

# **Preparing for CMIP6 in China**

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# Model Groups in China for CMIP6

Group name	Affiliation	Model name
IAP/CAS	Institute of Atmospheric Physics (IAP), Chinese Academy of Sciences (CAS)	CAS CSM1.0 / ESM1.0
LASG/IAP		FGOALS-CSM (-f1, -g3)
		FGOALS-ESM (-f1, -g3)
CESS/THU	Center for Earth System Science (CESS), Tsinghua University (THU)	CICSM1.0
		CIESM1.0
BCC	Beijing Climate Center (BCC)	BCC-CSM2.0
BNU	Beijing Normal University (BNU)	BNU-ESM 2.0
FIO	First Institute of Oceanography (FIO)	FIO-ESM 2.0

**CSM / ESM: Climate / Earth System Model**

**FGOALS: Flexible Global Ocean-Atmosphere-Land System**















**CICSM / CIESM: Community Integrated CSM / ESM**

# Climate component models of ESM

Model name	Coupler	AGCM	OGCM	LSM	SIM
CAS CSM	CPL7 or C-Coupler	IAP AGCM	LICOM2	CoLM	CICE
FGOALS-CSM	CPL7 or C-Coupler	FAMIL1	LICOM3	CLM3 or CLM4	CICE4-LASG
		GAMIL3			
CICSM	C-Coupler	FDAM	FDOM	CLM4 or CoLM	CICE4-LASG or New SIM
BCC-CSM	Not clear	BCC-AGCM3	MOM4	BCC-AVIM2.0	SIS
BNU-ESM	Improved CPL6	CAM5.1	MOM5	CoLM	CICE4.1
FIO-ESM	CPL7 or C-Coupler	CAM5	POP2 or MOM5	CLM4	CICE4

# Resolutions for ESM

(red for CSM; blue for ESM; black for both)

Model name	AGCM	OGCM
CAS CSM CAS ESM	1  L30	1   0.5  L30
FGOALS-CSM FGOALS-ESM	25km/200km 0.5  / 2.8  L26	0.25  / 1  L60
CICSM CIESM	1  / 2.8  L26	0.5  / 1  L60
BCC-CSM	45km	30km
BNU-ESM	0.9  X 1.25  L30	720x410 grid, L50
FIO-ESM	100km L50	50km L60

The horizontal resolutions of LSM and SIM are same as those of AGCM and OGCM, respectively

# Representative works after CMIP5

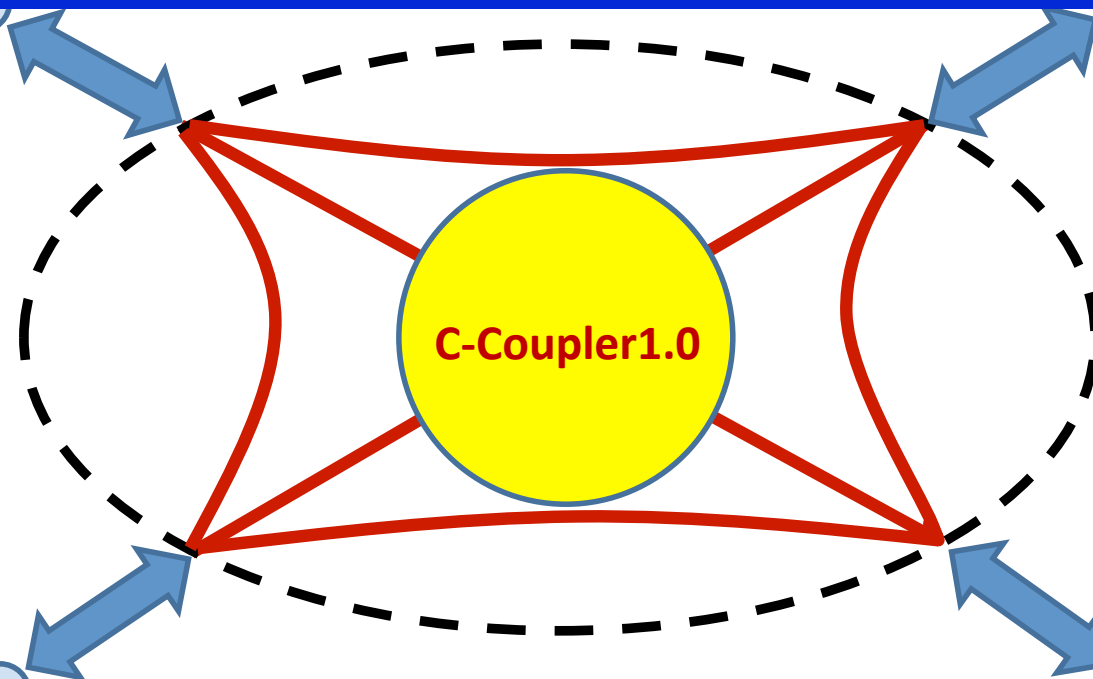
- **C-Coupler (CESS);**
- **High-resolution OGCM (LASG, CESS)**
- **High-resolution AGCM (LASG, CESS, BCC)**
- **High-resolution CSM (BCC)**
- **Land biogeochemistry in CoLM (BNU);**
- **IAP DGVM (IAP);**
- **Fire Model (IAP);**
- **Ocean biogeochemistry (IAP);**
- **MASNUM Wave model (FIO).**

