The Norwegian Climate Prediction Model (NorCPM)

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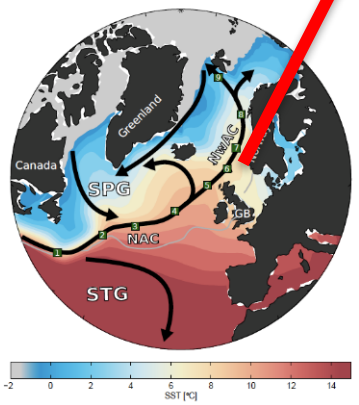
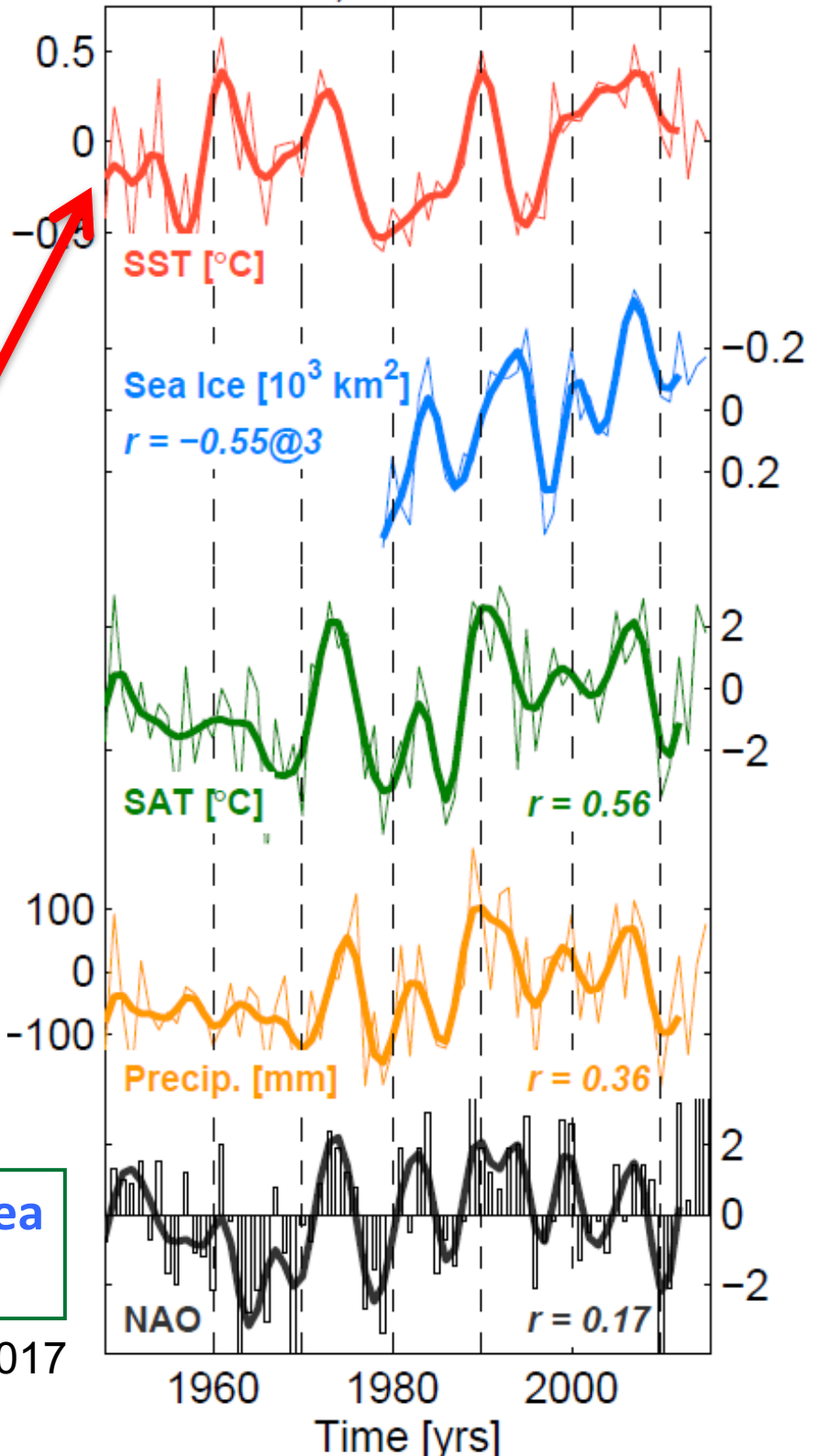
Research Focus

