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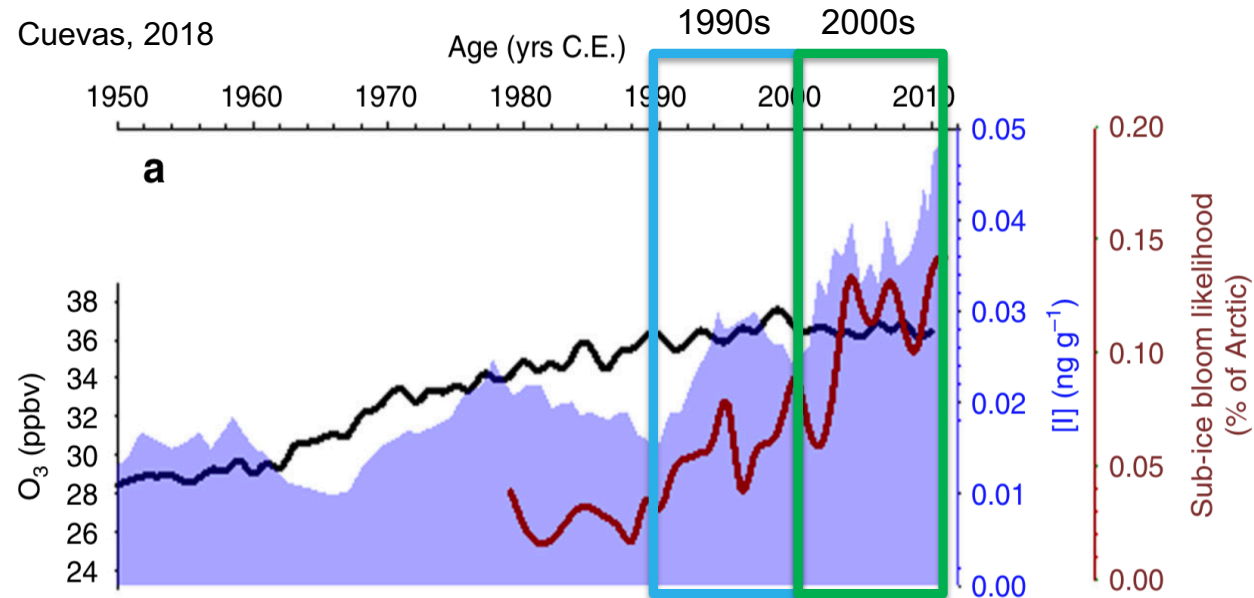
SEA ICE ACTIVITY & IODINE EMISSION