# C-Coupler

one of the earliest couplers developed in China

(by Liu et al, 2012)

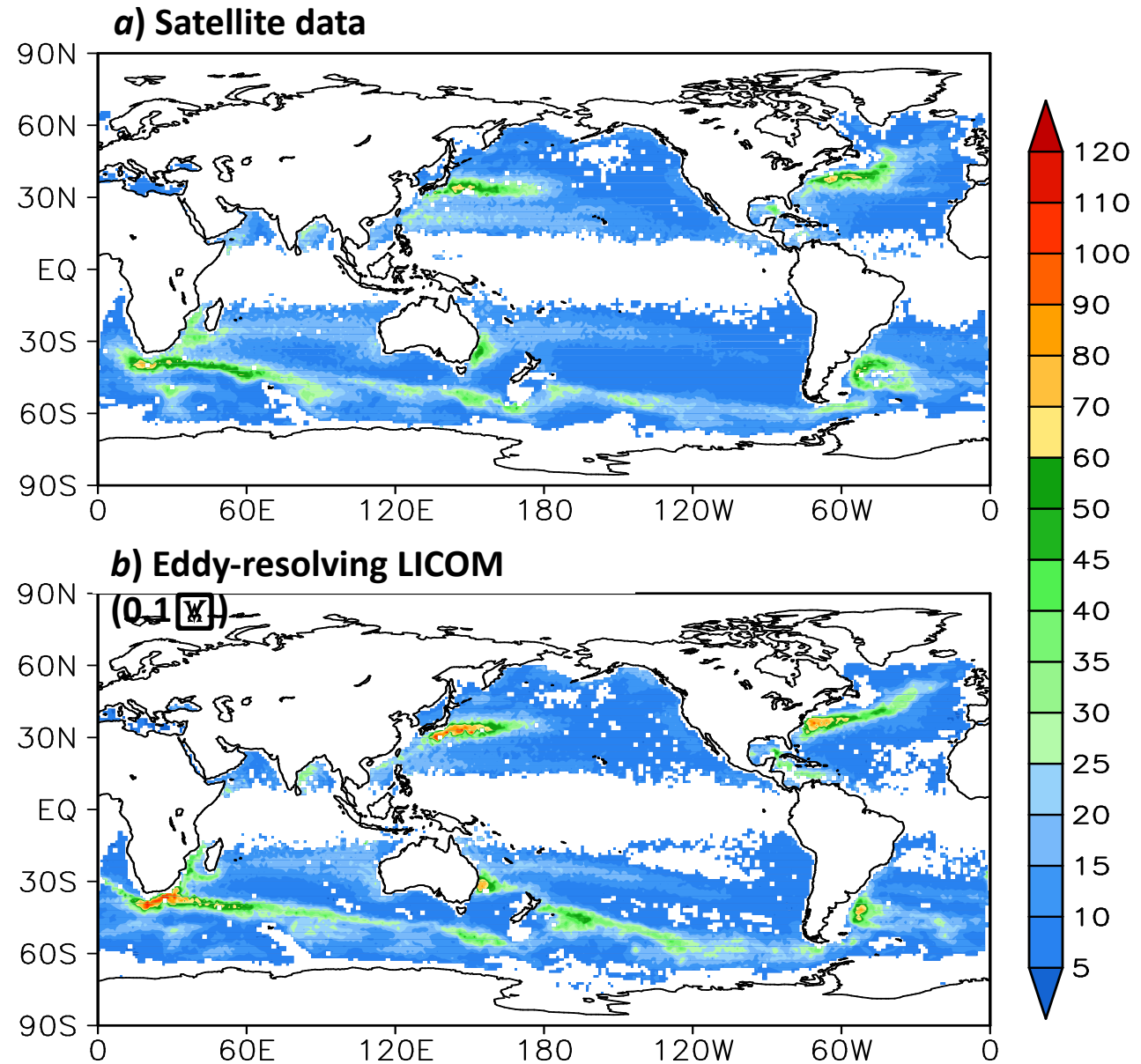
Merging the advantages of NCAR CPL6 and OASIS



