

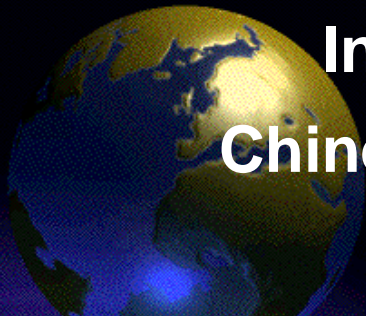
Pan WCRP Monsoon Activities

Guoxiong Wu

State Key Laboratory of Numerical Modeling for Atmospheric
Sciences and Geophysical Fluid Dynamics (**LASG**)

Institute of Atmospheric Physics (**IAP**)

Chinese Academy of Sciences (**CAS**), Beijing

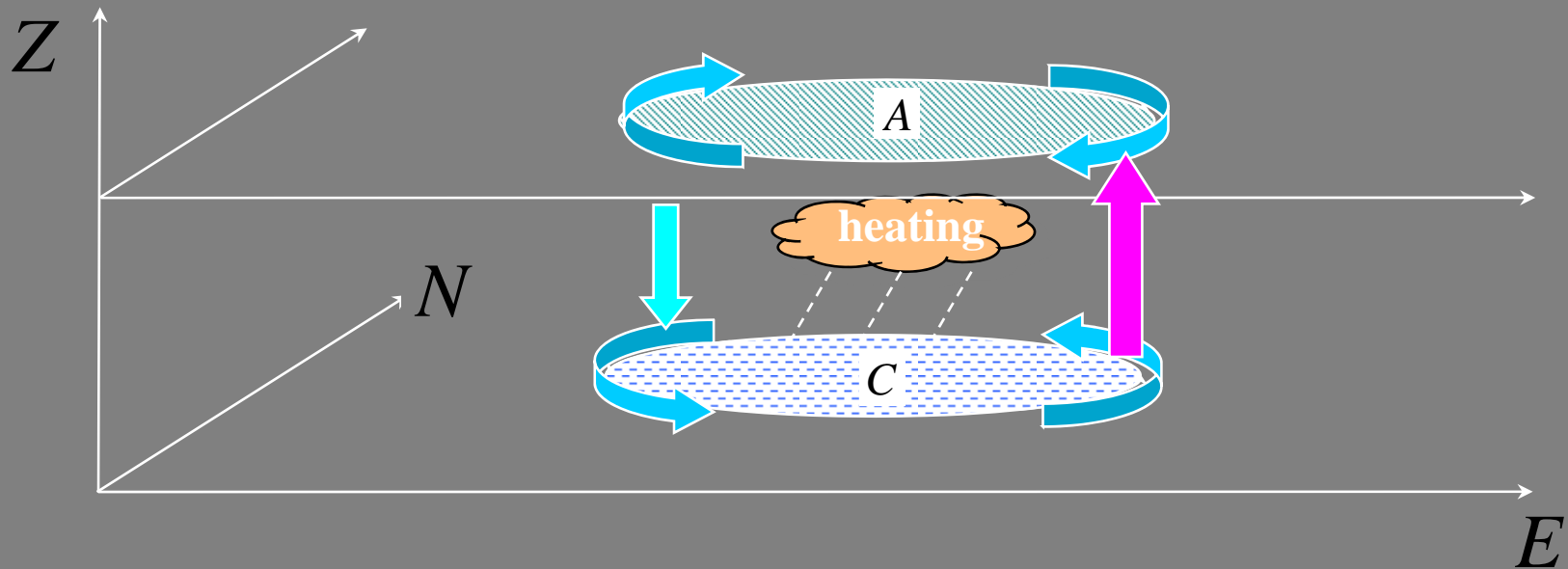


CEOP, Geneva, September 15-17, 2008

LIST

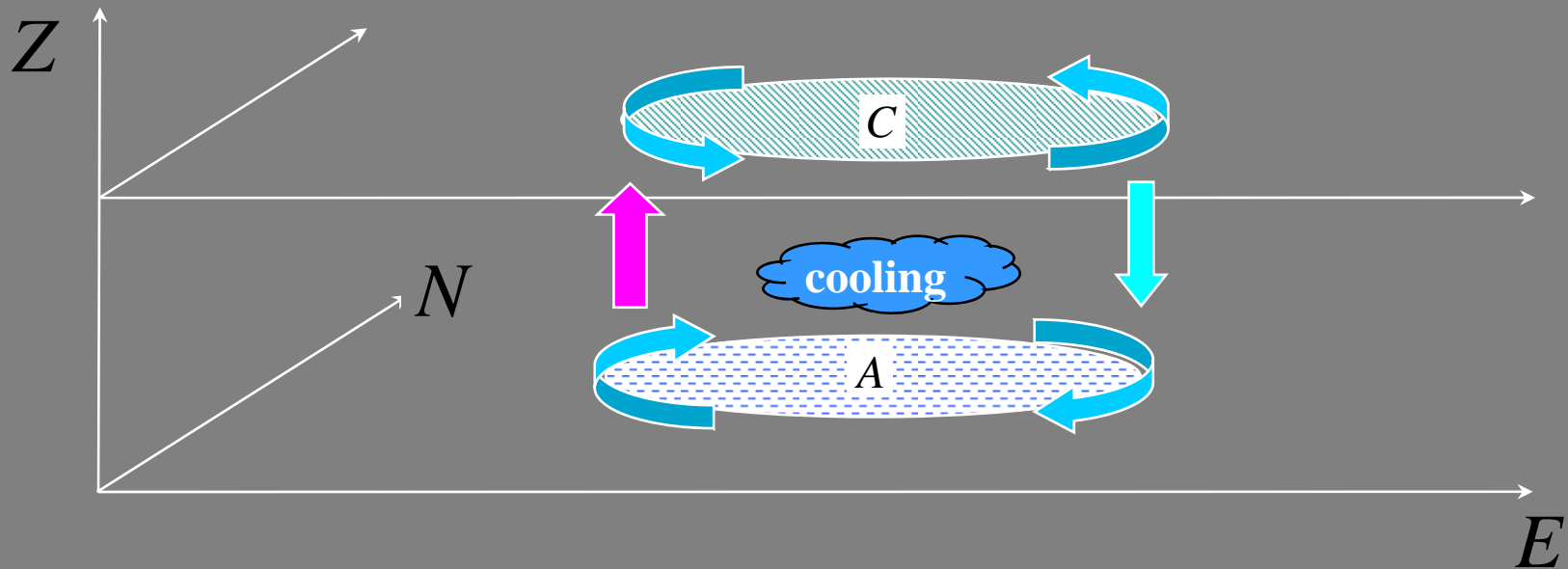
- 
- ➔ 1. Continental Scale “LOSECOD” Heating and Formation of Monsoon
 - 2. Orograph Local Scale Forcing
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Thermal Adaptation- heating



$$w \propto -\beta \frac{\partial v}{\partial z}$$

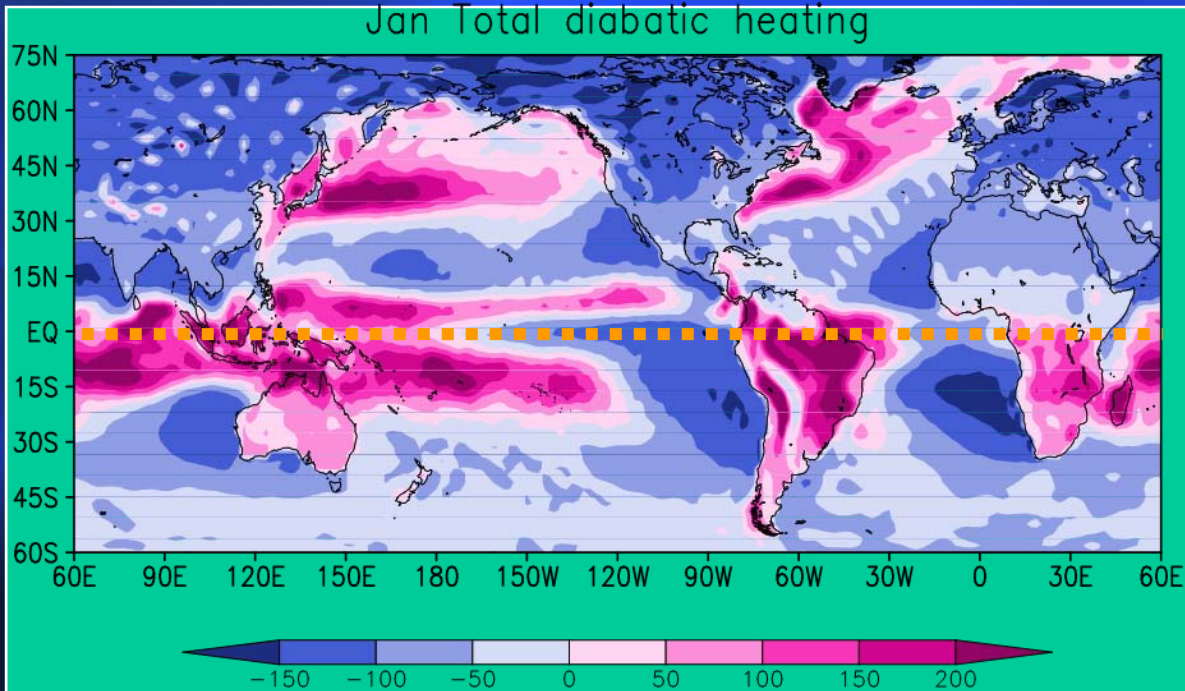
Thermal Adaptation-cooling



$$w \propto -\beta \frac{\partial v}{\partial z}$$

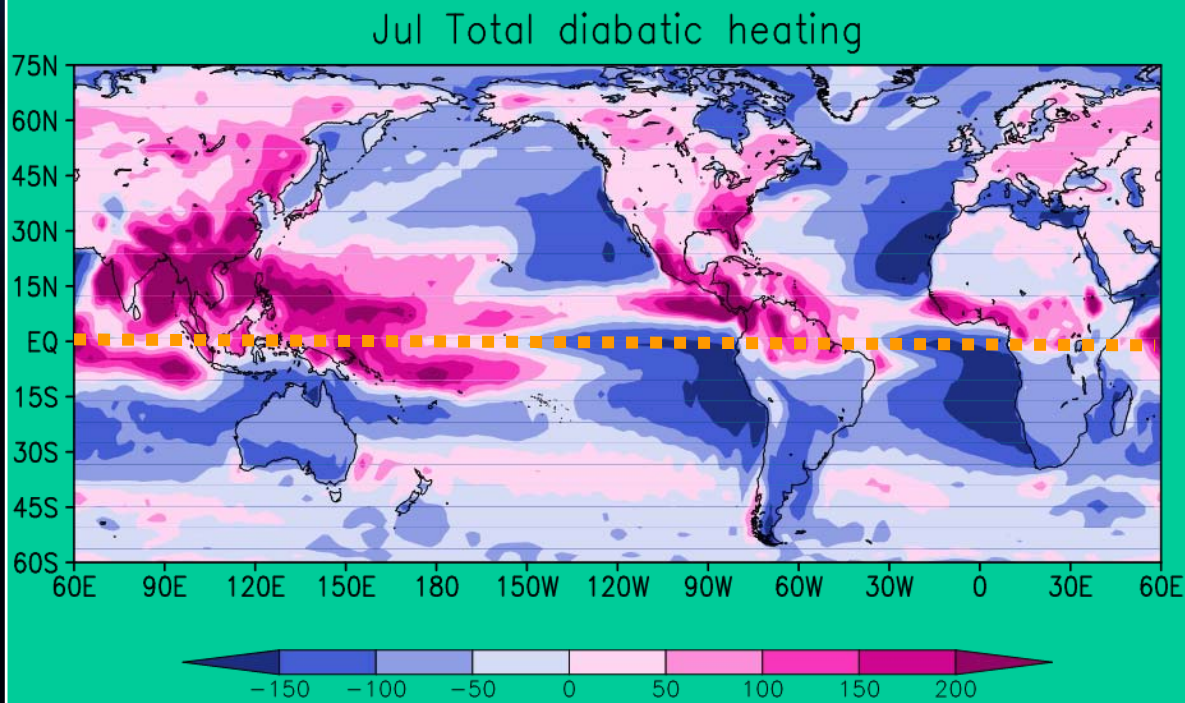
Winter:

Source-ocean; sink-land

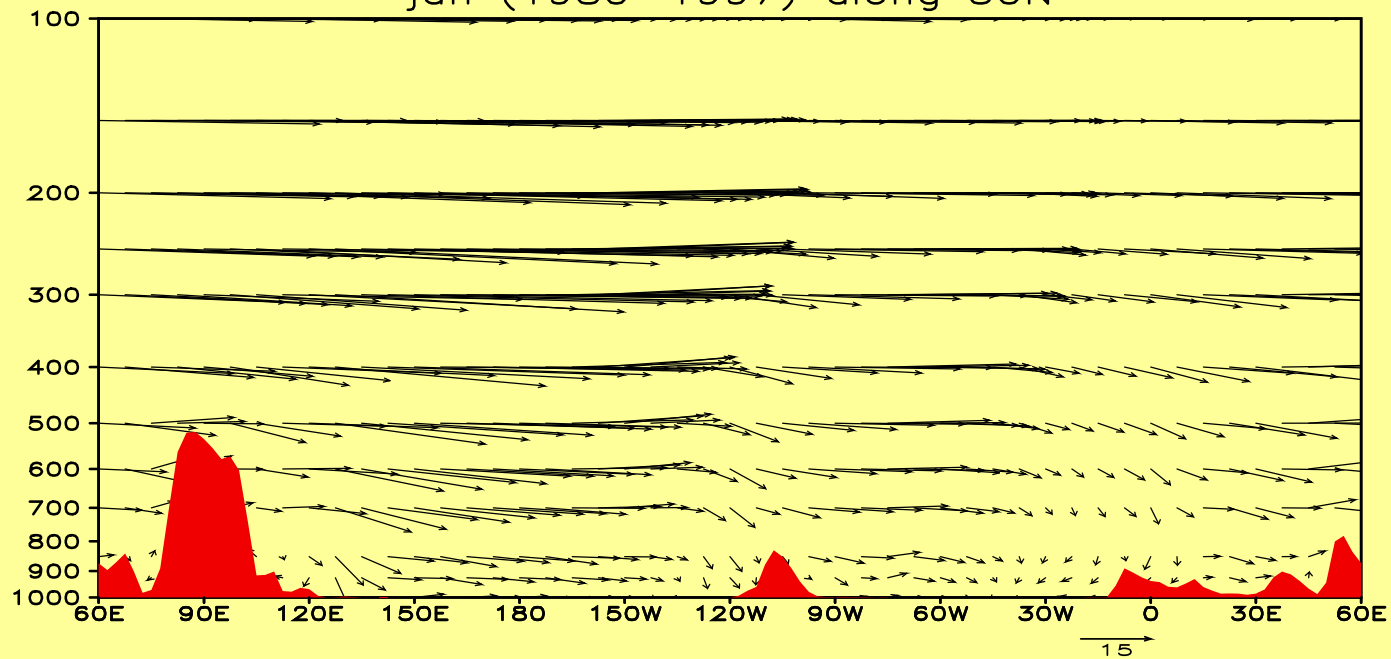


Summer:

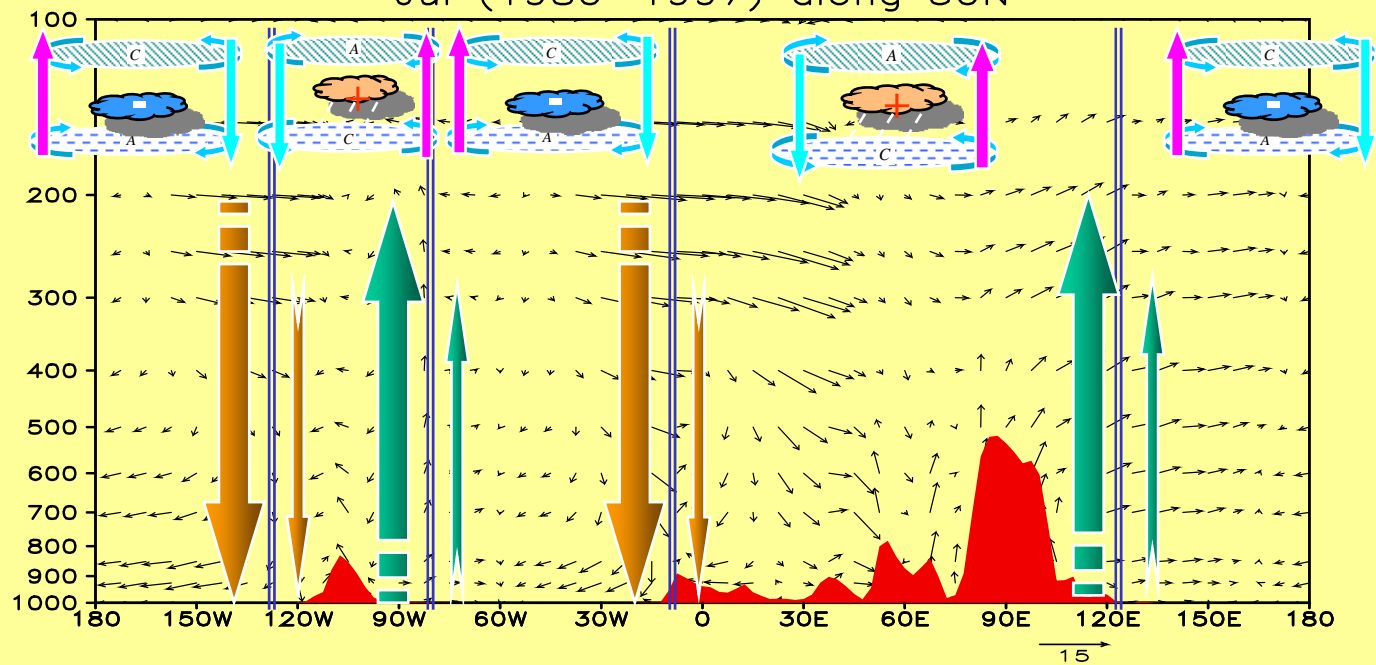
Source-land; sink-ocean



jan (1980-1997) along 30N

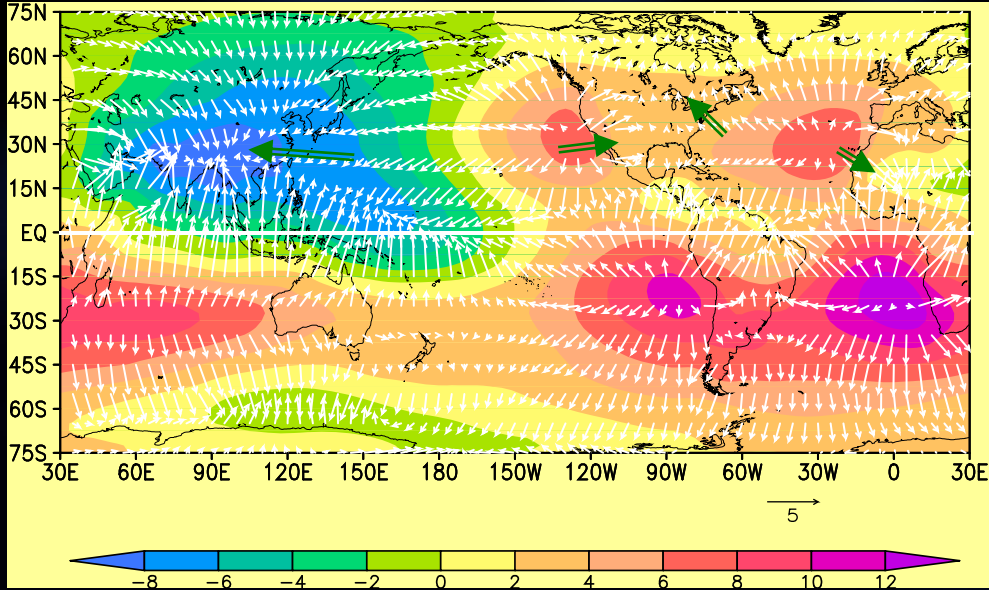
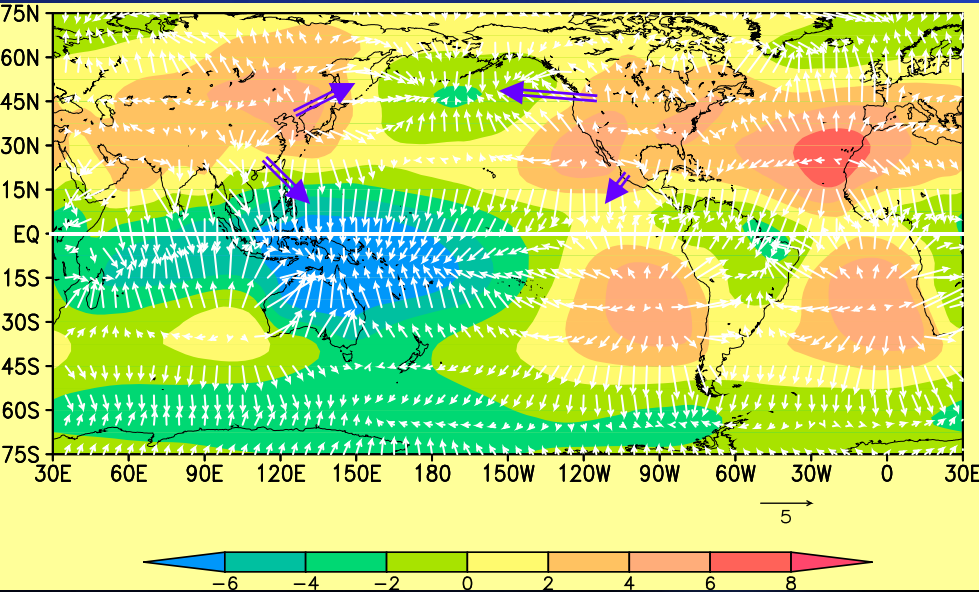


Jul (1980-1997) along 30N



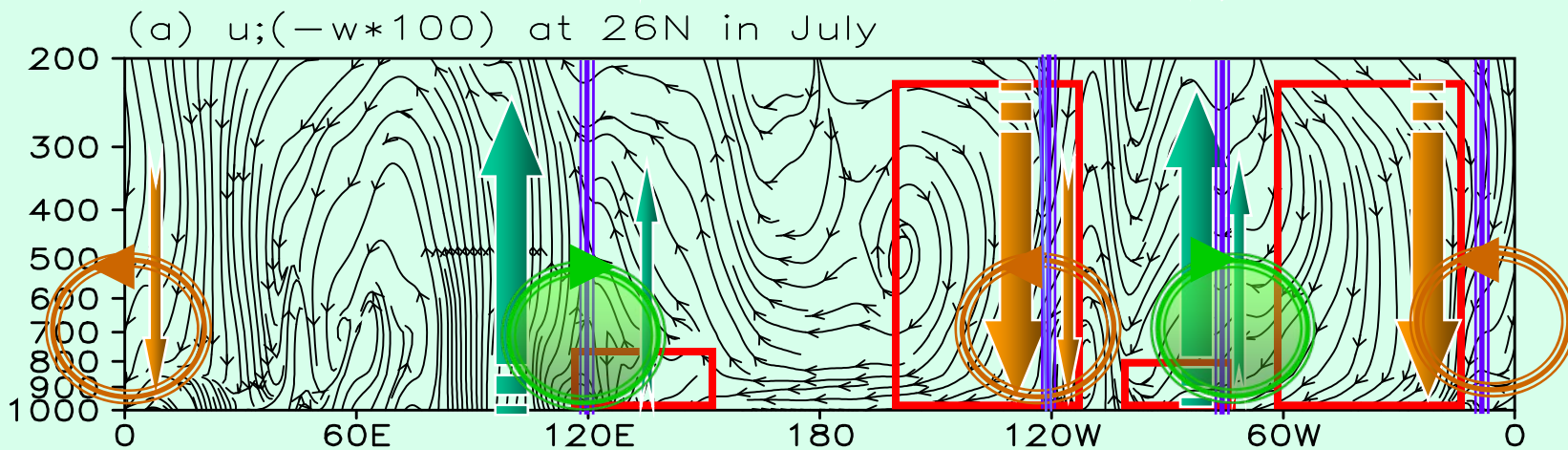
1000 hPa velocity potential (shaded) in unit of $10^6 \text{ m}^2/\text{s}$ and divergent wind component (arrow) in unit of m/s (1980-1997)

