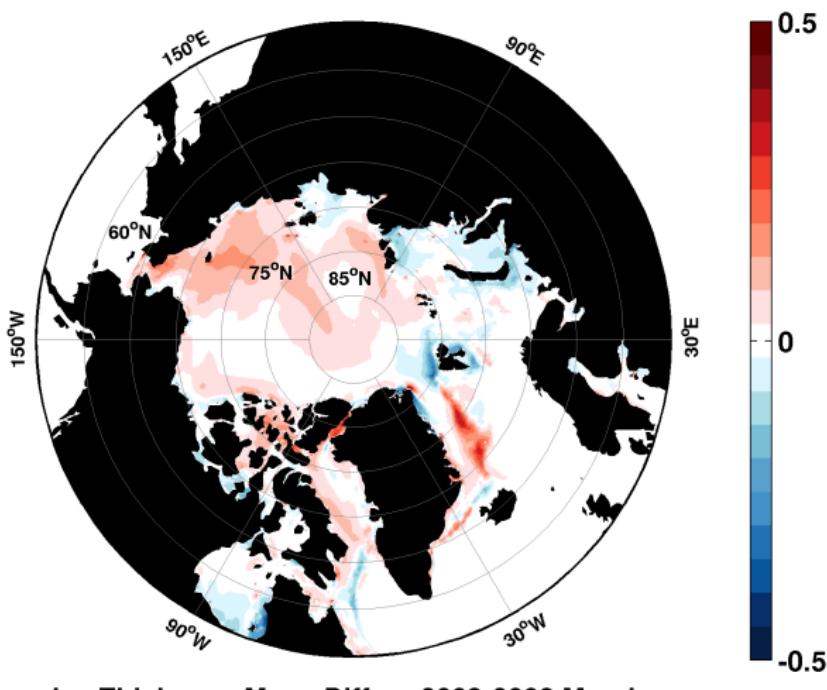
Mean Sea-Ice Thickness

I calculate the mean ice thickness based on the data of every single day in a specific month from 2003-2008.

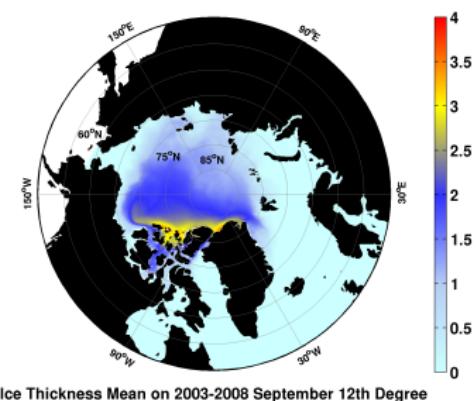
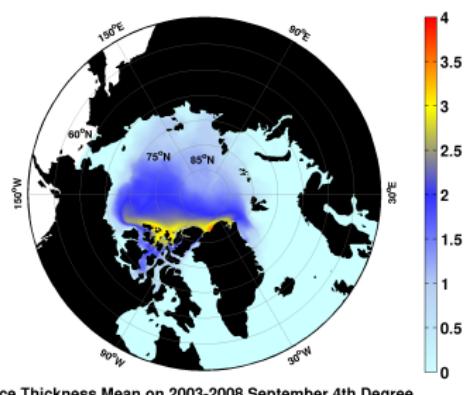
Mean Sea-Ice Thickness



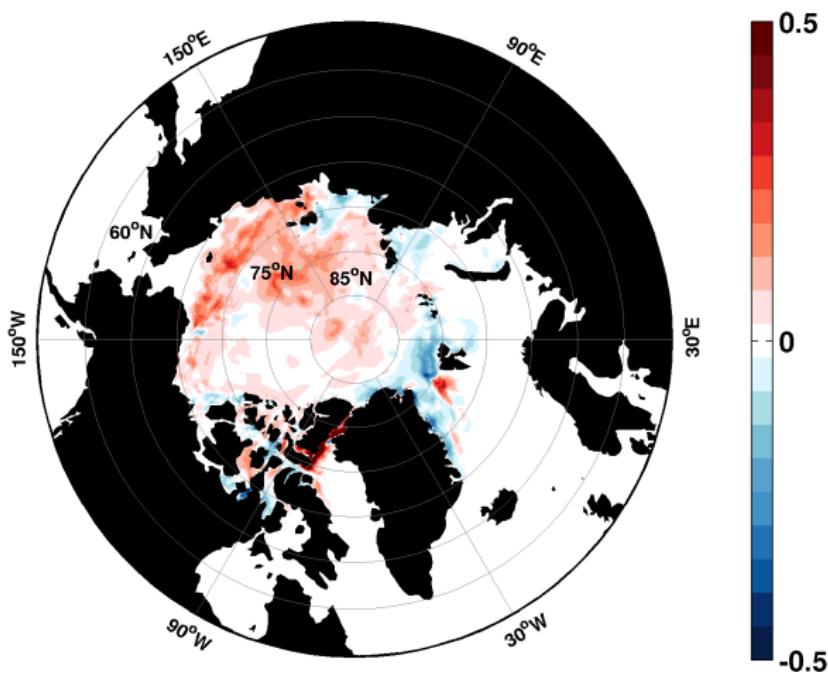
Mean Sea-Ice Thickness Difference(ANHA12-ANHA4)



