



CLIVAR-ICTP Workshop on Decadal Climate Variability  
and Predictability: Challenge and Opportunity

## Decadal Predictions by LASG/IAP CGCM FGOALS-s2

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## Outline



- Skill evaluations of the decadal predictions by FGOALS-s2
- New initialization scheme designed for decadal prediction experiment of the FGOALS in DCPP
- How to predict decadal variability of the East Asian summer monsoon?



## Design of initialization scheme



- Incremental analysis update (IAU) scheme
- Observational oceanic temperature and salinity over upper 1000m derived from gridded objective analysis data EN3\_v2a
- Anomaly assimilation approach, no posterior correction
- Hindcast and forecast runs follow the CMIP 5 protocol

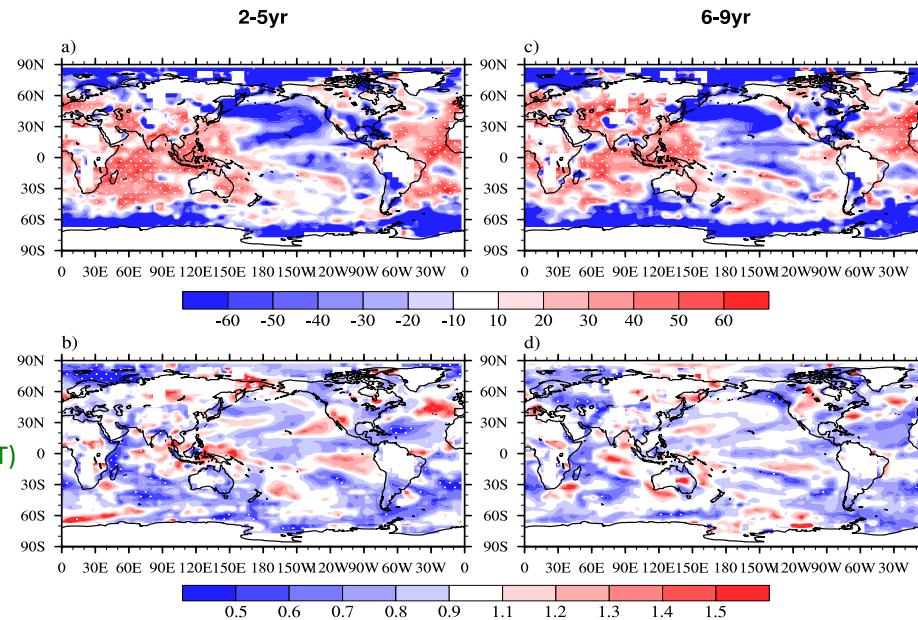


## Hindcast qualities of surface air temperature (FGOALS-s2)



RMSSS

RMSE(INIT)  
/RMSE(NoINIT)



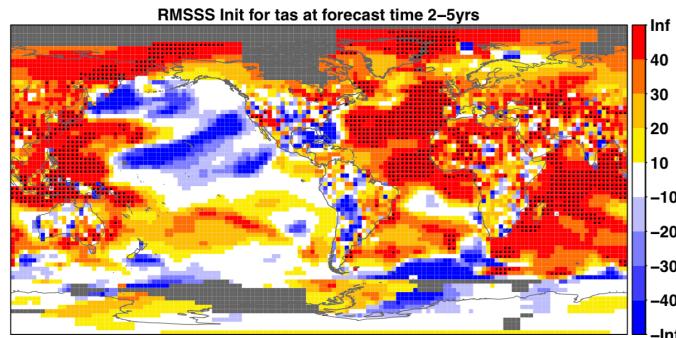
FGOALS-s2 shows significant high predictive skills in the Indian Ocean, tropical western Pacific and Atlantic (Wu et al. 2015 Advances in Meteorology)



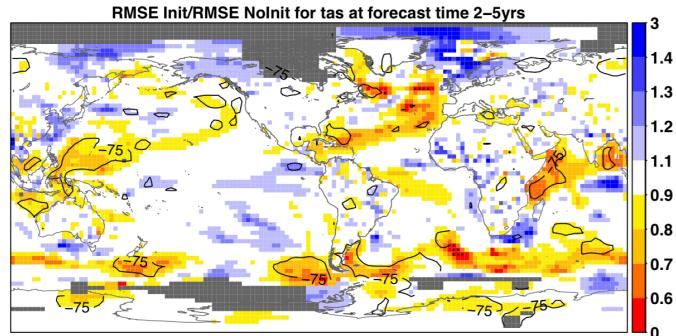
## Hindcast qualities of surface air temperature (CMIP5 MME)



