Pacific decadal oscillation hindcasts in LASG/IAP coupled climate model FGOALS_g2.0
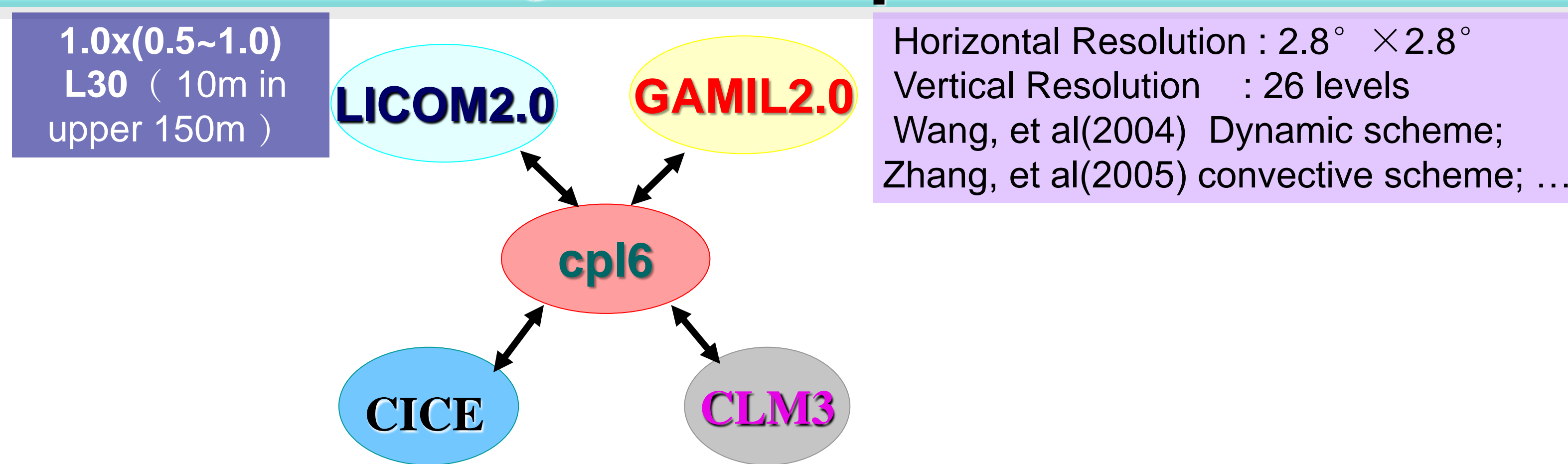
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① Objective & Method

➤ This study performs sets of hindcasts to examine the predictability of the PDO.

➤ Nudging is used to assimilating the observation into the model.

➤ EOF analysis is applied to reveal the spatial pattern of PDO

② Model & Experiment

1.0x(0.5~1.0)
L30 （10m in upper 150m）

LICOM2.0   GAMIL2.0

cpl6

CICE   CLM3

Horizontal Resolution : 2.8°×2.8°
Vertical Resolution   : 26 levels
Wang, et al(2004) Dynamic scheme;
Zhang, et al(2005) convective scheme; …

➤The coupled model was integrated for 200 years, the middle 100 years monthly output as control experiment are used for analysis.