Mean Sea-Ice Thickness



Mean Sea-Ice Thickness Difference(ANHA12-ANHA4)



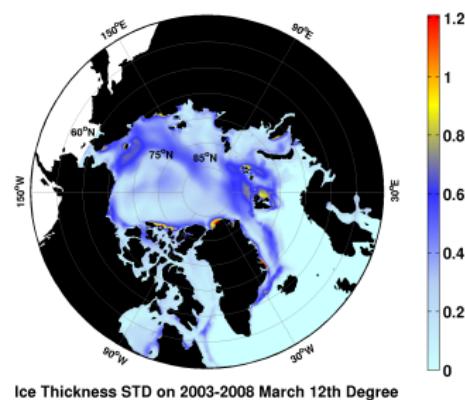
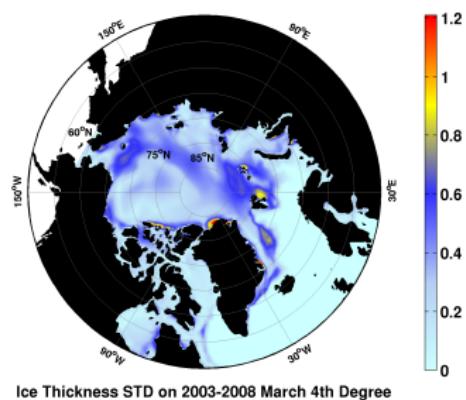
Sea-Ice Thickness Standard Deviation

I calculate the standard deviation on each grid point from 2003-2008 with following equation:

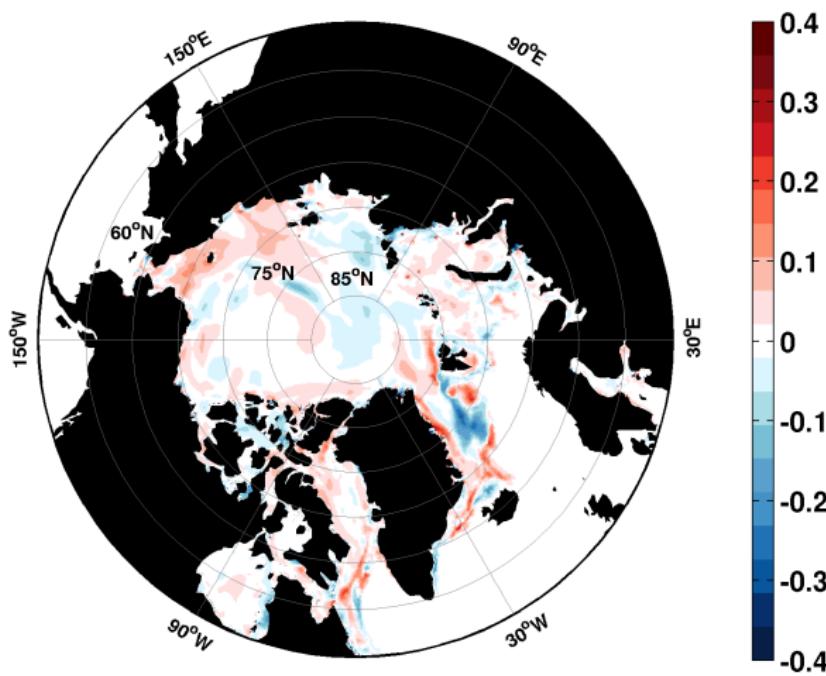
$$STD = \sqrt{\frac{1}{N-1} \sum_{i=1}^N (x_i - \mu)^2}$$

The sample for each grid point is a vector of 6 numbers.

