3rd FAMOS (*Forum for Arctic Modeling and Observing Synthesis****) workshop***

- If you need any assistance:
  Please contact Annie Doucette
  She is our travel and logistics coordinator
  Her phone is 508-289-2543
  Clark Office on 3rd floor, Room 337
  E-mail: adoucette@whoi.edu

- Wireless internet: Shareed ID – "FAMOS2014" and then follow instructions
  Users will look for and connect to WHOI_Meeting. When prompted they will enter the shared key. Please remember the shared key is case sensitive.
  Users that have connected to WHOI_Meeting in the past may have connection problems if they have saved the Shared Key.
  To delete the old Shared Key on a MAC... System Preferences --> Network --> Select Wi-Fi (left pane) Advanced --> Under Preferred Networks select WHOI_Meeting and click the minus (-) button to delete. Click OK. Close system preferences.
  Go to your wireless icon--> select WHOI_Meeting. You should be prompted to enter a password. Enter the new Shared Key and click Join. Some MAC users may also need to delete saved key chain for WHOI_Meeting go to Finder --> Applications --> Keychain Access.app. Under Category --> select All Items and then in search bar type WHOI. If anything is found it should be deleted. And then go back a try to connect.
  To delete the old Shared Key on a PC... Click on wireless icon...Select WHOI_Meeting --> right click, select properties. Under the security tab where it shows Network security key; erase and replace with current Shared Key. click OK
  (there are other ways to get there, but this way is less clicks).

- Please turn off your cell phones during sessions

- Please check your e-mail only during workshop breaks

- Please smoke outside (outdoors)

FAMOS: (Forum for Arctic Modeling and Observational Synthesis) goal is to improve models by:

- **Employing** the latest parameterizations of processes,
- **Validating** against observations and comparing with other model outputs, and
- **Determining** the most probable solutions with reduced uncertainties.

In this regard, we view the new FAMOS project as a collaborative framework wherein theoreticians, modelers and observers can discuss results, problems, and new ideas, all with the goals of model improvement and better understanding of the arctic seas and their role in the global ocean change.

1. **SIMIP**: The Sea Ice Model Intercomparison Project (SIMIP) is an international effort to develop an improved representation of sea ice in climate models. SIMIP is carried out by co-ordinated numerical experiments with contributions from several institutes in the framework of the Arctic Climate System Study (ACSYS) within the World Climate Research Programme (WCRP). At the first stage of SIMIP – sea ice dynamics was the focus of this study.
2. **SIMIP-2:** SIMIP2 is a joint initiative of the WCRP ACSYS/CliC Numerical Experimentation Group and the GEWEX Cloud System Study, Working Group on Polar Clouds. The main goal of SIMIP2 is to isolate, evaluate and improve the representation of vertical sea-ice thermodynamic processes in climate models. **–**

- **Note** that SIMIP-2 studies are not completed yet and many groups continue working with 1-D modeling of sea ice thermodynamics (Huwald, H., L.-B. Tremblay, and H. Blatter (2005), JGR; Griewank and Notz (2013), JGR.

3. **AOMIP:** AOMIP's sea ice studies have validated AOMIP models comparing simulation results of sea ice (concentration, thickness, drift and volume) among models and with observations and identified some causes of existing problems in both observational data and models.

Although the future focus of FAMOS projects will depend to a large degree on the interests of our participants, we envision that there will be four broad areas of interest related to model improvements:

The ***first area*** includes collection of observations for model forcing (including initial and boundary conditions) and validation. In this sense, we will be collecting and gridding all possible observational data about sea ice and its dynamics focusing on (1) sea ice concentration (2) sea ice thickness data from different observations (satellites, submarines, electromagnetic surveys, drill holes, Upward-Looking Sonars, airborne measurements such as IceBridge, etc. data sources); (3) sea ice drift and (4) sea ice deformations.

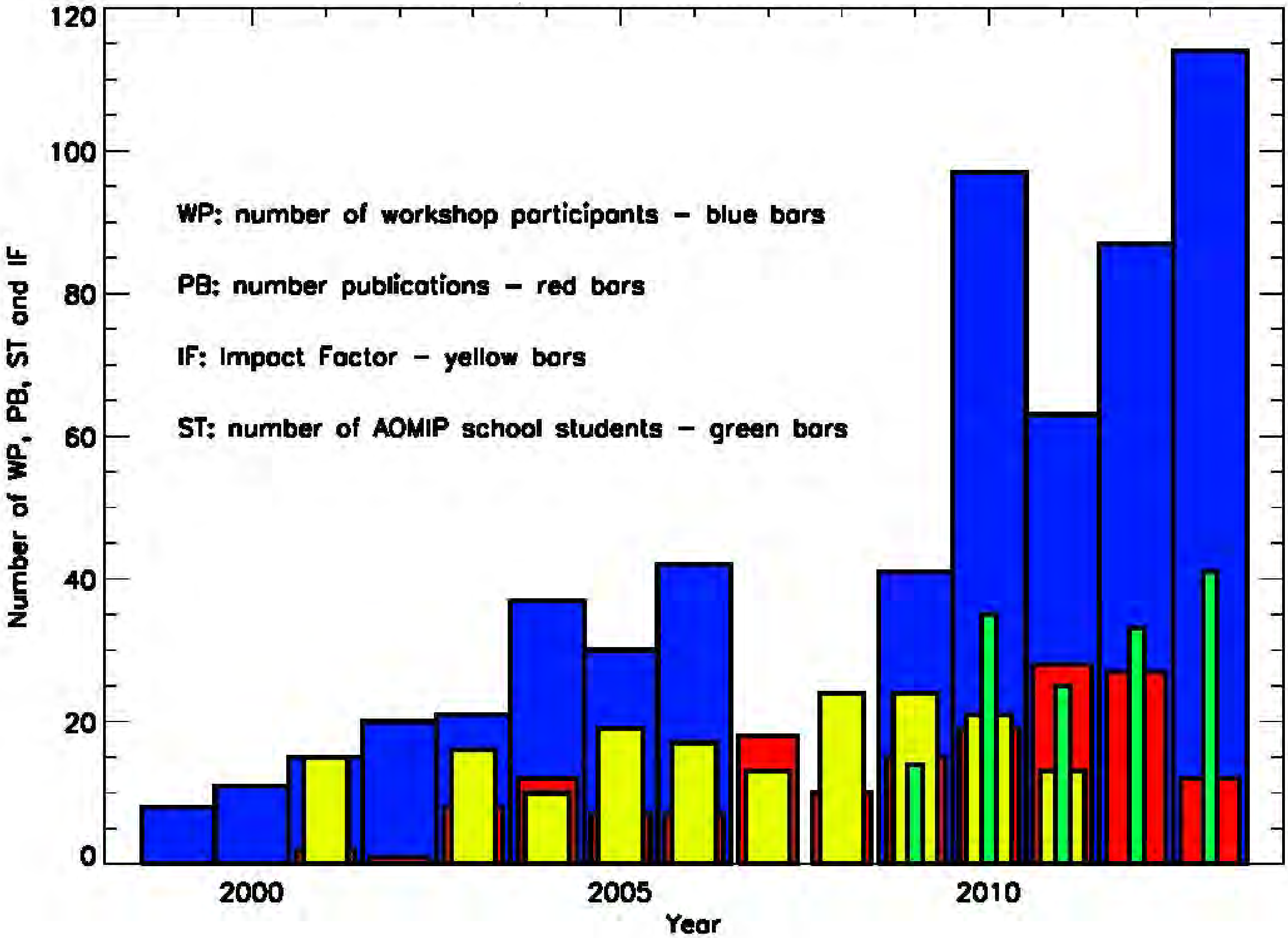
The ***second area*** is sea ice model numerics and parameterization of different processes of sea ice internal and external interactions (with ocean and atmosphere).

The ***third area*** of model improvement is the inclusion of processes important for the Arctic such as fast ice formation and break-up, and influence of tides on sea ice, inertial ice dynamics and ocean waves – ice interactions (in both marginal ice zones and at a distance where ocean swell propagates).