➤The ocean temp. and salt. are assimilated into the model to integrate 10 years and a 10 year hindcast .
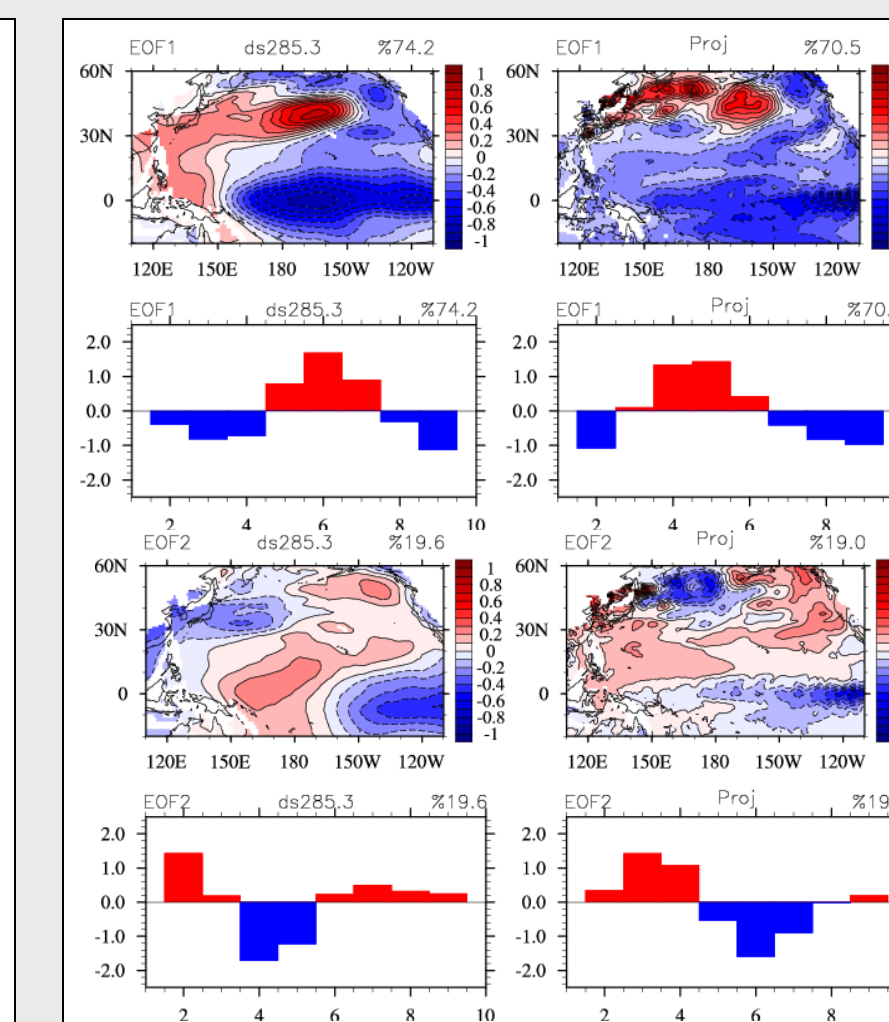
③ Results