Xu-Cheng He

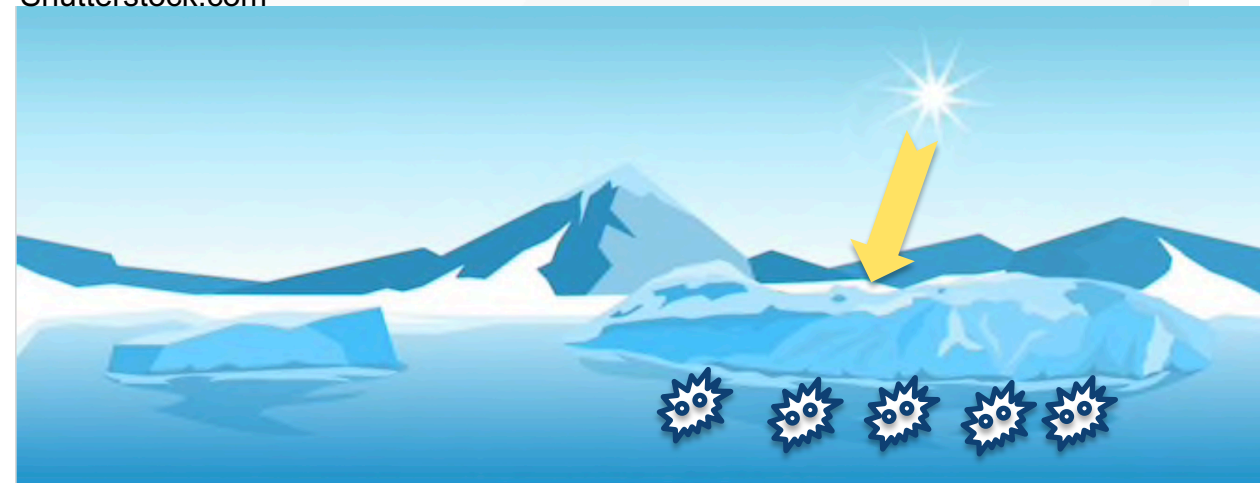


MOTIVATION & OUTLINE

- Triple atmospheric iodine in the past 70 years with rapid increase in 90s and 2000s
- Sea ice activity seems to influence the rapid increase
 - Sea ice retreating
 - Sea ice thinning



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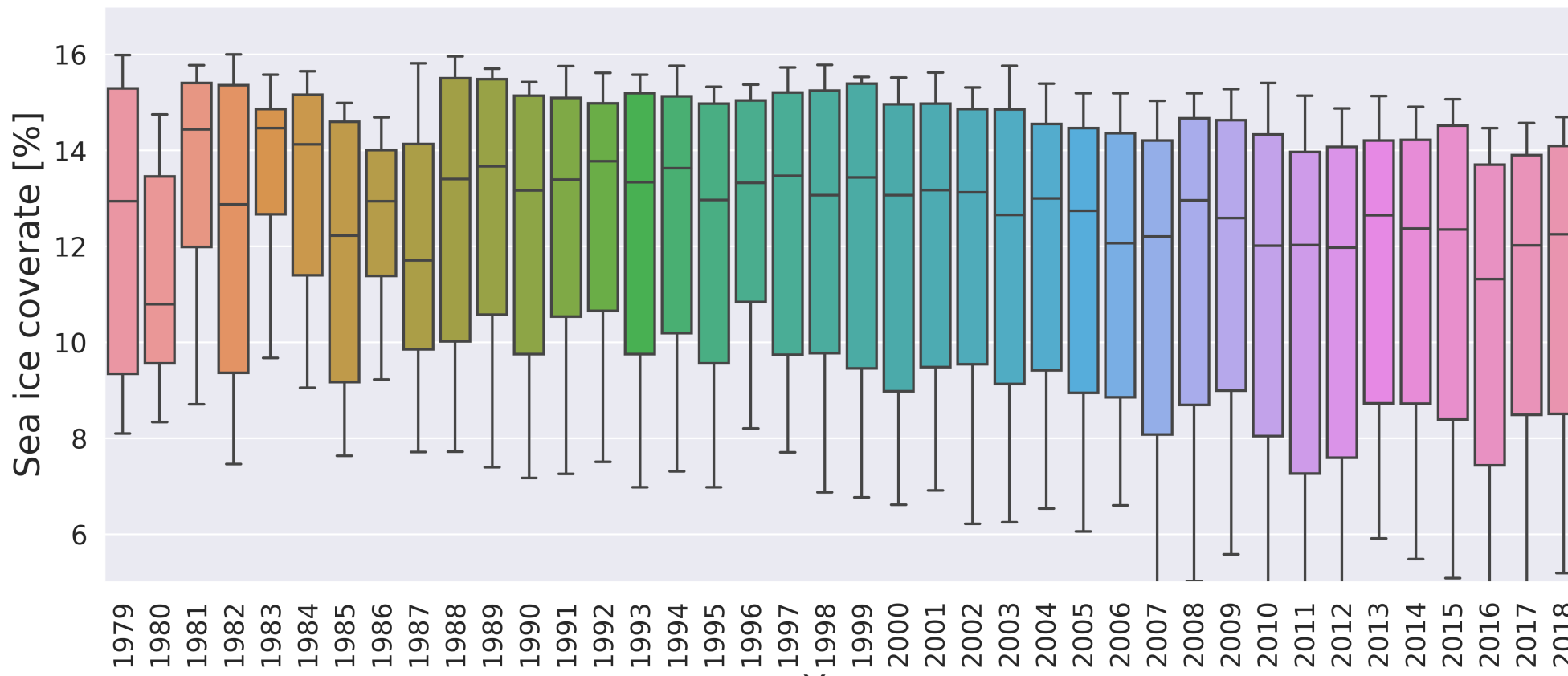