RMSSS



RMSE(INIT)/  
RMSE(NoINIT)



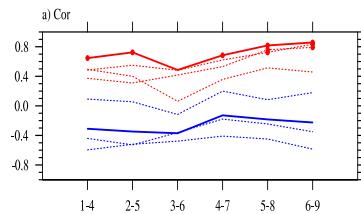
IPCC AR5 chp11



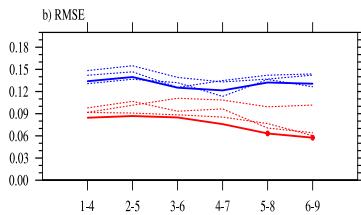
## Hindcast qualities of AMV



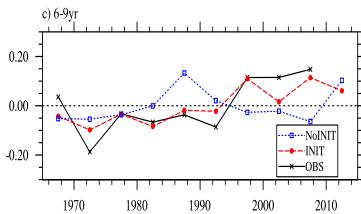
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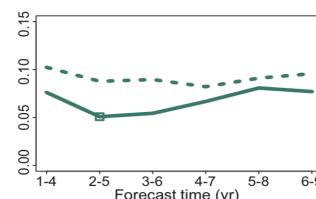
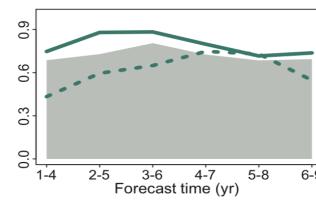
RMSE



Time Series



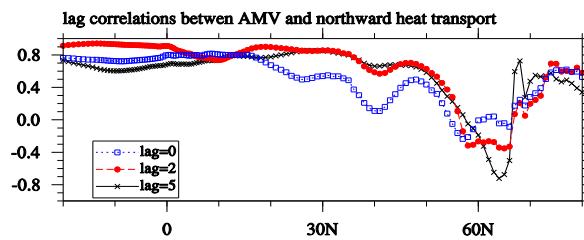
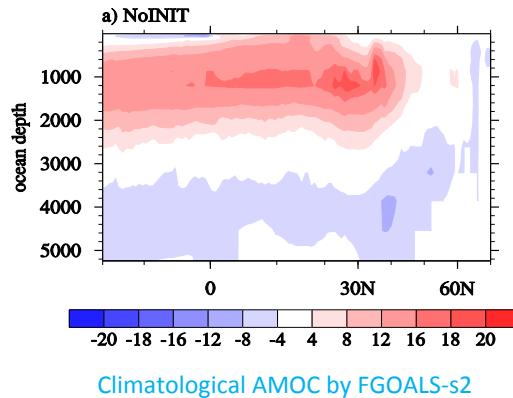
FGOALS-s2



IPCC AR5 chp11

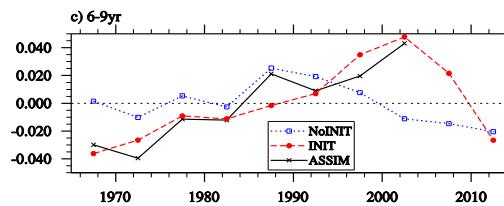
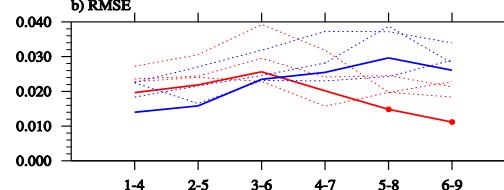
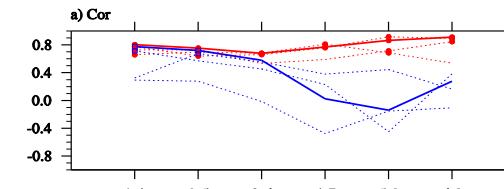


## Fluctuations of AMOC predicted by FGOLAS-s2



Skills of FGOALS-s2 in the prediction of the AMV  
depend on its skill in predicting fluctuation of the  
AMOC

