NABOS observations evaluate shift to more dynamic state of the eastern Arctic Ocean

by

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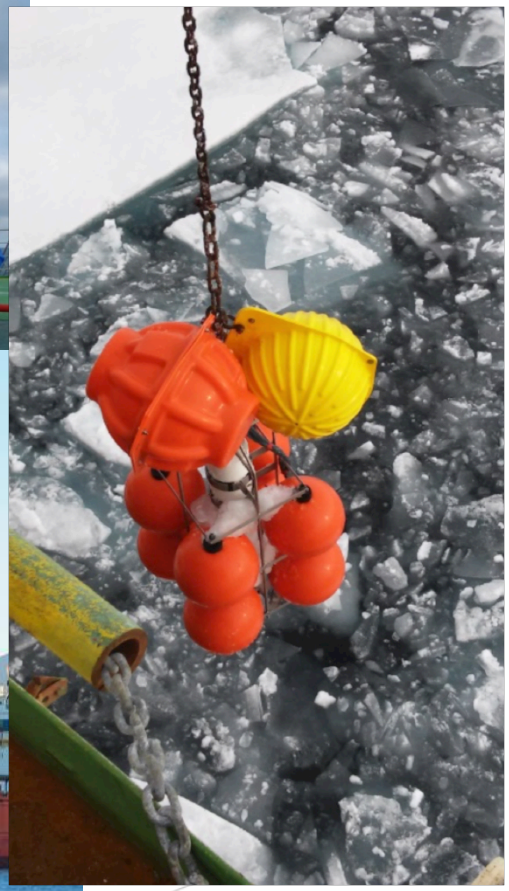
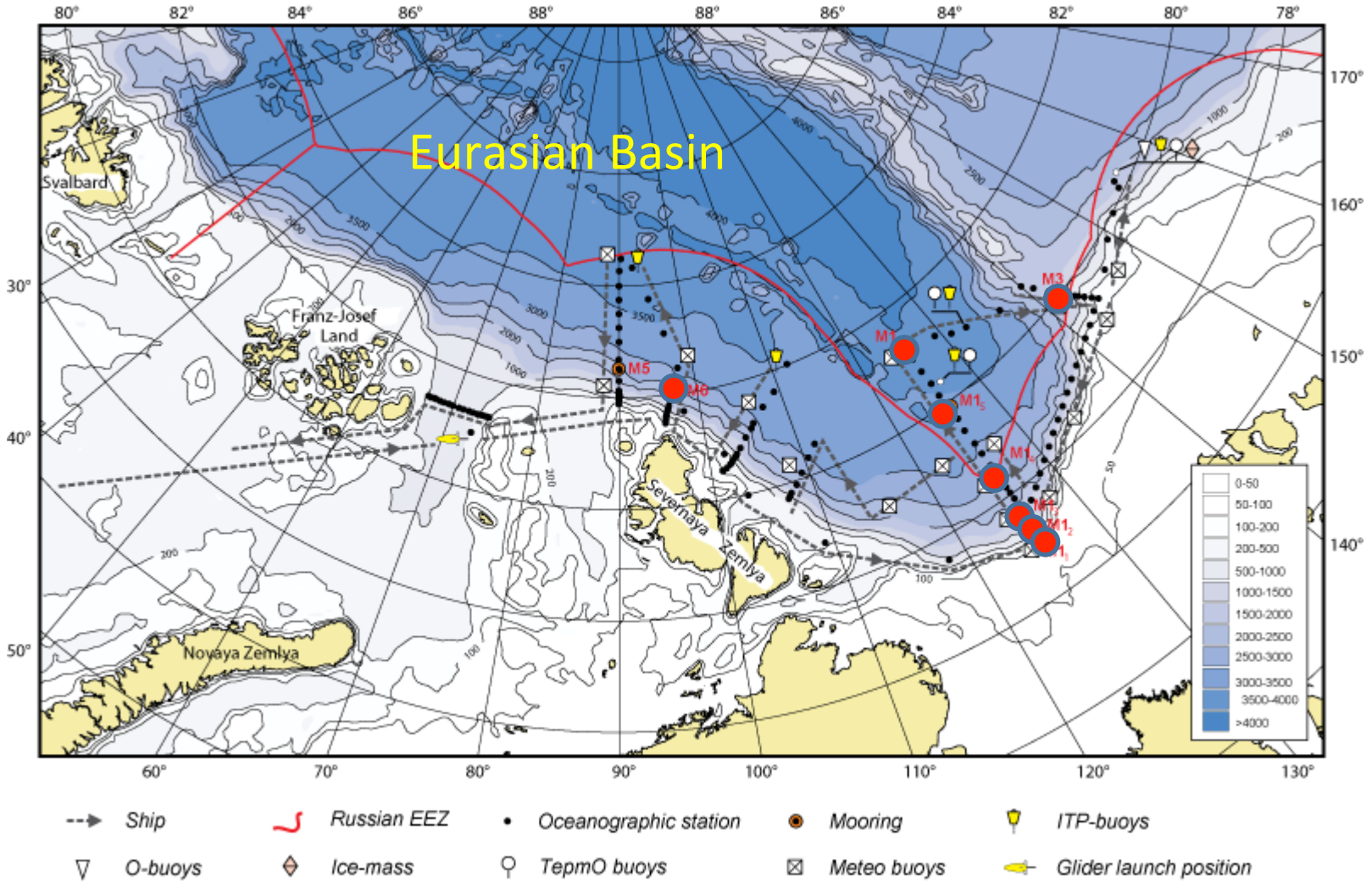


AOOSM Meeting, Seattle, WA. November 18 , 2015

2015 Recovered NABOS moorings

NABOS=Nansen and Amundsen Basins Observational System

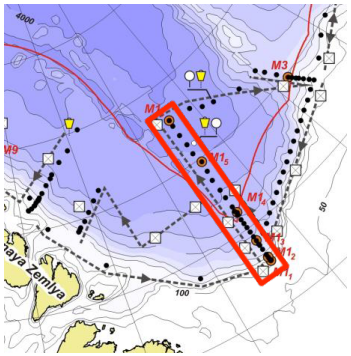
(8 moorings: M6, M11, M12, M13, M14, M15, M16, and M3)



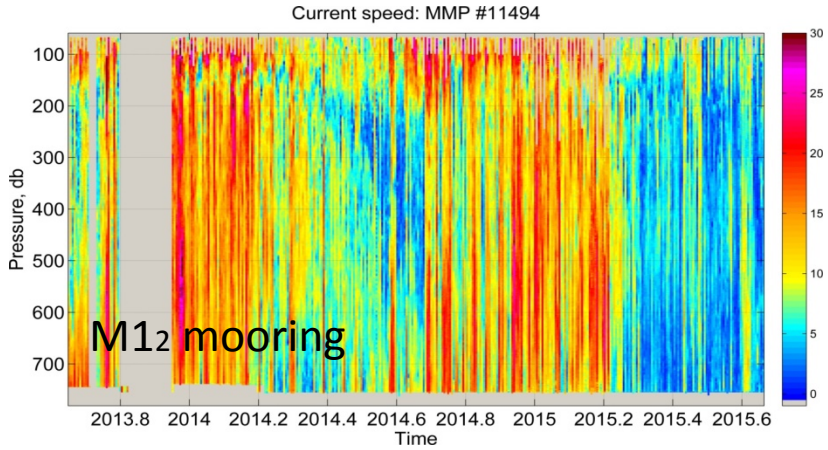
2015 Recovered NABOS moorings

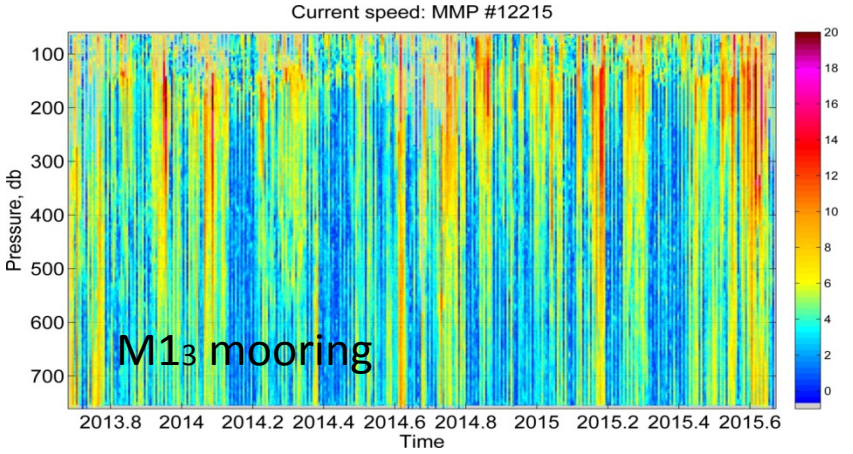
(8 moorings: M6, M1$_1$, M1$_2$, M1$_3$, M1$_4$, M1$_5$, M1$_6$, and M3)

