

Investigation of the linkage between AMOC slowdown and North Atlantic cold blob in the past century: a modeling study

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NOAA CDWP workshop

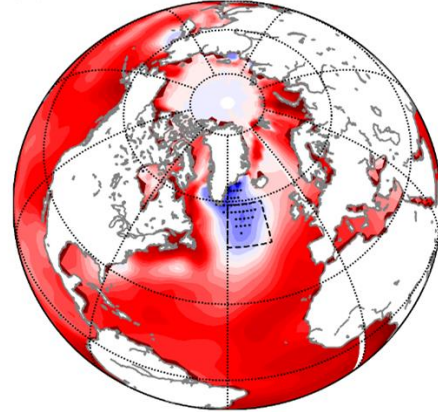
10/27/2021

Reference: Yifei Fan, Jianhua Lu and Laifang Li (2021). Mechanism of the centennial subpolar North Atlantic cooling trend in the FGOALS-g2 historical simulation. *JGR: Oceans*.

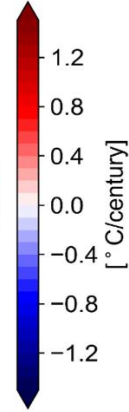
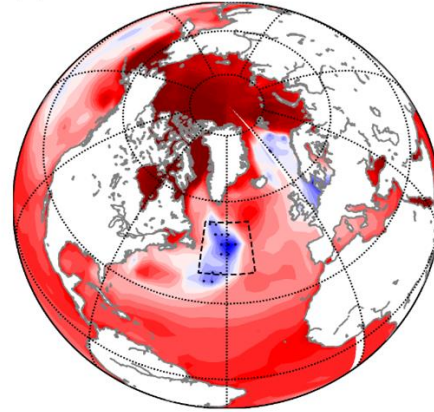
North Atlantic Cold Blob & Partial Temperature Changes

Cold Blob: **-0.5**

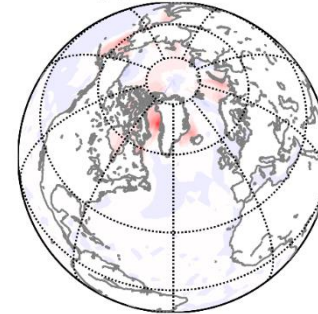
(a) NOAA ERSST °C/century



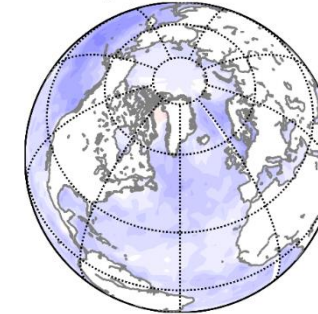
(b) FGOALS-g2 SST



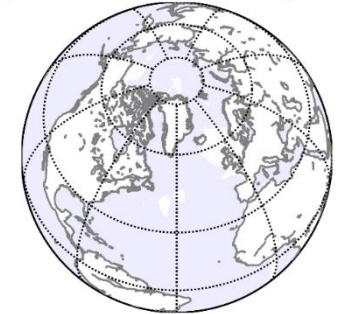
(a) T1: SAF



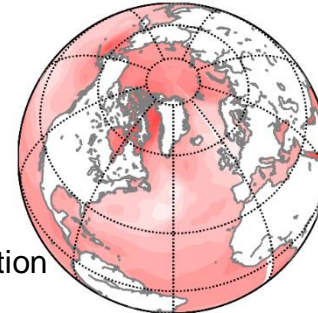
(b) T2: CRF



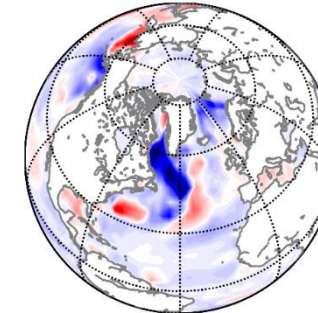
(c) T3: non-SAF ClrSky SWR



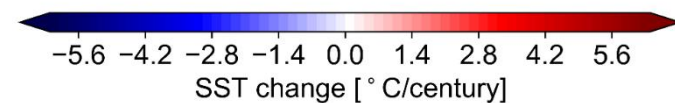
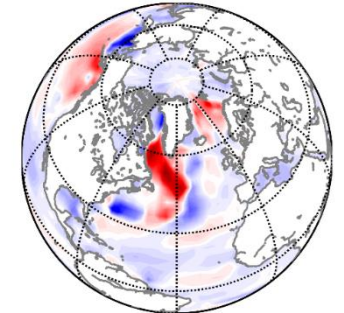
(d) T4: ClrSky LWR↓