PDO Index   FGOALS_g2.0

EOF1 FGOALS_g2.0 %24.9   EOF2 FGOALS_g2.0 %17.2
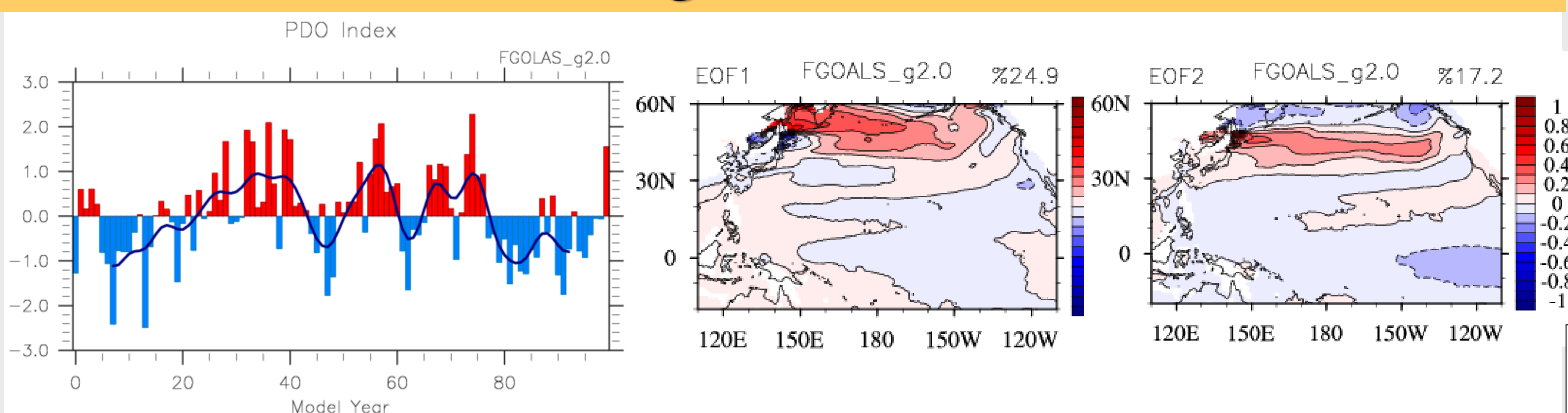
➤FGOALS_g2.0 is shown to capture the major signal of the PDO.
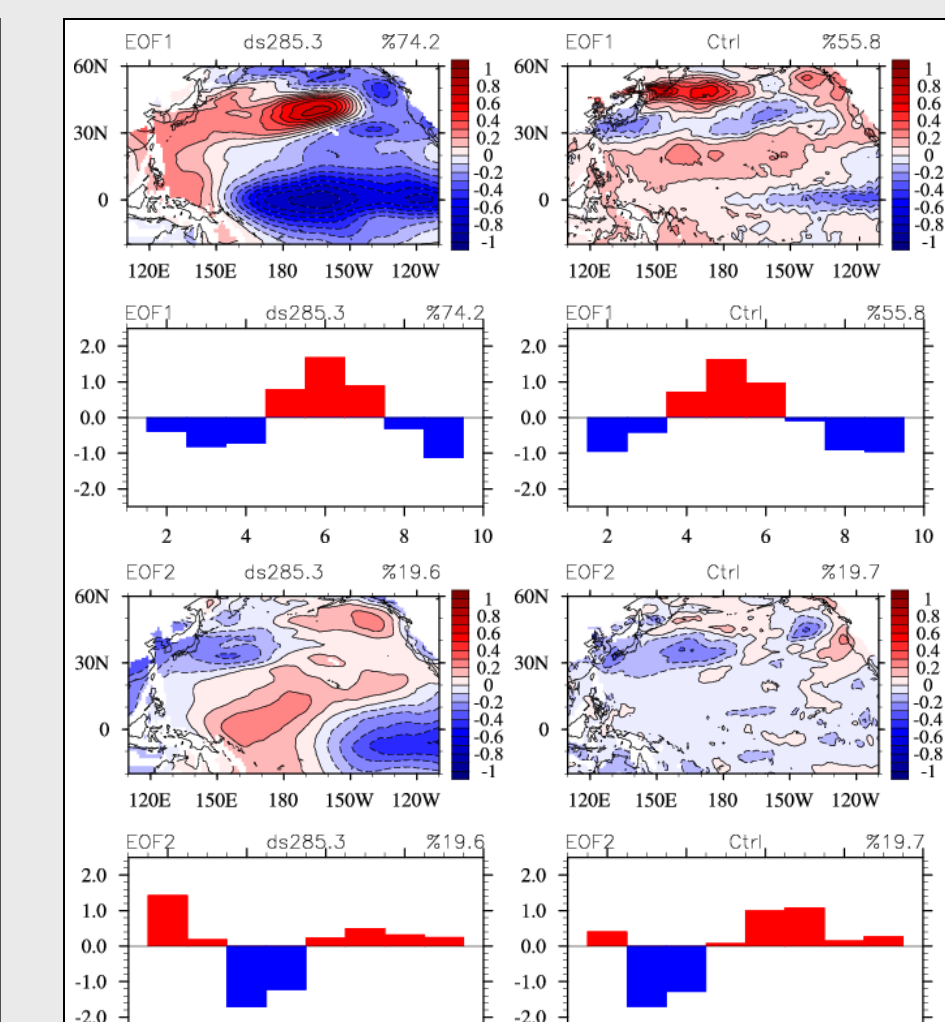➤The main deficency is that the warm center of the spatial pattern of the PDO is by north.
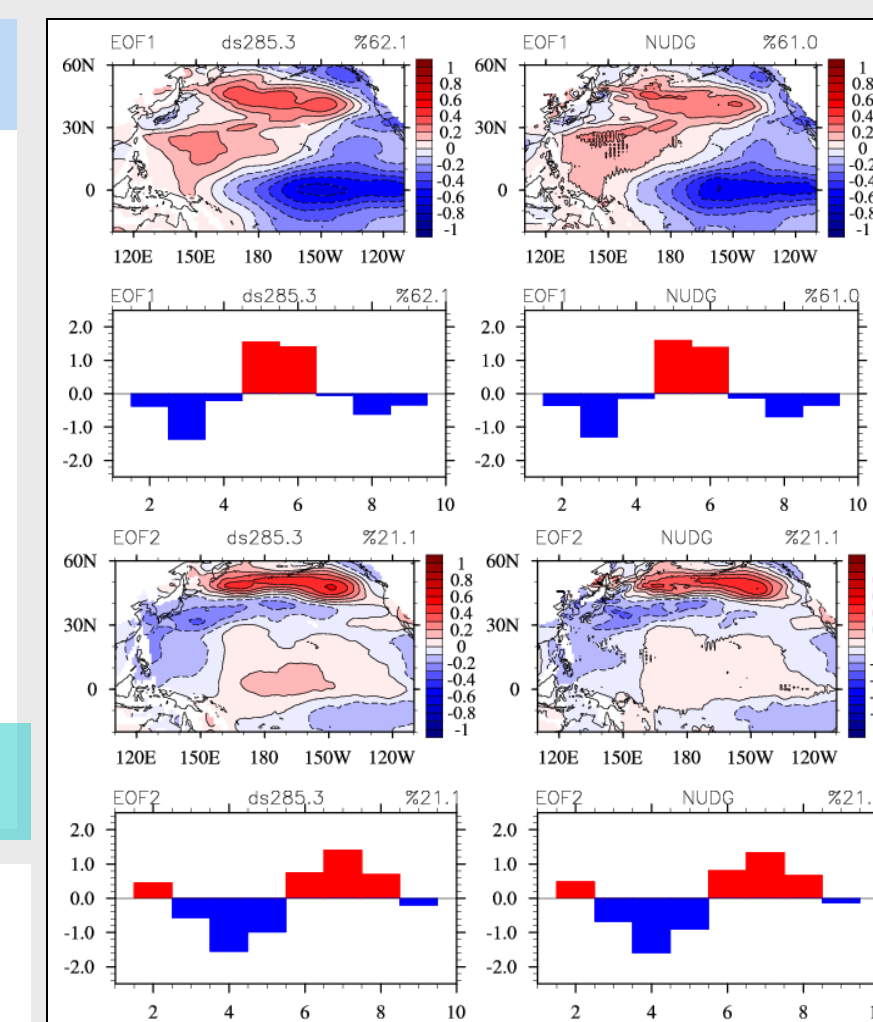
Assim. run