January



July





LO

$$\int_0^{p_0} Q \frac{dp}{g} < 0;$$

$$\vec{V} \cdot \nabla \theta = Q < 0.$$

D

$$\int_0^{p_0} Q \frac{dp}{g} < 0;$$

$$\vec{V} \cdot \nabla \theta = Q > 0.$$

SE

$$\int_0^{p_0} Q \frac{dp}{g} > 0;$$

$$\vec{V} \cdot \nabla \theta = Q < 0.$$

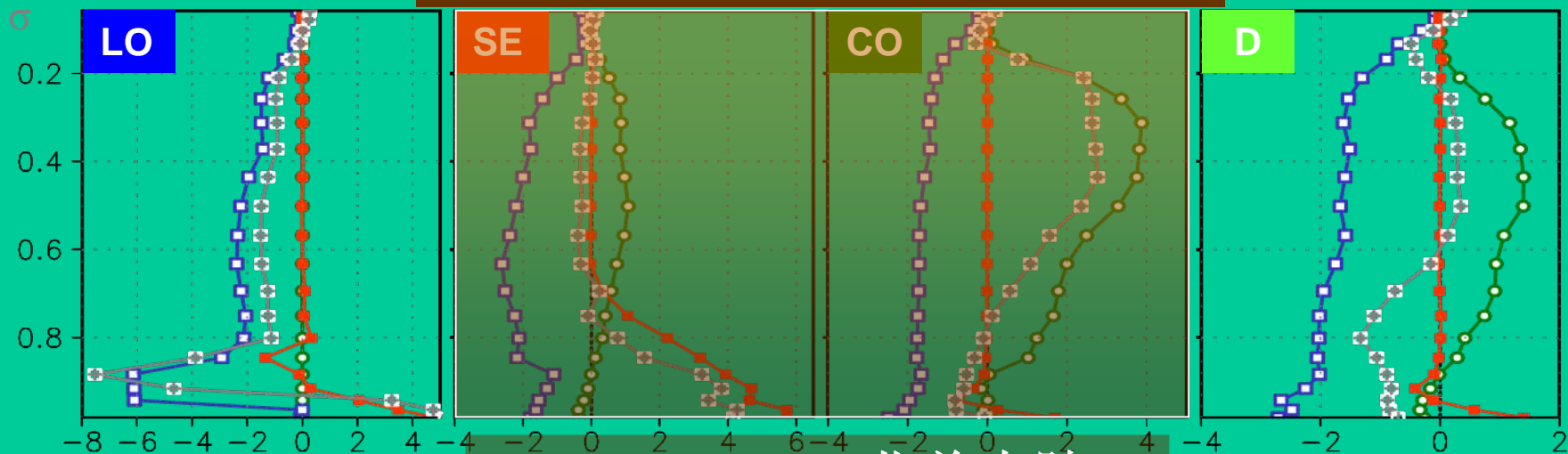
CO

$$\int_0^{p_0} Q \frac{dp}{g} > 0;$$

$$\vec{V} \cdot \nabla \theta = Q > 0.$$

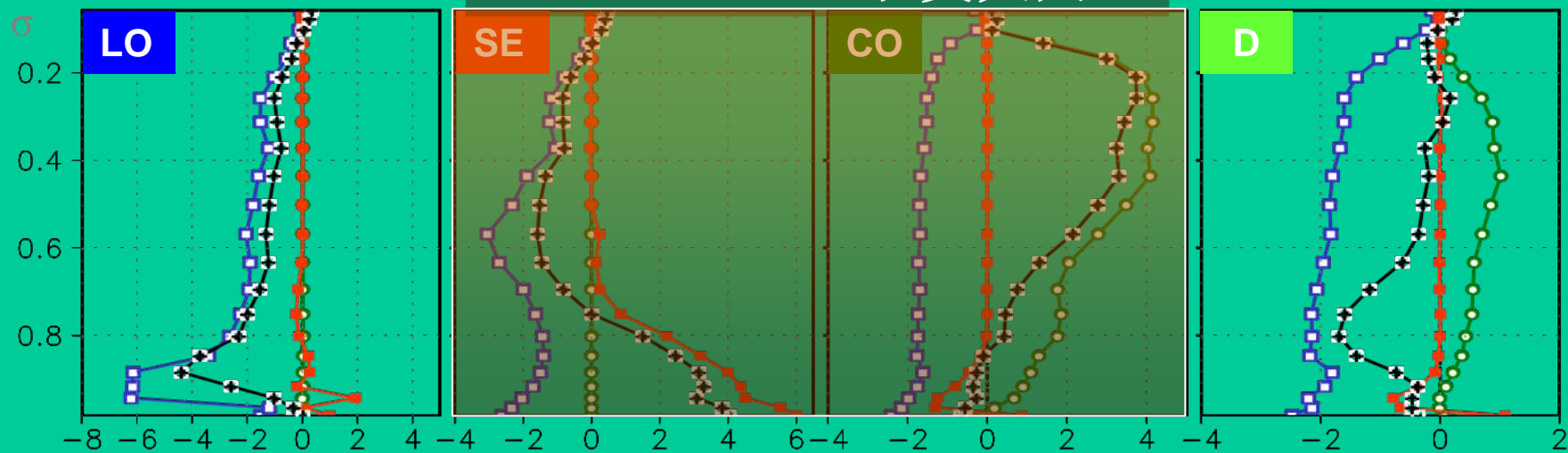
a)

Eurasian Continent / 欧亚大陆



b)

N. America / 北美大陆



Longwave rad.

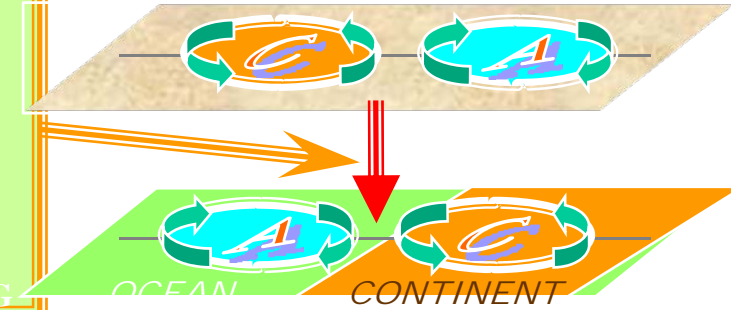
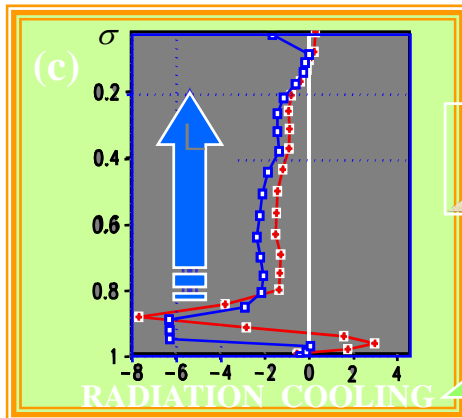
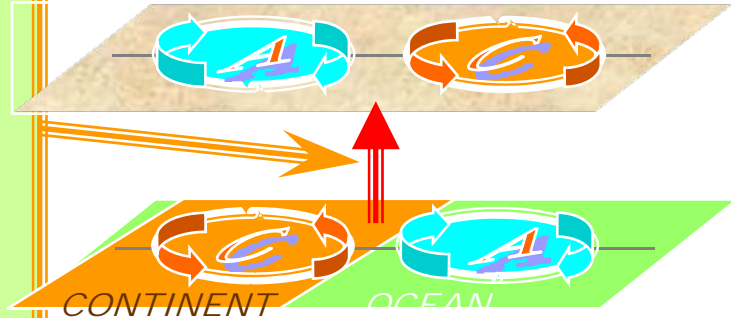
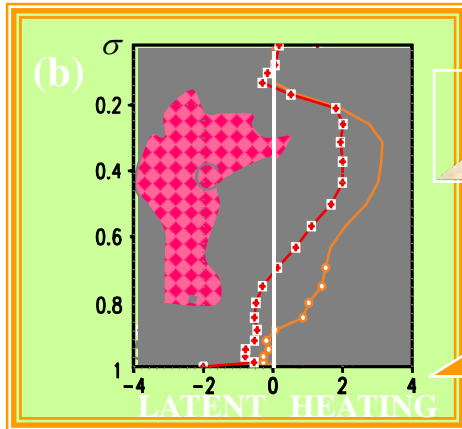
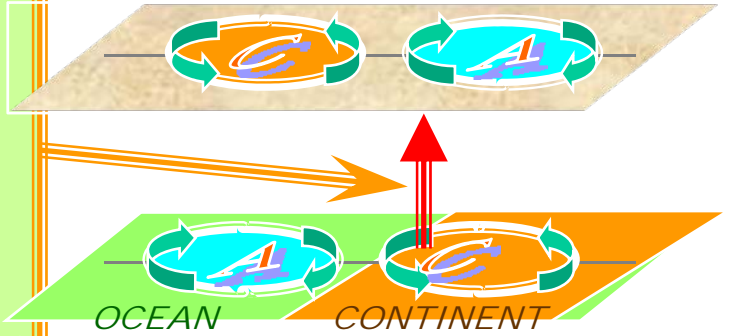
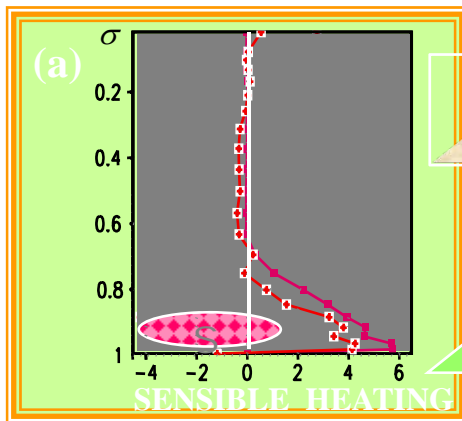
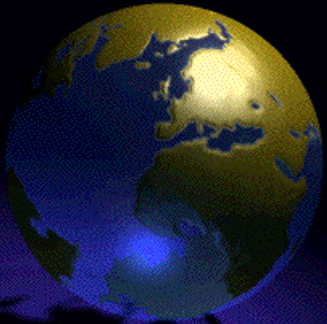
Diff. sensible

Deep conv.

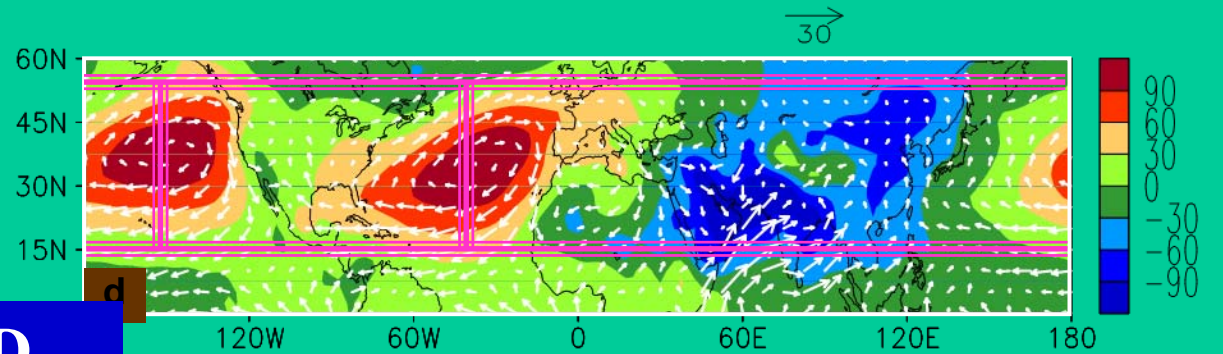
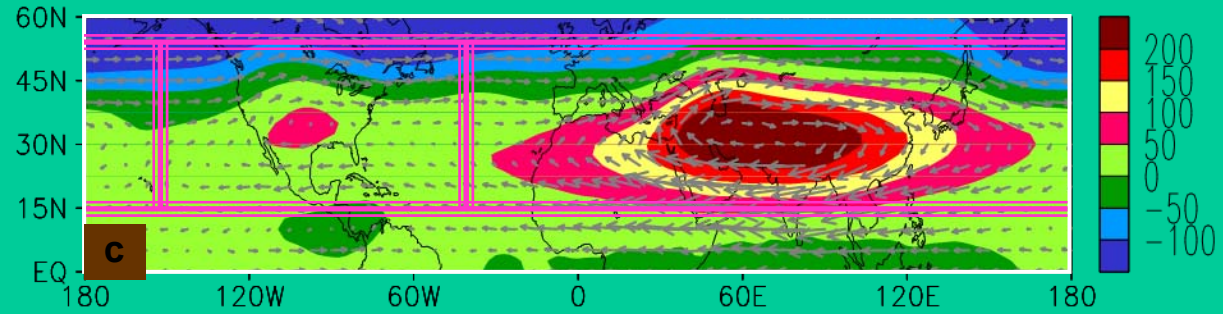
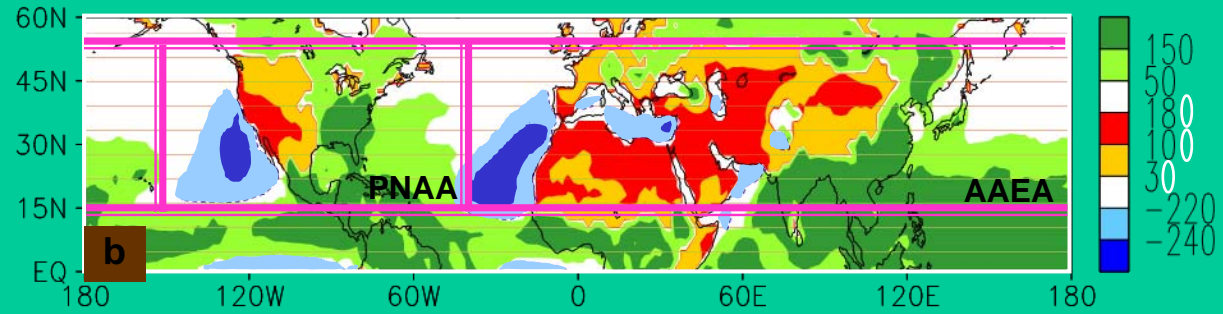
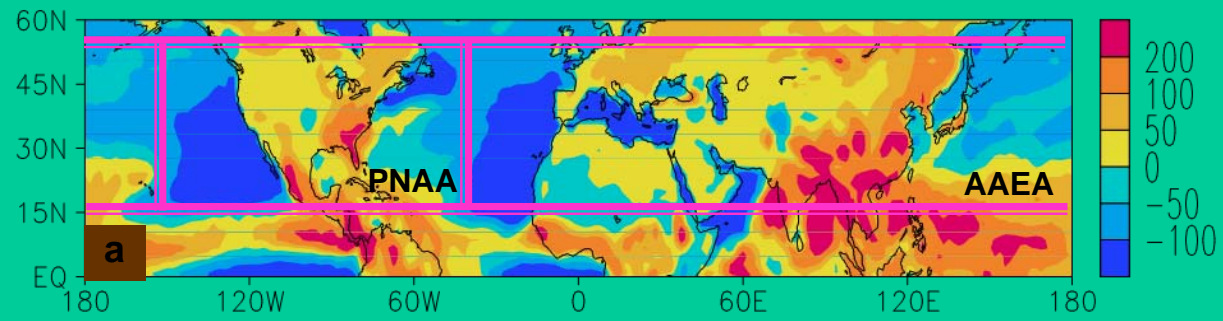
Total