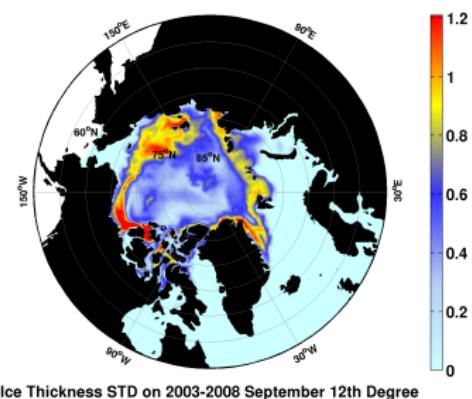
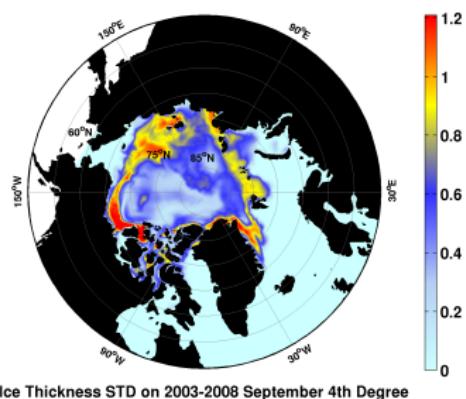
Sea-Ice Thickness Standard Deviation



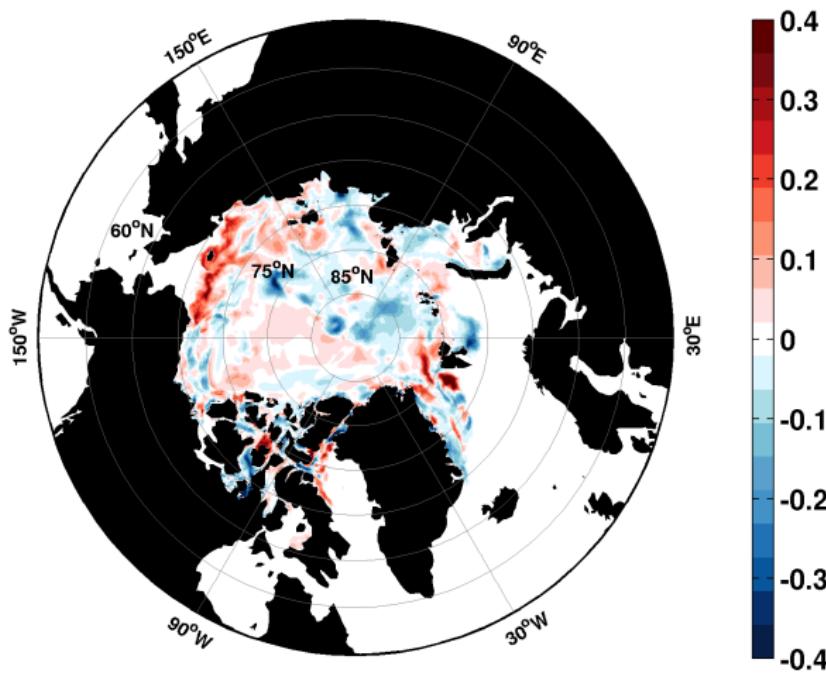
Sea-Ice Thickness Standard Deviation Difference(ANHA12-ANHA4)



Sea-Ice Thickness Standard Deviation



Sea-Ice Thickness Standard Deviation Difference(ANHA12-ANHA4)

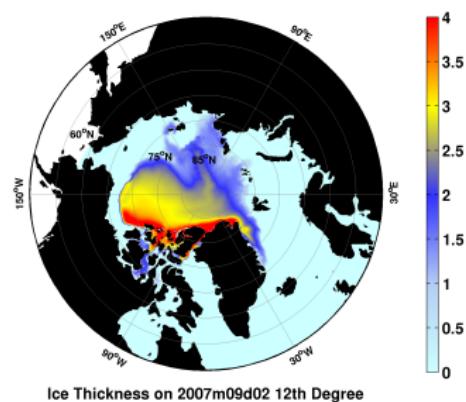
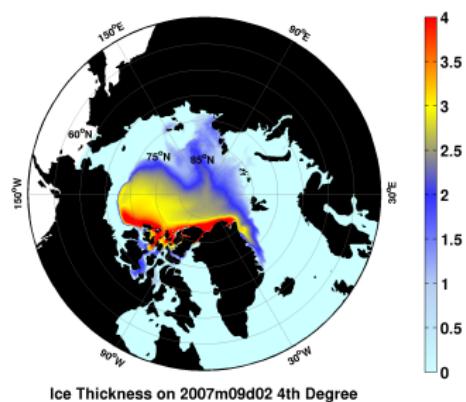