METHODS AND DATA

- Data source
 - ORAS5 reanalysis data from ECMWF for sea coverage and sea ice thickness
 - Measured sea ice thickness from CCI sea ice product (Envisat and CryoSat-2)
- Data analysis method
 - All the statistics are done between 60 °N to 90 °N
 - Data are weighted by grid areas
 - Sea ice coverage is the sea ice coverage between 60 °N to 90 °N
 - Sea ice thickness is the sea ice thickness *where there is sea ice* between 60 °N to 90 °N

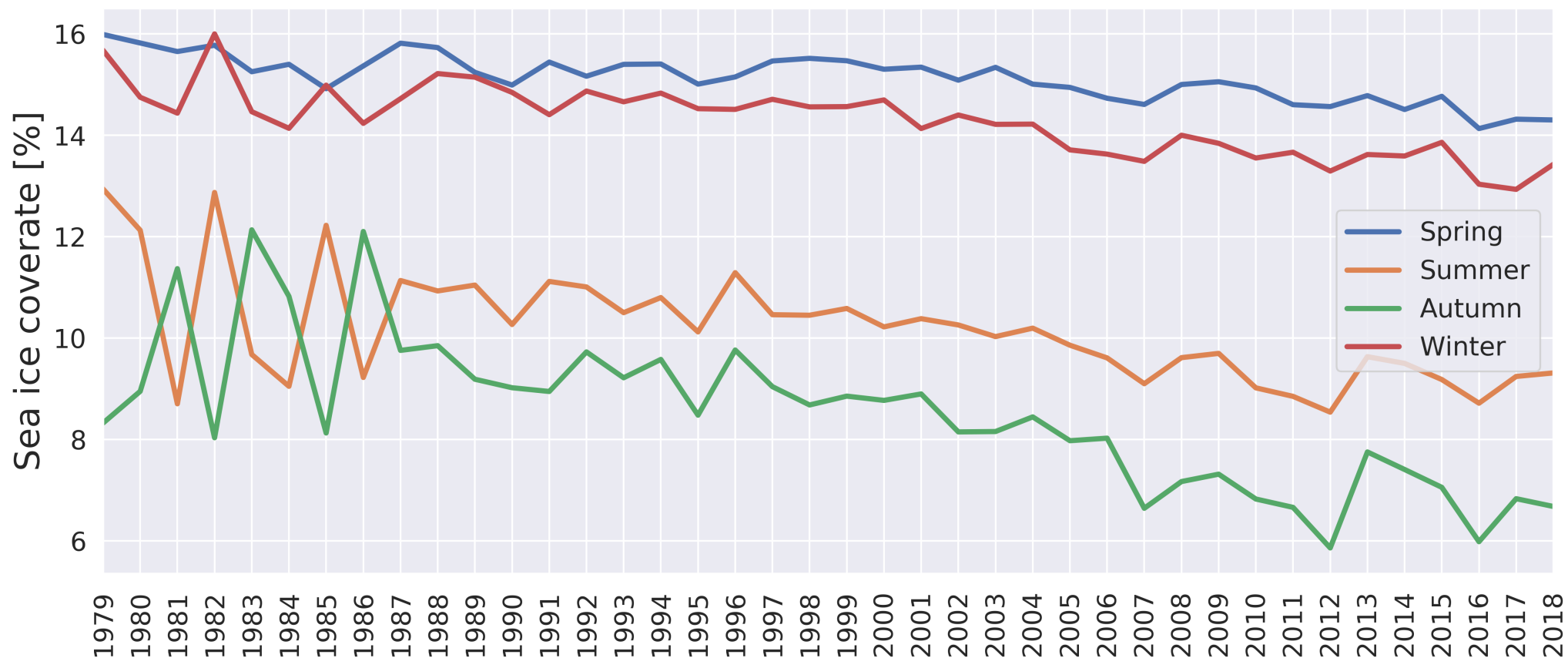


SEA ICE COVERAGE TREND (CCI)