 Kd^{-1}

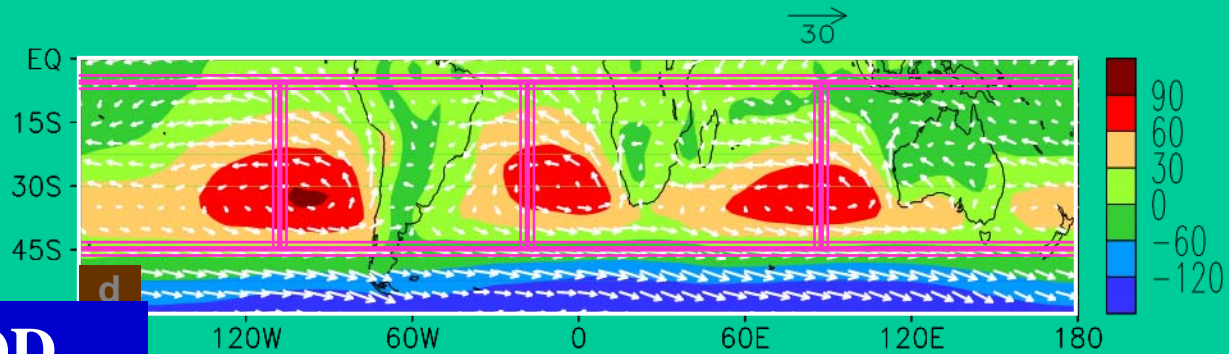
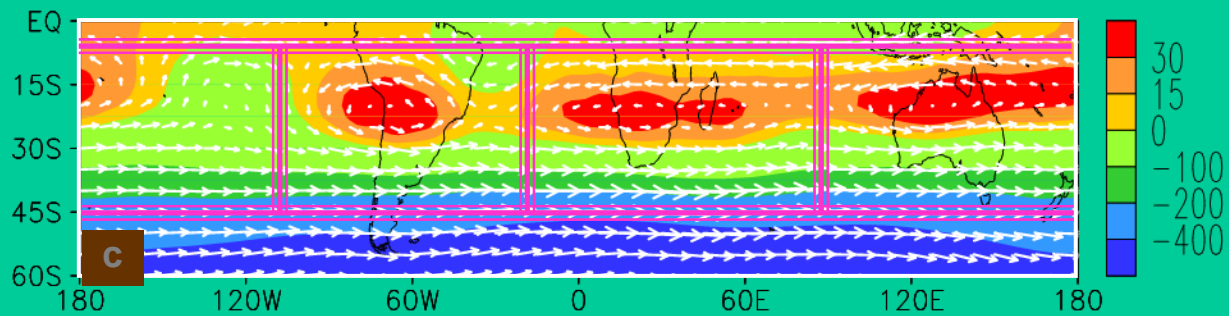
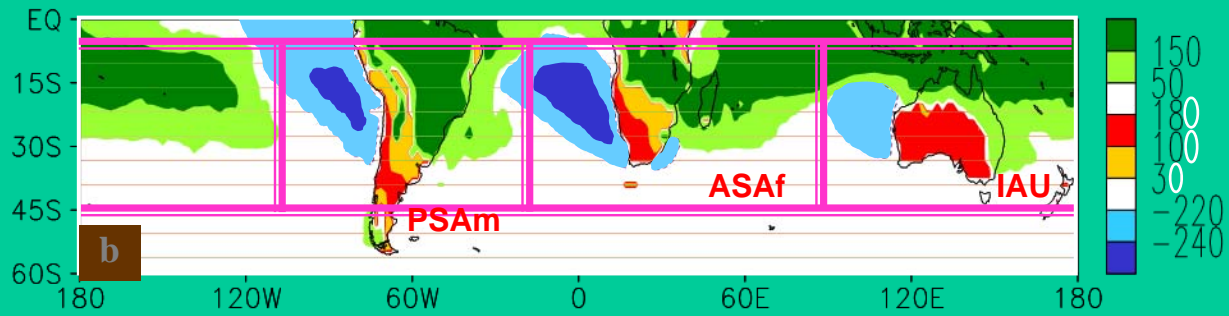
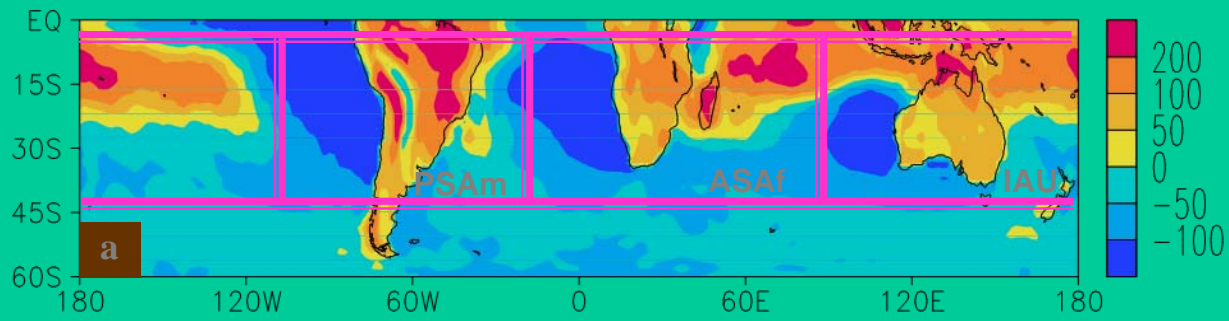
$$v \sim (f / \beta)(dQ / dz)$$



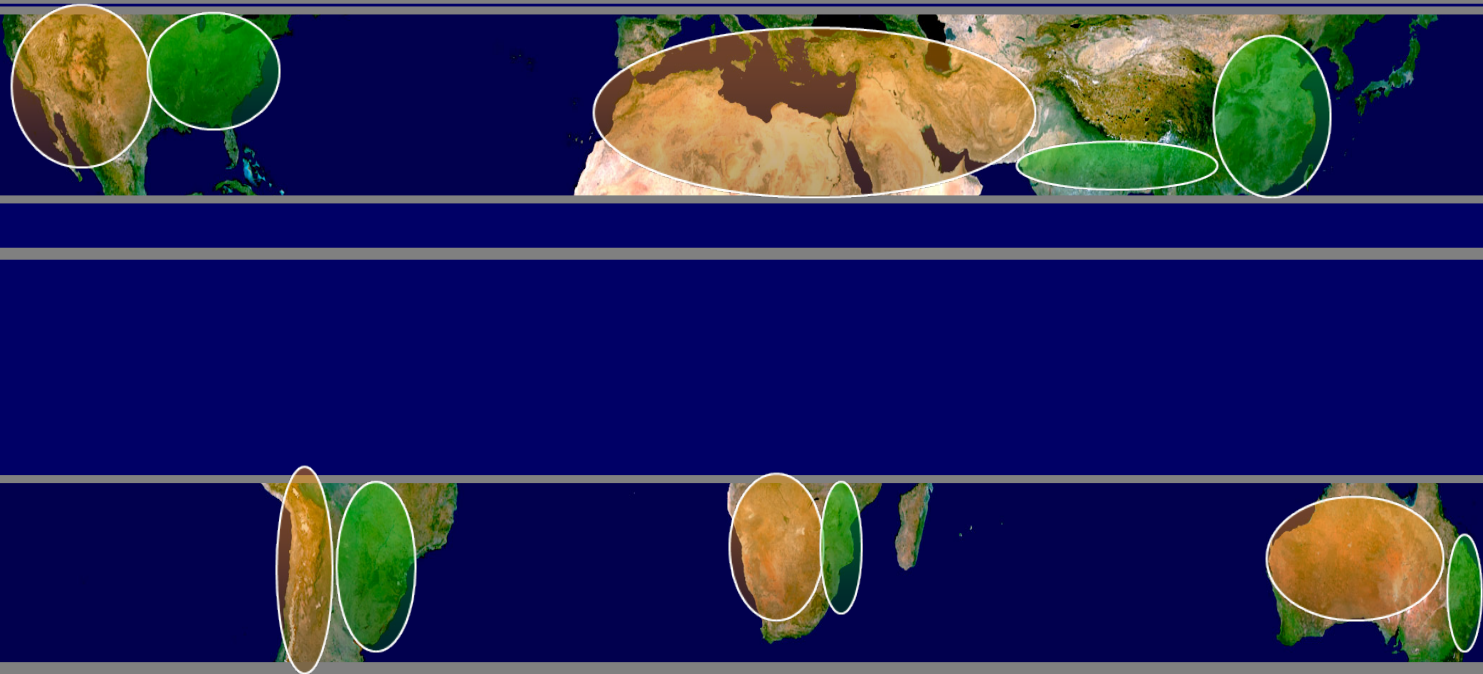
Heating and circulations



LOSECOD



LOSECOD



Desert/dry climate is formed over the western continents, whereas monsoon/wet climate is formed over the eastern continents!

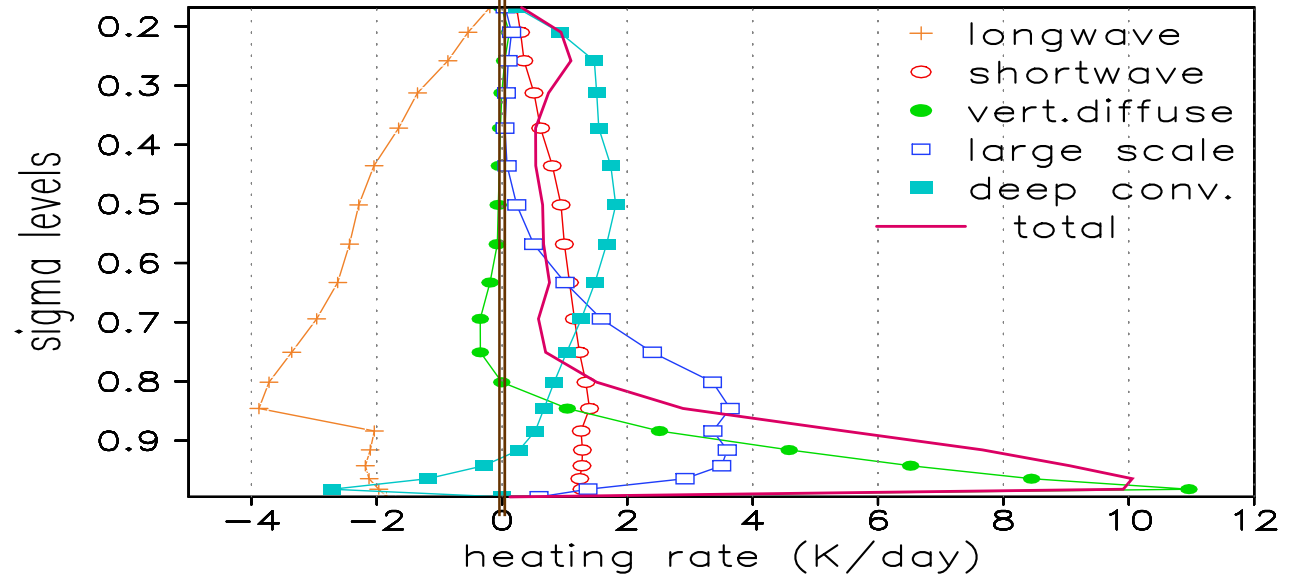
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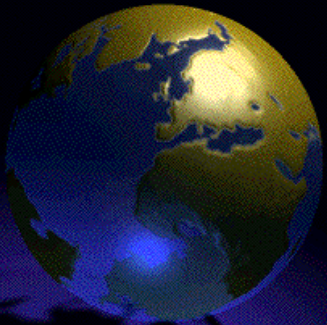
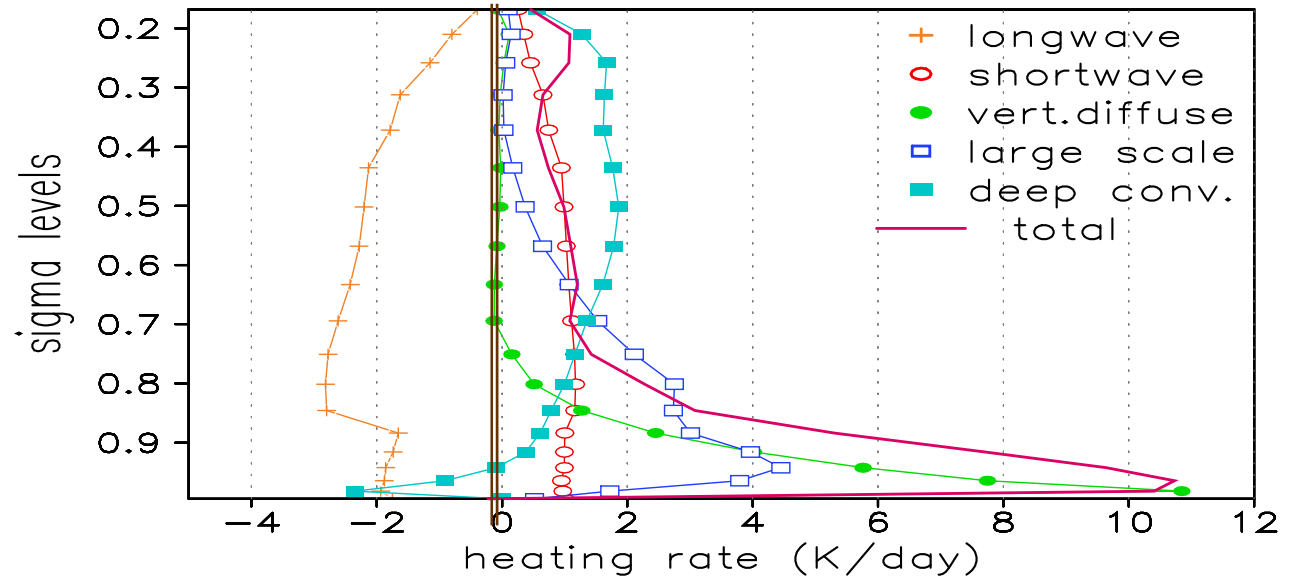