Ice Thickness STD Diff on 2003-2008 September

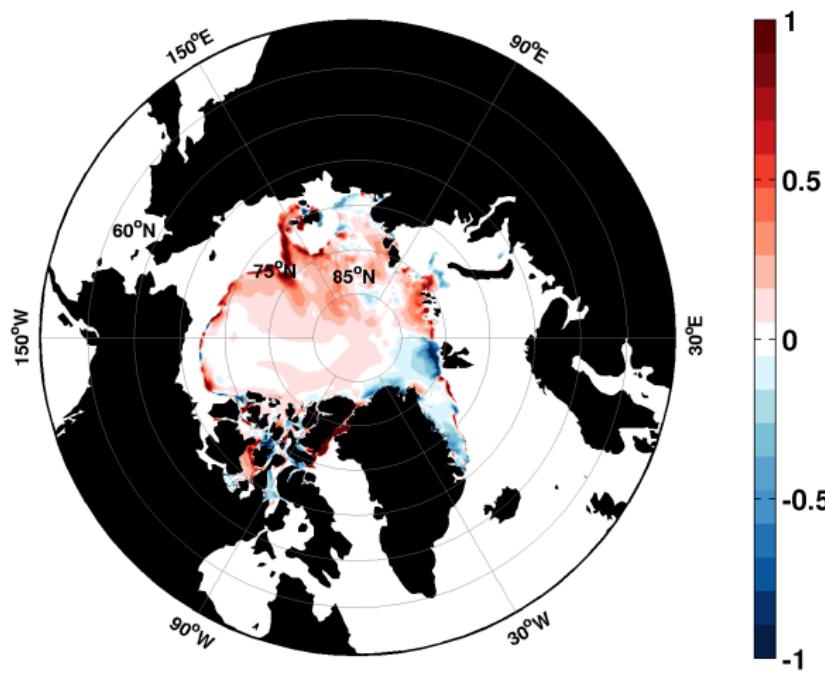
Sea-Ice Thickness September 2007

Simply plot Sea-Ice Thickness on each day in September 2007 along with difference plots of different configuration.

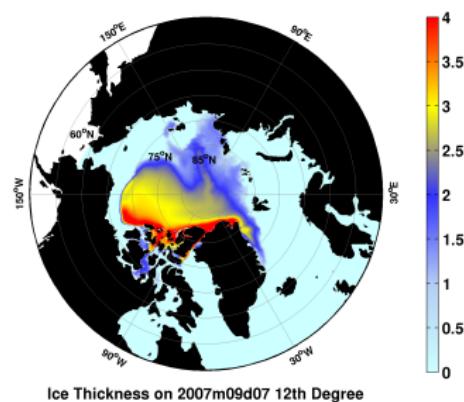
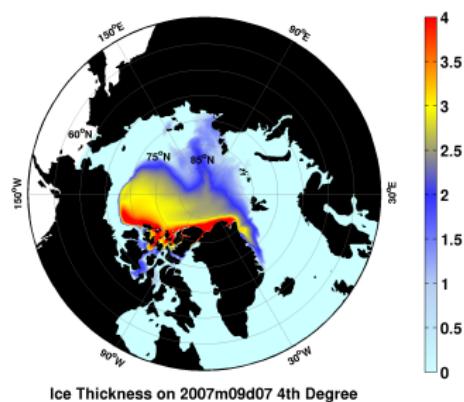
Sea-Ice Thickness September 2007



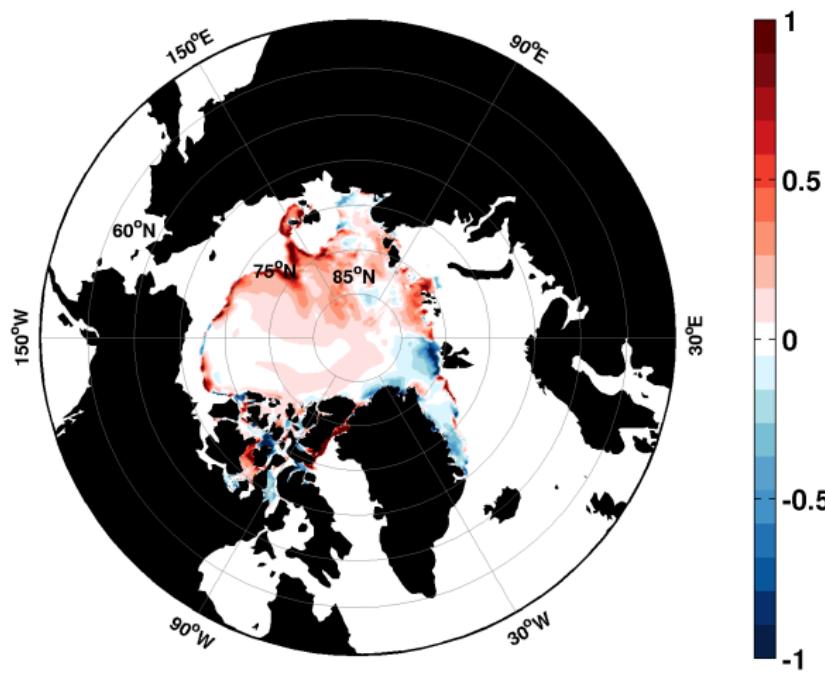
Sea-Ice Thickness September 2007 Difference(ANHA12-ANHA4)