- ❑ Arctic - North Atlantic climate
- ❑ Decadal prediction
- ❑ S2S and seasonal prediction *(newer)*





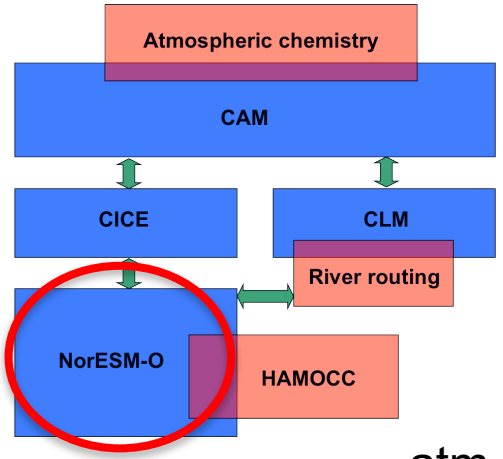
Oceanic influence

- Norwegian **SAT**, **precipitation**, and Arctic **sea ice** co-vary with Norwegian Sea **SST**.

Årthun et al., Nat. Comm., 2017

Norwegian Climate Prediction Model (NorCPM): ensemble re-analyses

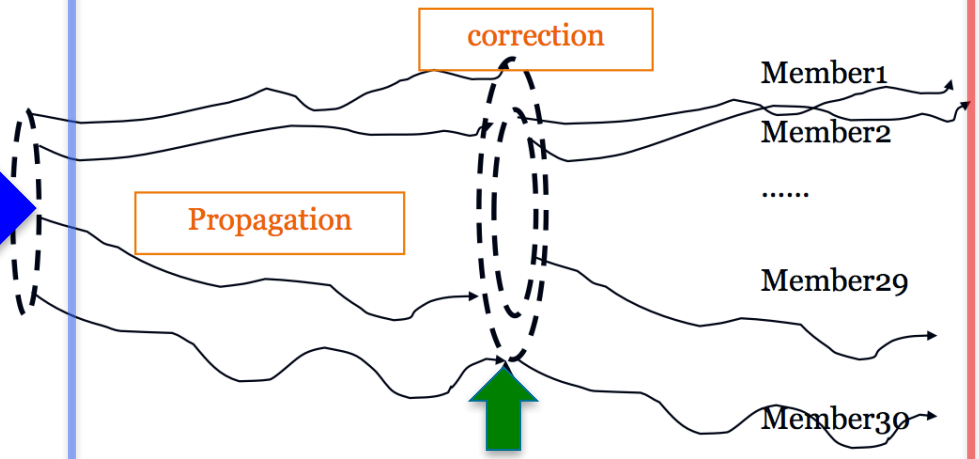
Earth System model (NorESM1-M)



atm 2°; ocean+ice 1°

30 members

Data assimilation (EnKF)



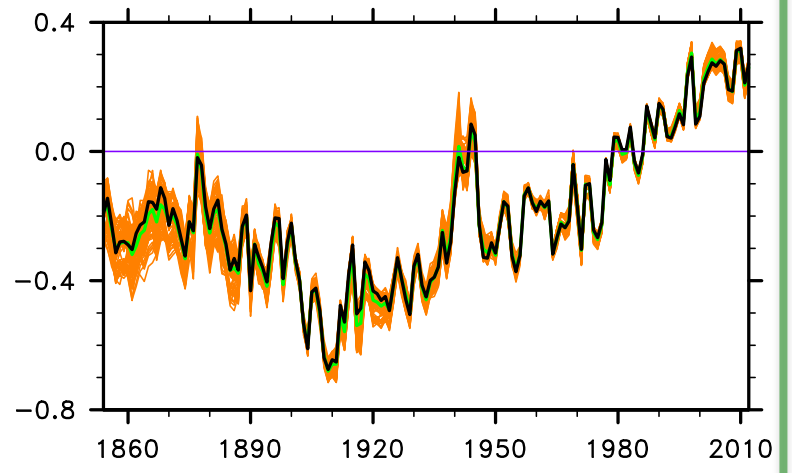
Multidecadal reanalysis: 1980-2016

V0 system: **SST anom**
V1 system: (**SST + ocean Temp-Salinity) anom**
V2 system: **+ Sea Ice-concentration (in progress)**

Counillon F. et al., Tellus 2014 & 2016

observations

HadISST2 anom (monthly)



Norwegian Climate Prediction Model (NorCPM) : S2S hindcasts

(used in SNOWGLACE initiative)

For initialisation :