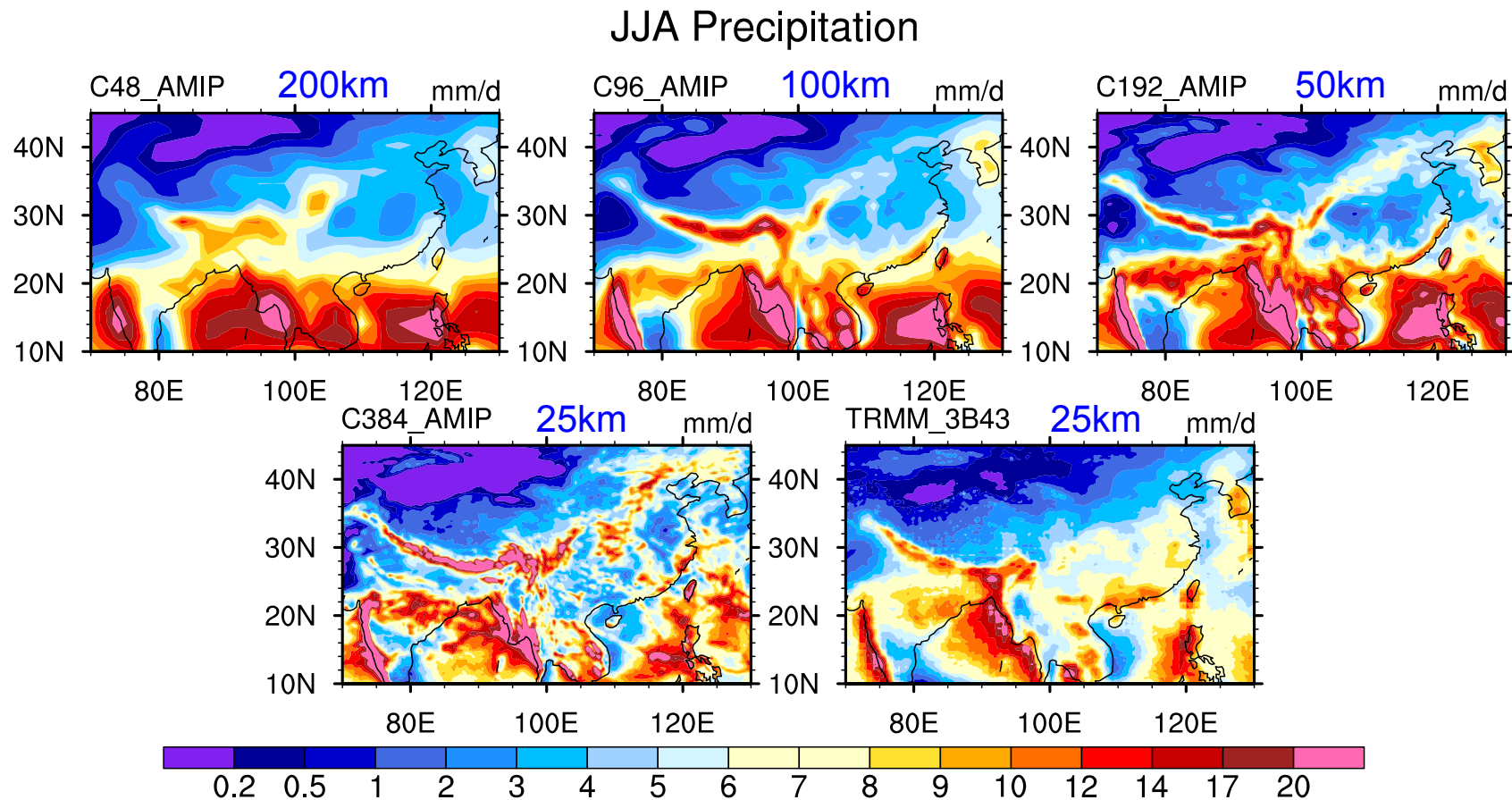
Including the functions of NCAR CPL7 as a special case