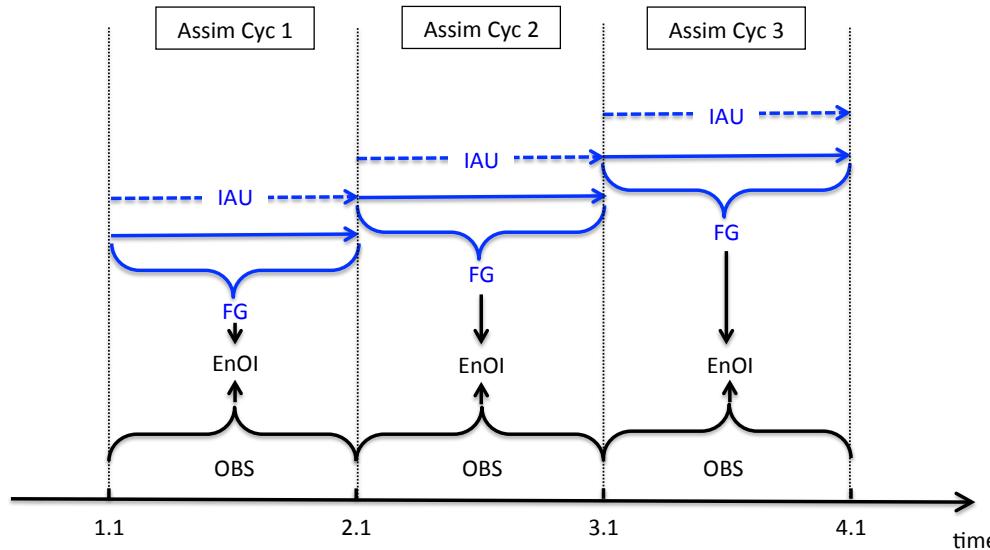
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FGOALS-s2 can predict interdecadal  
variation of AMOC



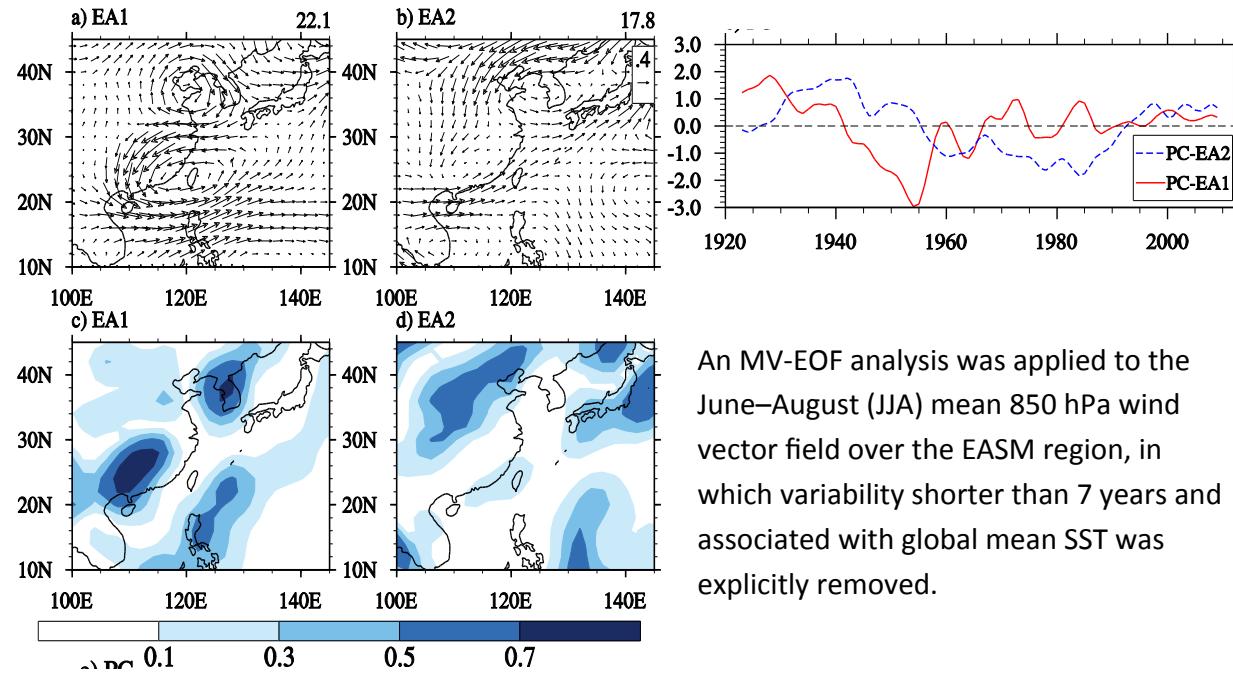
## Schematic diagram of EnOI\_IAU



- IAU: Incremental analysis update
- EnOI: Ensemble Optimal interpolation
- EN4.1.1(**Met Office Hadley Centre**) : collection of ocean temperature and salinity profiles from various sources