青藏高原对夏季季风降水的影响

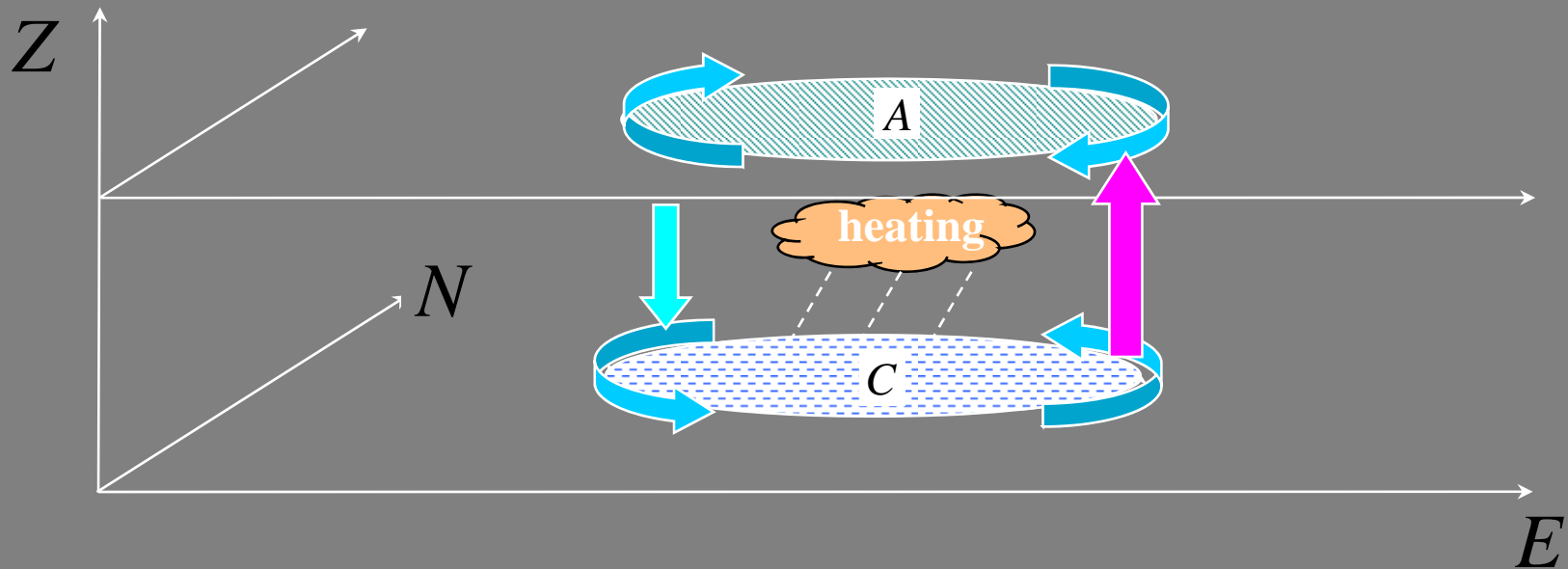
NCEP JULY areal mean heating rate
(a) western TP (78–90E, 29–38N)



(b) eastern TP (90–105E, 27–40N)

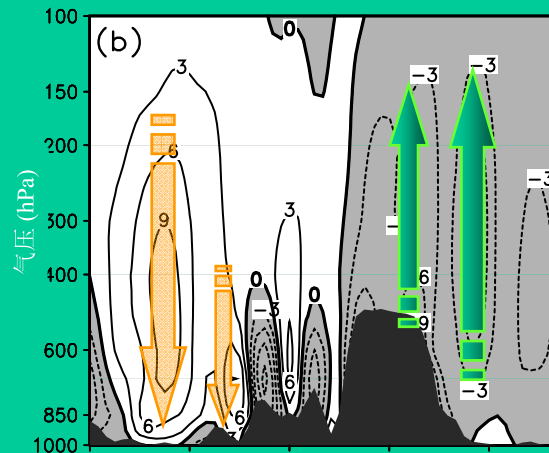
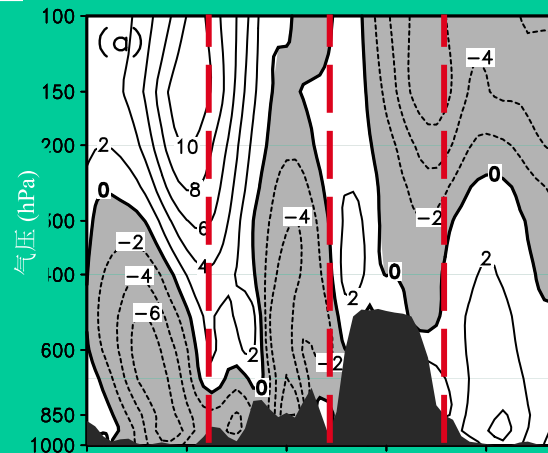


Thermal Adaptation- heating



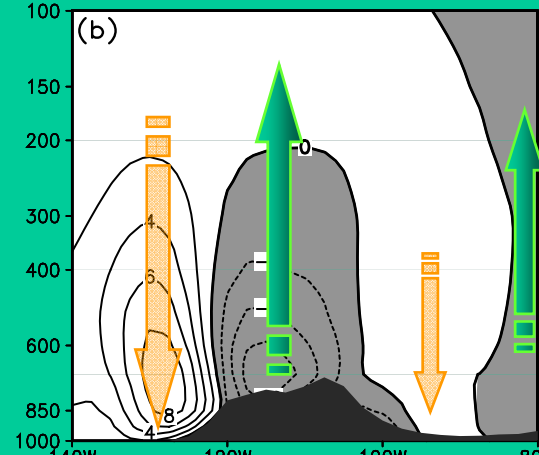
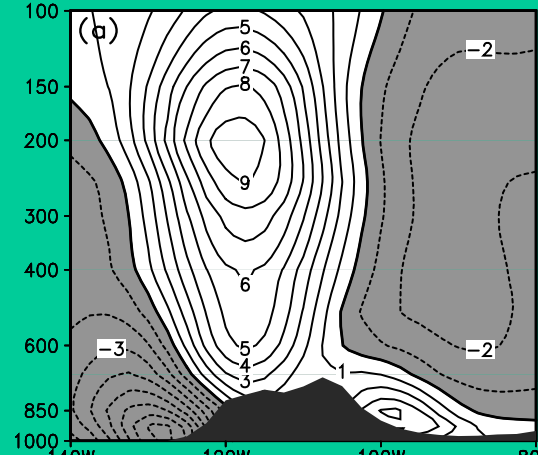
$$w \propto -\beta \frac{\partial v}{\partial z}$$

Tibetan July



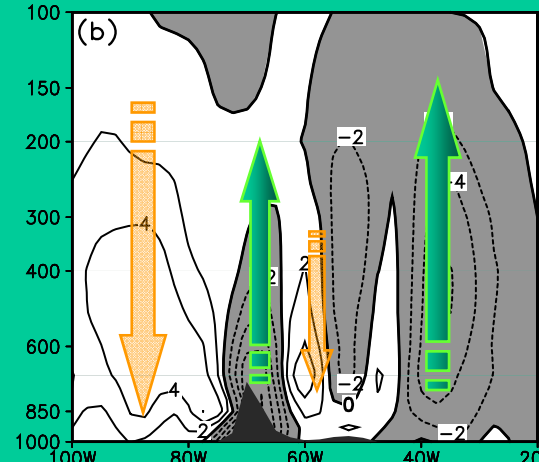
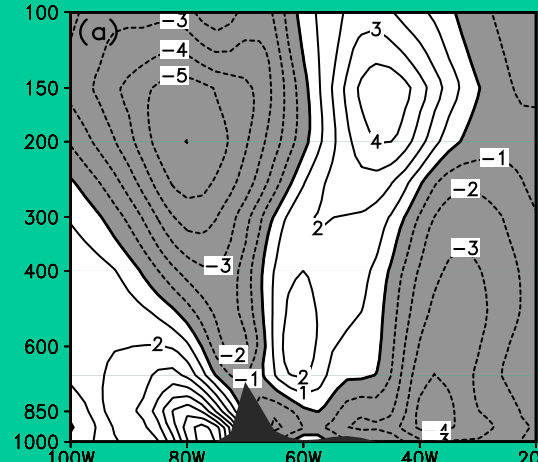
Rockies July

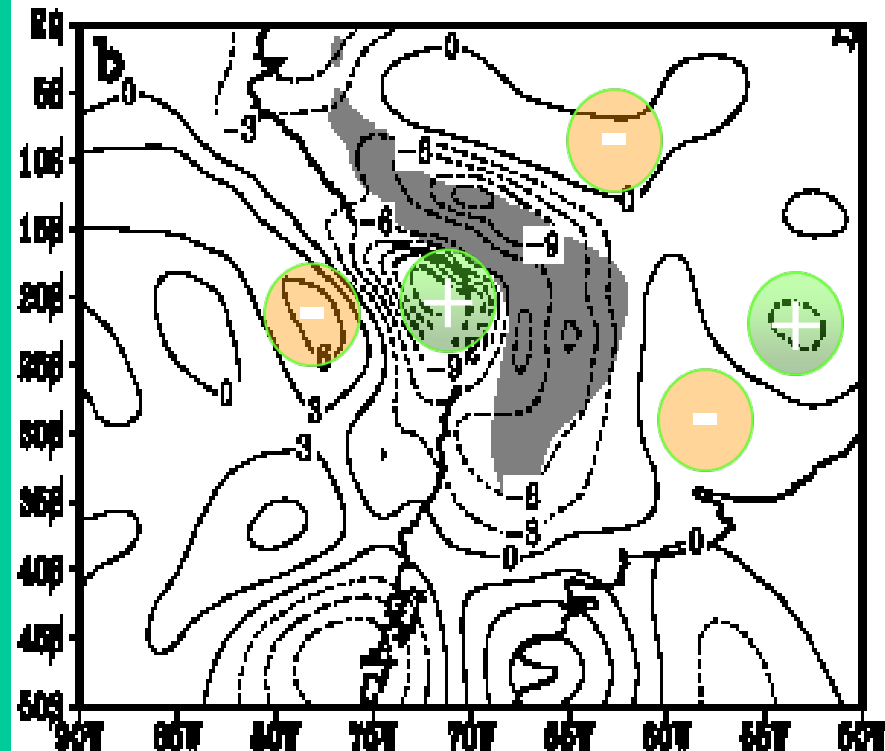
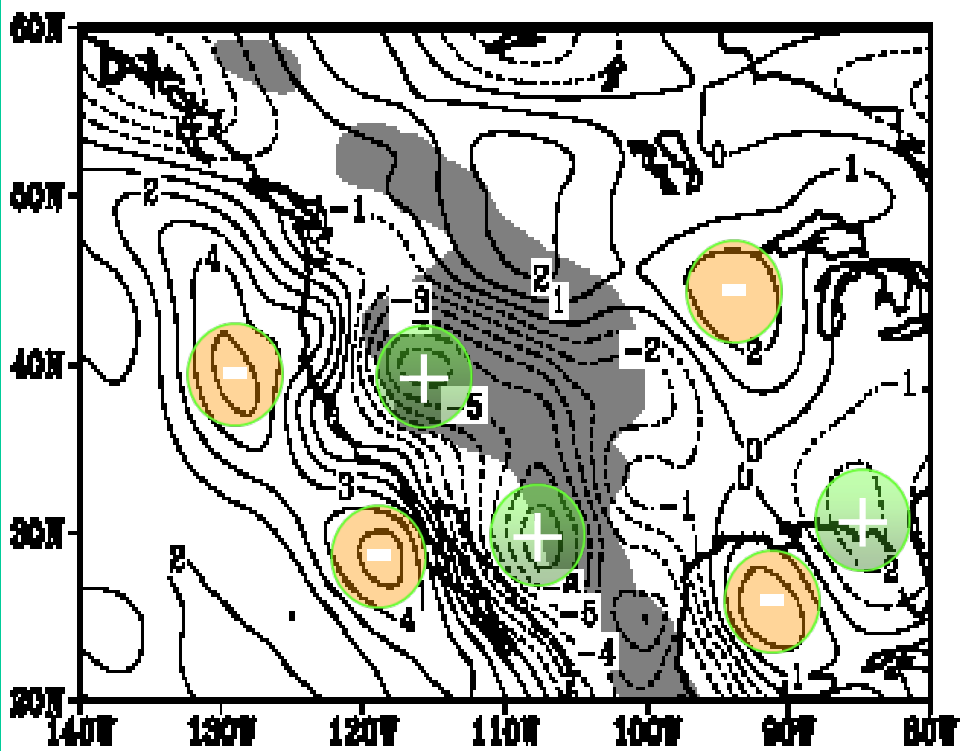
V