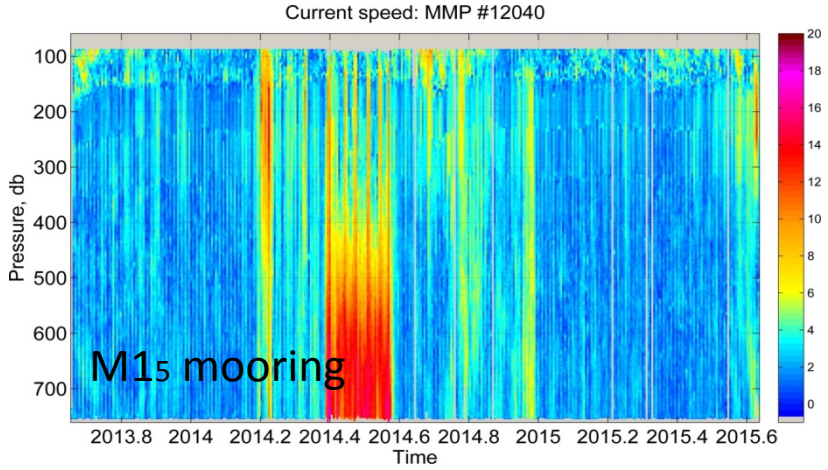
Date	Mooring ID	Recovery Position		Depth
1st Sept 2015	M1-1	77 04.25N	125 48.28E	250m
1st Sept 2015	M1-2	77 10.38N	125 47.52E	787m
2nd Sept 2015	M1-3	77 39.29N	125 48.40E	1849m
20th Sept 2015	M1-4	78 27.54N	125 53.76E	2721m
3rd Sept 2015	M1-5	80 00.20N	125 59.67E	3430m
4th Sept 2015	M1-6	81 08.18N	125 42.67E	3900m
7th Sept 2015	M3	79 56.13N	142 14.89E	1350m
30th Aug 2015	M6-B	82 05.98N	97 01.852E	2710m

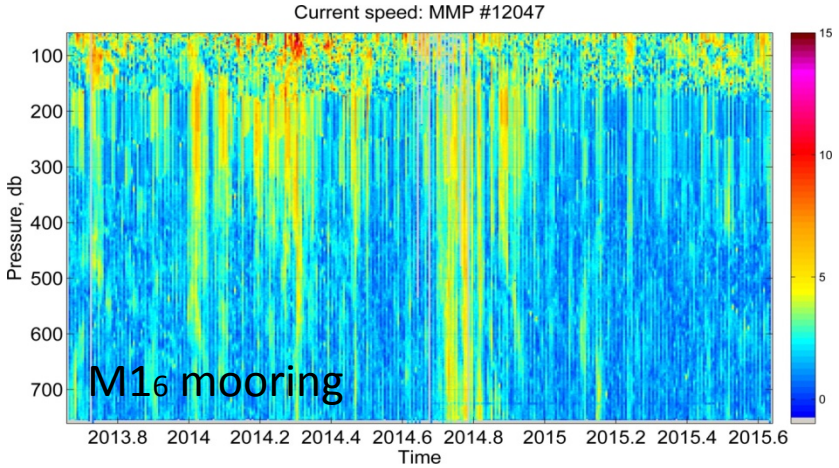


Recovered McLane Profilers (MMP) at the 125˚E section



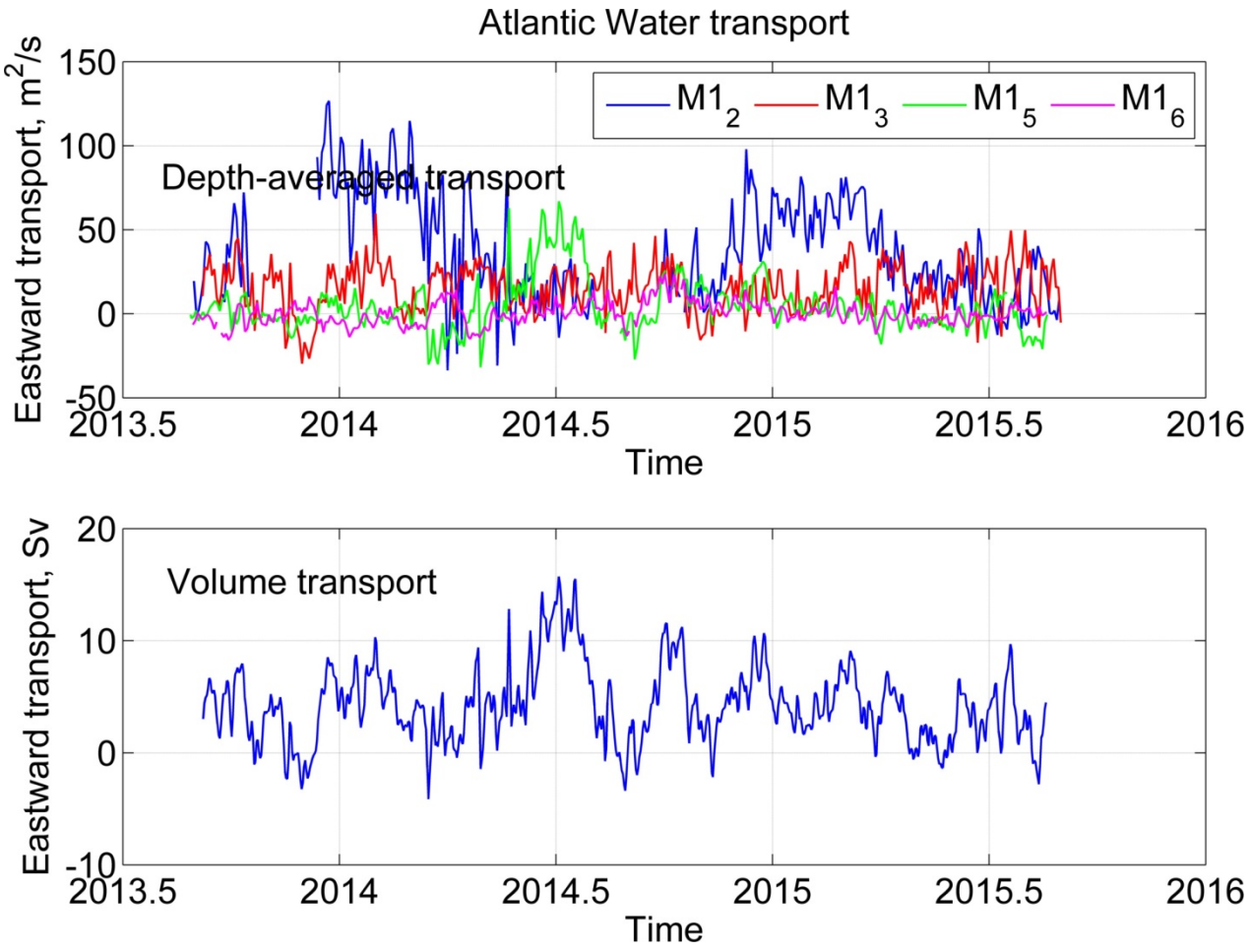


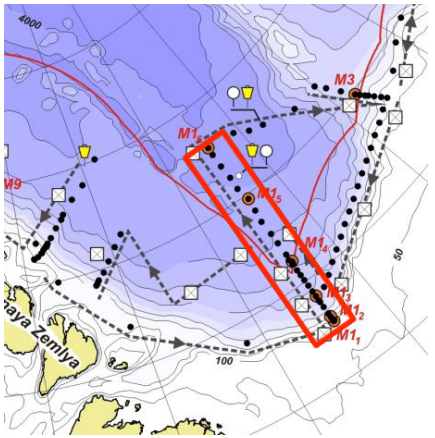




All moorings provide full two-year records

Atlantic Water (AW) transports through the 125˚E line





Transports:

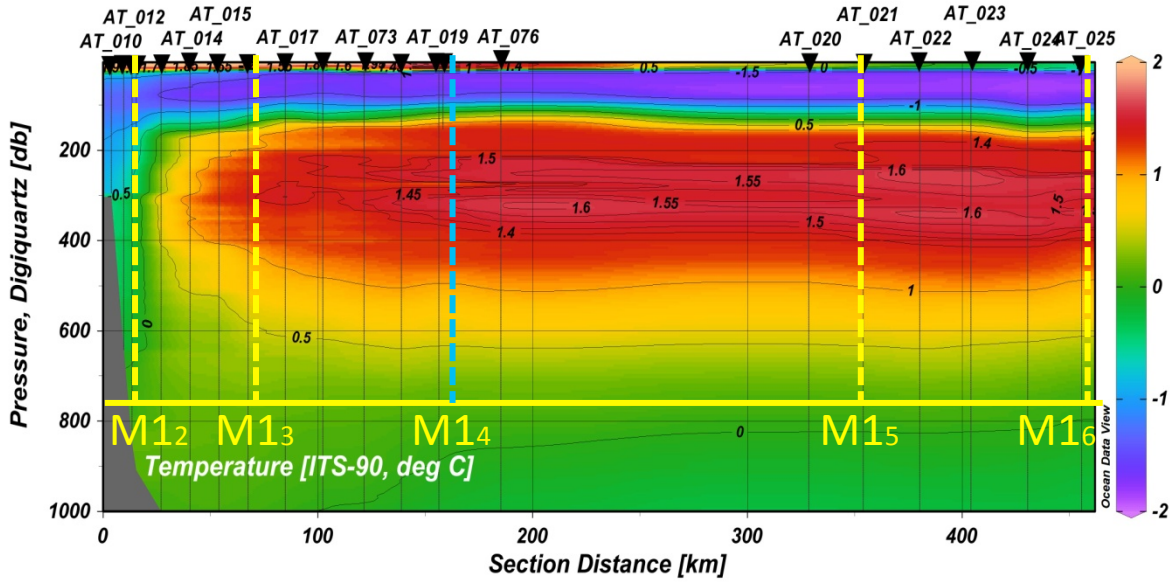
Volume=4.6±0.2 Sv

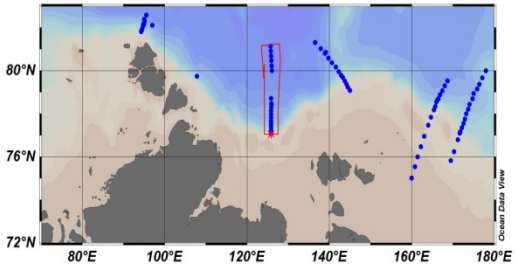
Heat=9.2 ±0.5 TW

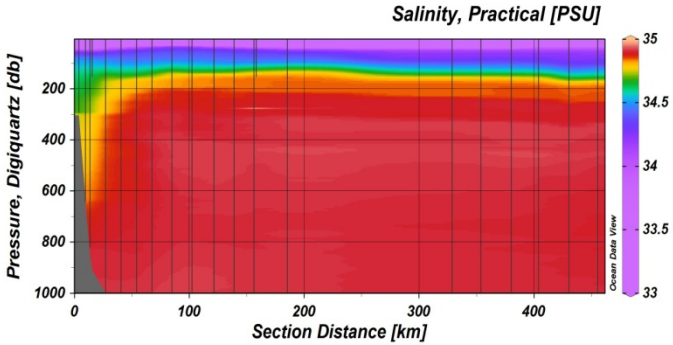
(*Tref*=0˚C)

According to *Schauer and Beszczynska-Möller (2009) and Beszczynska-Möller et al. (2011)*
Net northward heat transport in Fram Strait is 36 ±6 TW, and AW volume transport is ~4 Sv.