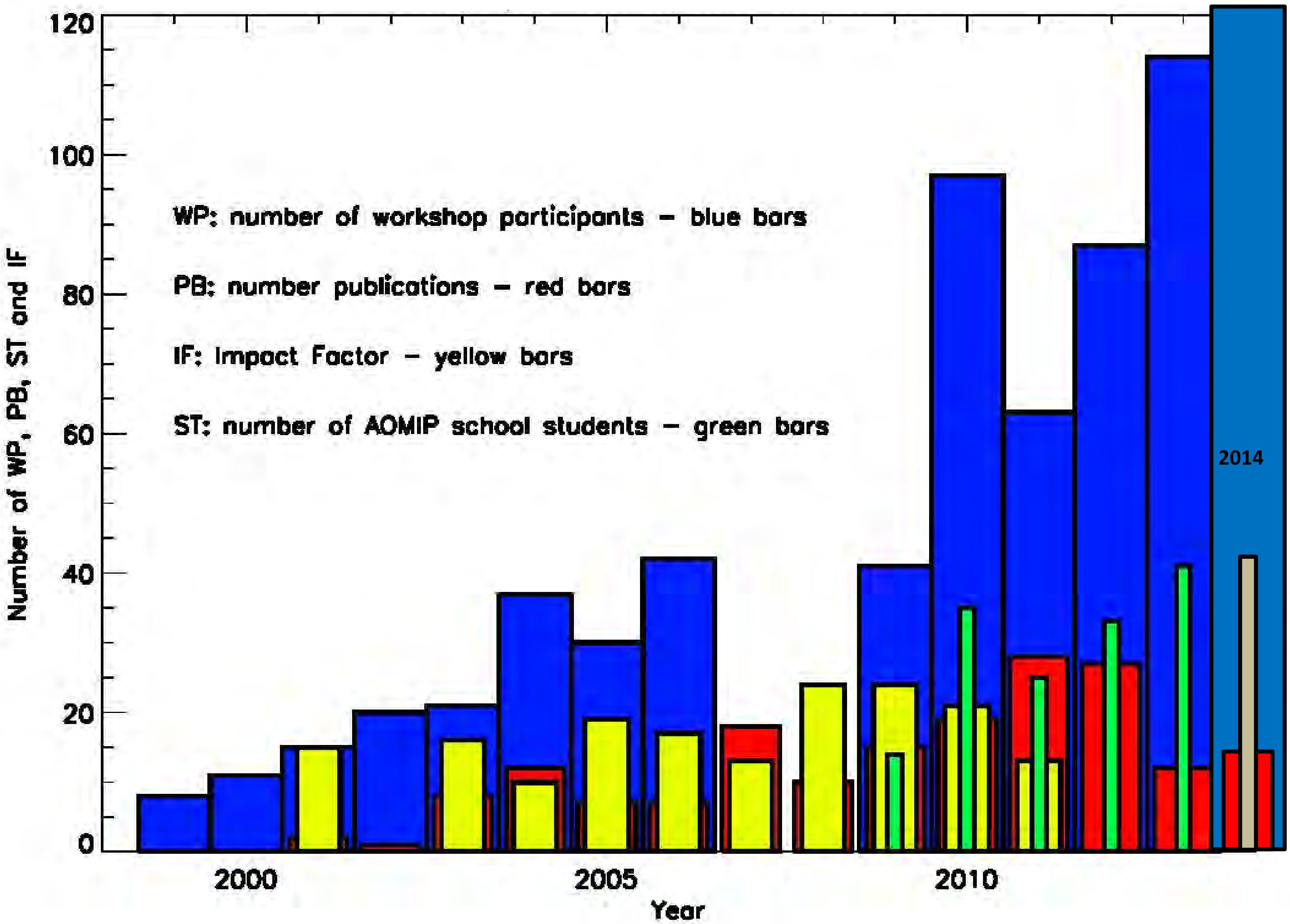
The ***forth area*** of FAMOS activities is associated with work needed to be done to understand better model's abilities to reproduce real processes and to be validated under changing modeling approaches, interpretation of simulated data and methodologies to be developed for model-data intercomparison and data assimilation

One example:
One question is how to validate model results if models widely use data assimilation? It is clear that model's physics in these models is "corrected" by assimilated data and model validation and estimation of model's uncertainties is problematic.

AOMIP/FAMOS history of work and accomplishments



AOMIP/FAMOS history of work and accomplishments



Sessions:

- Sea ice (A. Roberts, T. Martin, D. Feltham: - pack ice and B. Tremblay – landfast ice)
- Circulation (Y. Aksenov, B. Rabe , S. Bacon and Pål Isachsen)
- Modeling and Observations (M. Steele and M-L. Timmermans)
- Ecosystem modeling (K. Popova and P. Wassmann)
- Poster session where majority of presentations will be discussed

Working groups

1. Ecosystem modeling/observing (K. Popova, P. Wassmann): RF

2. Freshwater and heat content (S. Bacon): RF

3. Circulation (Y. Aksenov) + Greenland (Dukhovskoy): RF

4. Mixing (J. Toole, S. Cole) + BG tracer experiment (P. Mayers): Foye

5. Pack sea ice (A. Roberts, T. Martin, D. Feltham): #204

6. Landfast ice (B. Tremblay): Exhibition Center

Organization of working group meetings

Each group will meet 5 times having ~90 minutes per discussion including reports at plenary sessions.

It is recommended that each working group:

at first meeting will discuss :

1. What was done in 2013-2014 and what was not and what the major success results and problems are.

Please discuss not only good things but bad things also : If it is not progressing, why not? How can FAMOS help?

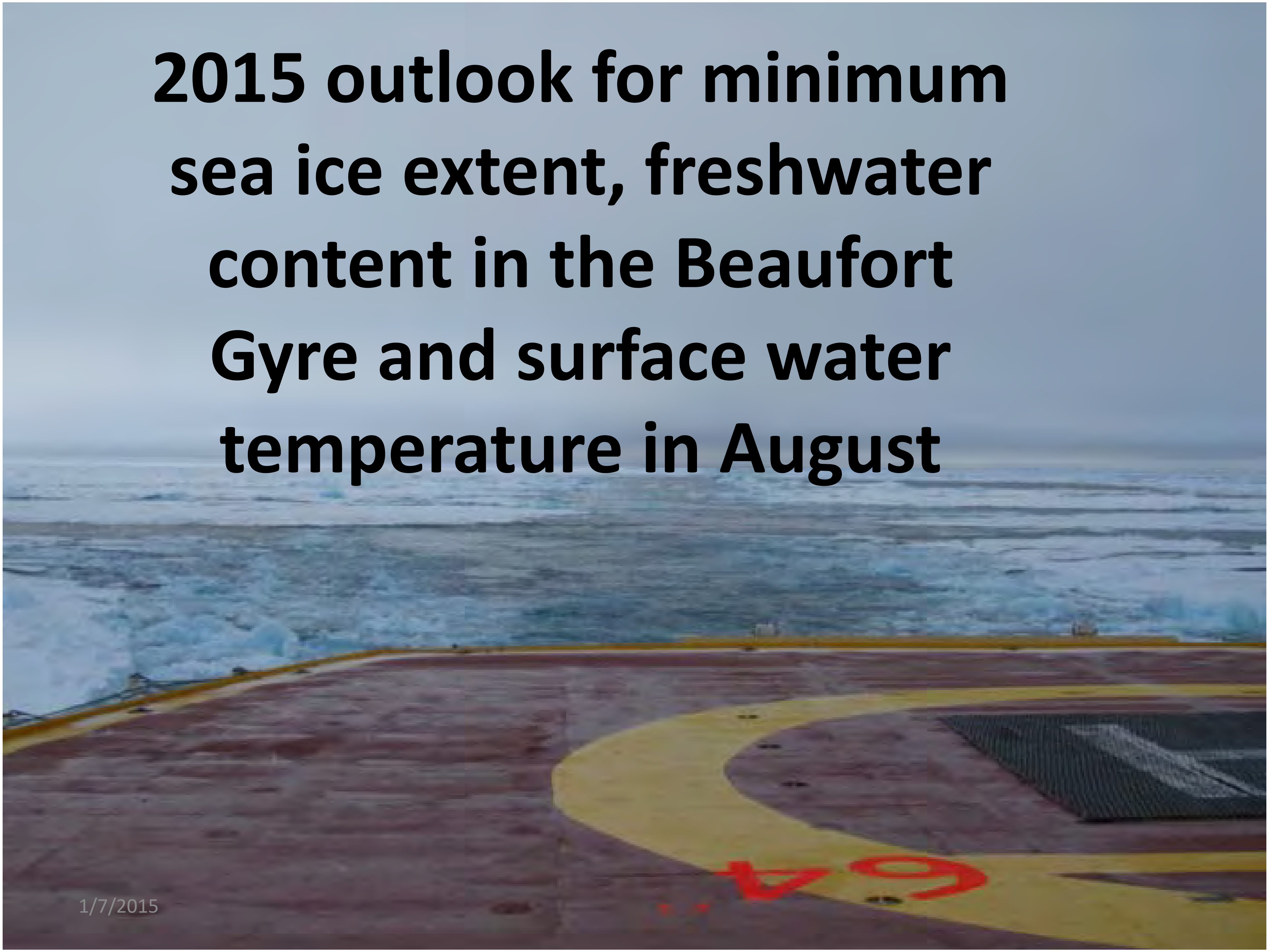
2. In general, you will discuss state of the problem, directions of future modeling and observational work (what modeling and what kind of observations are needed to solve problems and to answer scientific questions