# Eddy-resolving LICOM (0.1 $\times$ )

**Intensity  
of  
Eddy**  
(Liu et al, 2013)



# Precipitation by FAMIL

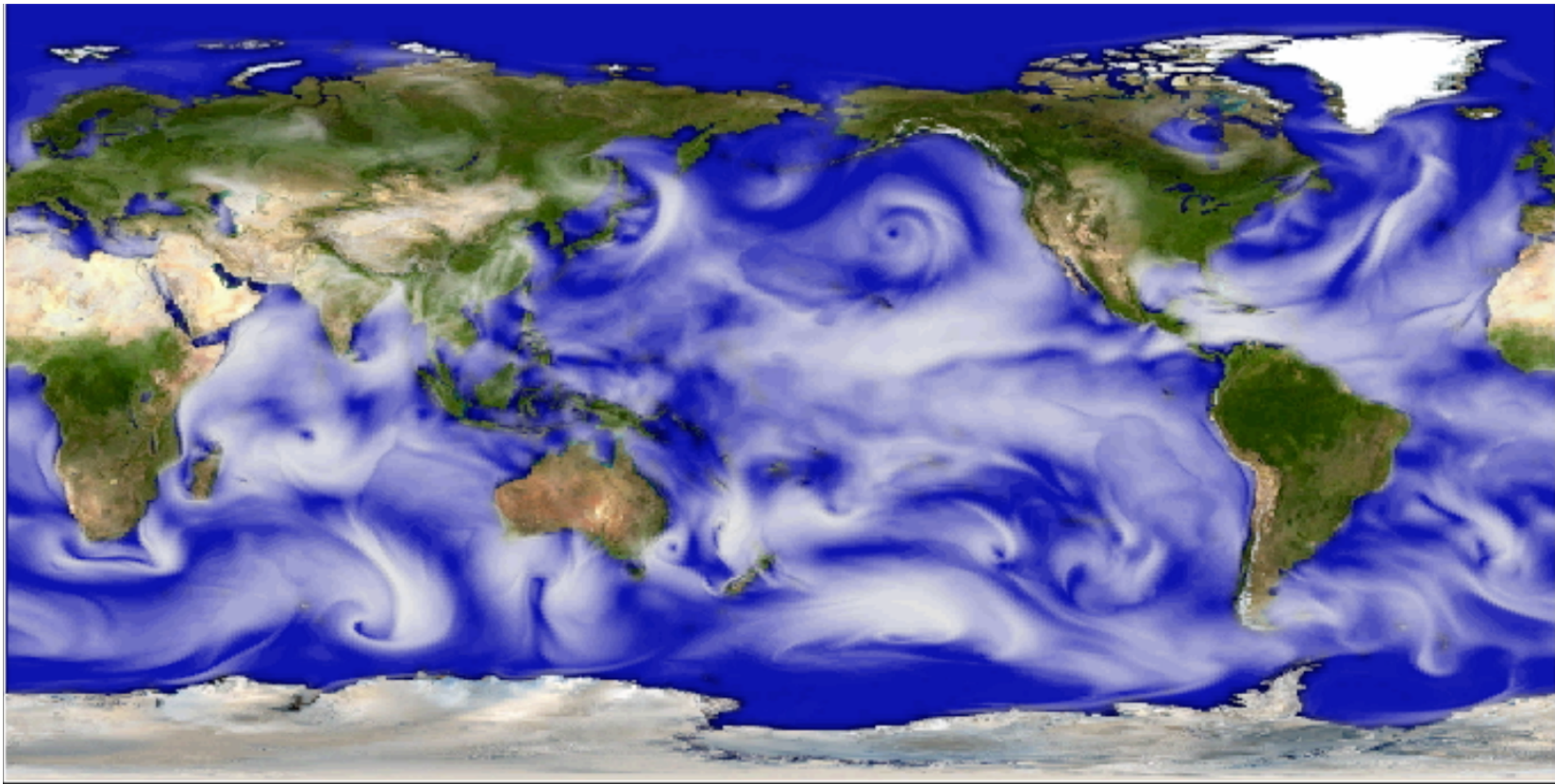


**Topographic precipitation is improved in the higher resolutions  
(Bao et al, 2013)**