Atlantic Water (AW) transport through the 125˚E line

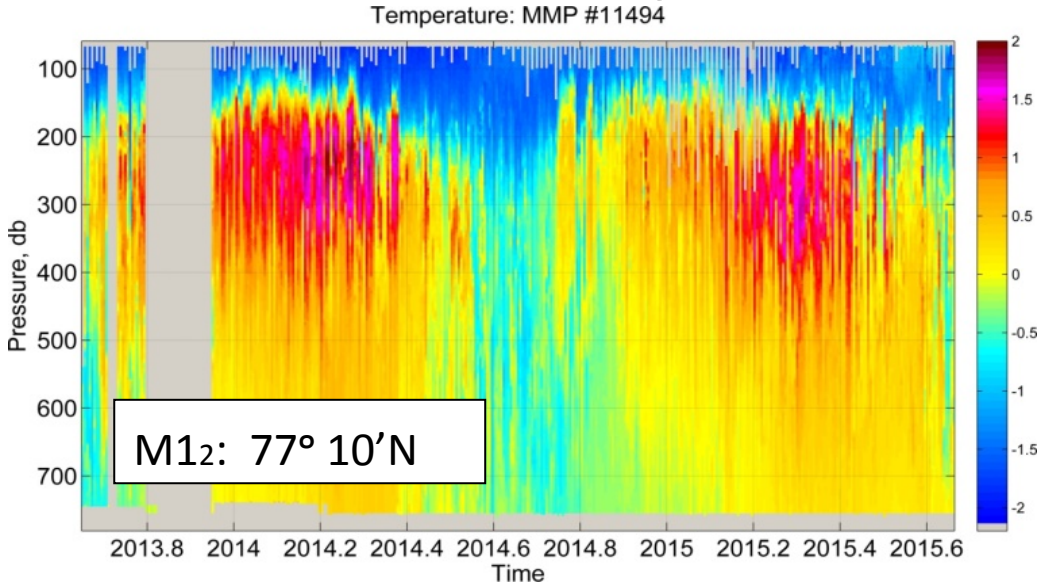


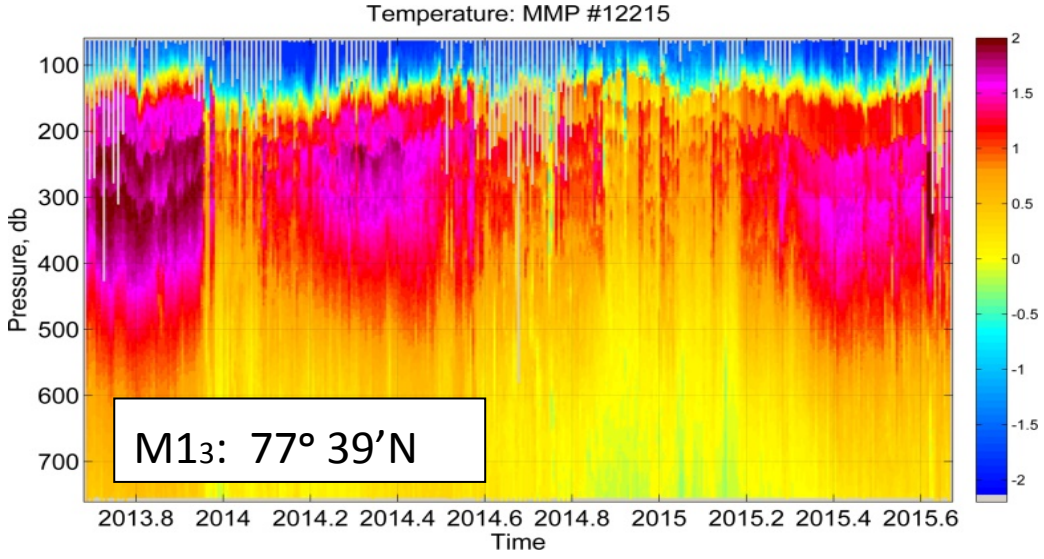


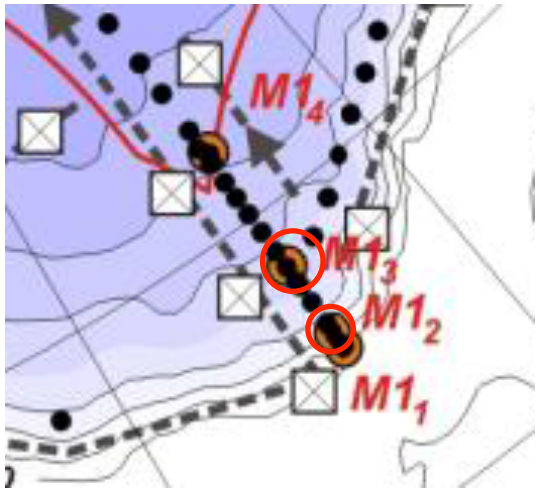


~10 % (0.4 Sv) uncertainty in AW transport due to data coverage

Seasonality of AW temperature



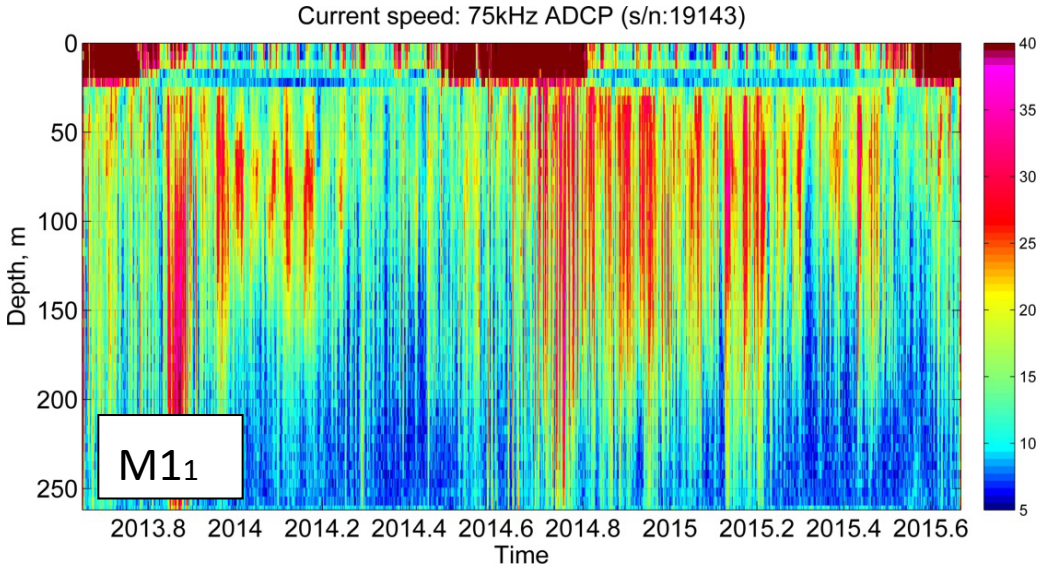


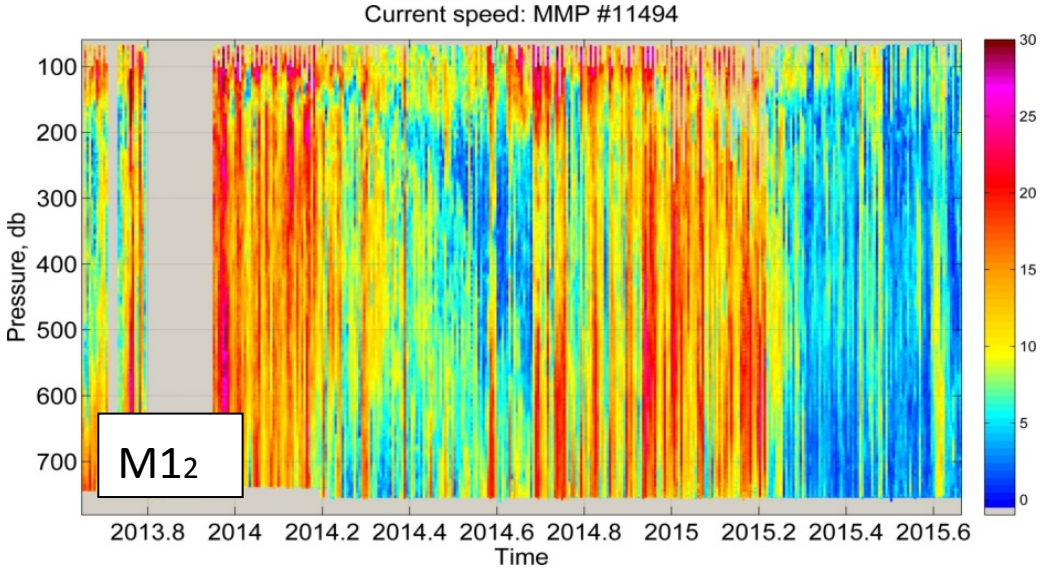


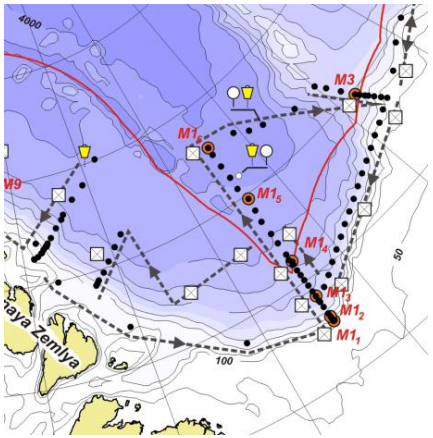
-Strong amplitude of seasonal signal (>2 °C)
- Shift in phases of T_{max}

Seasonal Amplitude (SA) of AW core temperature was ~0.4 °C (*Pnyushkov et al., 2015*) in 2007-11 or even smaller (~0.25 °C; *Dmitrenko et al., 2009*) in 2004-07