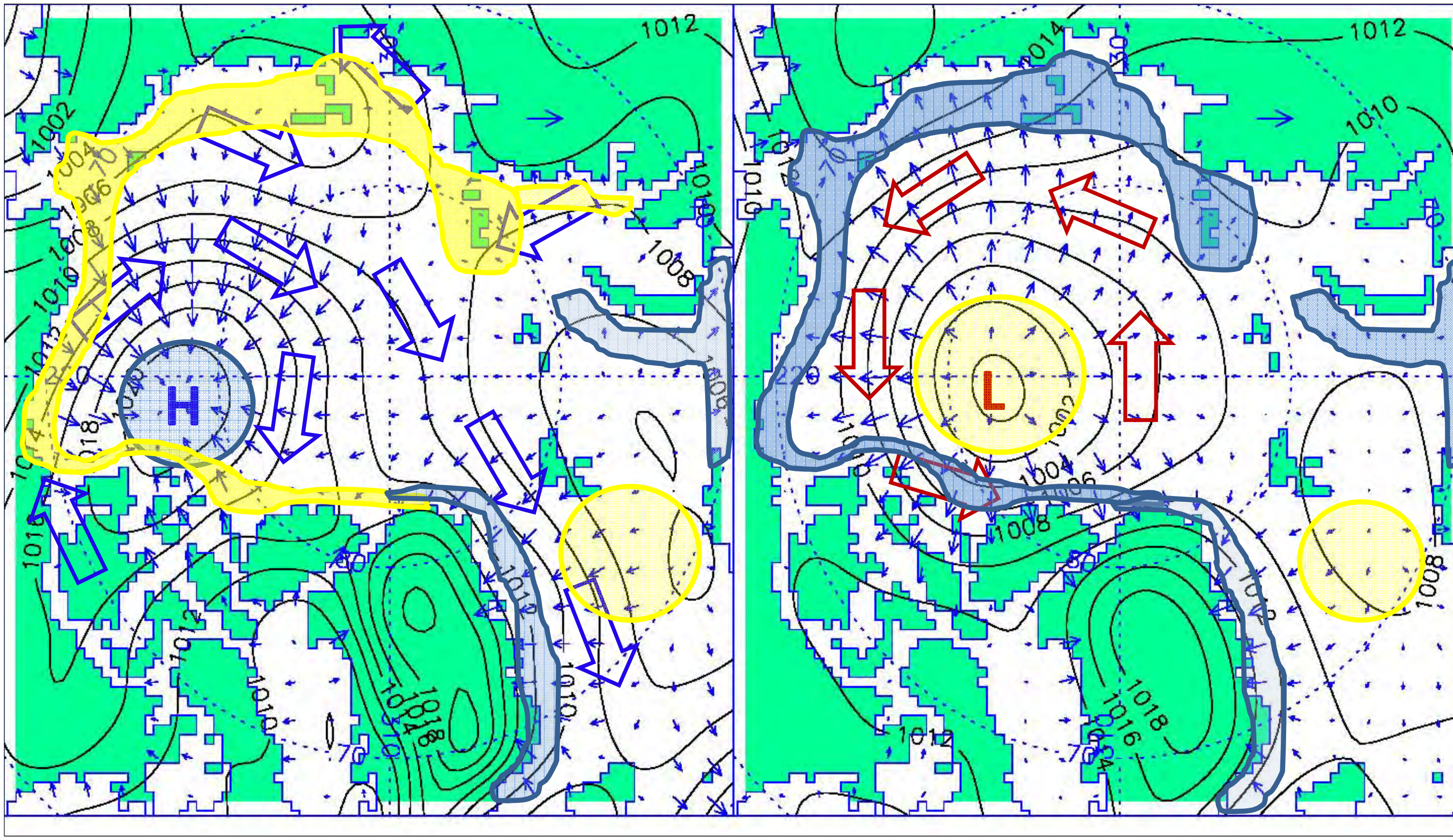
3. Publications and provide us with a list of papers to be prepared for FAMOS JGR special collection (preliminary target date for papers submission: March 1, 2015)

Coordinated experiments:

- Atlantic/Pacific water circulation (Aksenov, Steele, Timmermans, et al.)
- Beaufort Gyre Freshwater tracer experiment (P. Mayers, J. Ledwell et al.) + Mixing (J. Toole; S. Cole, et al.)
- Sea ice reatreat and forecasting (A. Roberts, T. Martin, et al.)
- Landfast ice (B. Tremblay et al.)
- Greenland melt, circulation of freshwater and climate (Dukhovskoy et al.)

2015 outlook for minimum sea ice extent, freshwater content in the Beaufort Gyre and surface water temperature in August

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Please use this information to

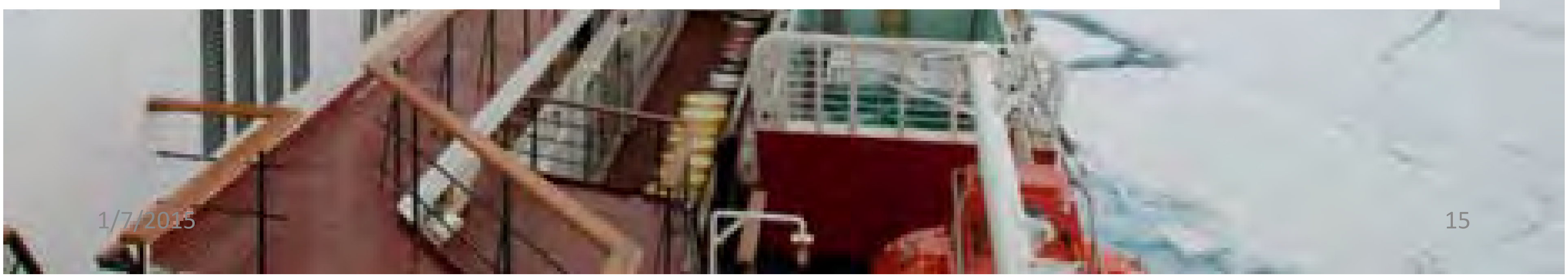
predict sea ice conditions in 2015 using attached information below (slide 4) .

What is your outlook for:

1) **Area of minimum sea ice extent in 2015? (answer at slide 1 below)**
2) **Date of minimum sea ice extent in 2015? (answer at slide 1 below)**

Draw your line showing your prediction of sea ice extent configuration in 2015 (answer at slide 2 below) using information from slide 3 below.