# High-resolution GAMIL (0.25<sup>W</sup>)

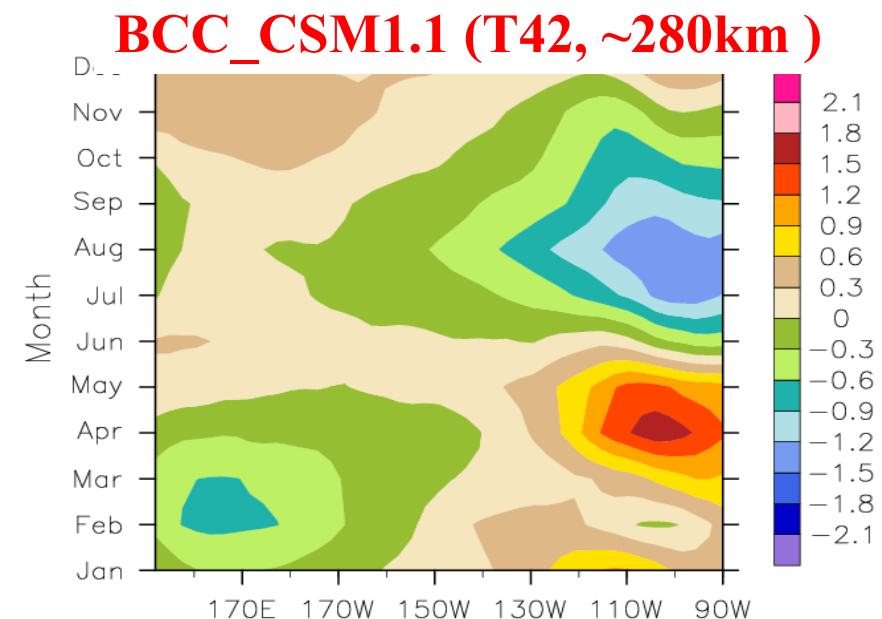
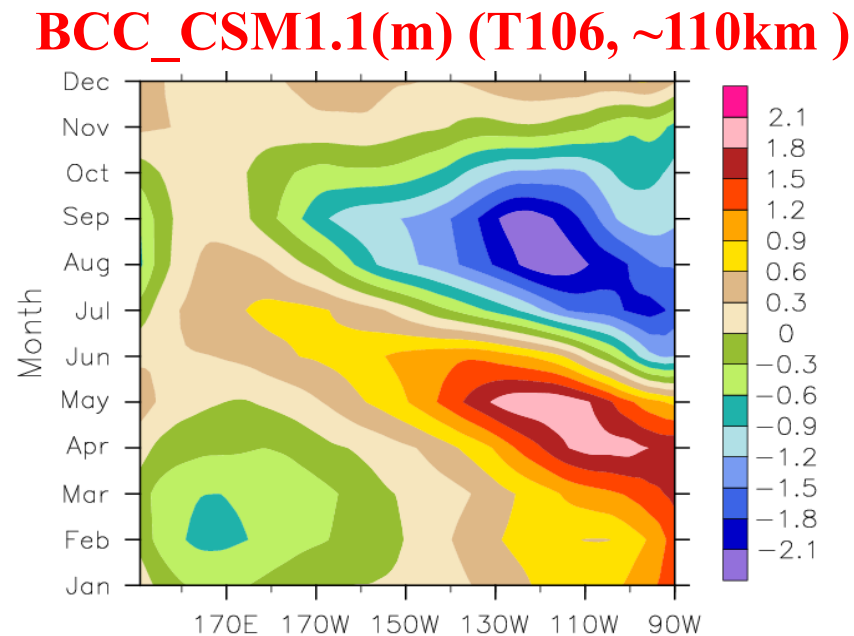
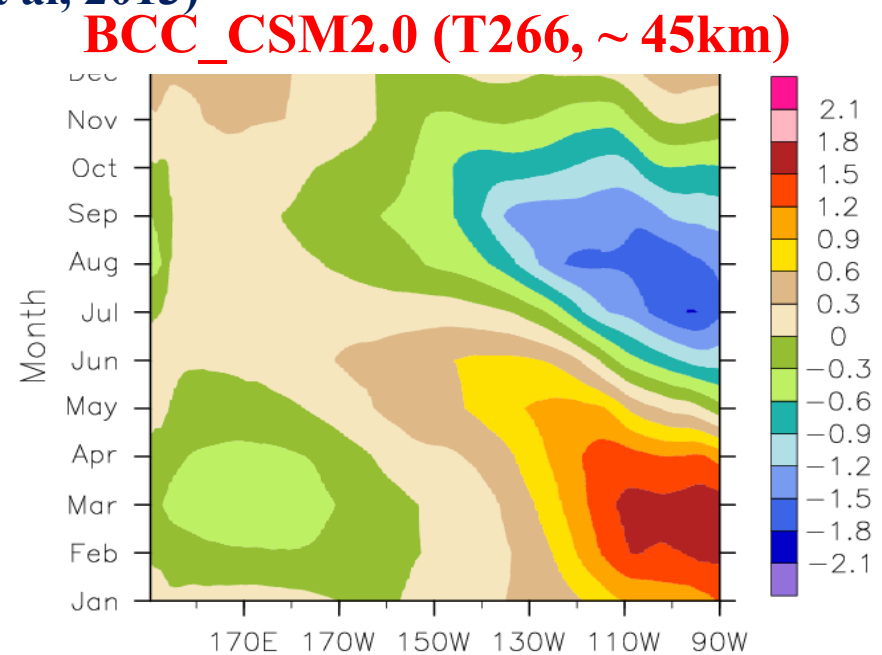
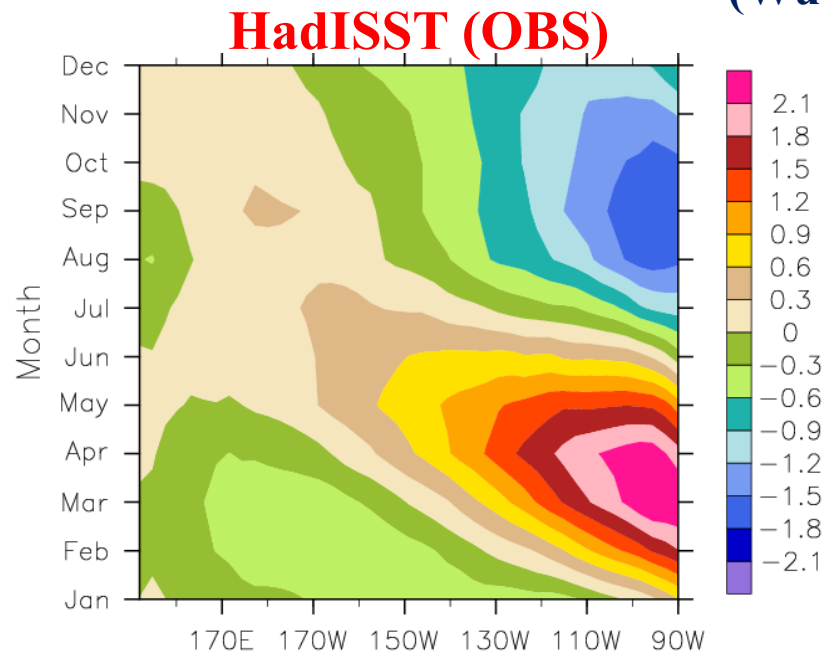
(Wang et al, 2013)