SEA ICE COVERAGE SEASONALITY





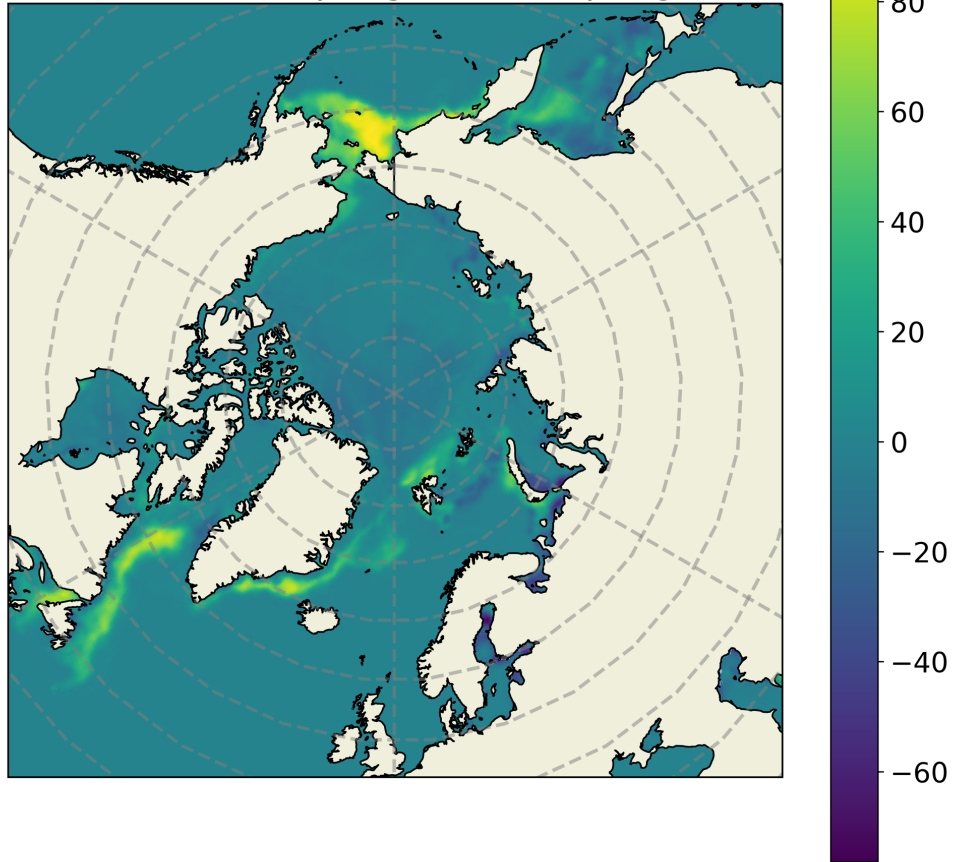
SEA ICE COVERAGE STATISTICS

Season	1990 [%] (1989 – 1991)	2017 [%] (2016-2018)	Relative change [%]	Absolute change [%]
Spring	15.223943	14.249915	-6.398	-0.974028
Summer	10.810534	9.091792	-15.898765	-1.718741
Autumn	9.053151	6.50061	-28.195063	-2.552542
Winter	14.798527	13.131146	-11.267213	-1.667382