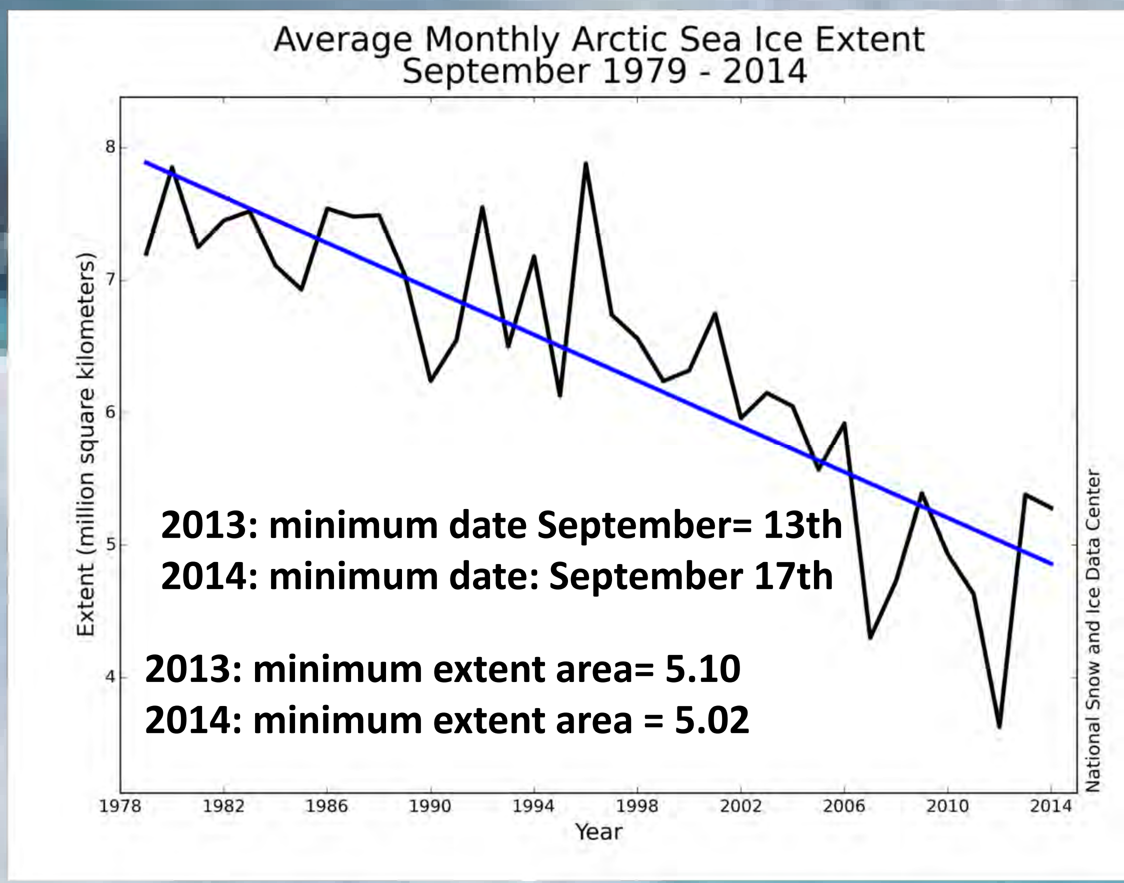
YOUR NAME and INSTITUTION:

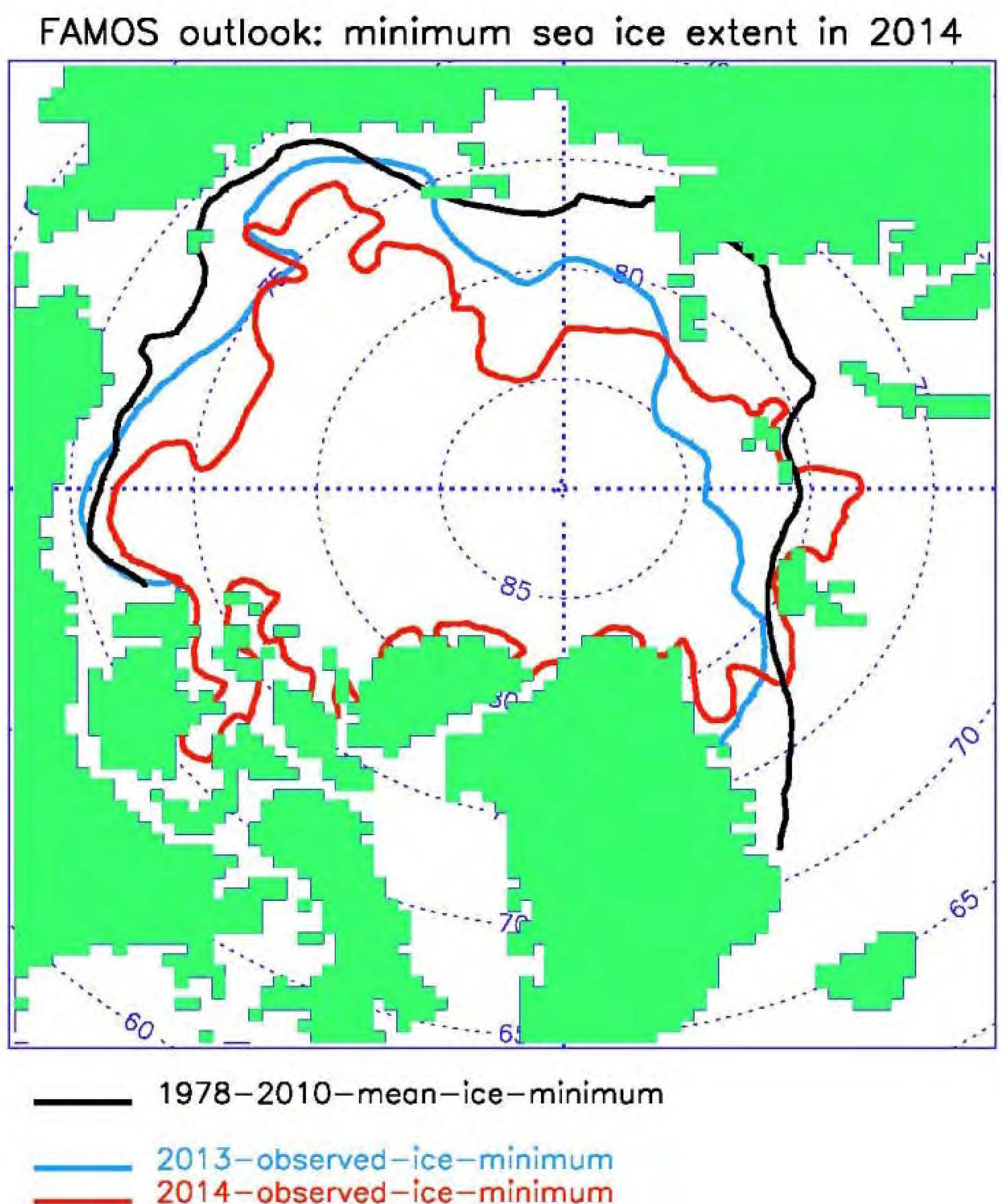


What is your prediction of September minimum ice extent date and September mean sea ice extent area in 2015?

A) DATE of MINIMUM ice extent:_________________ September ?
B) MINIMUM ice extent area:_________________ Million Square kilometers ?

SLIDE 1





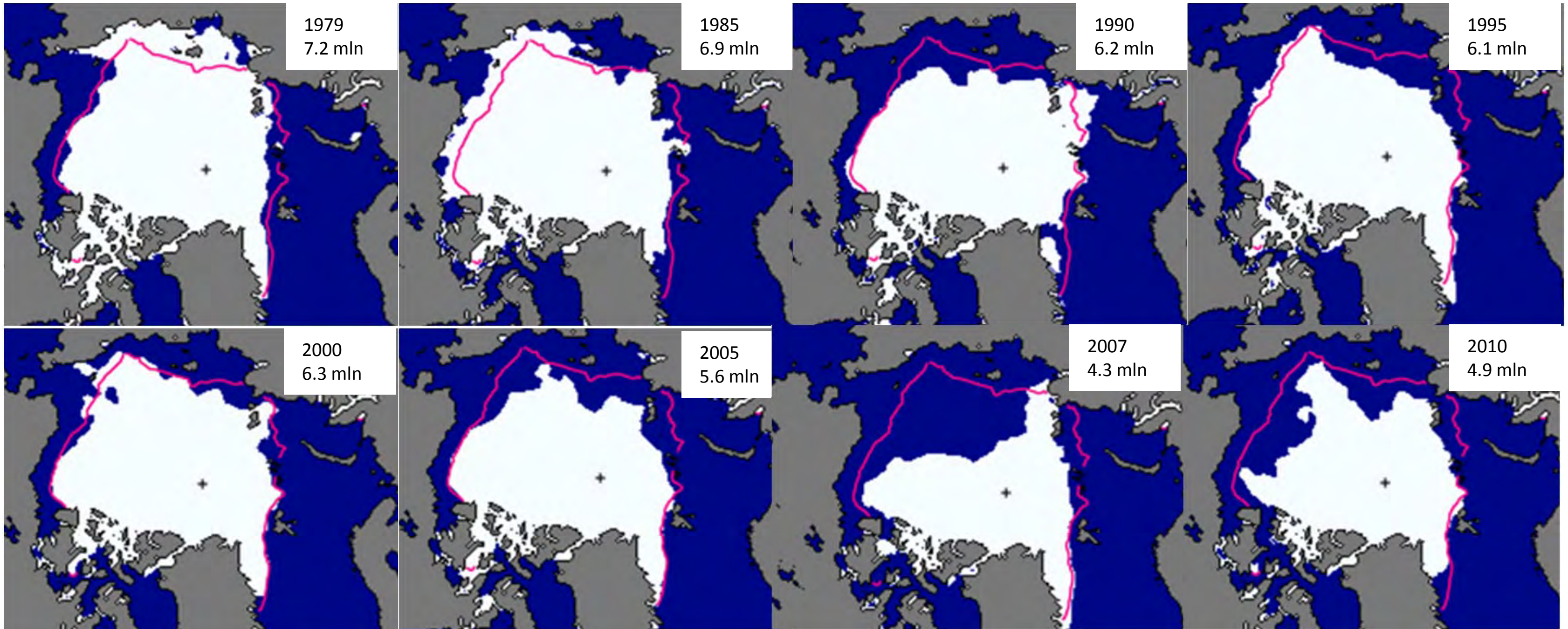
Black: This is 1979-2000 mean minimum ice extent