Geographical distribution of near-surface moisture in the middle of May 2004

# SST annual cycle in Equatorial Pacific Ocean (5S-5N)

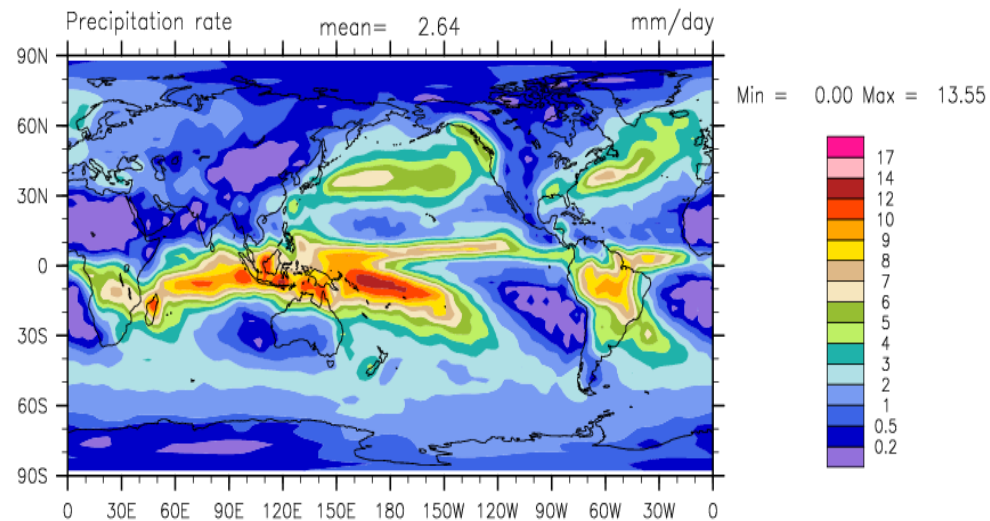
(Wu et al, 2013)