- Land: **land model (CLM) off-line run**
- Atmosphere: **nudging to ERAINT**
- Ocean & sea ice: **NorCPM re-analyses (V1)**

Followed by 2nd-stage nudging with full coupled model over 2 weeks, to harmonize the different components (applied each individual ensemble member)

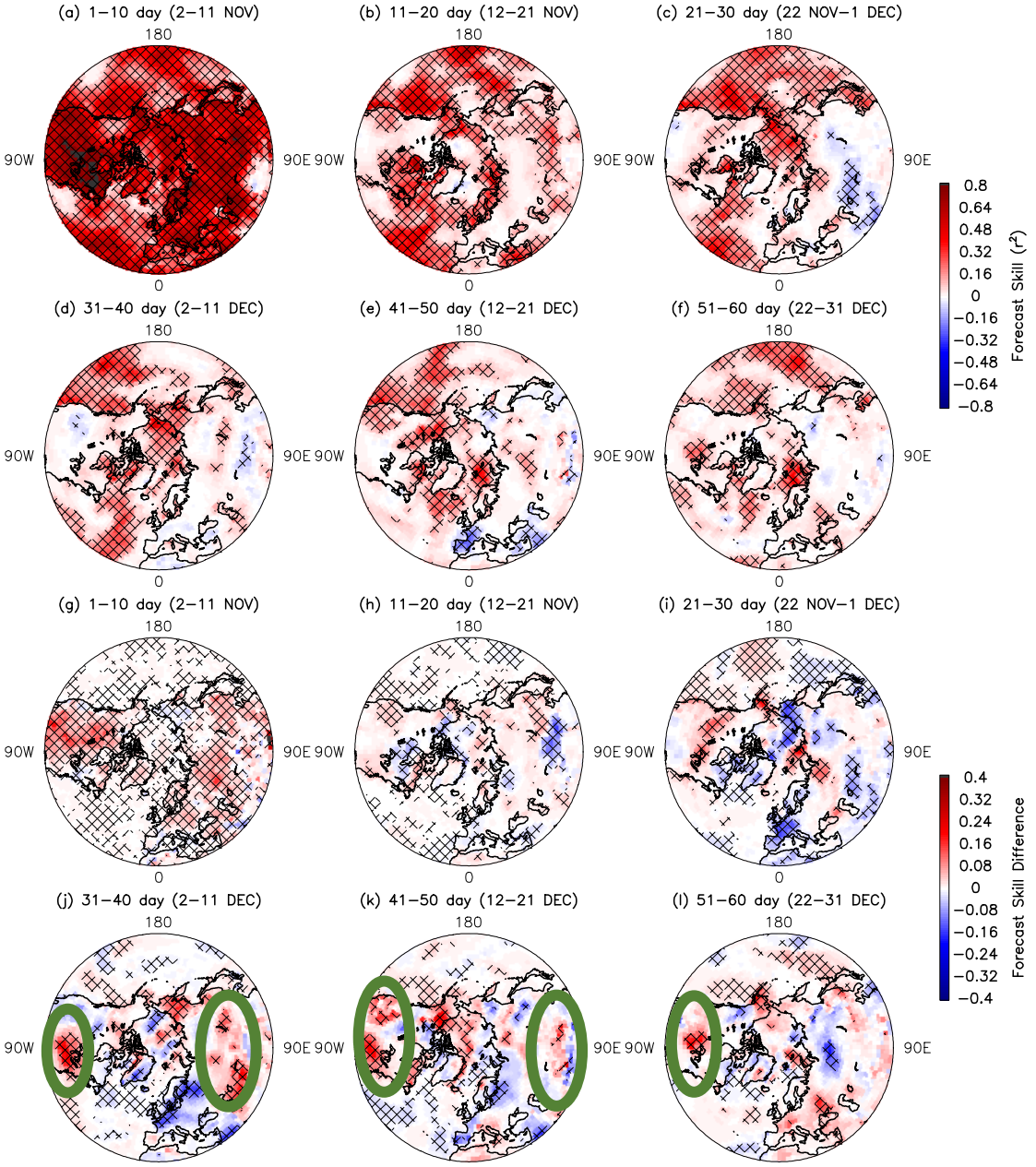
Other features :

Ensemble Generation : members from Ocean re-analyses (30#)

High-top model (WACCM) : 140 km (full stratospheric chemistry, incl. interactive ozone)

Period: 1985-2016, 30-member

Ensemble of retrospective S2S winter forecasts (1985-2016) with Norwegian Climate Prediction Model (NorCPM) : role of snow initialisation



Skill: Series 1
(realistic initialisation)