ω

Andes January



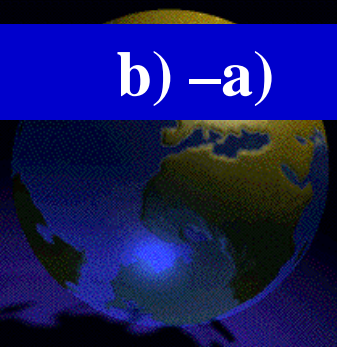
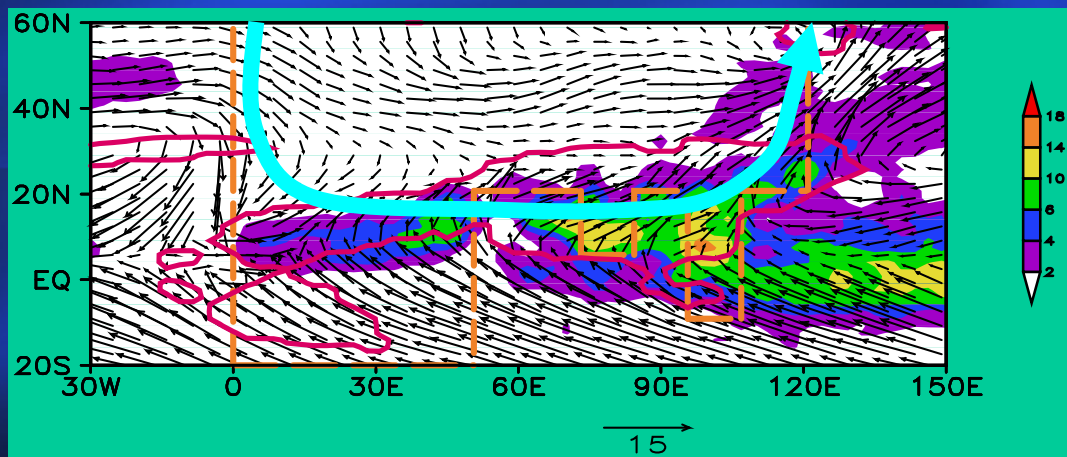


July Monsoon/desert Experiment 7月季风降水敏感试验

a) Without mountain

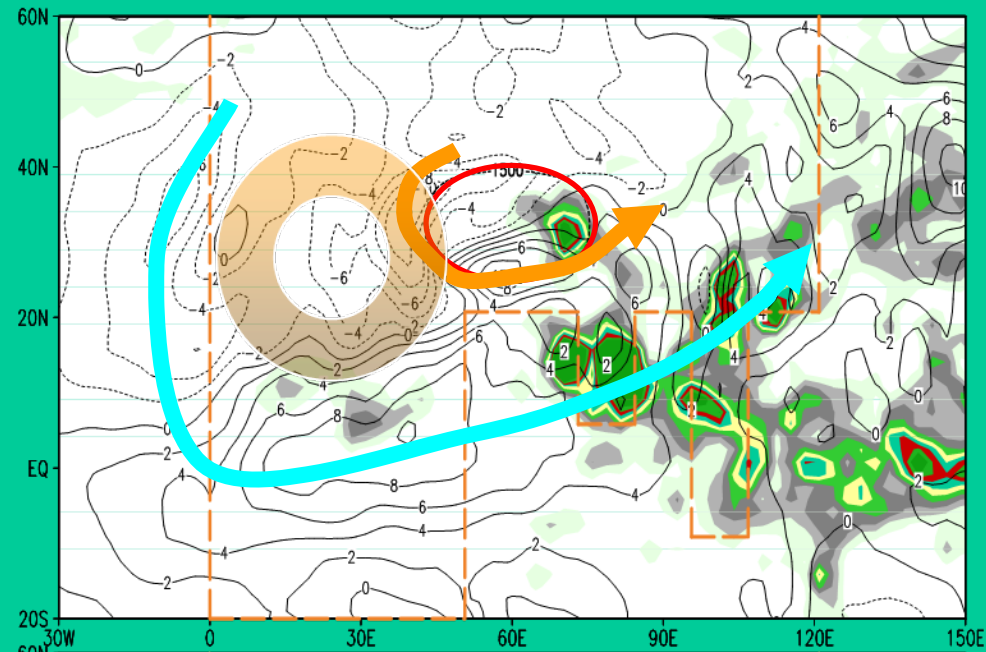
b) With mountain

b) - a)

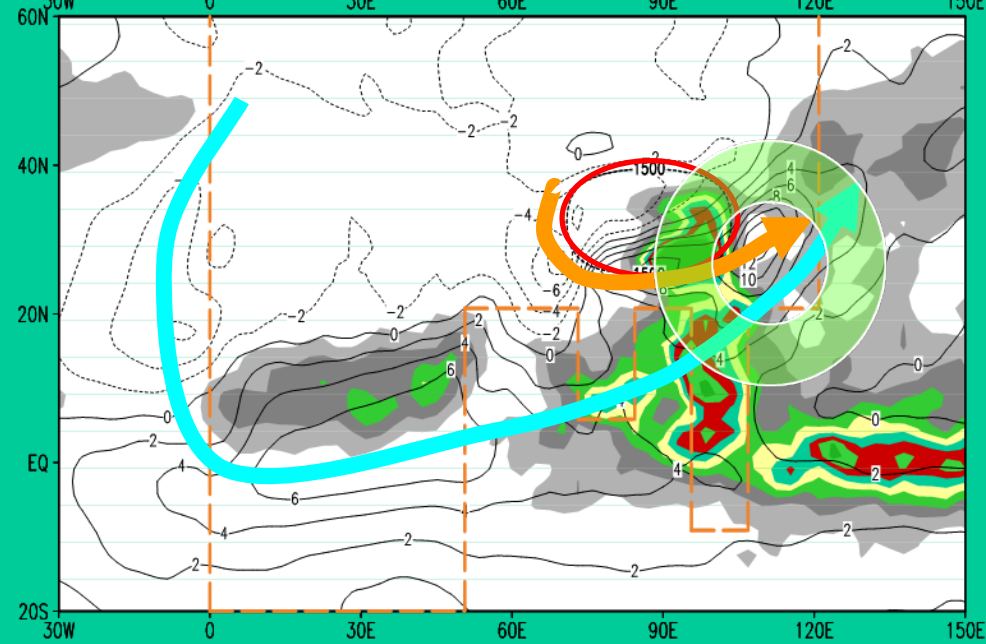


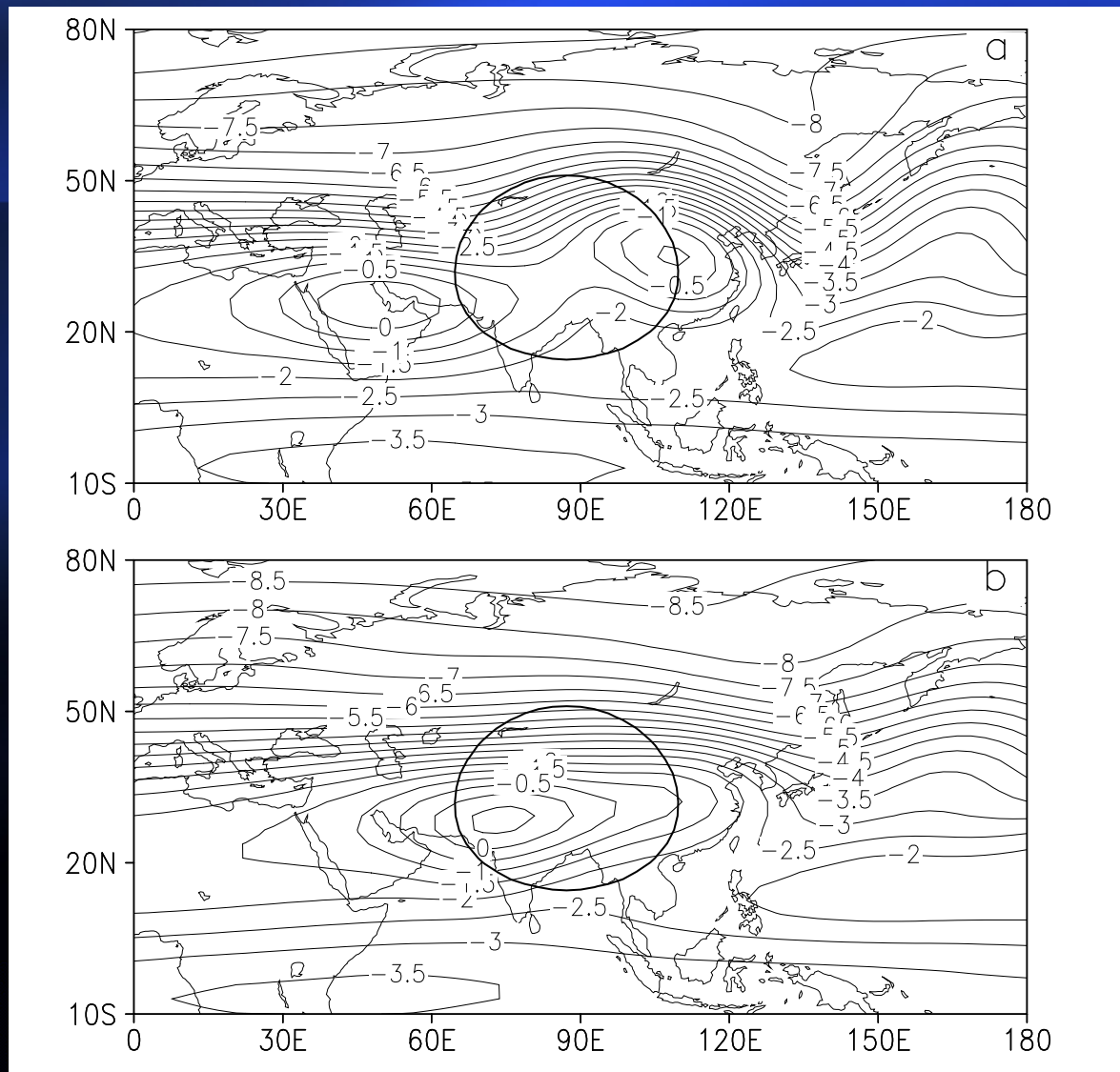
July Monsoon/desert Experiment 7月季风降水敏感试验