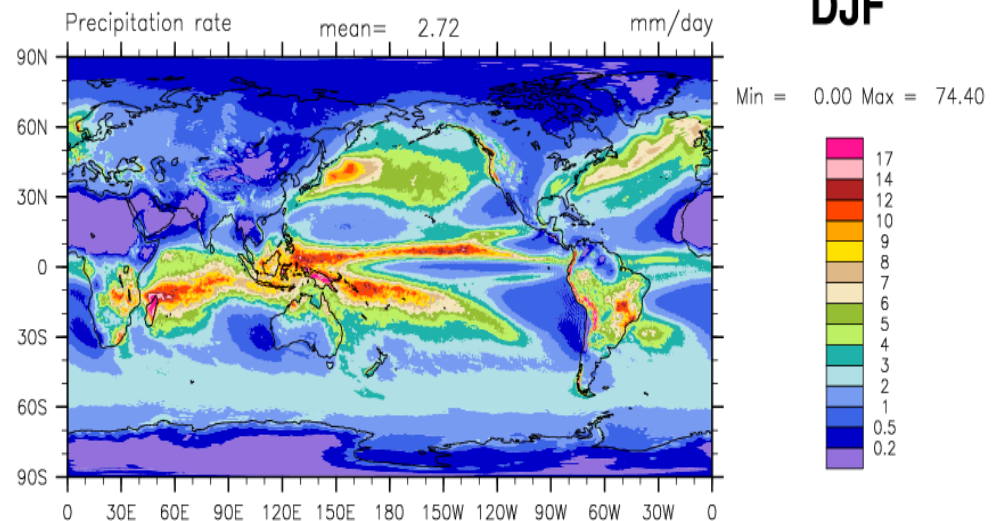
# DJF mean precipitation

(Wu et al, 2013)