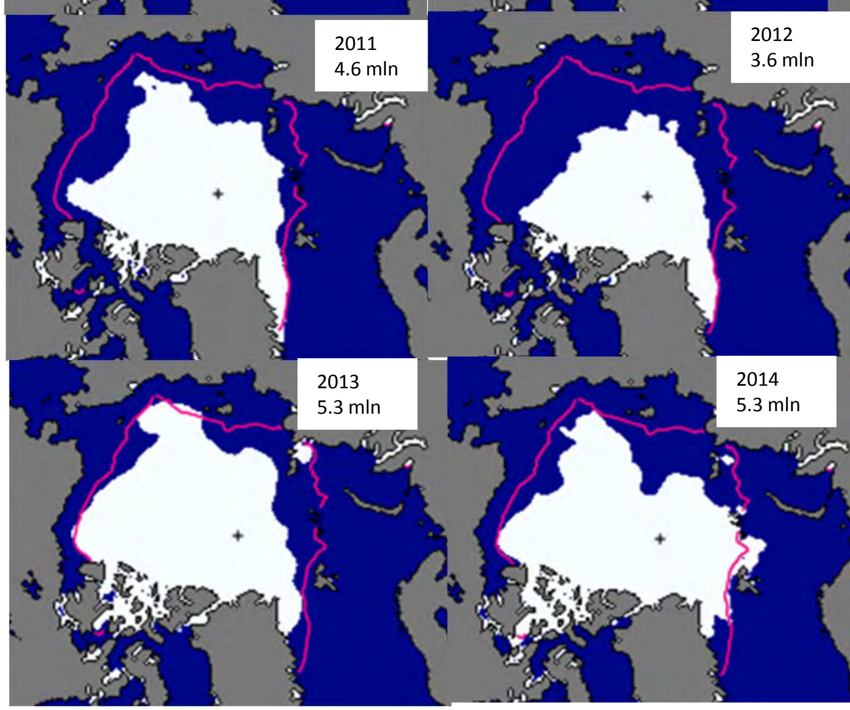
Red – minimum ice extent in 2014

Blue – minimum ice extent in 2013

DRAW HERE YOUR LINE SHOWING YOUR PREDICTION OF MINIMUM SEA ICE EXTENT in 2015

SLIDE 2

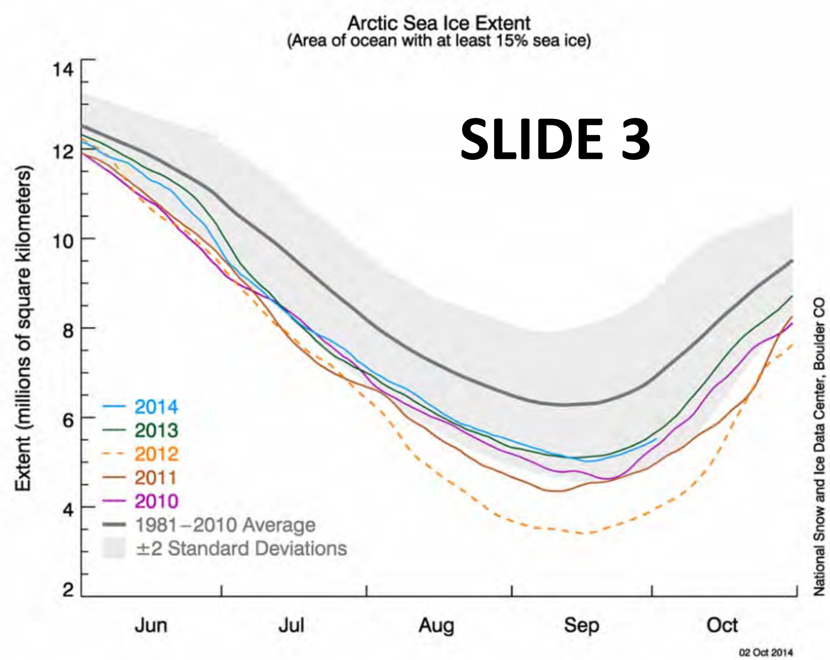




Mean Sea Ice Extent in September for different years

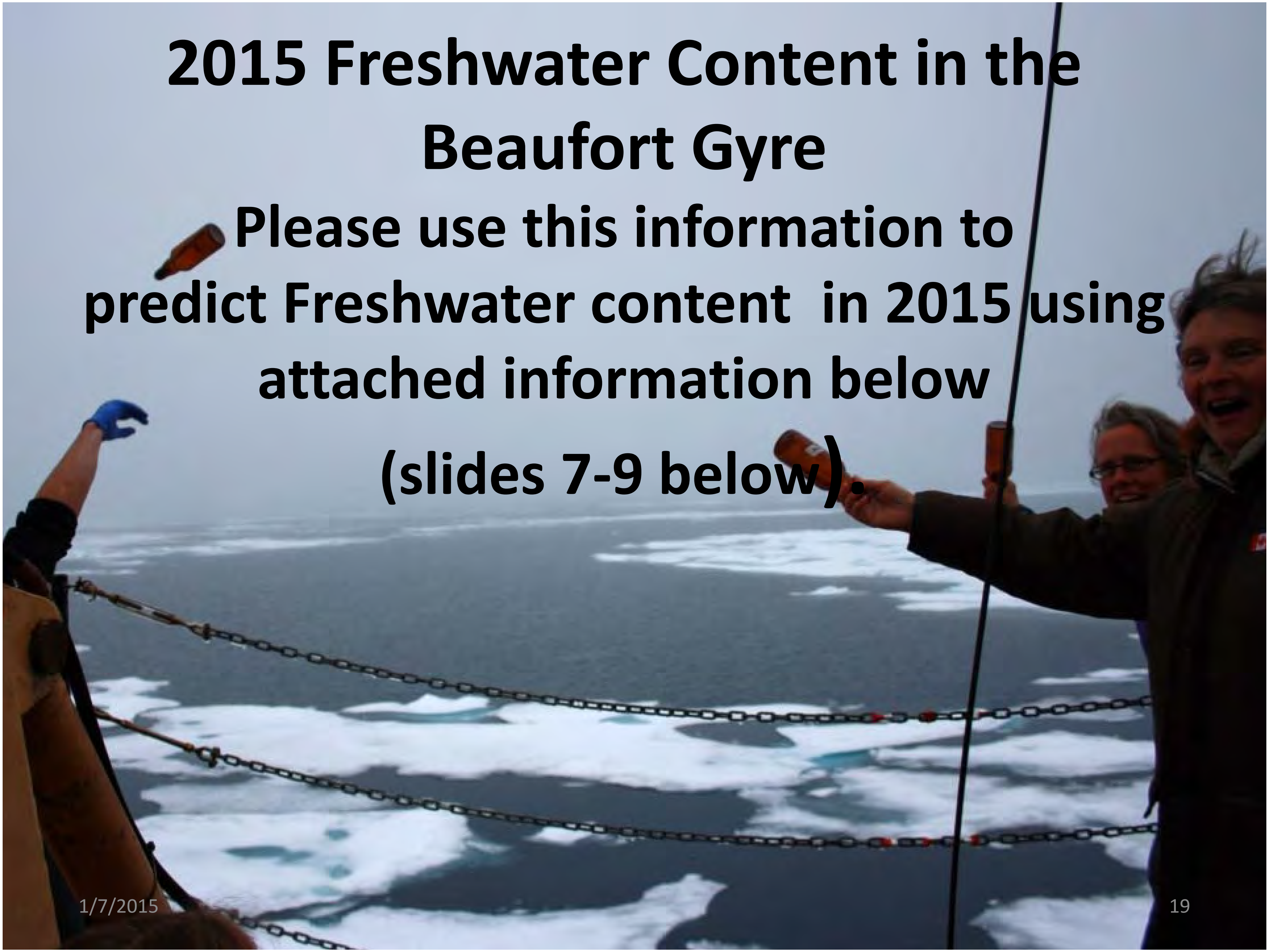
Use this information to predict **minimum** ice extent in 2015

SLIDE 3



2015 Freshwater Content in the Beaufort Gyre

Please use this information to predict Freshwater content in 2015 using attached information below (slides 7-9 below).