This chart can tell us that FGOALS_g2.0 can simulate the PDO almost exactly as the observation through the assimilation.
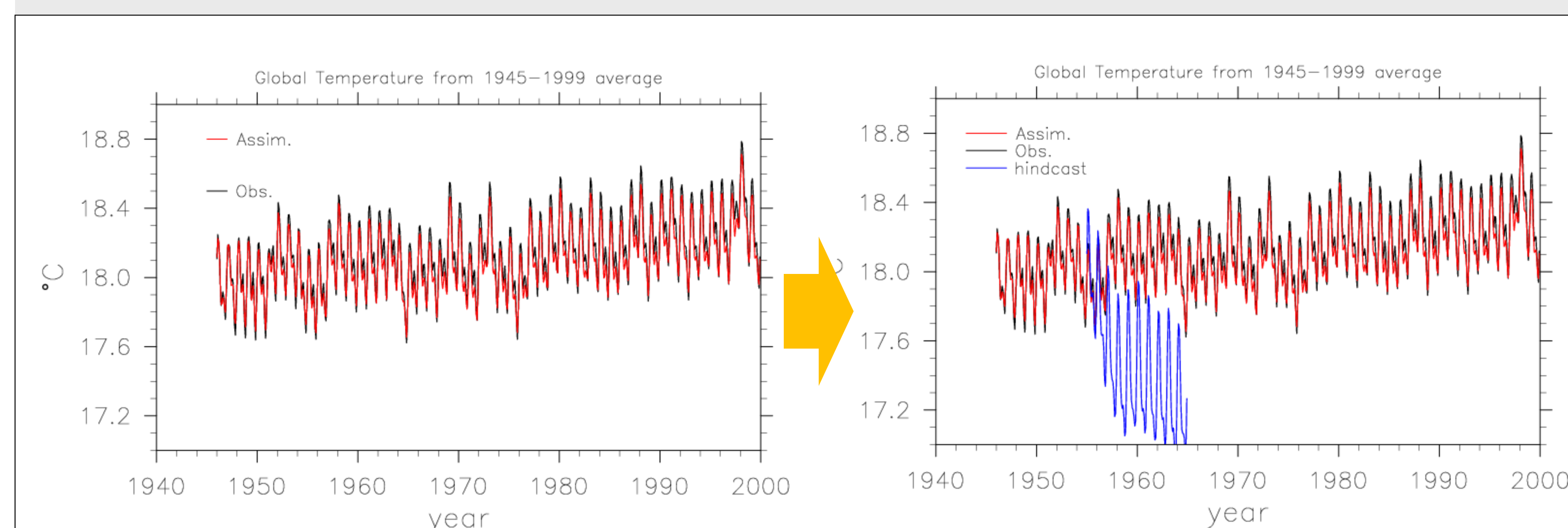

Hindcast

The hindcast shows that the spatial pattern of the PDO is more reasonable in the coupled model.

