Outline

- Variability of EASM
  -- Interdecadal variability
  -- Interannual variability
  -- Diurnal cycle & ISO
- New Projects
- Suggested interactions with AAMP
Interdecadal variability of EASM

Focus

South-to-North Water Diversion Project

http://www.nsbd.gov.cn/zx/english/
Proposed Mechanisms

- **Tropical Ocean warming** (Hu, 1997; gong and Ho, 2002; Zeng et al., 2007)
- **Tibetan Plateau forcing** (Wang et al., 2008; Duan and Wu, 2008)
- **Aerosol forcing** (Qian and Giorgi, 1999; Menon et al. 2002; Lau et al. 2006)
- **Internal variability** (Zhu and Wang 2002; Ding et al. 2007a,b)

Arguments on the mechanism

Optical Thickness of 2001

SCIENCE 2002
EASM and Global Monsoon

(Wang and Ding 2006 GRL; Zhou et al. 2008 GRL; Zhou et al. 2008a J. Climate)
EASM index in the reanalysis and simulation

(Li et al. 2010 Clm Dyn)
SSTA related to monsoon weakening

(Zhou et al. 2008a J. Climate)
Focus

- The Skill of AMIP models
- The Pacific and Indian Ocean forcing to EAM
- Teleconnection and statistical prediction
Interannual variability modes of AAM

S-EOF analysis; from JJA(0) to MAM(1)

---

27.4%

OBS
Shading - Rainfall ; Vectors – 850 hPa wind

31.3%

AMIP

(Zhou et al. 2009a J. Climate)
Correlations between observed and AMIP MME rainfall anomalies

- High skill in tropical region
- Nearly no skill in summertime WNP monsoon area.
- Better in winter

(Zhou et al. 2009a J. Climate)
During El Nino decaying summer, the WNPAC in June relies on the negative SSTA in the WNP.

Following the growth of WNP monsoon trough in July and August, the IOBM impact gradually intensifies and drives the WNPAC in the Philippine Sea through atmospheric Kelvin wave forcing.
NAO and EASM: Empirical Prediction Model

EASM index in Observation, MME of 14 CGCM and statistical model

(Wu et al. 2009 JGR)
Focus

- Diagnostic analysis based on rain-gauge observations
- Analysis based on satellite data
- Discussion of the mechanism
- Regional modeling
Diurnal Cycle of JJA precipitation

(Yu et al, 2007, GRL)
Spatial distributions of the amplitude (colors) and phase (arrows, LST) of the diurnal (24h, S1) harmonics of 2000-2004 mean JJA precipitation

Amount

Frequency

Intensity

Rain-gauge  PERSIANN  TRMM

(Zhou et al. 2008b J. Climate)
Northward Propagation of ISO and Flooding along the YZR Valley

30-60 days band-pass filtered rainfall along 105~122.5°E of 1998

(Sun D. 2010)

Outline

• Variability of EASM
  -- Interdecadal variability
  -- Interannual variability
  -- Diurnal cycle & ISO

● New Projects

● Suggested interactions with AAMP
◆ Ministry of Science & Technology (MOST)
◆ Chinese Academy of Sciences (CAS)
◆ National Natural Science Foundation of China (NSFC)
◆ China Meteorological Administration (CMA)
1. Development of High Resolution Climate System Model  
   PI: R. YU  
   Period: 2010-2015;  Budget: ~ 4.5 million USD

2. Development of Biogeochemistry model  
   PI: M. ZHANG  
   Period: 2010-2015;  Budget: ~ 4.5 million USD

3. Attribution and Projection of Climate Change based on the Multi-Model Ensemble Simulations from CMIP5  
   PI: W. Dong  
   Period: 2010-2015;  Budget: ~ 4.5 million USD

4. Air-Land-Sea Interactions in Asia and their role in Global Change  
   PI: J. Li  
   Period: 2010-2015;  Budget: ~ 4.5 million USD

5. Reconstruction of the past 2000-yrs climate of China  
   PI: Q. Ge  
   Period: 2010-2015;  Budget: ~ 4.5 million USD
1. Ocean-Atmosphere-Land Interaction and EASM Variability
   PI: H. Wang & Y. Hou
   Period: 2010-2011; Budget: $2.5 million USD

2. Data Uncertainty and 20th century climate change over China
   PI: Yang & Lu
   Period: 2010-2015; Budget: $5 million USD

3. Improvement of uncertainties in CAS climate system model
   PI: Lin & Zhou
   Period: 2010-2015; Budget: $5 million USD

4. Aerosol emission in China and its climate impacts
   PI: Cao & Liao
   Period: 2010-2015; Budget: $5 million USD

5. Reconstruction of climate records of China for the past 2000-yrs
   PI: Ge
   Period: 2010-2015; Budget: $5 million USD
Projects from NSFC

Climate of China during the past millennium
PI: X. Zhou (CMA)

Period: 2009-2012;    Budget: ~ 2.5 million USD

- Sub-project-1: Reconstruction based on tree ring (PI: Y. Liu)
- Sub-project-2: Numerical simulation (PI: T. Zhou)
- Sub-project-3: Diagnosis and inter-comparison of proxy data (PI: P. Zhao)

......

......
Detection and attribution of interdecadal EA monsoon variability

Predictability of interdecadal monsoon variability (CMIP5 decadal prediction Exps)

Future change of AAM in RCP Exps. (AR5)

Monsoon variability in last millennial simulation
Prominent Features

- **S. China Flood N. China drought** (Hu, 1997; Wang, 2001)
- **Westward extension of WPSH** (Hu, 1997; Gong and Ho, 2002)
- **Zonal expansion of South Asian High** (Zhang et al., 2000)
- **Tropospheric cooling over E. Asia** (Yu et al. 2004; Yu and Zhou, 2007)
- **East Asian westerly jet** (Yu et al. 2004; Schiemann et al., 2009)
- **Spring rainfall change** (Xin et al. 2006; Cai et al. 2009)
- **Land-Sea thermal contrast change** (Ding et al. 2007)
- .......

Westward Extension of WPSH due to IWP warming

Warm, Cold, and Normal SST

(Zhou et al. 2009 J Climate)