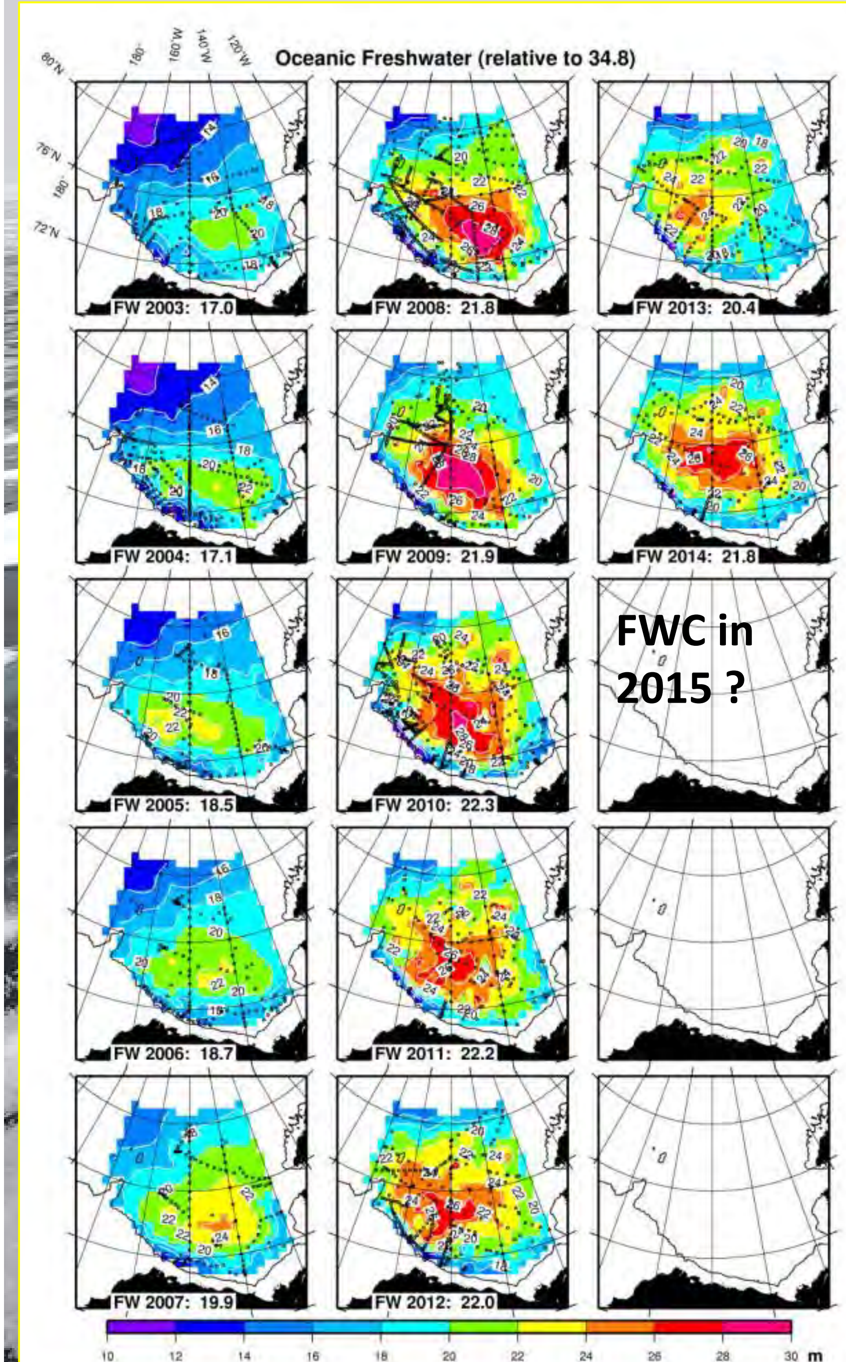
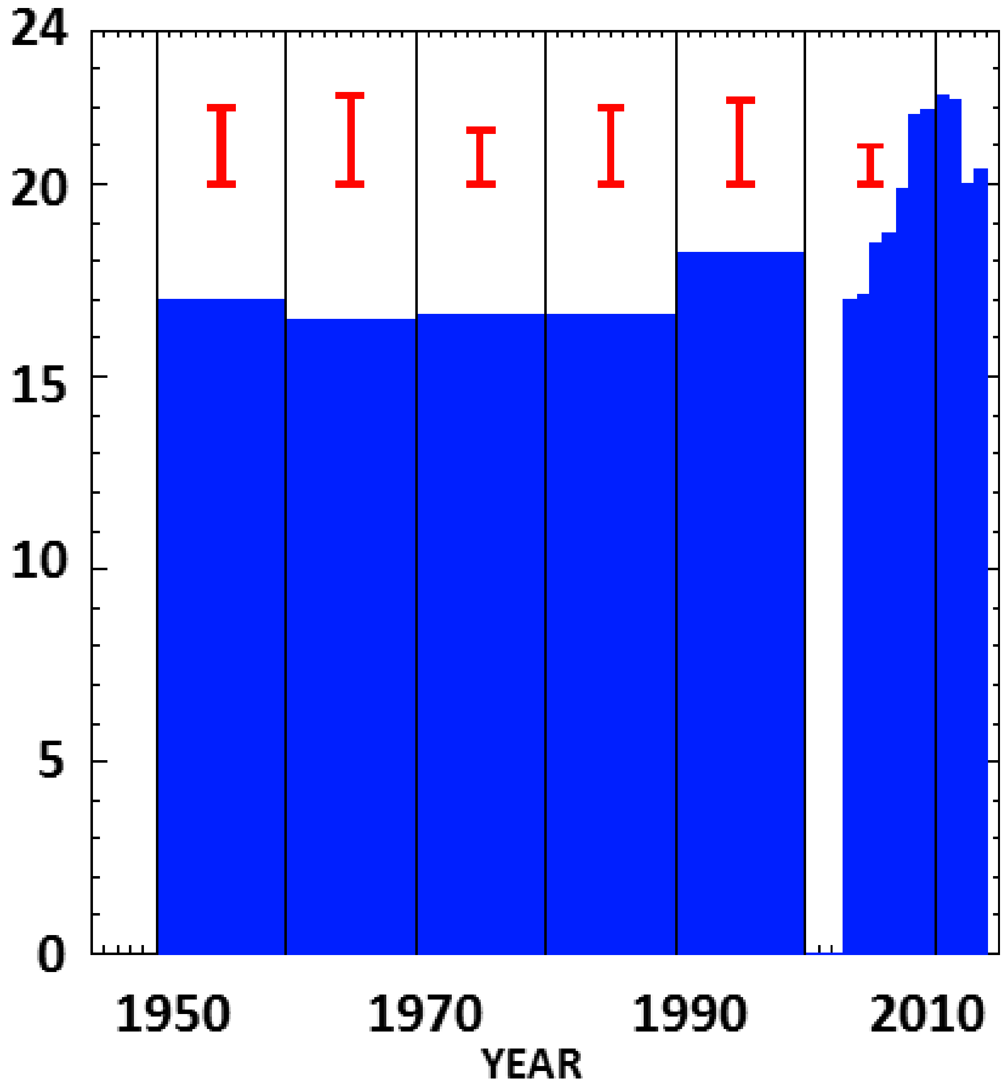
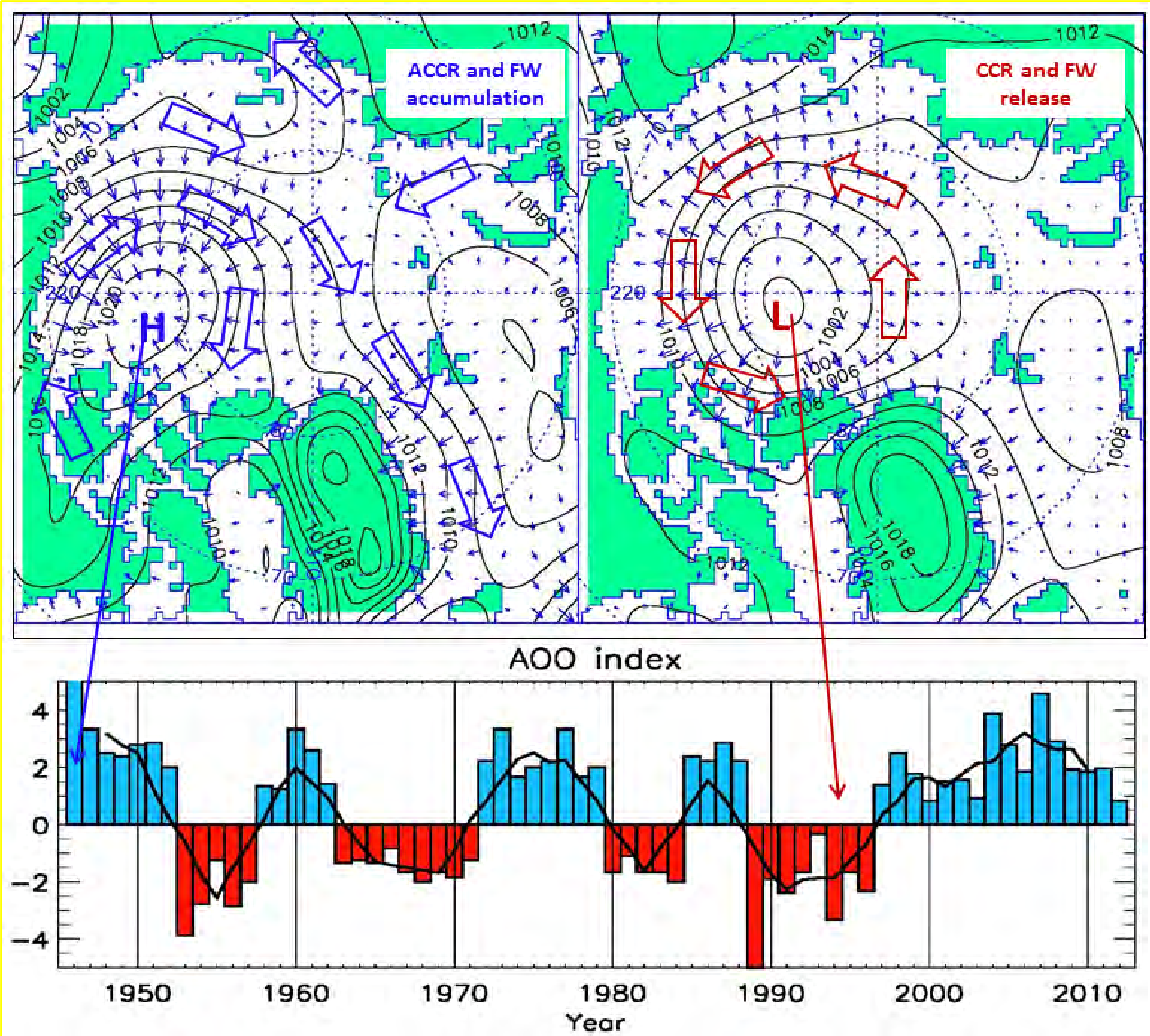