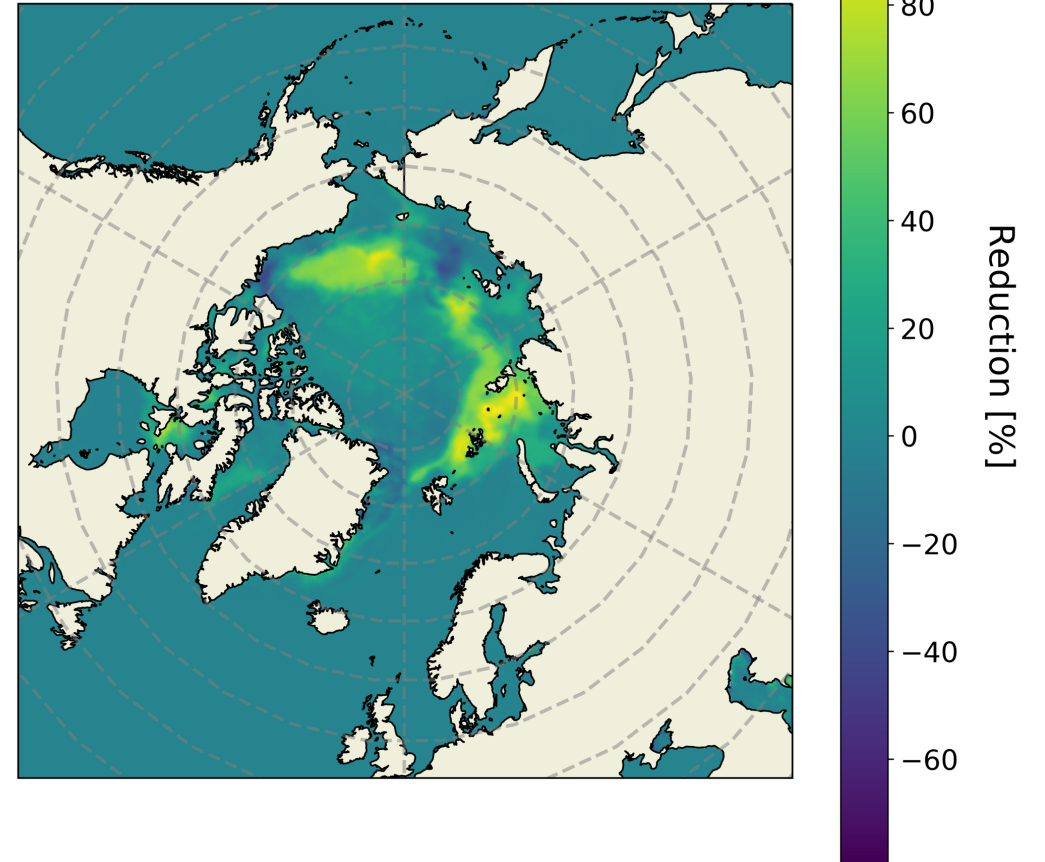


SEA ICE CHANGE SPRING AND AUTUMN

Reduction from Spring-1990 to Spring-2018



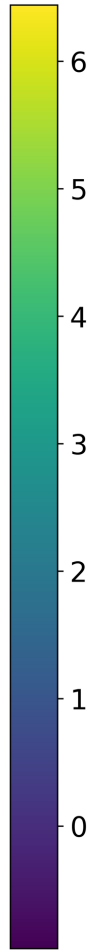
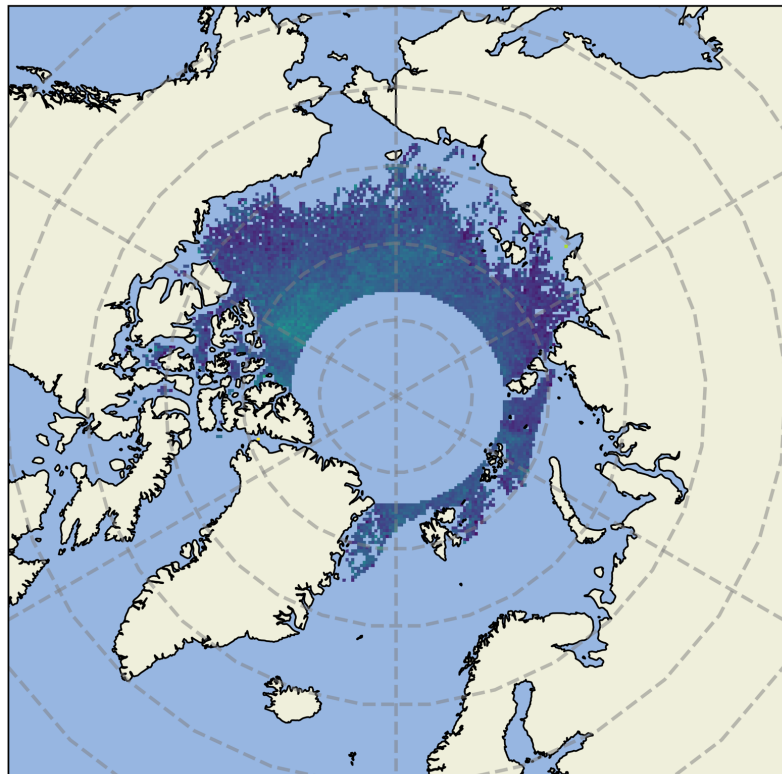
Reduction from Autumn-1990 to Autumn-2018