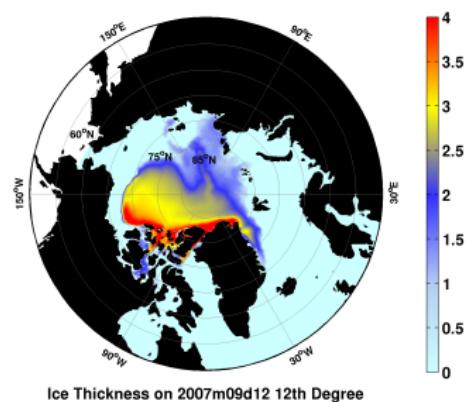
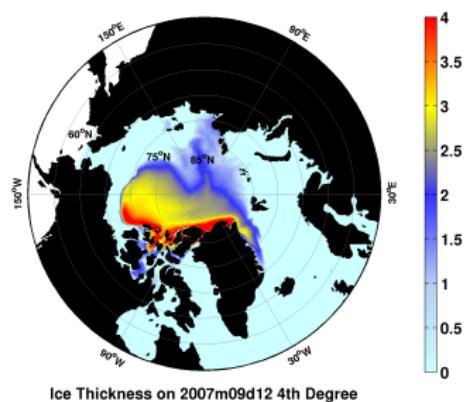
Sea-Ice Thickness September 2007



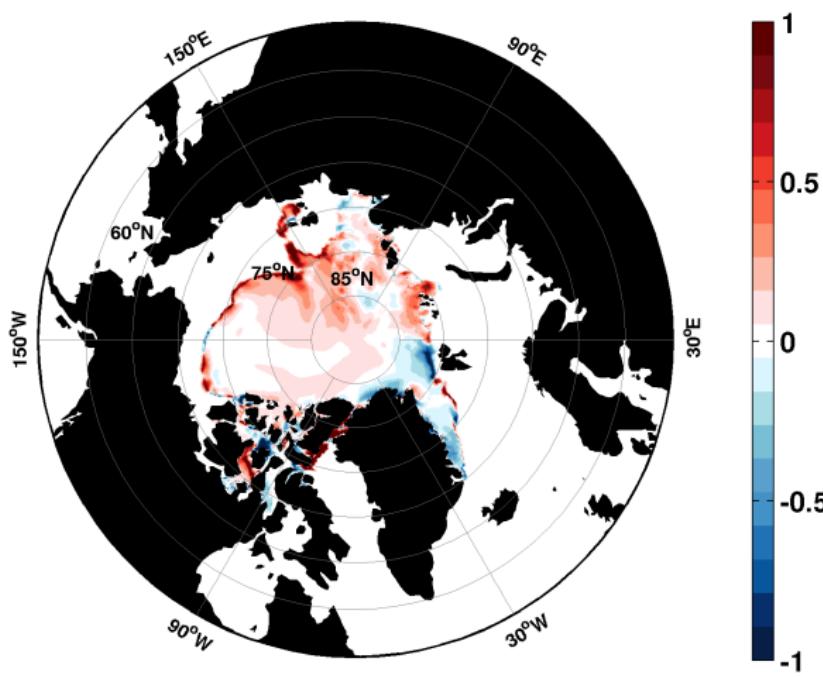
Sea-Ice Thickness September 2007 Difference(ANHA12-ANHA4)



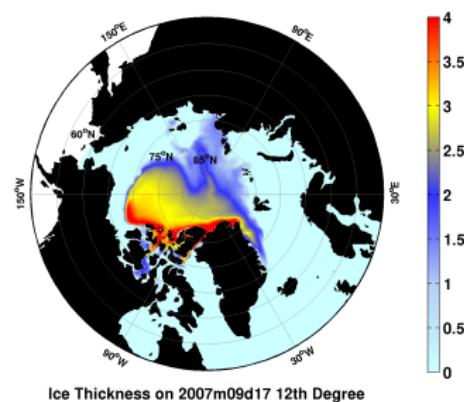
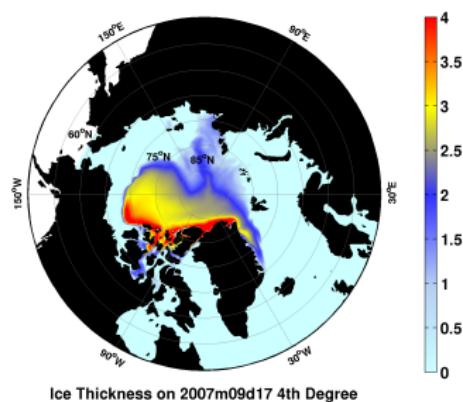
Sea-Ice Thickness September 2007