a) 60E
mountain

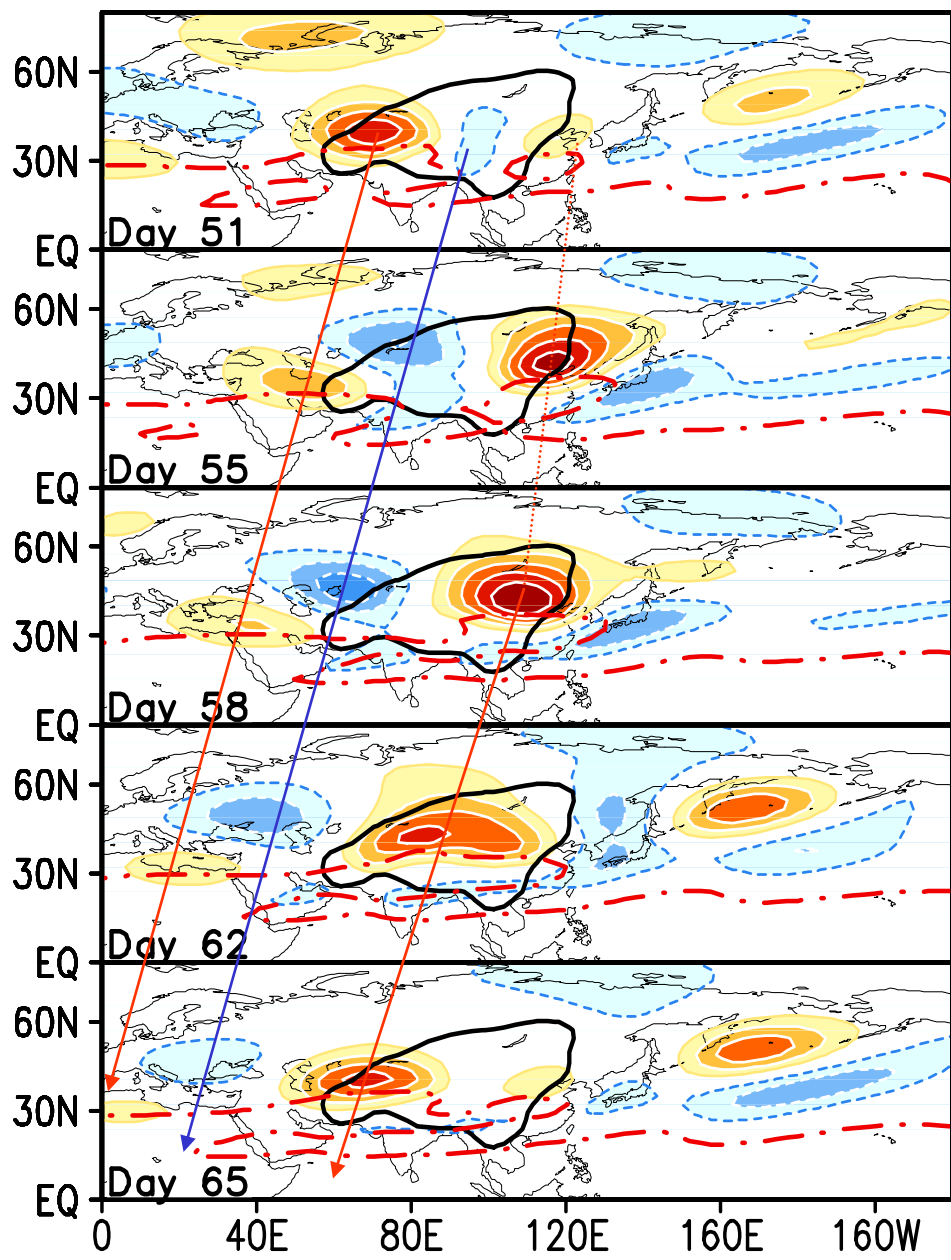


b) 90E
mountain





Bimodality of South Asian High: E-TP and W-TP modes and its biweekly Oscillation



DAY 51
W- mode

DAY 58
E- mode

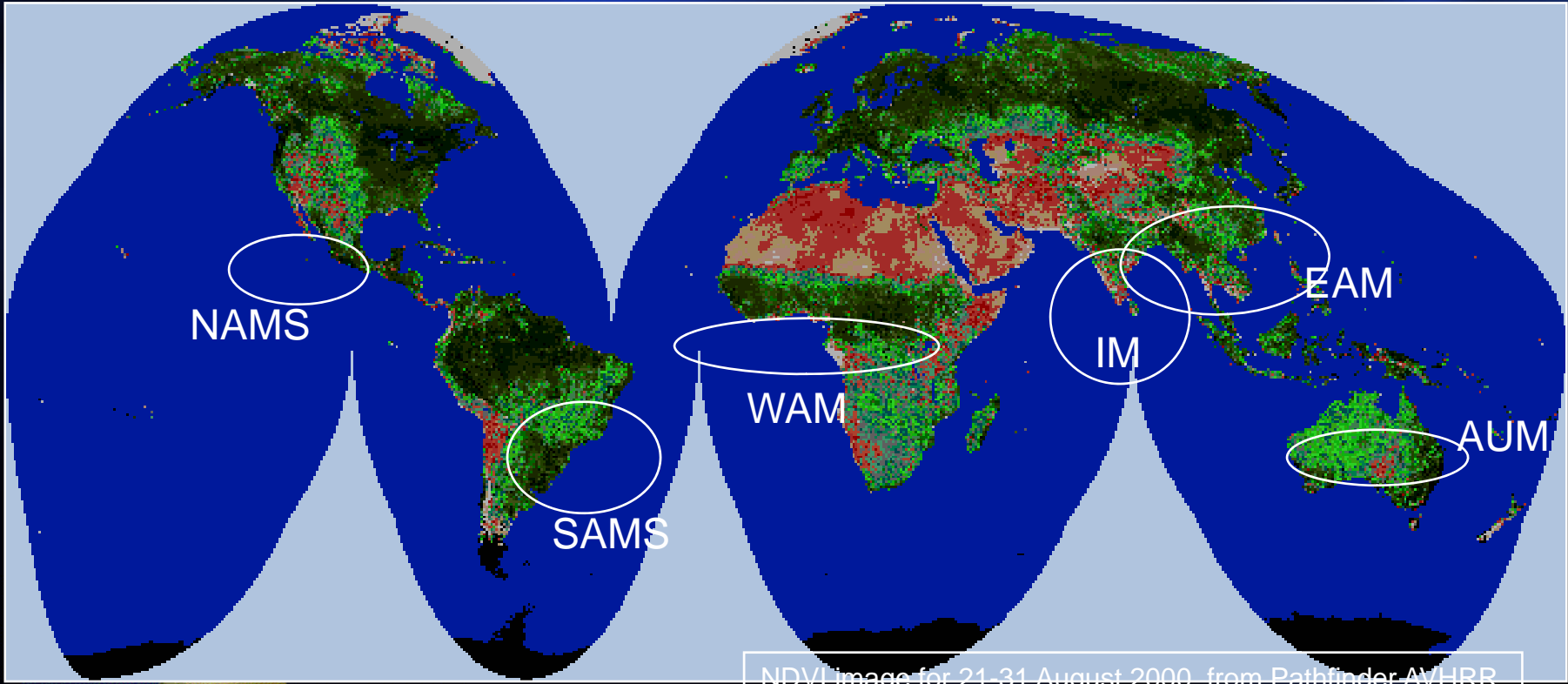
DAY 65
W- mode

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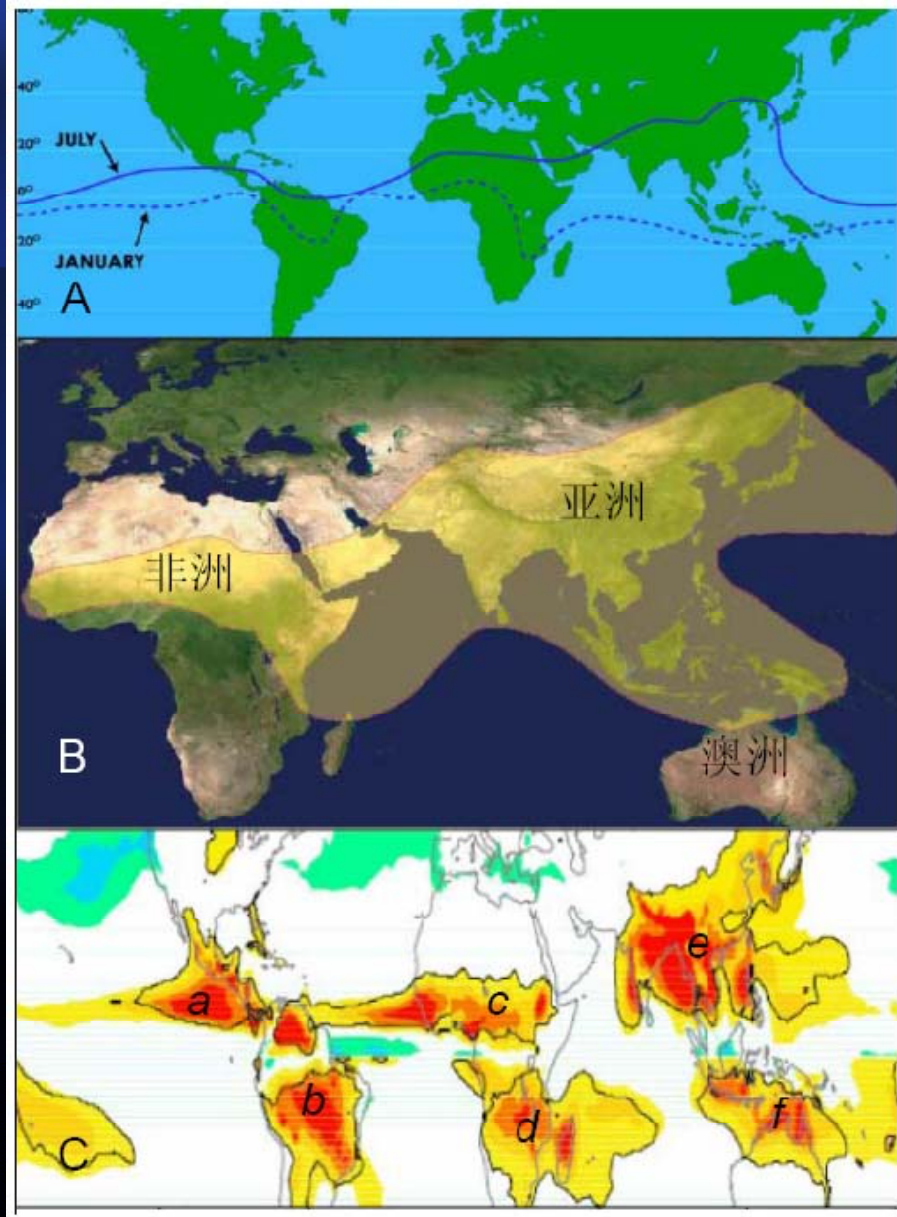


Major monsoons systems of the world



NDVI image for 21-31 August 2000, from Pathfinder AVHRR

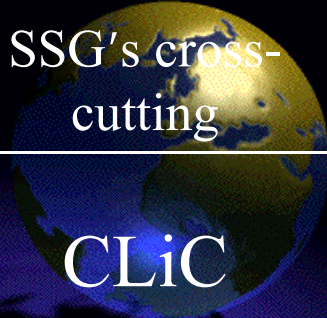
NDVI surface vegetation



季风系统。A. ITCZ的季节变化：实线—七月，虚线—一月；B. 亚洲-非洲-澳洲季风区，注意其界限与ITCZ季节变化相一致(据Black, 2002)；C. 根据降水率季节差得出的六大季风区：*a*—北美季风，*b*—南美季风，*c*—北非季风，*d*—南非季风，*e*—亚洲季风，*f*—澳洲印尼季风(据Wang & Ding, 2006)

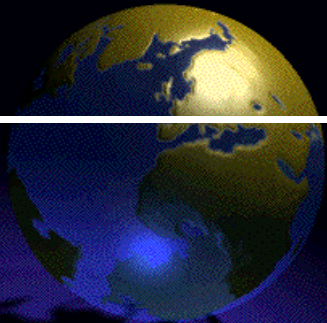
2. WCRP Monsoon Activities

Organization and governance of WCRP

	Asia	Africa	N. America	S. America
CLIVAR SSG's cross-cutting	AAMP	VACS (AMMA)	VAMOS (NAME, MESA, VOCALS)	
GEWEX SSG's cross-cutting	CEOP/CIMS coordinating global scale and each of the Regional Hydroclimate Projects (RHPs) providing input along with GMPP and GRP			
 CLiC	role of the snow/ice cover of the Tibetan Plateau, role of the cold Asian continent in the Asian winter monsoon.			

Monsoon Studies launched by WCRP

	Asia	Africa	N. America	S. America
CLIVAR	SCSMEX*	AMMA WAM	NAME/ VOCALS	MESA
GEWEX CSE's	GAME	CATCH	GAPP	LBA
	*launched by WMO/ TMRP			





Mackenzie GEWEX Study (MAGS)

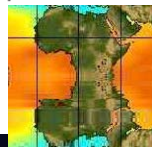
Baltic Sea Experiment (BALTEX)

GEWEX Americas Prediction Project (GAPP)

Large Scale Biosphere-Atmosphere Experiment in Amazonia (LBA)



Coupling of the Tropical Atmosphere and Hydrological Cycle (CATCH)



Murray-Darling Basin Water Budget Project (MDB)



GEWEX Asian Monsoon Experiment (GAME)

Data Management

Water and Energy Budget Studies

Sources and Cycling of Water

Extremes

Transferability

Predictability

Water Resource Applications Project

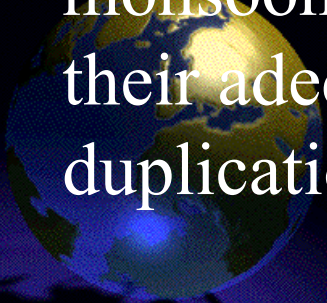


In 2004 the Joint Scientific Committee (JSC) requested an assessment of

- (1) WCRP monsoon related activities and
- (2) the range of available observations and analyses in monsoon regions.

The purpose of the assessment is to

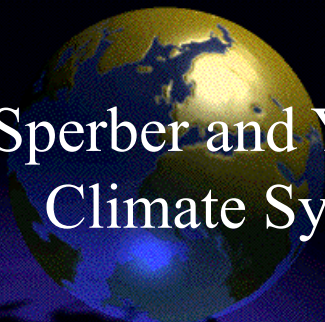
- (a) define the essential elements of a pan-WCRP monsoon modeling strategy,
- (b) the procedures for producing this strategy, and
- (c) the procedure for making any necessary improvements in monsoon observations and analyses with a view toward their adequacy, and addressing any undue redundancy or duplication



‘1st Pan-WCRP Workshop on Monsoon Climate Systems: Toward Better Prediction of the Monsoons’ at the University of California, Irvine, CA, USA from 15-17 June 2005.

- **to assess the current understanding of the fundamental physical processes governing monsoon variability;**
- **to highlight outstanding problems in simulating the monsoon that can be tackled through enhanced cooperation between CLIVAR and GEWEX”.**

(Sperber and Yasunari: The 1st Pan-WCRP Workshop on Monsoon Climate Systems: Toward Better Prediction of the Monsoons)



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A key overarching issue for monsoon prediction is the fundamental need for improved representation of tropical convection.