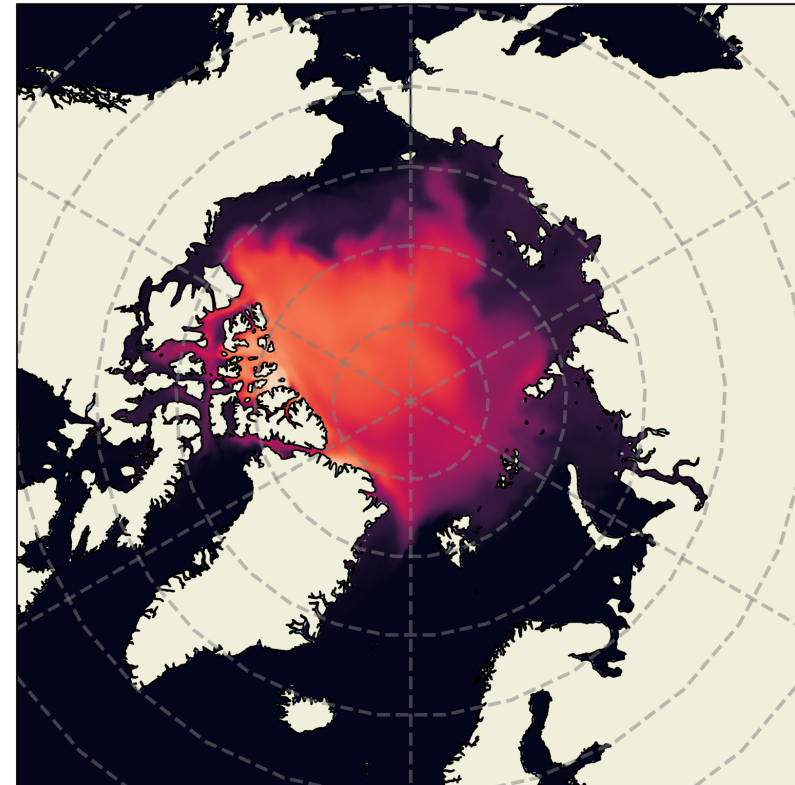
SEA ICE THICKNESS DATA COVERAGE

CCI



Sea ice thickness [m]