2m Air Temperature

6 lead times (0-day to 50-day) ; start date : NOV 1

Skill increment : Series 1 minus Series 2
(gain from realistic vs. degraded snow initialisation)

Moderate skill increment (0.3-0.4) at southern edge of continental snowpacks at long leads (analogous to soil moisture – Koster 2010)

F. Li, Y. Orsolini, N. Keenlyside, M.-L. Shen, F. Counillon, Y. Wang, Impact of snow initialisation in subseasonal-to-seasonal winter forecasts with the Norwegian Climate Prediction Model , submitted to JGR special issue on Bridging Weather and Climate: Subseasonal-to-Seasonal (S2S) Prediction, submitted April 29, 2019

Conclusions

- Weakly coupled data assimilation of SST, oceanic temperatures and salinity, sea ice anomalies using EnKF has potential for skilful long-term reanalysis (currently 1980-present, in future 1850-present)

- NorCPM with only SST achieves competitive skill in seasonal predictions compared to NMME systems. Wang Y. et al. (2019), in review.

- Use to test impact of snow initialisation in S2S forecast
  Li, F., Y. Orsolini et al. (2019), submitted to JGR.

Emerging issues

- Role of stratosphere : fully coupled chemistry-dynamics in a high-top framework

(Role of initial ozone anomalies, …)