Ctrl

The control experiment can not simulate the PDO well in the same year as the hindcast.

Assimilated, hindcasted, and observed time series of globally averged SST.

The hindcast SST can keep as the Obs. for 2 years then slide down because the climate temp. of the model is lower than the Obs. This is the problem we will solve in the future.
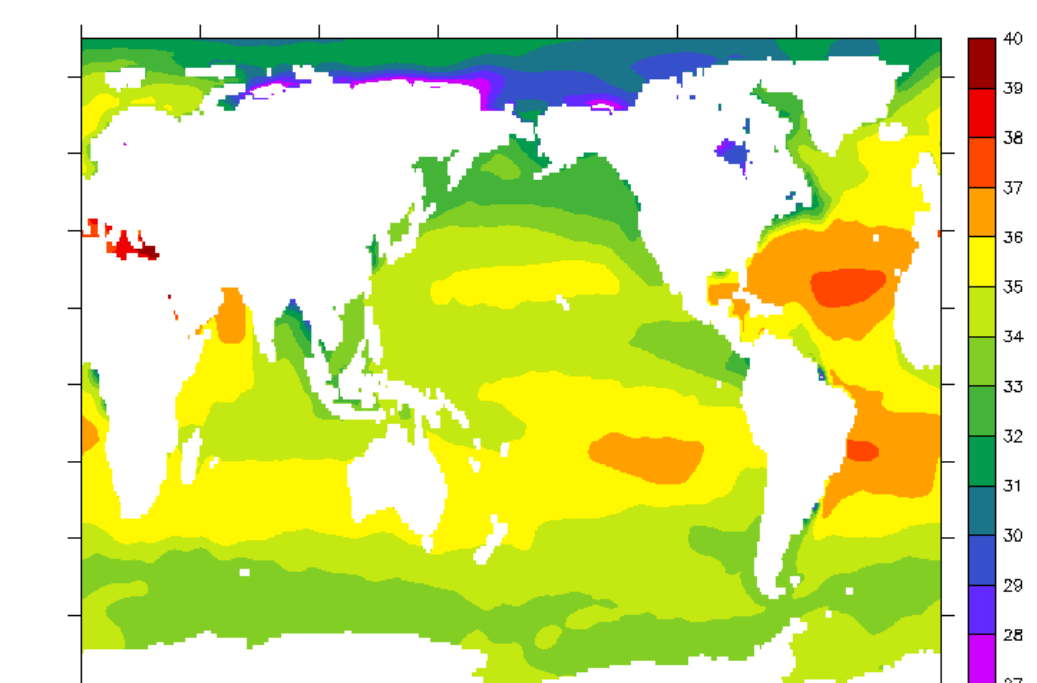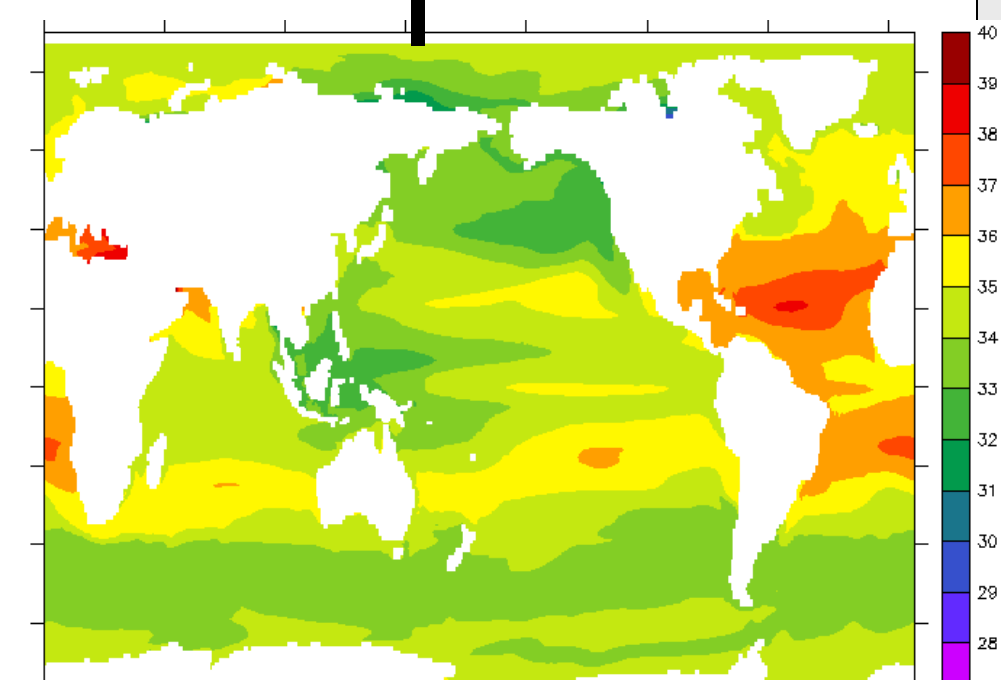
Ocean temp. & salt. are assimilated into the coupled model.