ORAS5

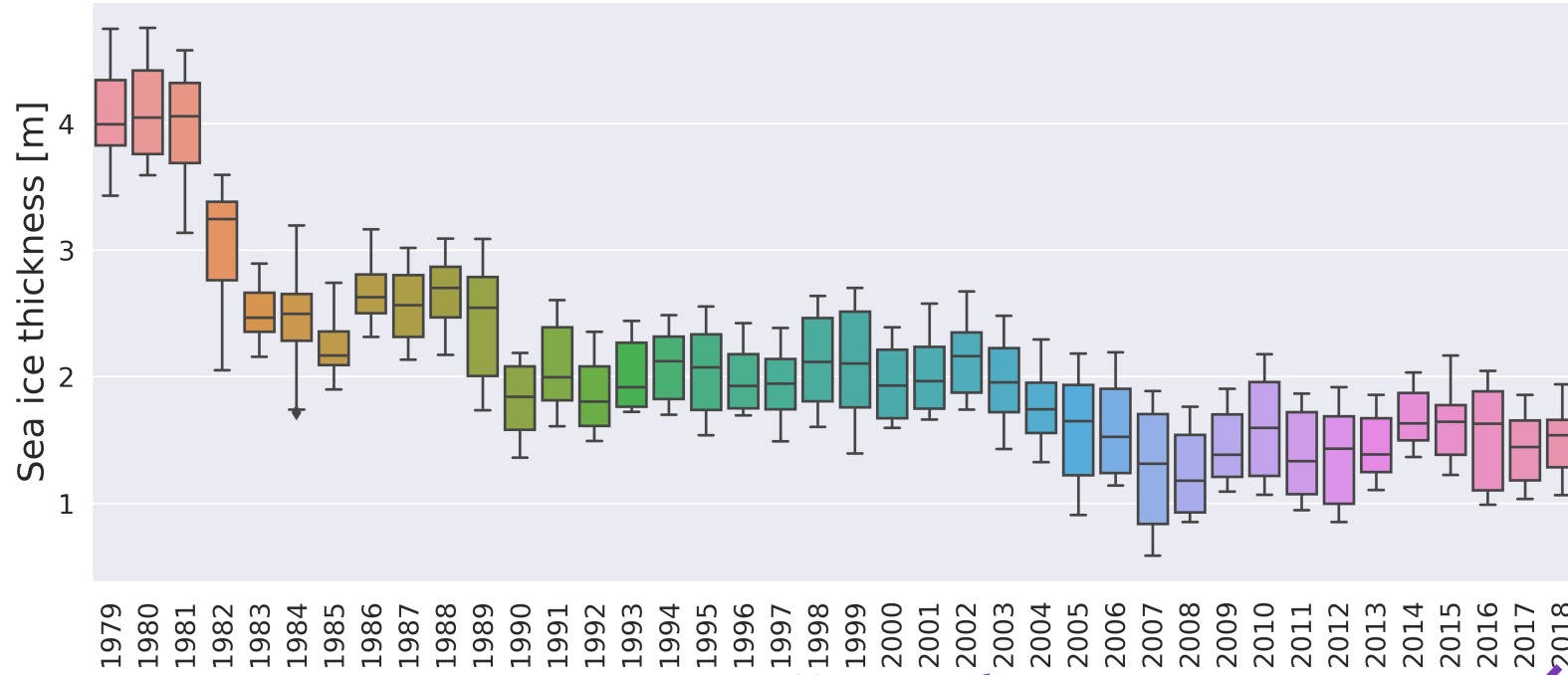


Sea ice thickness [m]