## Dominant modes of EASM in 20CR

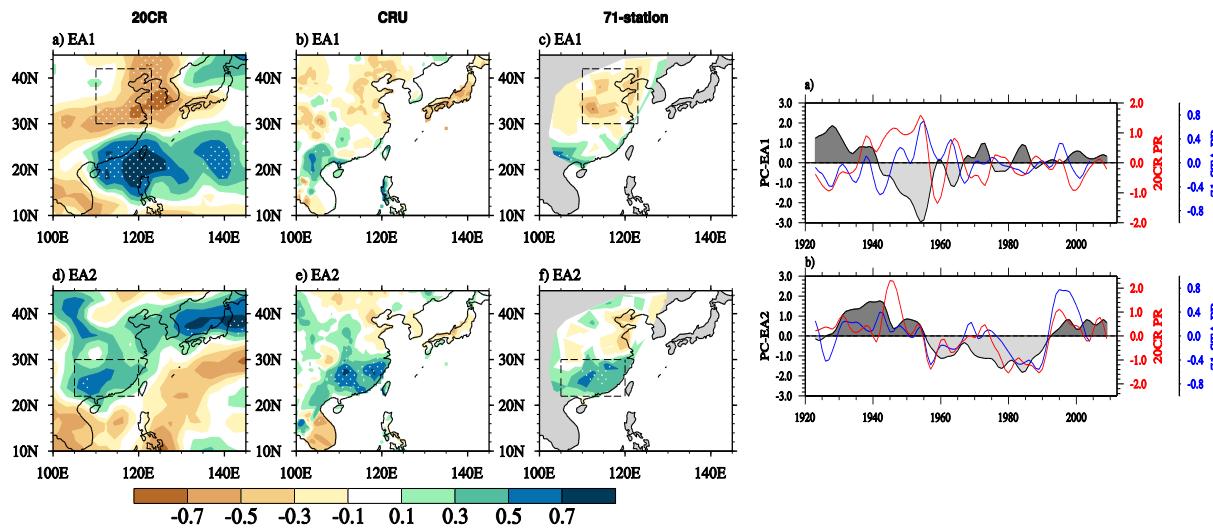


An MV-EOF analysis was applied to the June–August (JJA) mean 850 hPa wind vector field over the EASM region, in which variability shorter than 7 years and associated with global mean SST was explicitly removed.

Wu et al. Submitted to J. Climate

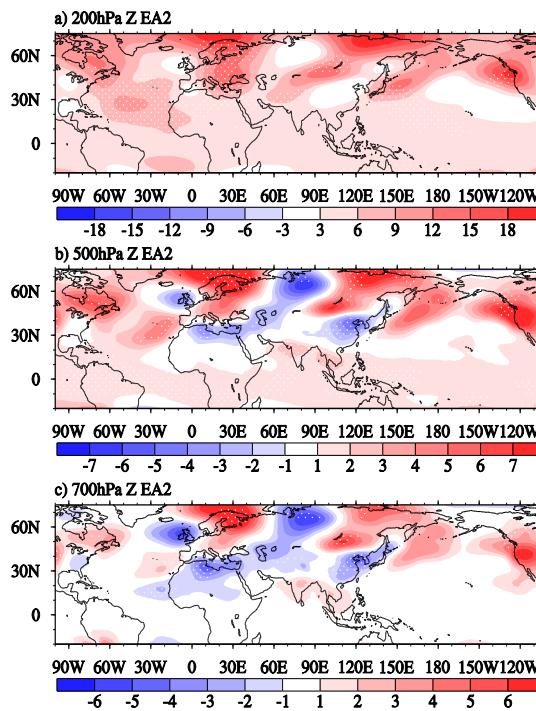
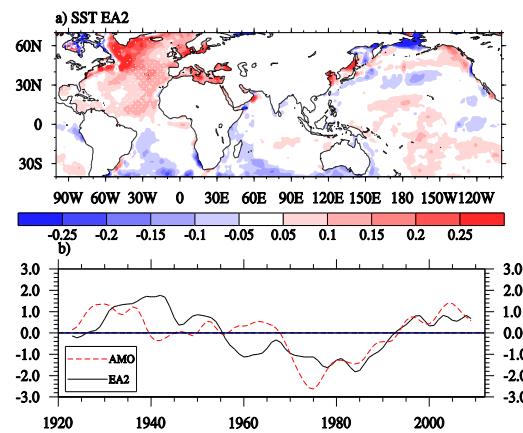