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RESERVE SLIDES

SLP in winter

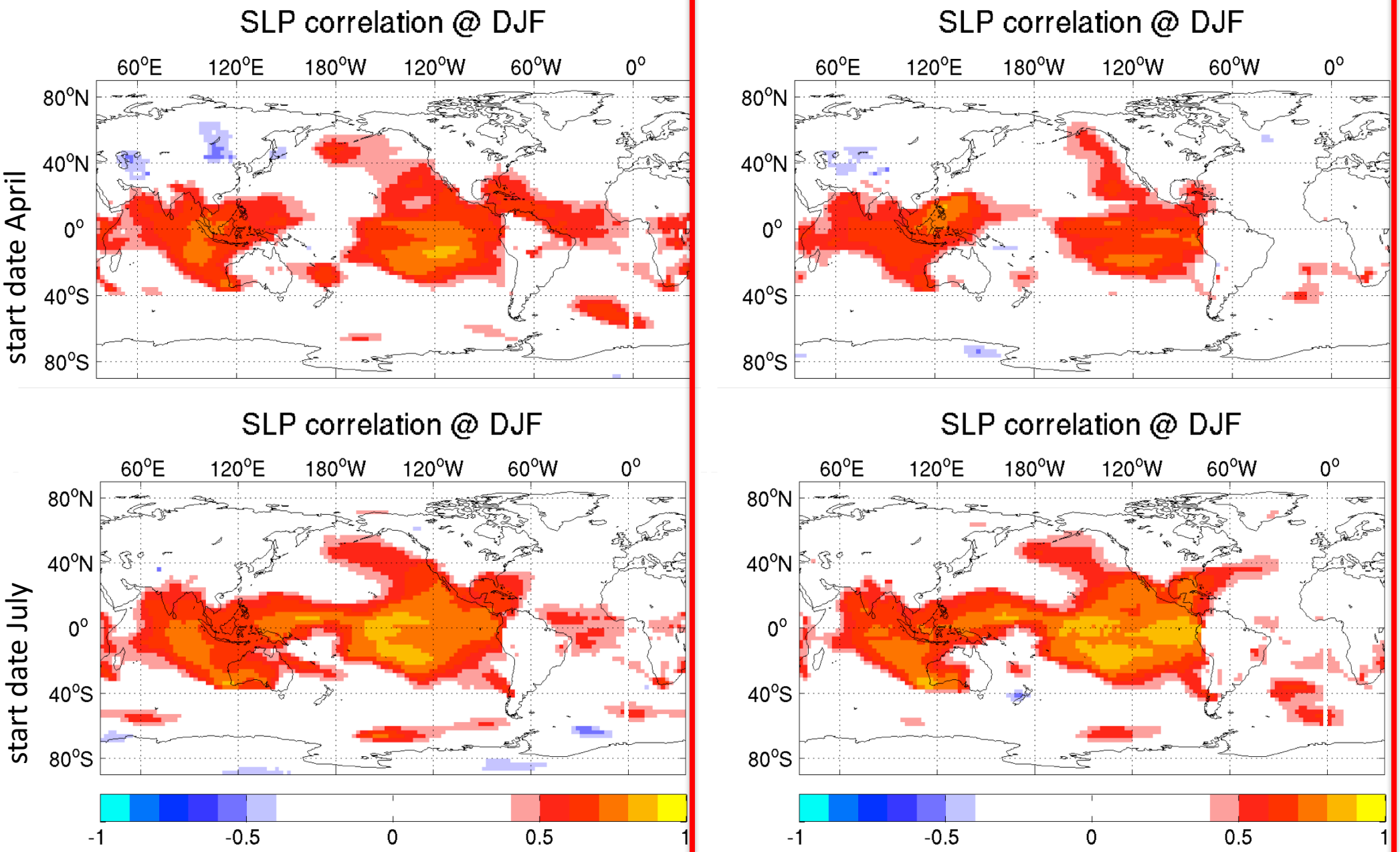
Anomaly Correlation (NCEP) 1985-2010

Initialisation with SSTA

Initialisation with SSTA, T-S A

start date April

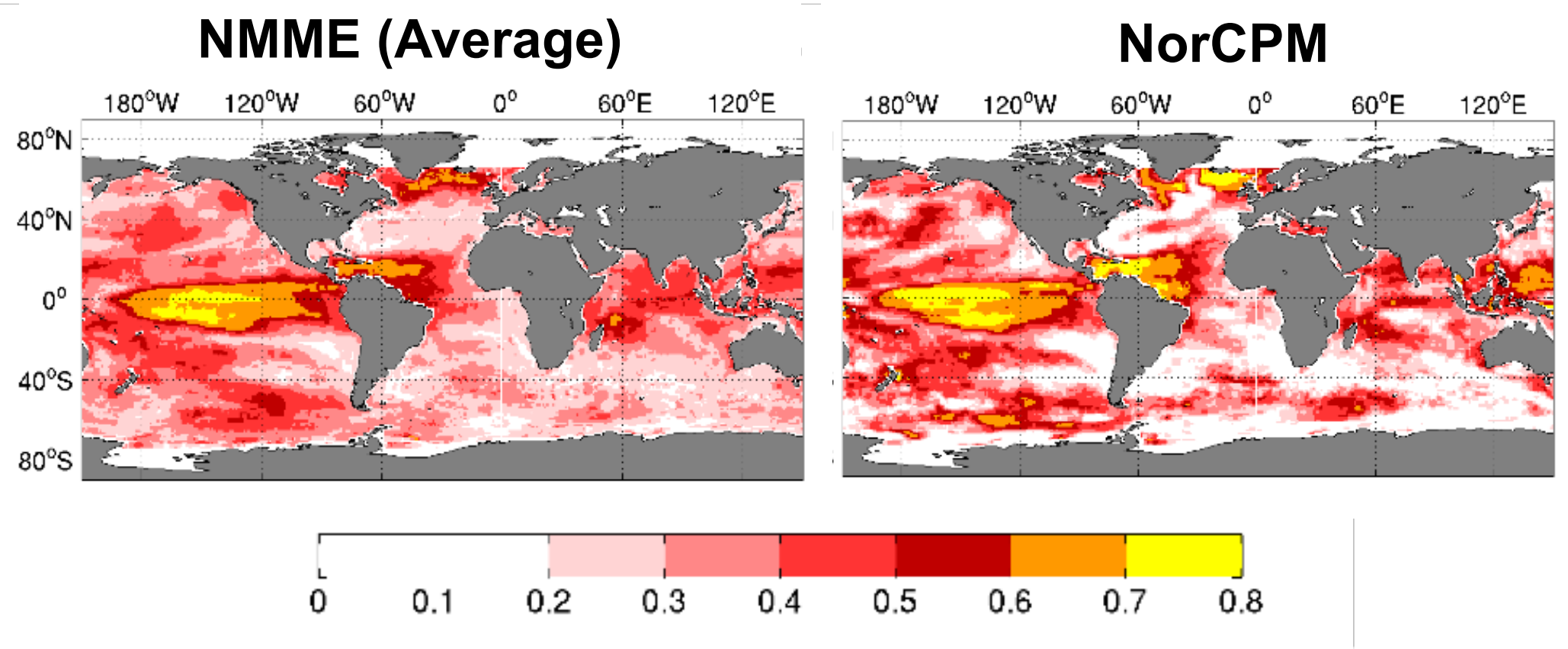
start date July



Courtesy of Yiguo Wang

Anomaly correlation skill, 6-month predictions, SST

NorCPM, North American Multimodel Ensemble



Emerging issues

- Role of stratosphere : fully coupled chemistry-dynamics, high top

(Role of initial ozone anomalies, …)