(e) T5: Heat Storage



(f) T6: Latent/Sensibel Heat



Primary Factors

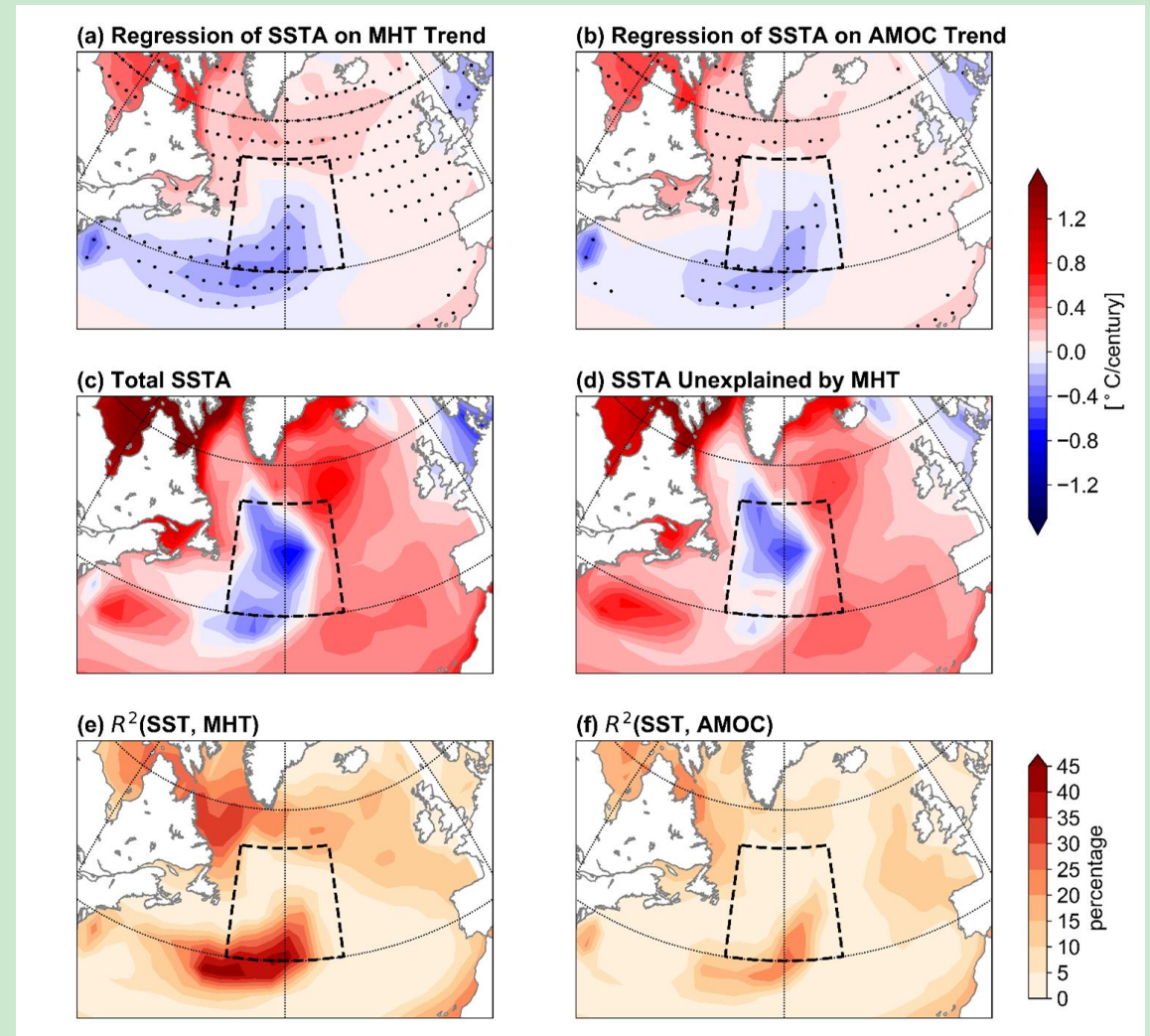
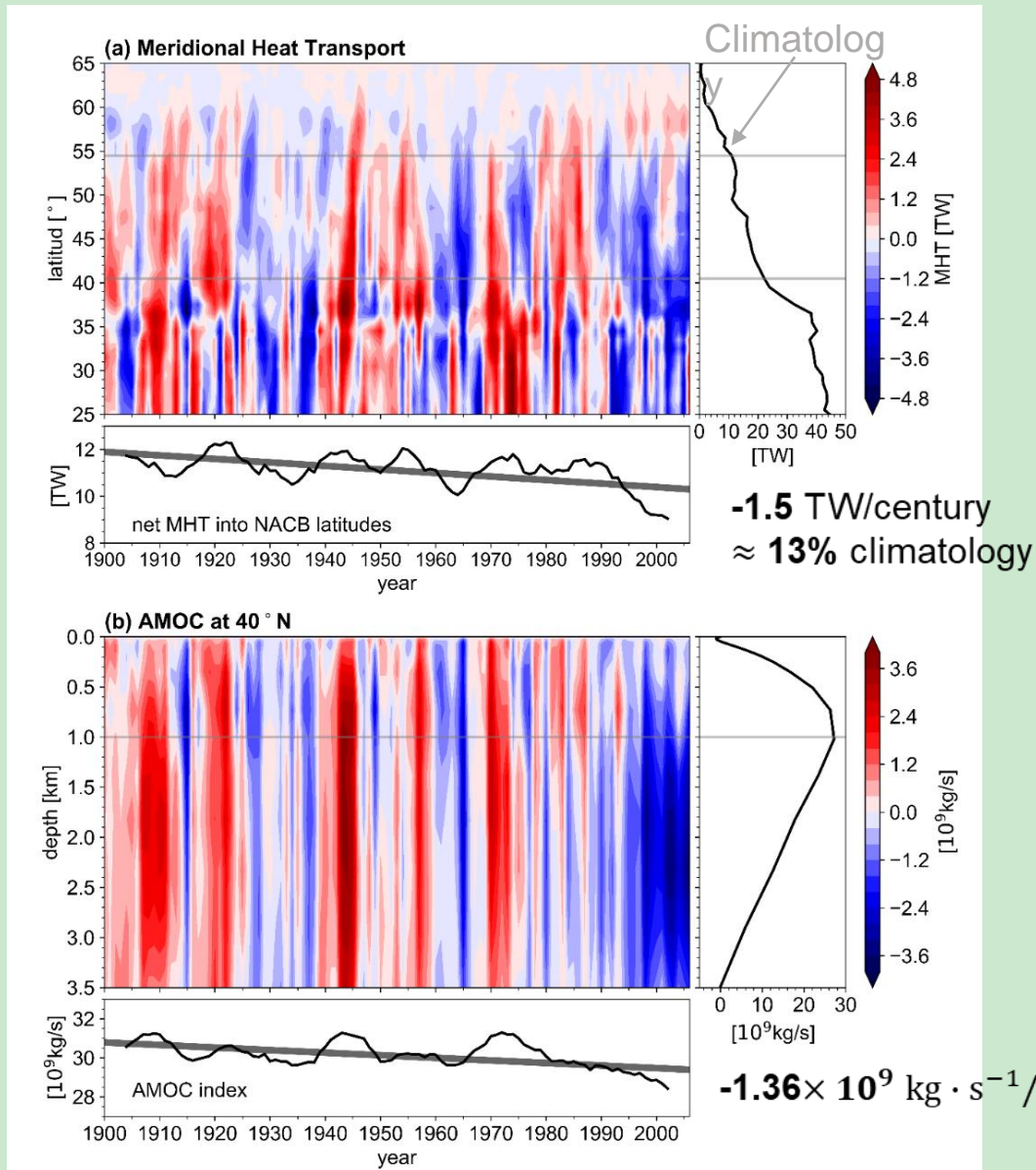
$$4\sigma\bar{T}^3\Delta T =$$

| | |
|---|--|
| $-\Delta\alpha (\overline{SW^\downarrow} + \Delta SW^\downarrow)$ | T1: Surface Albedo Feedback change |
| $+ (1 - \bar{\alpha})\Delta SW^\downarrow(\text{cld}) + \Delta LW^\downarrow(\text{cld})$ | T2: Cloud Radiative Forcing change |
| $+ (1 - \bar{\alpha})\Delta SW^\downarrow(\text{clr})$ | T3: non-SAF-induced change in clear-sky SW Radiation |
| $+ \Delta LW^\downarrow(\text{clr})$ | T4: downward clear-sky LW Radiation change |
| $-\Delta Q$ | T5: heat storage change |
| $-\Delta(\text{SH} + \text{LH})$ | T6: surface turbulent heat flux change |

Divided by $4\sigma\bar{T}^3$ → **Partial temperature changes**

Temporal period: year 1900~2006

Meridional Overturing Circulation Change & Its Limited Contribution



<
30%