A JOINT WCRP/THORPEX PROPOSED ACTIVITY

Year of Tropical Convection (YOTC)

**YEAR OF COORDINATED OBSERVING,
MODELING AND FORECASTING:**

**ADDRESSING THE CHALLENGE OF
ORGANIZED TROPICAL CONVECTION**



This proposal arose from a recommendation from the THORPEX/WCRP/ICTP Workshop on Organization and Maintenance of Tropical Convection and the MJO, held in Trieste in March 2006. If implemented in 2008, this initiative would be a WCRP/THORPEX contribution to the UN Year of

YEAR OF TROPICAL CONVECTION

Web Organization of Overlapping Field Programs

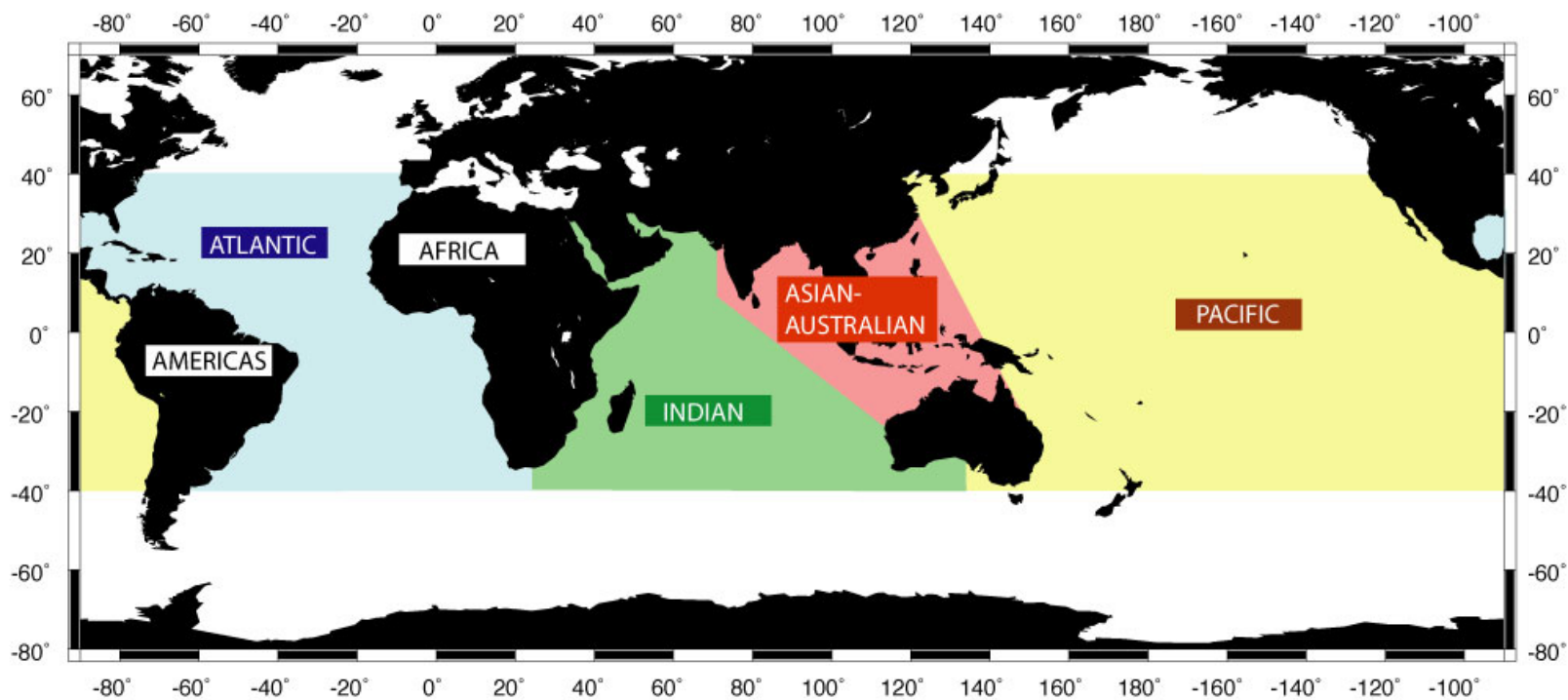
CLIVAR HELP - Thanks Howard & Nico

CLIVAR

CLIMATE VARIABILITY AND PREDICTABILITY

[Year of Coordinated Observing, Modeling and Forecasting:
Addressing the Challenge of Organized Tropical Convection](#)

[Background](#) | [By Regions](#) | [By Climate Category](#)



3. Emerging activities in the AA Monsoon region

“Asian Monsoon Year (AMY’08)”:

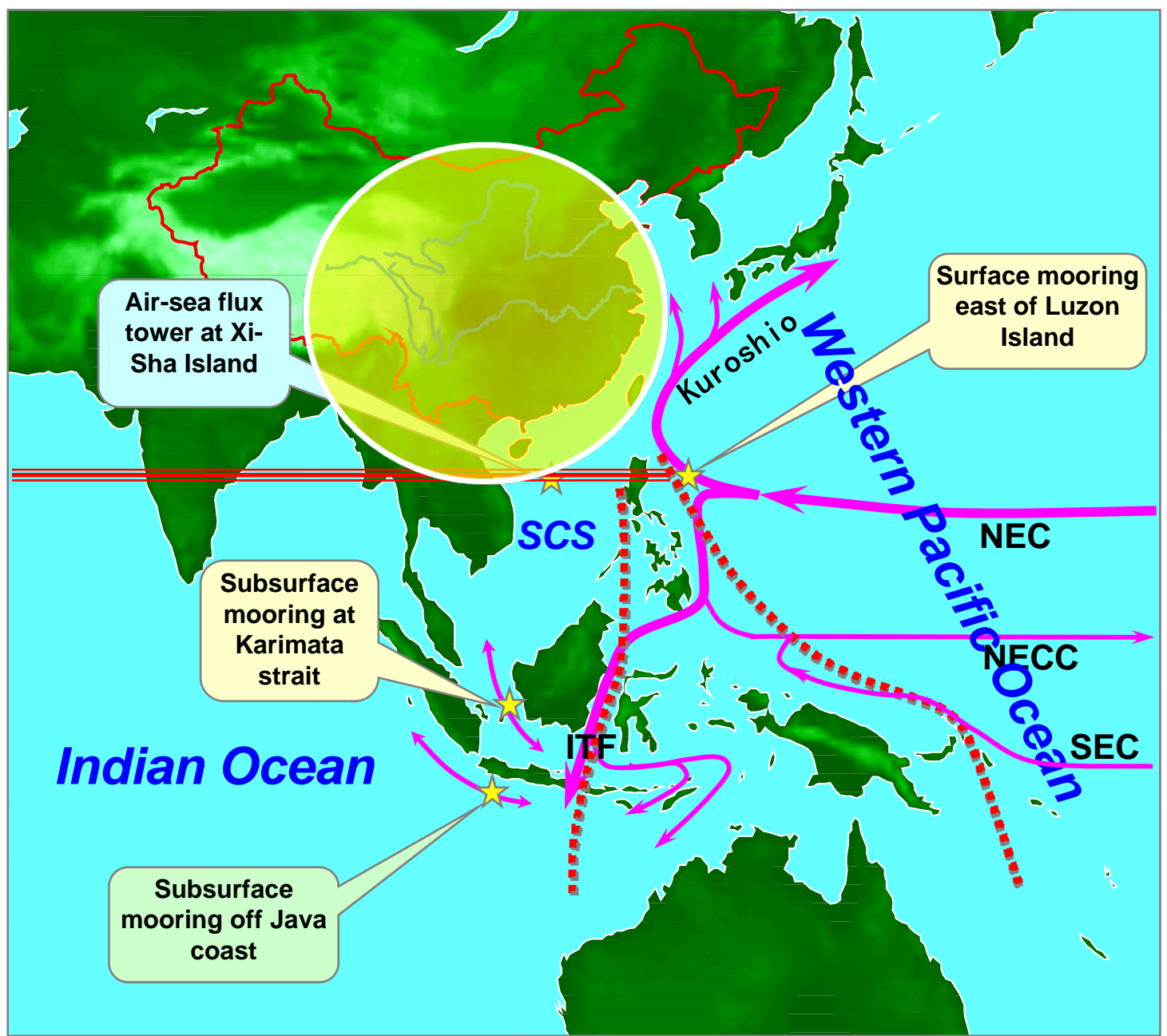
The “Asian Monsoon Year (AMY08)” (2008-2009) initiative is a coordinated observation and modeling effort on understanding the aerosol-cloud/radiation--hydrology cycle-circulation interaction and ocean-land-atmosphere interaction of the Asian monsoon system, and on improving monsoon prediction.

Some Related International Projects

AMY08

- China – AIPO
- India – STORM
- India – CTCZ
- Japan – JEPP/JAMSTEC
- Japan – MAHASRI (GEWEX)
Monsoon Asia Hydro-Atmosphere Scientific Research and Prediction Initiative
- (WWRP) China – SCHeREX
- (WWRP) SoWMEX
- (WWRP) US-TiMREX
- Joint Aerosol-Monsoon Experiment (JAMEX)
- Monsoon Asia Integrated Regional Study (MAIRS)

Schematic observation plan of atmosphere-ocean interaction at the Asia-Indo-Pacific Region



JSC-28 (Zanzibar 2007)

- Decided to endorse the WCRP cross cutting monsoon initiative;
- Cross-cut should include all monsoon groups with a broader perspective,
- Led by CLIVAR and GEWEX with participation of SPARC, CliC and WGNE and several relevant activities outside of WCRP (particularly THORPEX);
- Requested CLIVAR and GEWEX to agree on how it should be supervised and the development of an implementation plan;
- Asian Monsoon Year and an International Year of Tropical Convection considered as the components of an International Monsoon Study 2007-11 (IMS);
- GEWEX and CLIVAR to rationalize the number of monsoon committees;
- Appointed a JSC oversight group for monsoons consisting of G Wu (chair), J Slingo, T Yasunari, C Vera, L A Ogallo and J Shukla.



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2nd AMY Workshop

Following the resolution of the First International Workshop on AMY'08 at Beijing, the Second AMY'08 workshop was held at Bali, Indonesia on September 3-4, 2007.

The major objectives of 2nd workshop are to **discuss and finalize the Science plan and Implementation Plan for AMY'08.**



ASIAN MONSOON YEAR 2008 (AMY08) WORKSHOP

September 3rd- 4th 2007, Ramada Bintang Bali Resort, Bali, Indonesia



Objectives of International Monsoon Studies (IMS)

(results of discussion in Bali, Sep.2007)

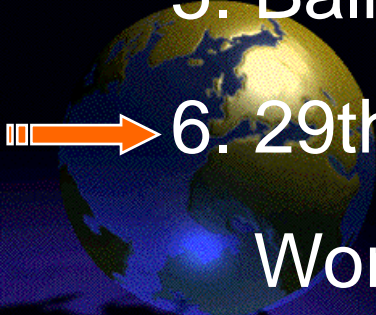
- Improve forecasts from intra-seasonal to inter-annual time-scales in monsoon regions
- Improve our understanding of the relative role of land and oceans on diurnal to interannual (decadal) time scales.
- Improve our understanding of (natural & anthropogenic) climate change on monsoons
- **Enhance the observational networks and data utilization**
- **Enhance the collaboration among regional monsoon research communities**
- **Facilitate the use of knowledge on monsoon climate in societal impact studies**

Organization of IMS scoping group (SG) under WCRP-JSC (tentative)

- **From JSC Monsoon Oversight Group (JMOG)**
(Wu.G.X., T.Yasunari, J.Slingo, J.Shukla, C.Vera, L.Ogallo)
- **From CLIVAR/GEWEX Monsoon Panels&WGs**
(J. Matsumoto, B.Wang, J.Polcher, H. Berbery, OCEANS)
- **From CEOP**
(T.Koike, K.M.Lau)
- **From THROPEX (YOTC)**
(D. Waliser)
- **From MAIRS and others**
(C.B. Fu, B. Goswami)
- **From WMO monsoon study committee**
(C.P. Chang)
- **(exofficio) IPO directors of CLIVAR and GEWEX**

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2. Orograph Local Scale Forcing
3. 1st Pan-WCRP Workshop on Monsoon Climate Systems
4. 28th JSC/WCRP Endorsement- IMS
5. Bali One-day workshop
6. 29th JSC/WCRP decision- 2nd Pan-WCRP Workshop on Monsoon Climate System



JSC-29 Proposal on Monsoon Issues—April 2, 2008

WCRP/WWRP Monsoons and Tropical Meteorology Coordinating Panel

Coordinating Role:
Facilitating joint meetings,
Promoting targeted activities

Monsoon studies:
AMY, IMS..

YOTC

Future emerging
priorities.....

GEWEX CEOP &
GMPP

CLIVAR Regional &
Modelling Panels

WWRP Tropical Met.,
WGNE, THORPEX



**Second Pan-WCRP Monsoon Workshop
(PWM-2)**

will be held jointly with the

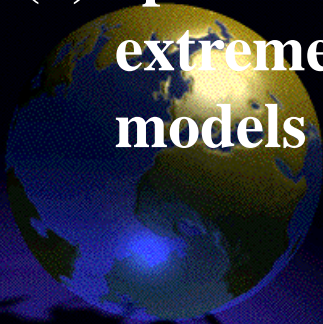
**WMO Fourth International Workshop on
Monsoons (IWM-4)**

20-25 October 2008, Beijing, China

Specific objectives and key agenda

To discuss some important and urgent cross-cutting issues on regional as well as global monsoon systems in the world. Particularly,

- (1) understanding the role of the monsoons in the changing global climate system, in relation to phenomena such as energy & water cycles and floods & desertifications, using various data and coupled ocean-atmosphere GCMs and RCMs.**
- (2) predictions of seasonal march, intraseasonal variations and extreme events in the monsoon systems, using cloud resolving models (CRMs).**



Issues related to CEOP

To help understanding, modeling and prediction of the interdependence among heating, circulation and rain components of the monsoon system, we need

- to deal with the data concerning continental forcing;
 - trend, inter-decadal and inter-annual variability.
- to identify L-scale Orograph (Tibetan Plateau) forcing.
 - inter-decadal, inter-annual and LFV variability.
- to detect the land/sea breeze.
 - inter-decadal, inter-annual, LFV and diurnal variability.

Welcome to join us in Beijing in October 20-24!

Thank You!