Figure shows Freshwater content (FWC) in the Beaufort Gyre region. Isolines show FWC in meters relative to 34.8 reference salinity. Numbers at panel's bottom show total FWC in the regions in cubic kilometers.

Taking into account sea ice extent you have predicted for 2015, what freshwater content do you predict in the Beaufort Gyre region in 2015? …………… cubic kilometers?



Decadal summer FW content (thousands of km^3) in the BG region before 2000 and annual after 2002. Vertical red bars are uncertainties in FW content. Before 1990, the data for FWC calculations are from the Environmental Working Group Atlas (T and S gridded fields averaged for 1950s, 1960s, 1970s and 1980s). The 1990s data are from different expeditions (see www.whoi.edu/beaufortgyre) and after 2002 are from our BGOS program.



Freshwater content (FWC) in the Beaufort Gyre is regulated by atmospheric circulation regime. The BG region accumulates FW during anticyclonic regime (left figure) due to Ekman pumping and releases FW during cyclonic regime (right figure) due to Ekman sucking.
Since 1997 the Arctic Ocean is dominated by anticyclonic circulation regime. What regime will dominate in 2015?

2015 Surface water temperature anomaly

Please use this information to predict sea surface temperature SST) in 2015 using attached information below (slides 12- 14below).

Information below and information above will help you to predict SST in the Arctic Seas because these SSTs are closely related to the sea ice extent in the Arctic Ocean and atmospheric circulation. Try to connect all things together and predict SST anomalies in 2015 in the:

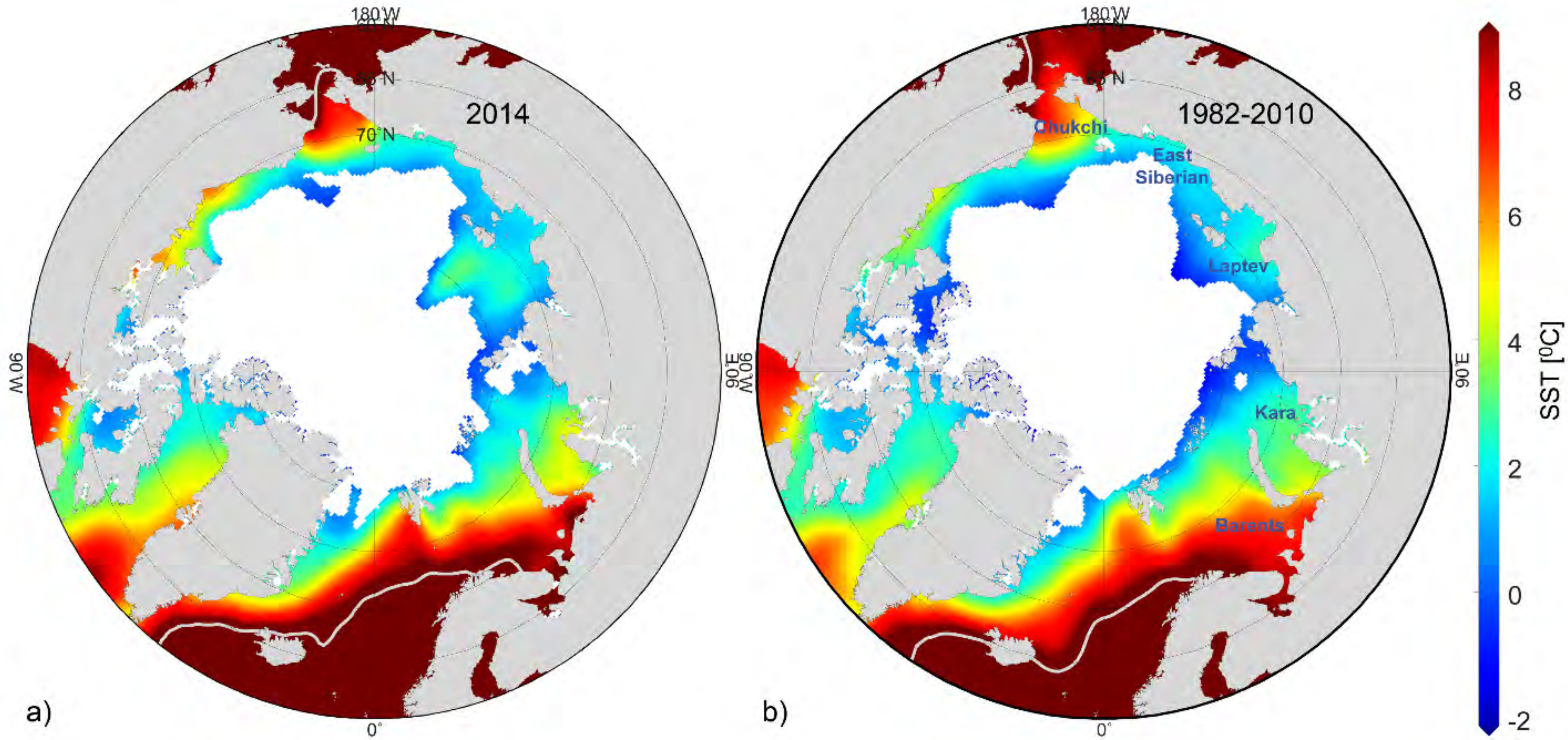
Chukchi Sea …………………………….?