Shelf-basin Interaction

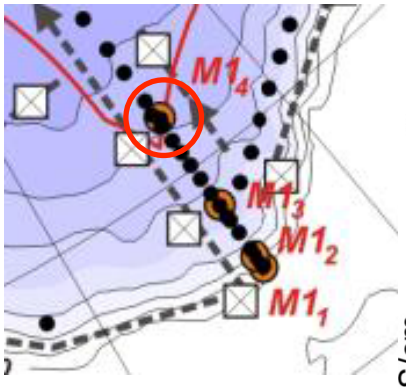




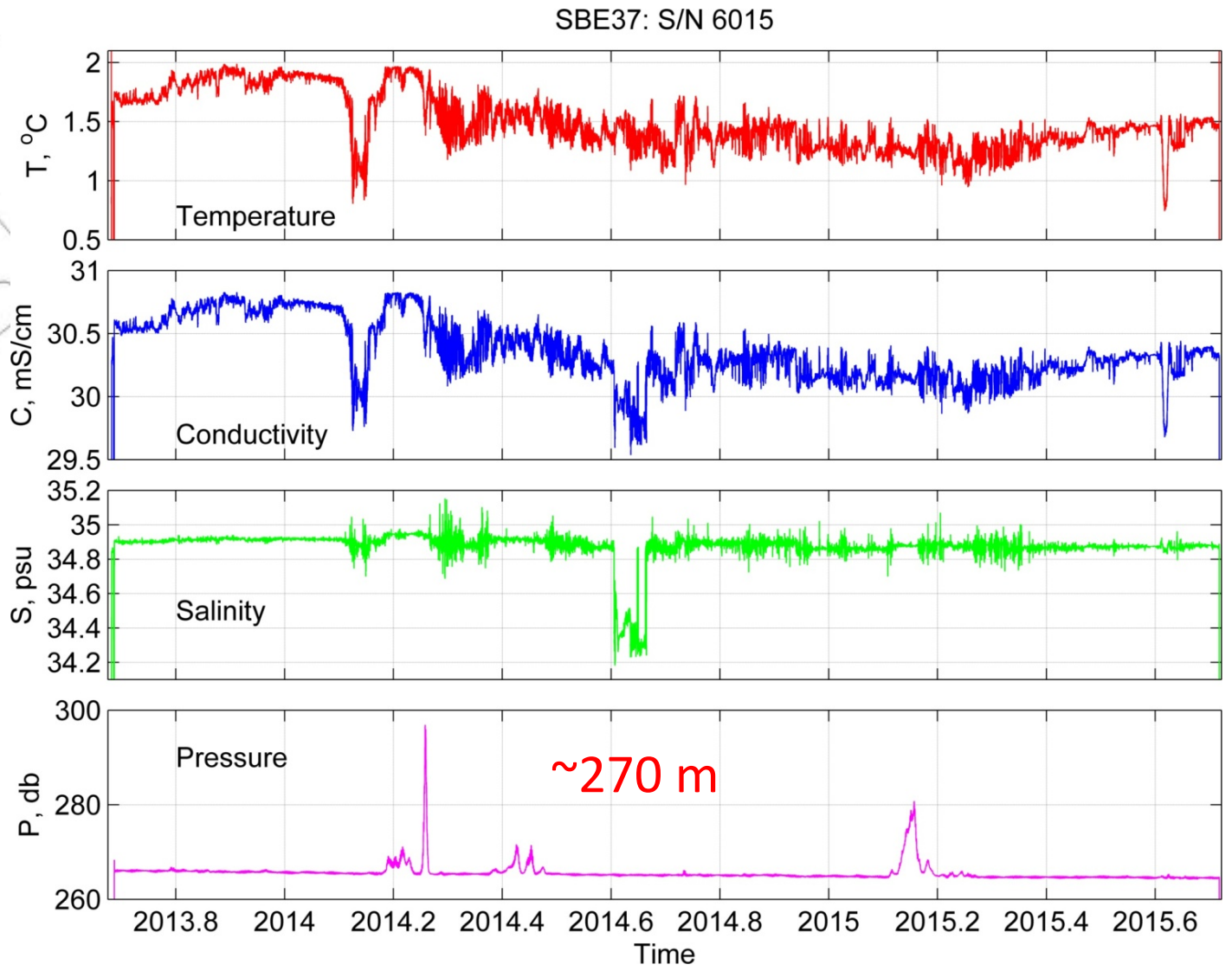


- Strong phase shift of seasonal peaks
- peaks in temperature and current speed do not match