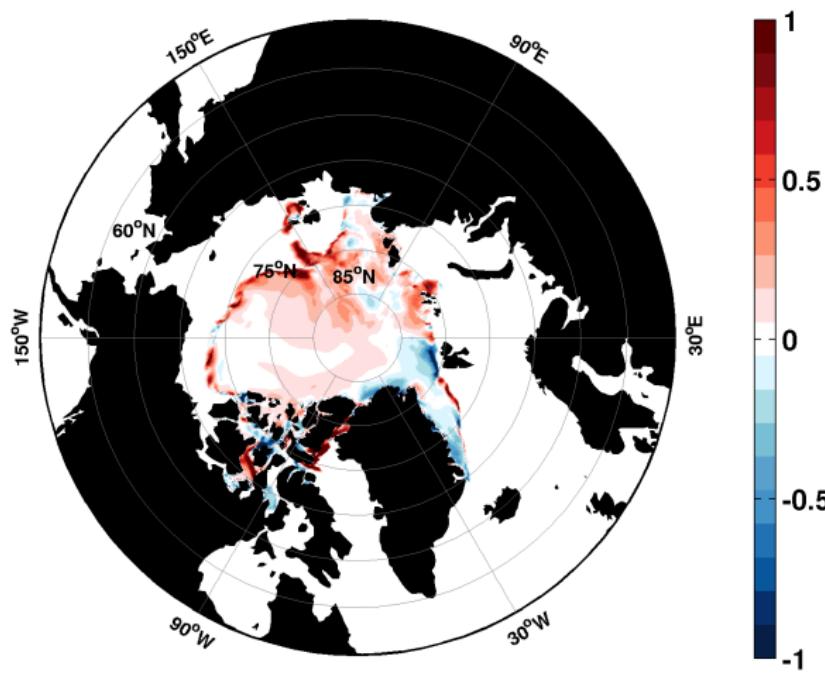
Sea-Ice Thickness September 2007 Difference(ANHA12-ANHA4)



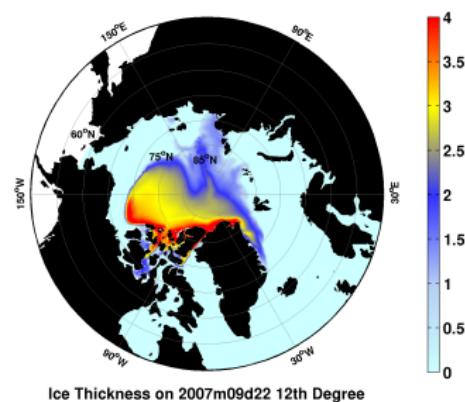
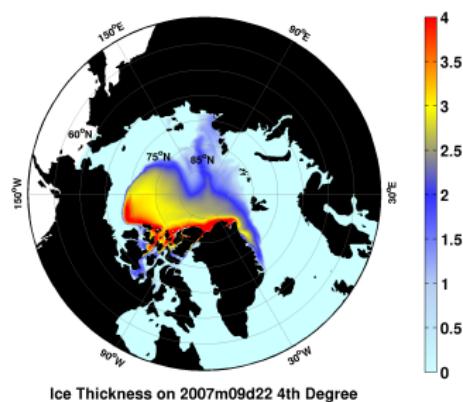
Sea-Ice Thickness September 2007



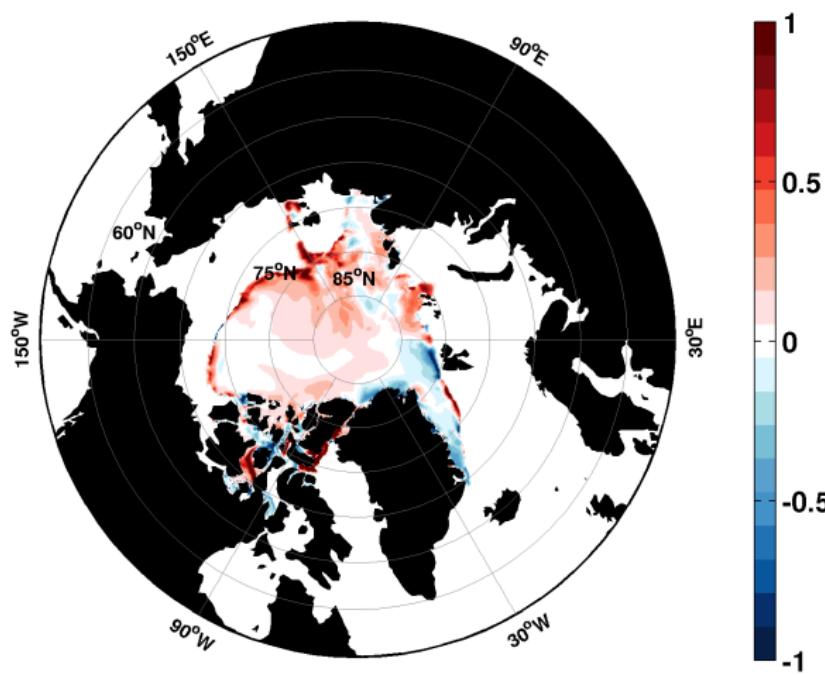
Sea-Ice Thickness September 2007 Difference(ANHA12-ANHA4)