East-Siberian Sea ………………….?

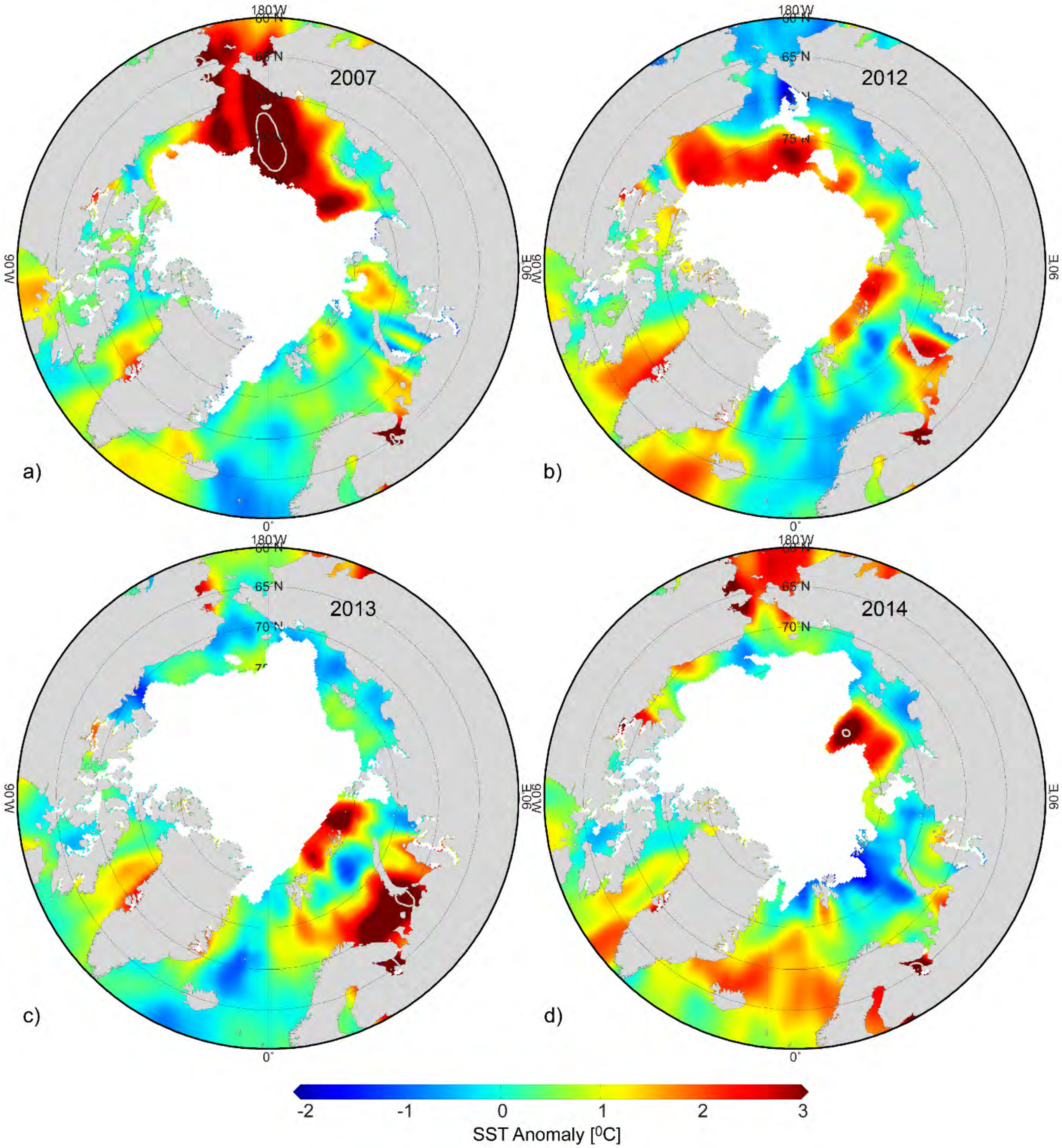
Laptev Sea ……………………………..?

Kara Sea ………………………………….?

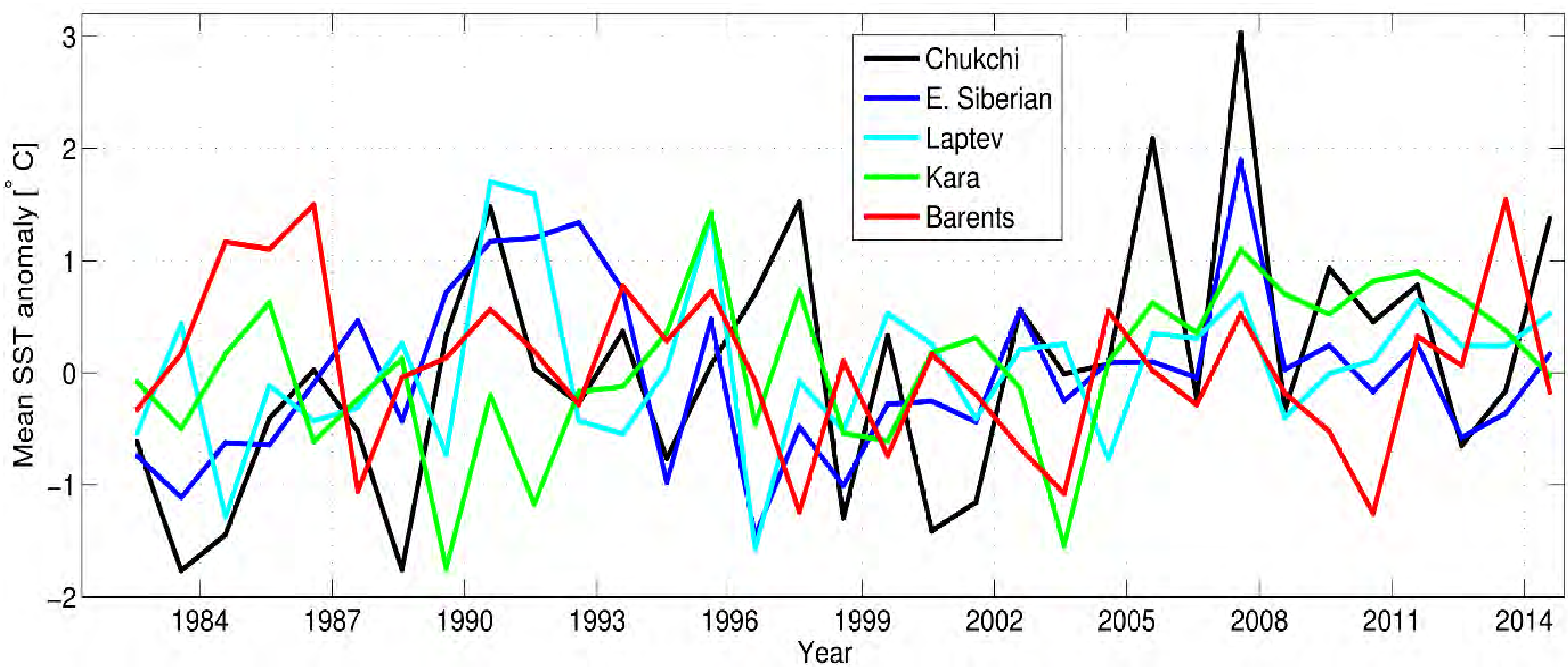
Barents Sea ……………………………..?



(a) Mean sea surface temperature [SST, °C] in August 2014. The white shading indicates the August 2014 mean sea-ice extent from National Snow and Ice Data Center (NSIDC) passive microwave data. (b) Mean SST in August during the period 1982-2010, with white shading indicating the August 2010 sea-ice extent. Grey contours in both panels indicate the 10°C isotherm. SST data are from the NOAA Optimum Interpolation (OI) SST V2 product (a blend of in situ and satellite measurements) provided by the NOAA/OAR/ESRL PSD, Boulder, Colorado [http://www.esrl.noaa.gov/psd/data/gridded/data.noaa.oisst.v2.html]; Reynolds et al. (2002, 2007).



SST anomalies [°C] in (a) August 2007, (b) August 2012, (c) August 2013, and (d) August 2014 relative to the August mean for the period 1982-2010. White shading in each panel indicates August-average sea-ice extent for each year. Grey contours indicate the 4°C isotherm



Time series of area-averaged SST anomalies [°C] for August of each year relative to the August mean of 1982-2010 over each of the marginal seas (slide 12B) of the Arctic Ocean.