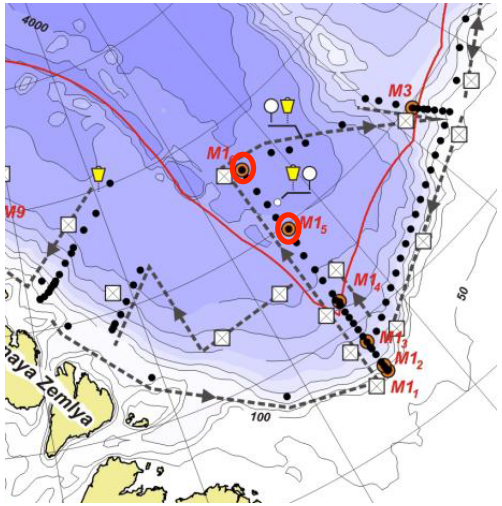
Seasonality of AW temperature



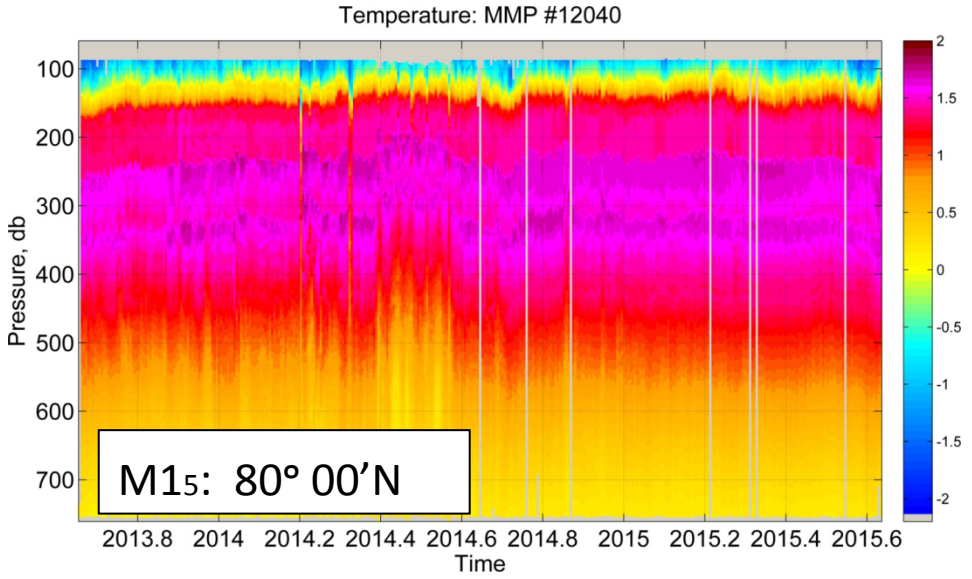
Low seasonal signal

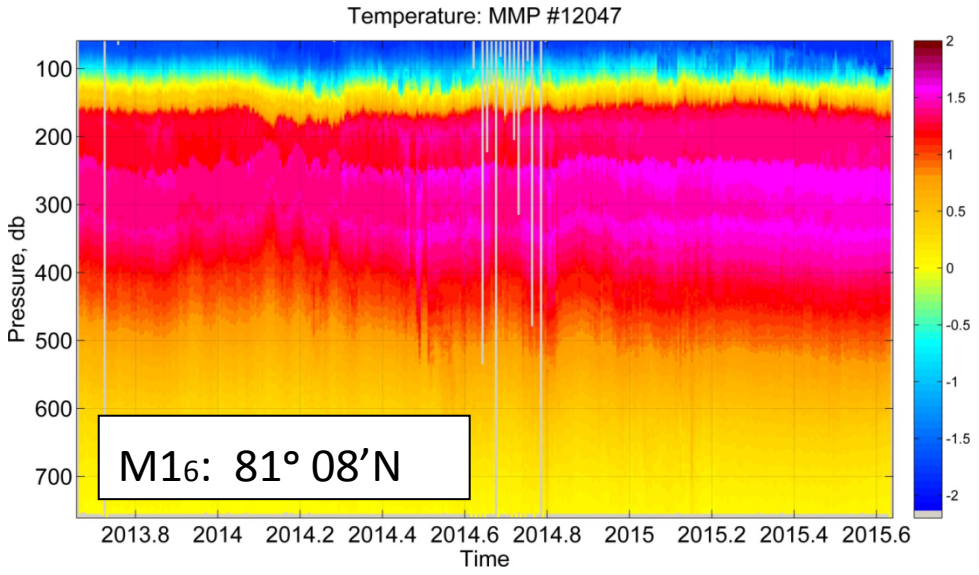


Seasonality of AW temperature

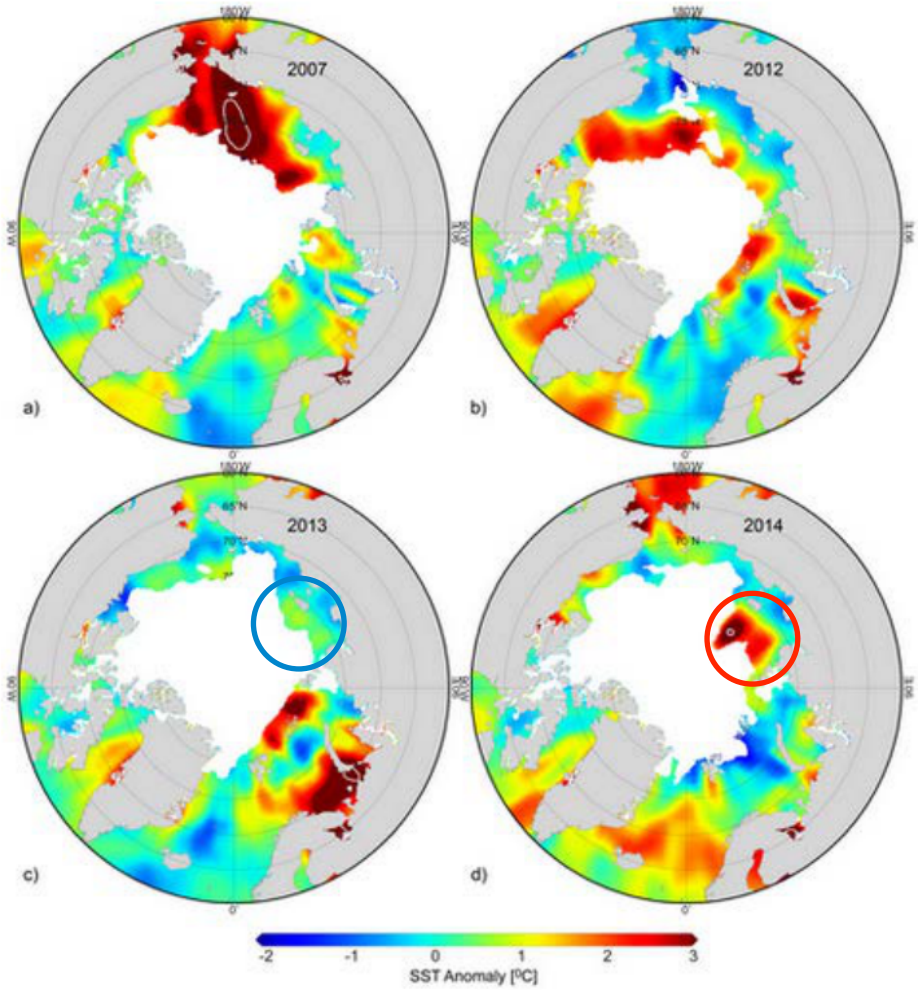


No seasonal signal



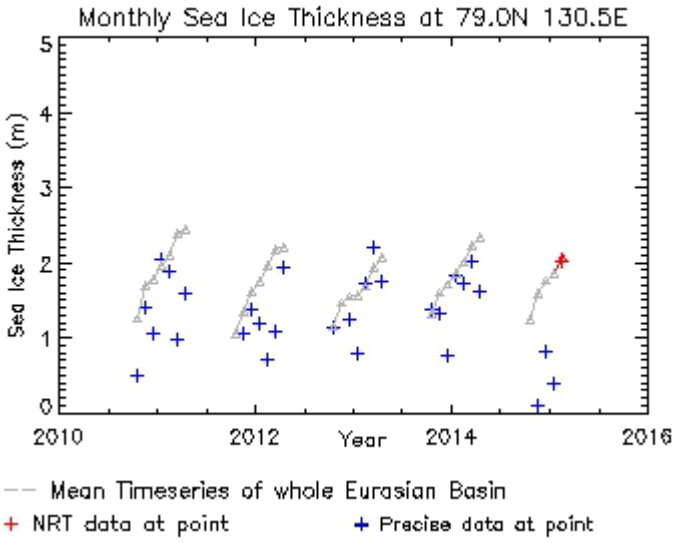


Upper ocean temperature anomalies



Arctic Report Card 2014, (arctic.noaa.gov/reportcard)

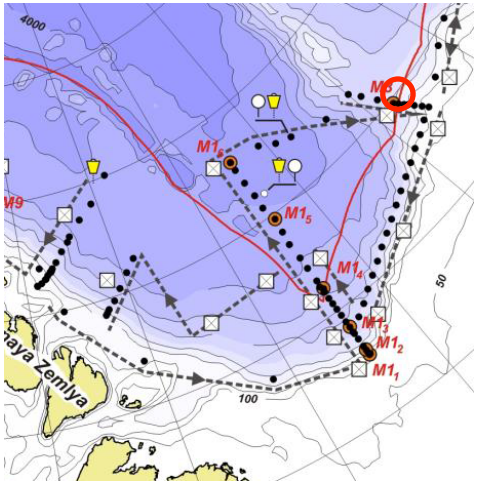
>3 °C anomaly in 2014 in the eastern EB

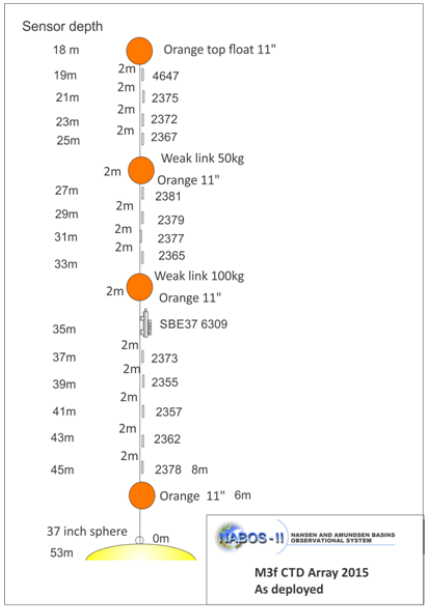


Sea Ice Thickness derived from CryoSat data (http://www.cpom.ucl.ac.uk)

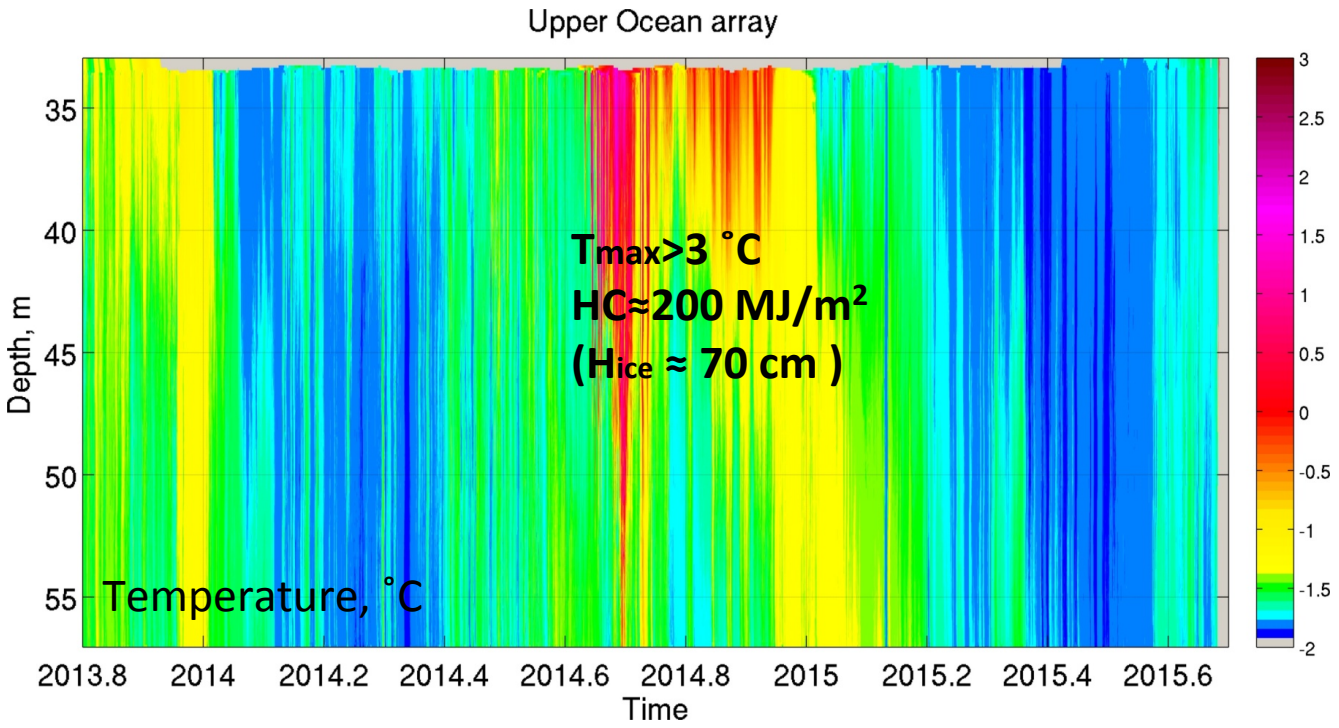
Fig. 5.2. SST anomalies [°C] in (a) August 2007, (b) August 2012, (c) August 2013, and (d) August 2014 relative to the August mean for the period 1982-2010. White shading in each panel indicates August-average sea-ice extent for each year. Grey contours indicate the 4°C isotherm.