**XIE-ARKIN**

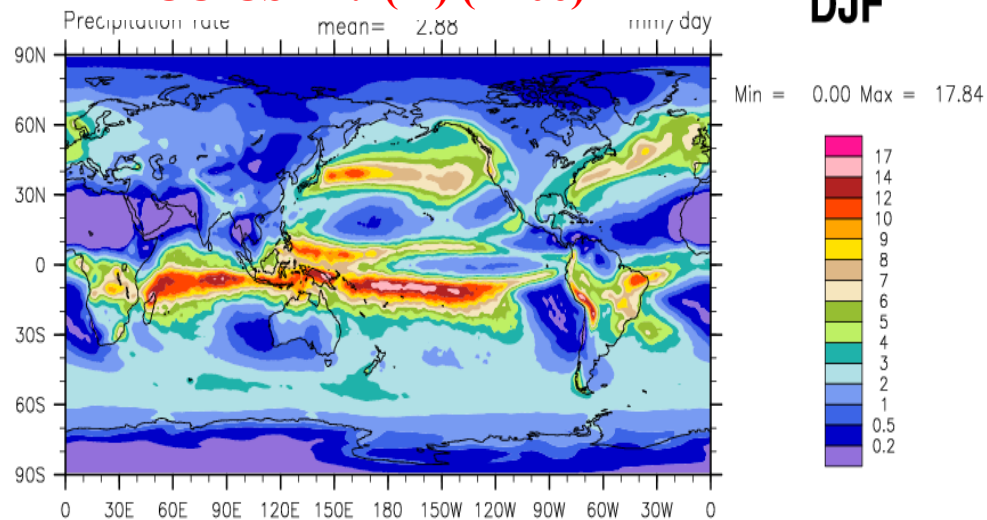


**BCC-CSM2.0 (T266)**



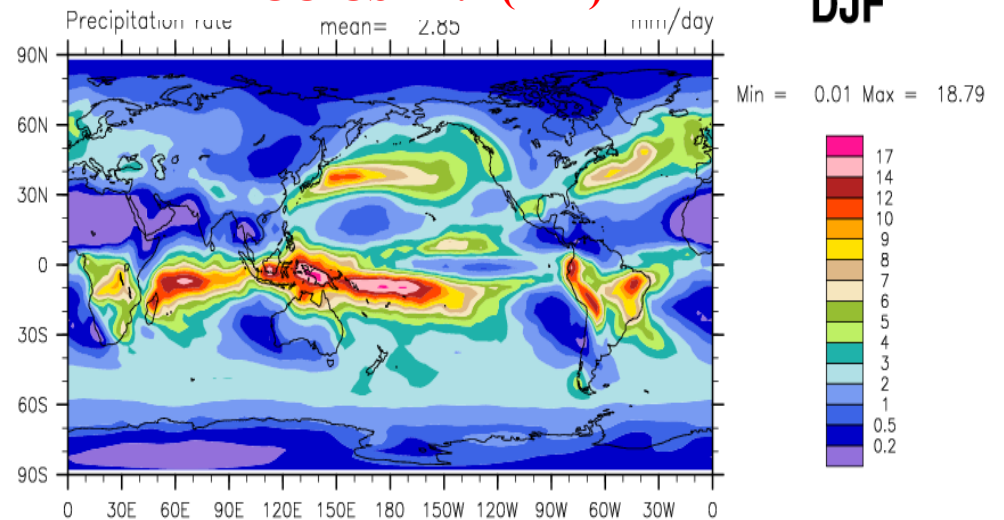
**DJF**

**BCC-CSM1.1(m) (T106)**



**DJF**

**BCC-CSM1.1 (T42)**



**DJF**

# **Suggestions from Chinese Scientists**

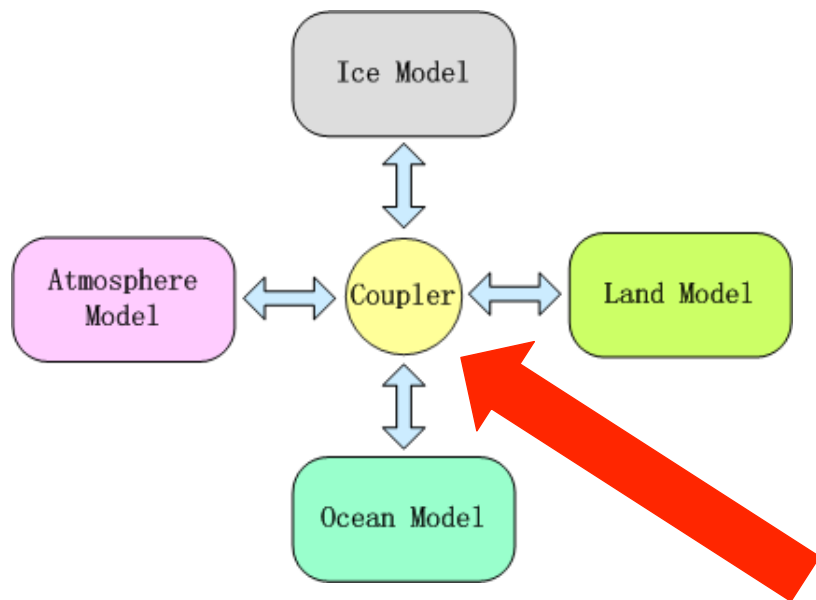
- **To design a kind of experiments on historical responsibilities of the developed countries and the developing countries for CMIP6;**
- **To add a RCP based on the governmental commitments of emission reduction to CMIP6;**
- **To reduce the CMIP frequency so that we have enough time to understand the model outputs.**
- **To develop new assimilation approaches of coupled models for decadal prediction.**

**Thank you  
for your attention.**



# Lack of direct flux exchange in available couplers

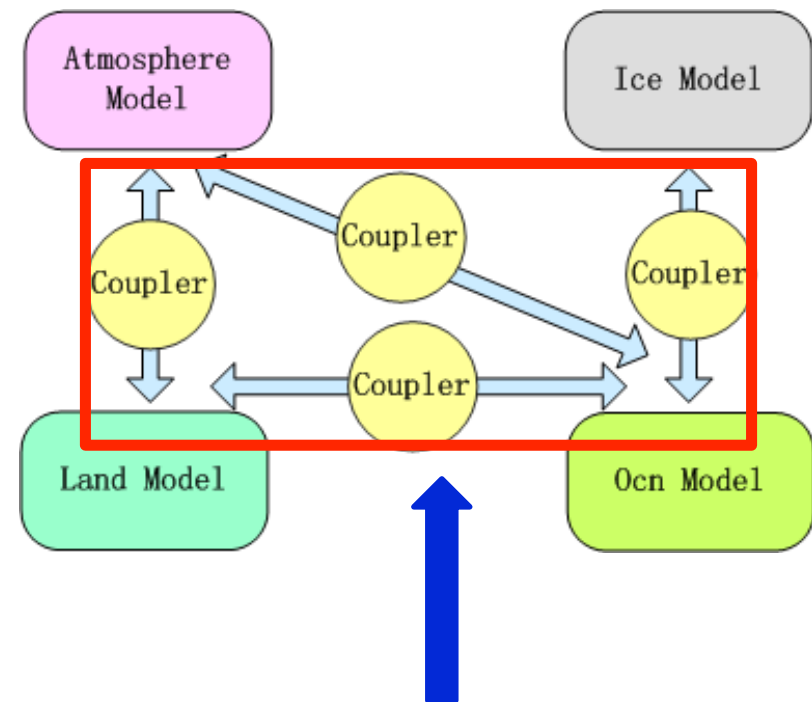
## NCAR Coupler



**Centralized flux coupler  
without direct flux exchange**

(Liu et al, 2011)

## OASIS Coupler



**Decentralized  
non-flux coupler  
without direct  
flux exchange**

# C-Coupler: to overcome the imperfection

(the first coupler developed by Chinese scientists)