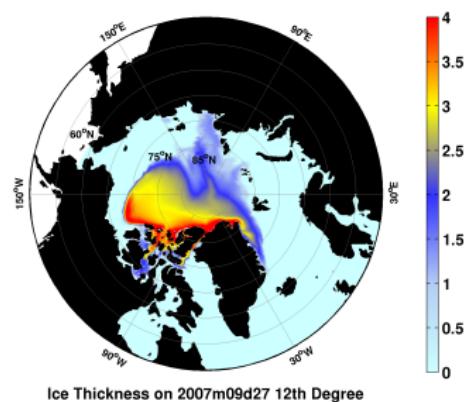
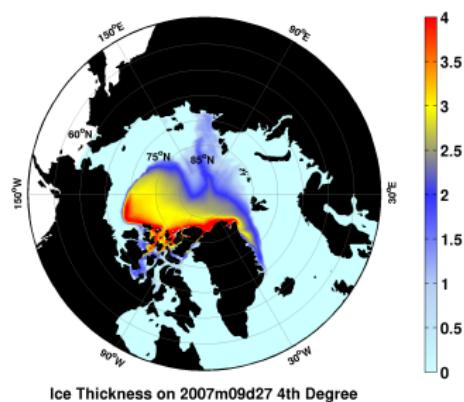
Sea-Ice Thickness September 2007



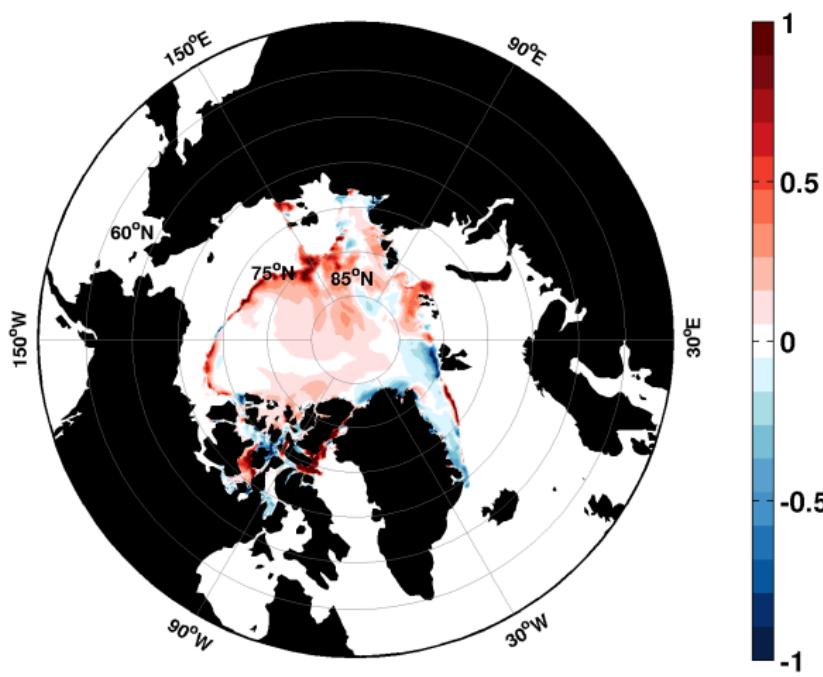
Sea-Ice Thickness September 2007 Difference(ANHA12-ANHA4)



Sea-Ice Thickness September 2007



Sea-Ice Thickness September 2007 Difference(ANHA12-ANHA4)



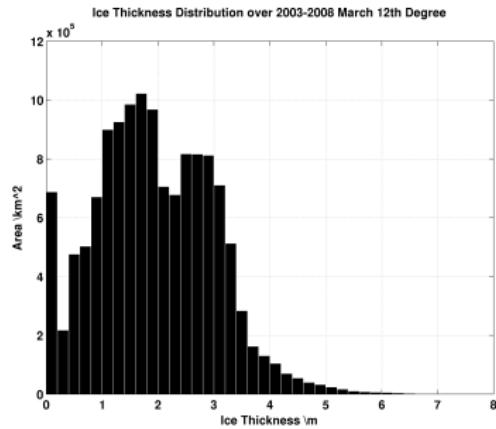
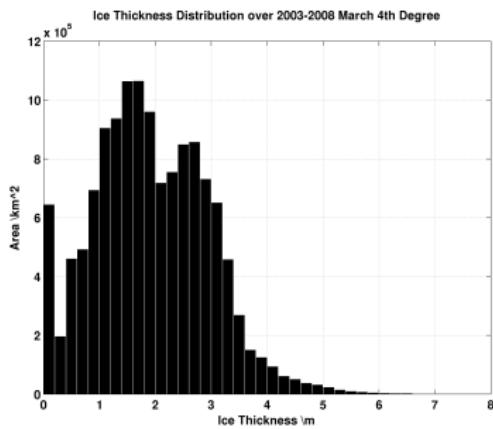
Sea-Ice Thickness Distribution