Upper ocean temperature anomalies



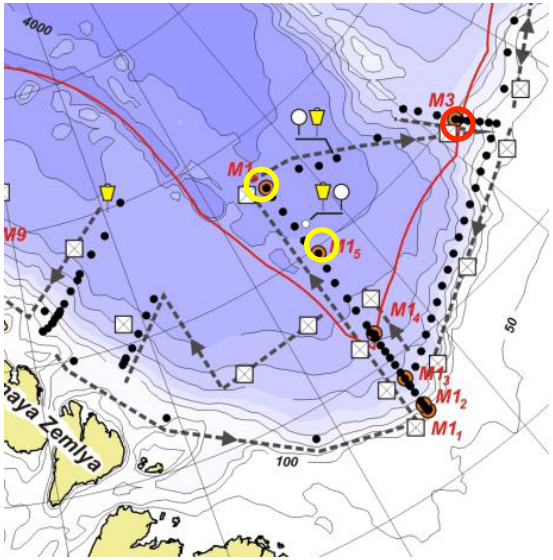


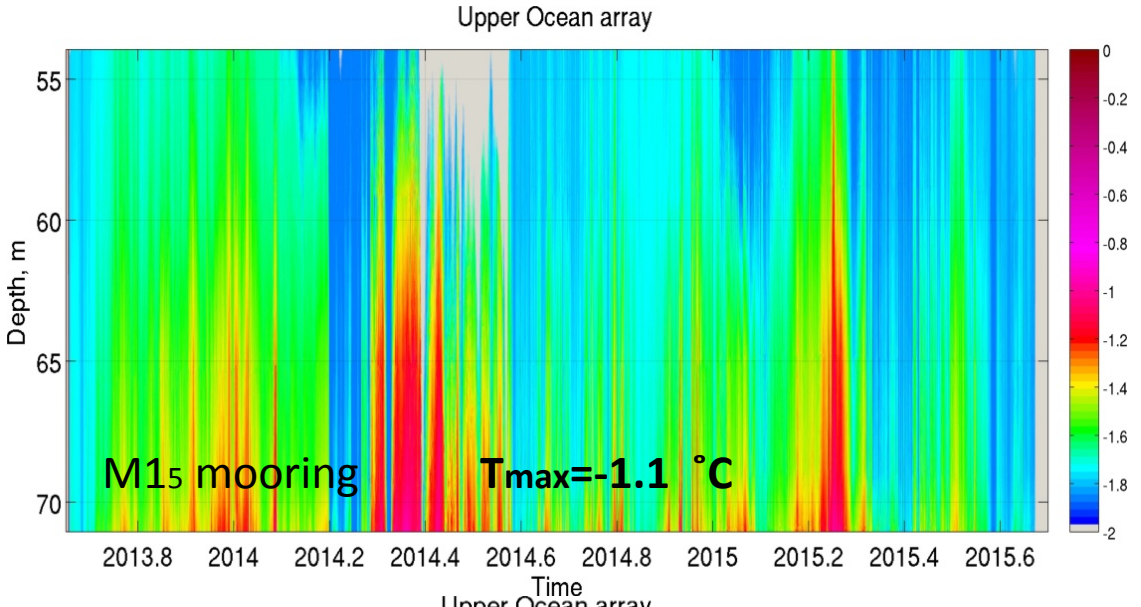
High temperatures (T_{max}>3 ˚C) at M3 mooring in 2014

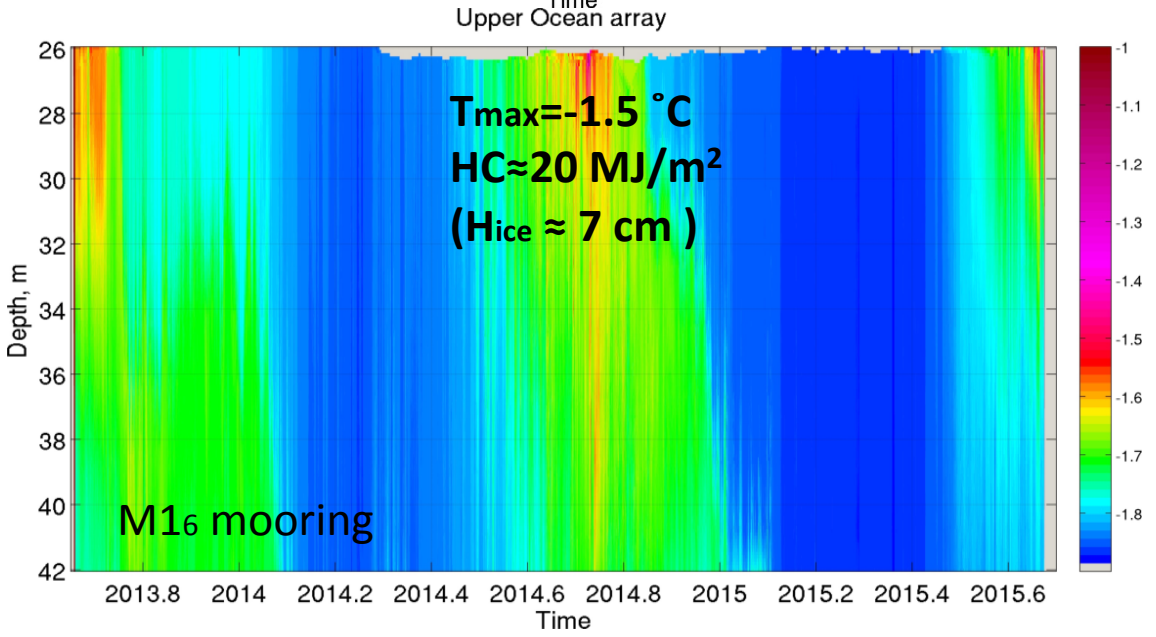


Upper ocean temperature anomalies

2014 temperature anomalies have regional flavor, likely caused by sea ice distribution