## Precipitation anomalies in 20CR and observation





## Large-scale variability associated with the EA2

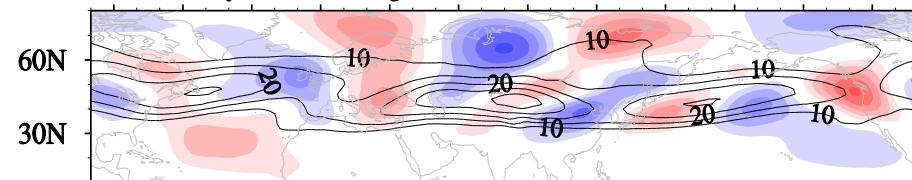




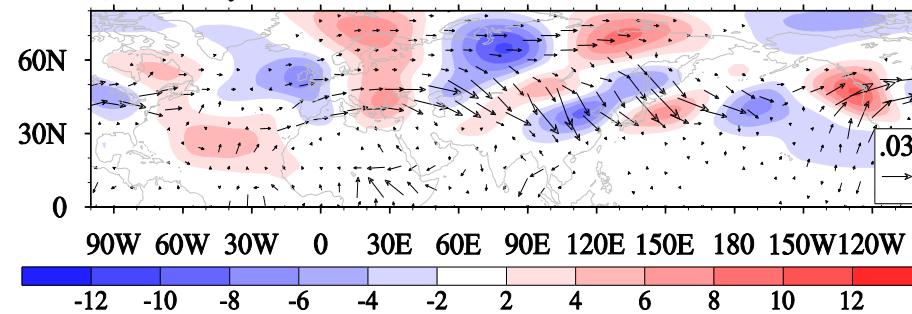
## Interdecadal circumglobal tele-connection pattern



a) Z200 eddy & Climatological U200

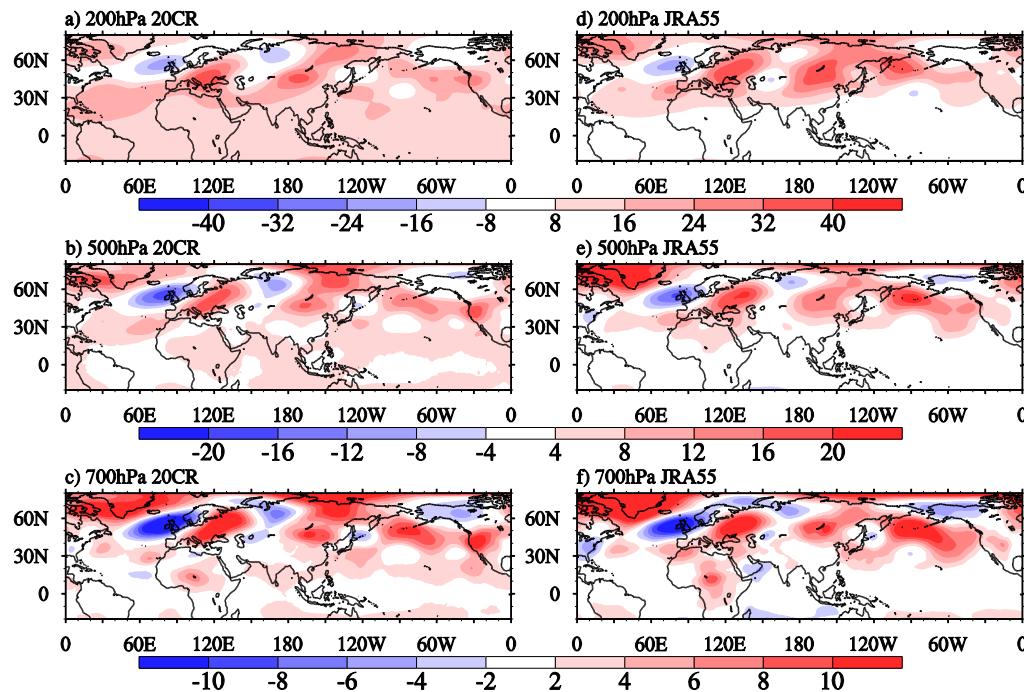


b) Z200 eddy & WAF





## Comparison between 20CR and JRA-55





## Conclusion



- Based on 20CR, the dominant modes of interdecadal variability of the EASM are obtained.
- The EA2 is characterized by cyclone anomalies extending from northeastern China to Japan, which are part of a interdecadal CGT pattern.
- The interdecadal CGT pattern is associated with the forcing from the AMO.
- Considering that the decadal prediction experiments in CMIP5 show high skills in the North Atlantic, the results may be used in the decadal prediction of the East Asian summer monsoon.



**Thanks!**

**LASG**

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