I noticed that there are two types of methods to calculate the thickness distribution:

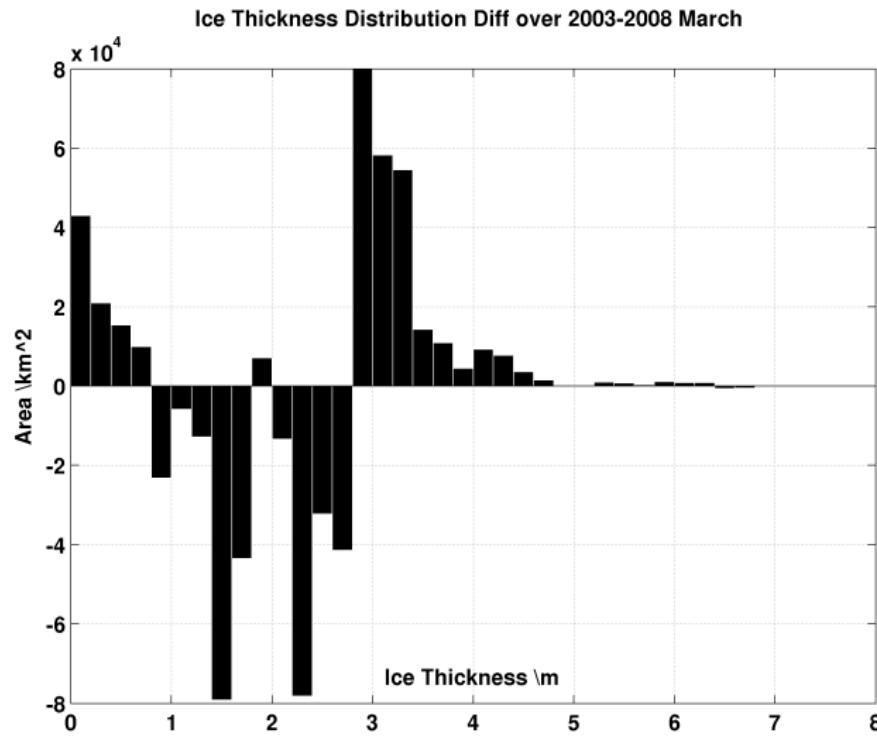
- Directly calculate the mean ice thickness of a month based on the location and get the area of ice distributed in each bin
- First, calculate the area distributed in each bin on each day of a month. Then get the mean distribution based on every single distribution.

The first attempt is an absolute one, while the second attempt is a relative one. I think the latter is more reasonable because it is not influenced by those thin ices which move drastically in a month-long time. Because of the movement of ice, thicker ice may be regarded as thinner one while calculating the mean in first method.

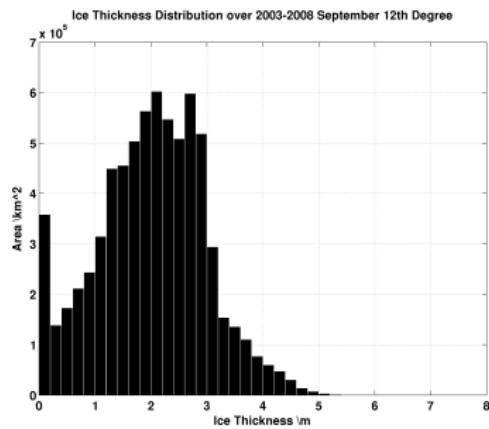
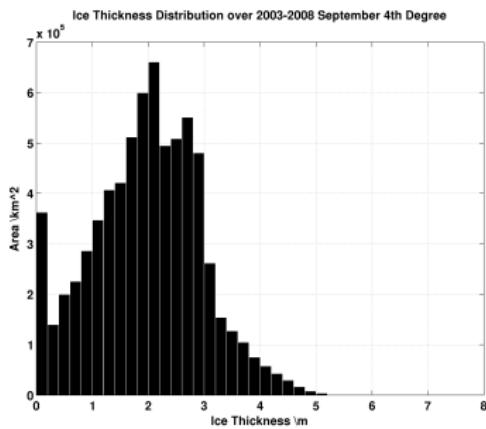
Sea-Ice Thickness Distribution in March



Sea-Ice Thickness Distribution Difference(ANHA12-ANHA4) in March



Sea-Ice Thickness Distribution in September



Sea-Ice Thickness Distribution Difference(ANHA12-ANHA4) in September