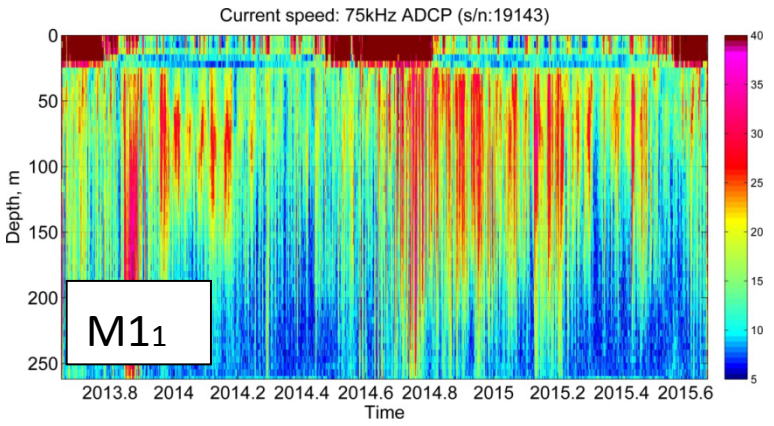


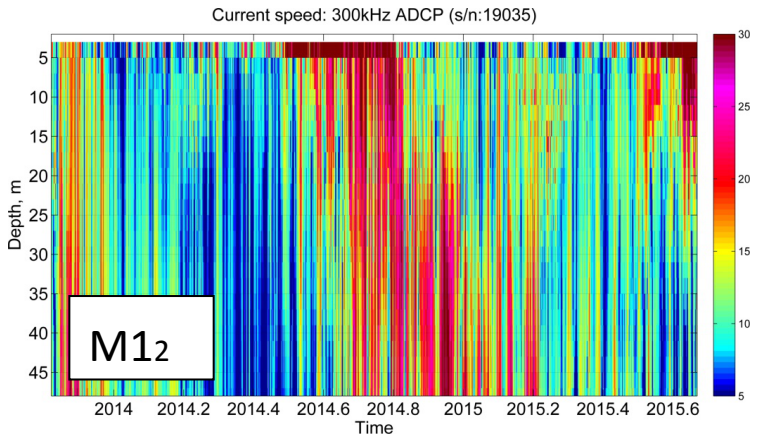


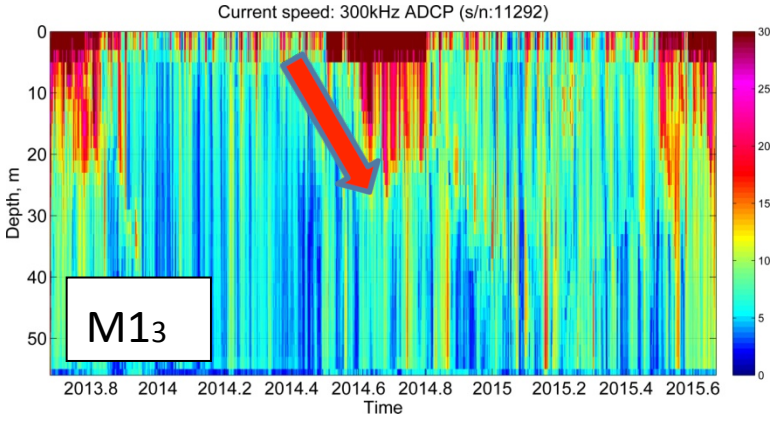


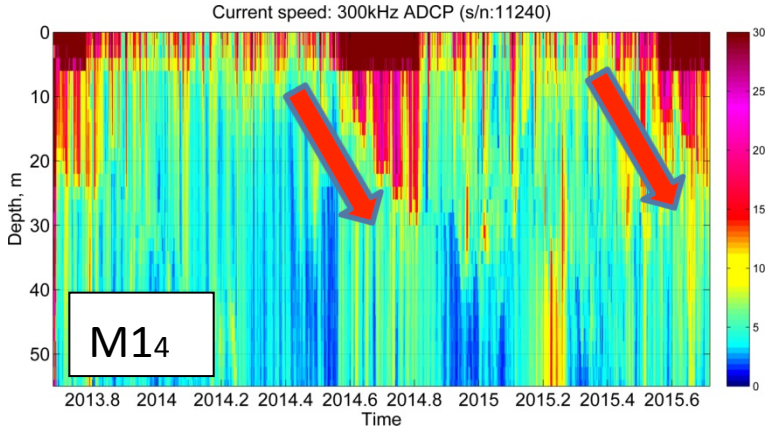
Velocity observations in the upper ocean layer

Downward propagation of NIW energy

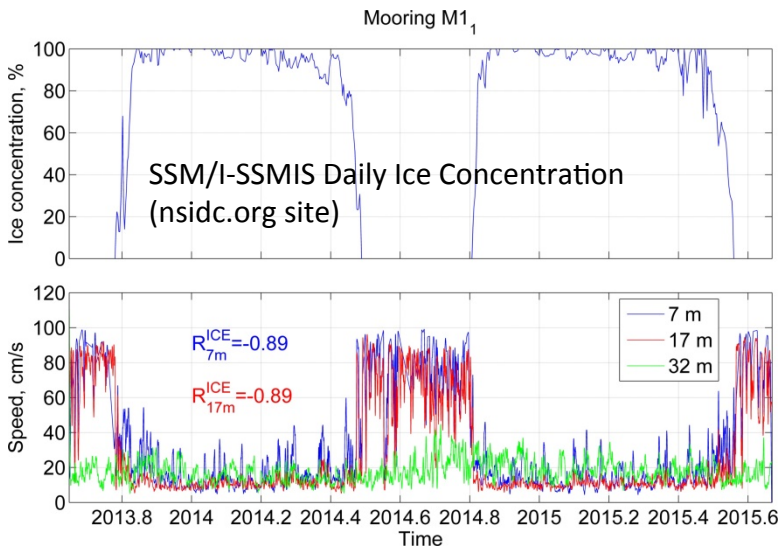


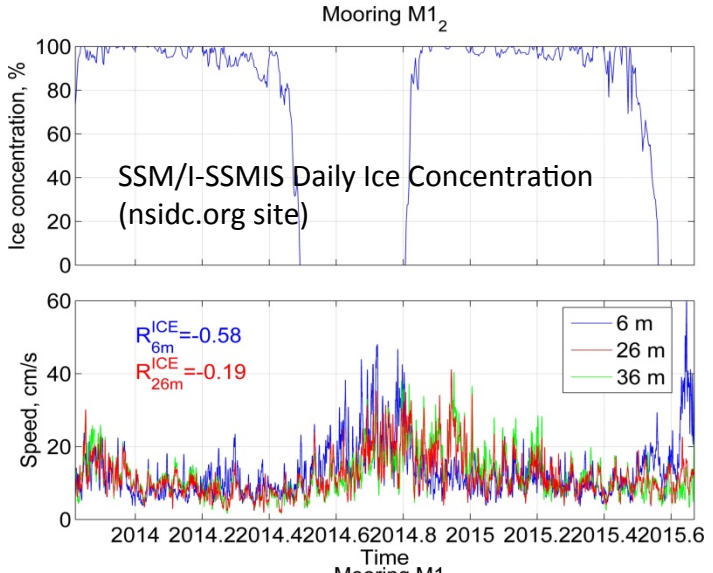


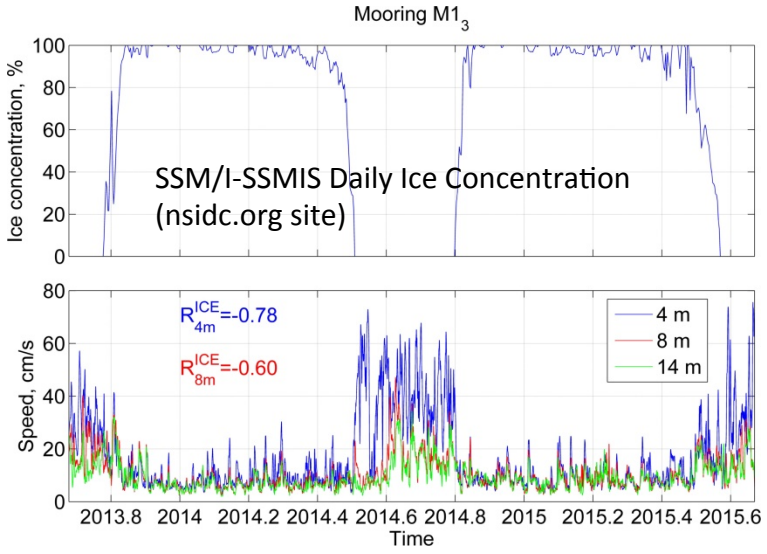


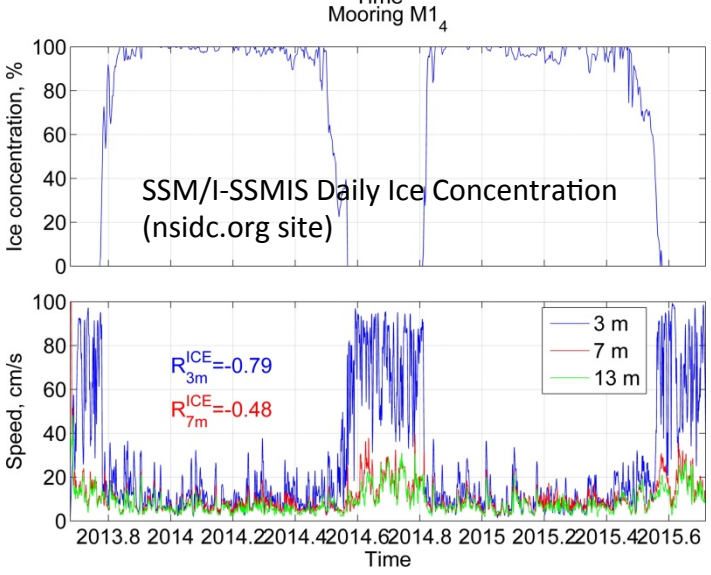


Velocity observations in the upper ocean layer









Summary

- 2013-15 NABOS observations suggest that the eastern EB is in its more dynamic state indicating possible shift to the "new Arctic".
- Instrumental measurements have revealed strong warming of the upper ocean layer in the eastern EB in 2014, potentially linked to ice conditions.
- In recent years we found indications of enhanced seasonal signal in AW temperature driven by stronger shelf-basin interaction in the EB.
- Recovered moorings allow us estimating 2013-15 heat (9.2 TW) and volume (4.2 Sv) AW eastward transports across the 125˚E section. Further observational efforts are required to evaluate interannual changes of these transports.