It shows that the simulated surface salinity in the hindcast is more close to the observation
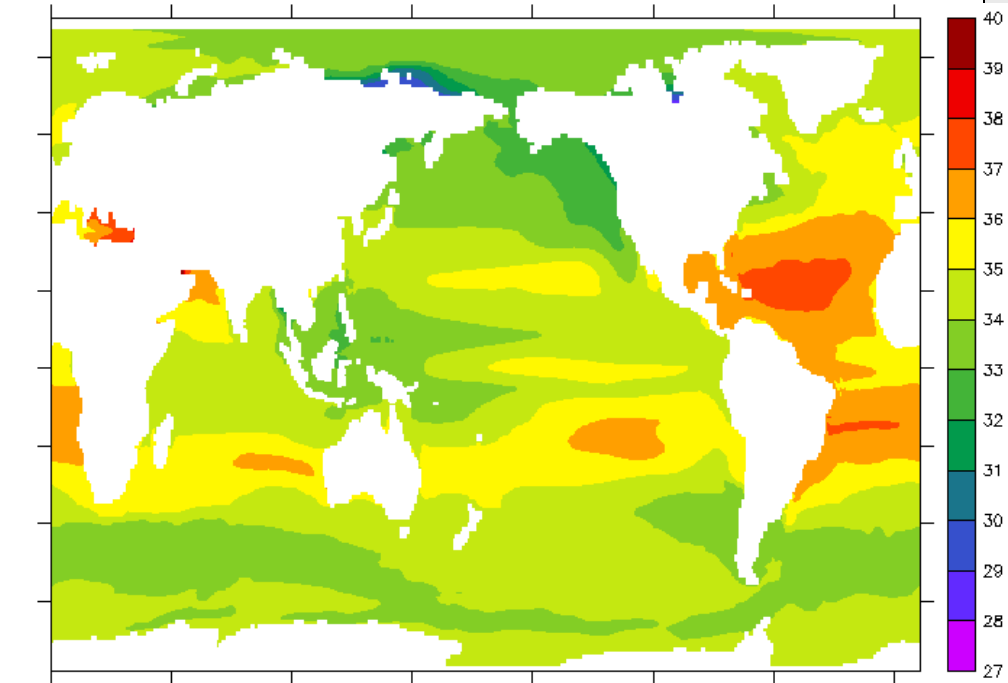

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Obs.Salinity

Hindcast

④ Summary

➤FGOALS_g2.0 is verified to be able to capture the major signal of the PDO, the main bias is the spatial pattern of the PDO.
➤Through nudging the Ocean tempreture, the spatial pattern of the PDO is improved ,but the global mean tempreture slides down because the climate temp. is lower than the observation.
➤From the hindcast of the salinity, we can find that assimilating the temp. and salt. can enhance the simulation capabilities

Reference

Takashi Mochizuki, et al, Pacific decadal oscillation hindcasts relevant to near-term climate prediction, PNAS, Vol107, 1833-1837,2009
Keenlyside NS,Latif M et al, Advancing decadal-scale climate prediction in the North Atlantic sector,Nature,453:84-88, 2008
Pohlman H, et al,Initializing decadal climate predictions with the GECCO oceanic synthesis:Effects on the North Atlantic, J Climate,22:3926-3938,2009
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