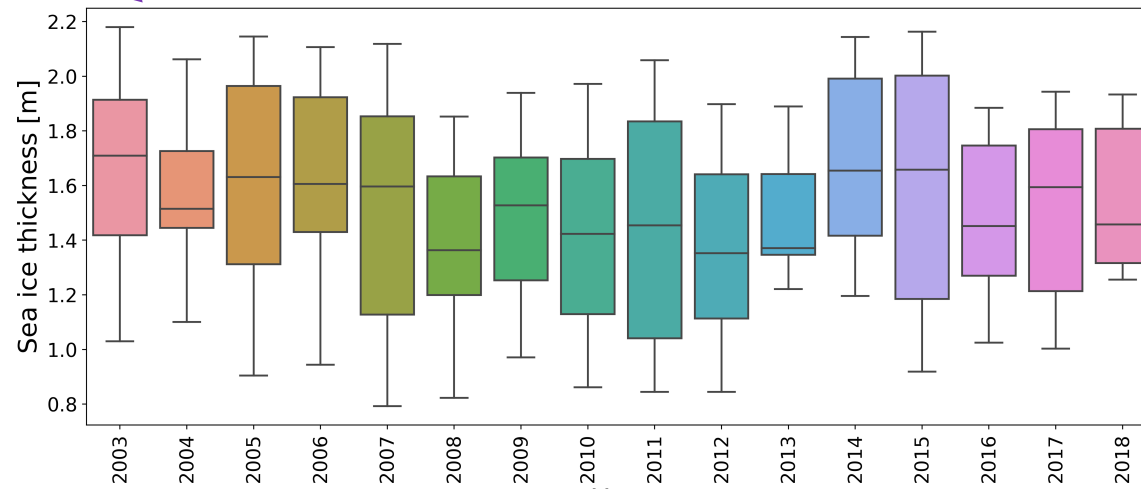
SEA ICE THICKNESS



ORAS5

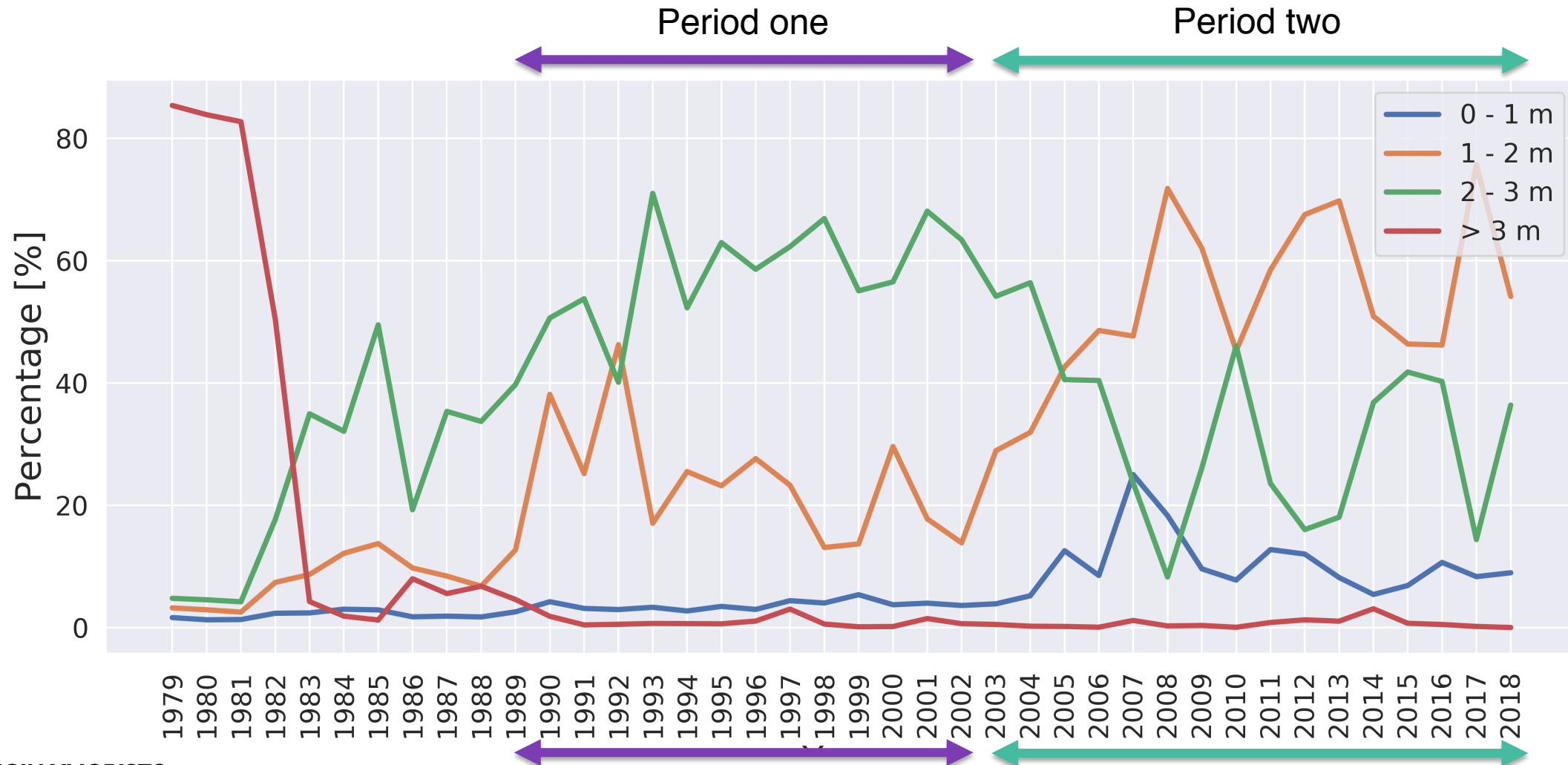


CCI





SEA ICE THICKNESS CHANGE





CONCLUSION

- Sea ice coverage
 - Sea ice coverage has been decreasing in the 30 years
 - In **Autumn**, the sea ice coverage shrunk **28%** from 1990
- Sea ice thickness
 - Sea ice thickness also has been decreasing in the past 30 years
 - Sea ice between 0 – 1 m increased **6 times** since 1990
- The moderate coverage change together with a general thinner sea ice may contribute significantly the sub-ice phytoplankton bloom, which in turn, the iodine emission to the atmosphere