

# 973 Basic Research Program

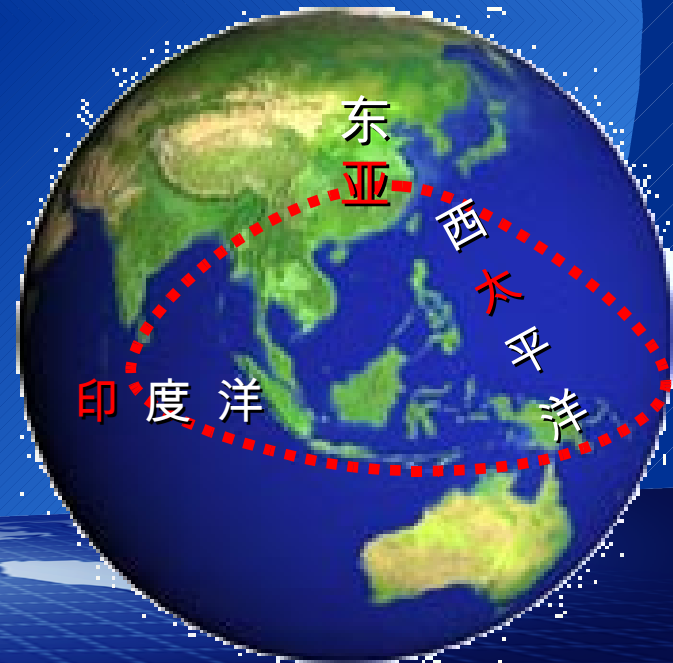
## **Ocean-Atmosphere Interaction over the Joining Area of Asia and Indian-Pacific Ocean (AIPO) and Its Impact on the Short-Term Climate Variation in China**

□ PERIOD: January, 2007-December, 2011

CHIEF SCIENTIST:

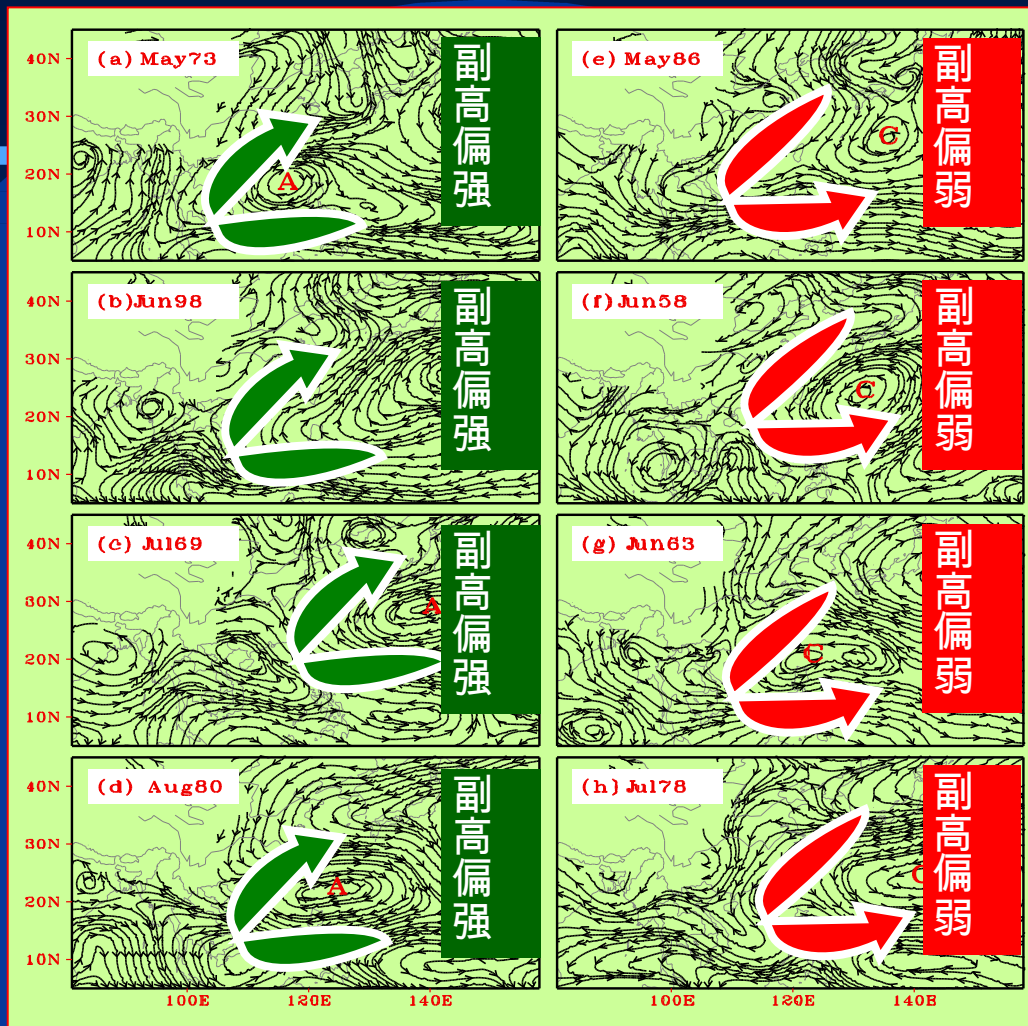
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Chinese Academy of Sciences (CAS)

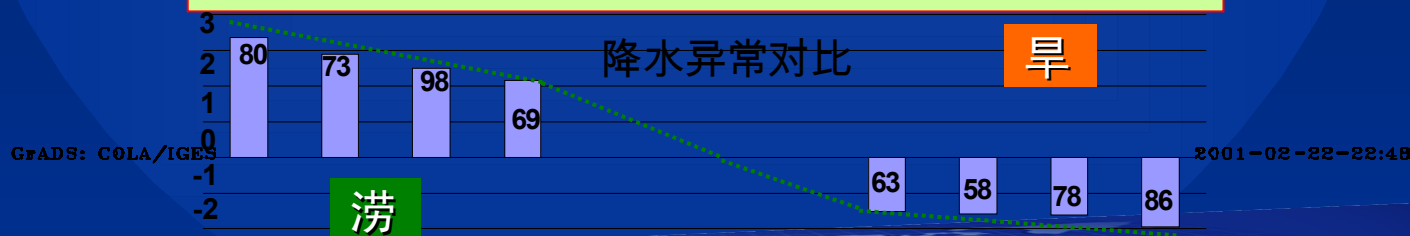


1.5 km 低空

长江流域特涝月环流异常



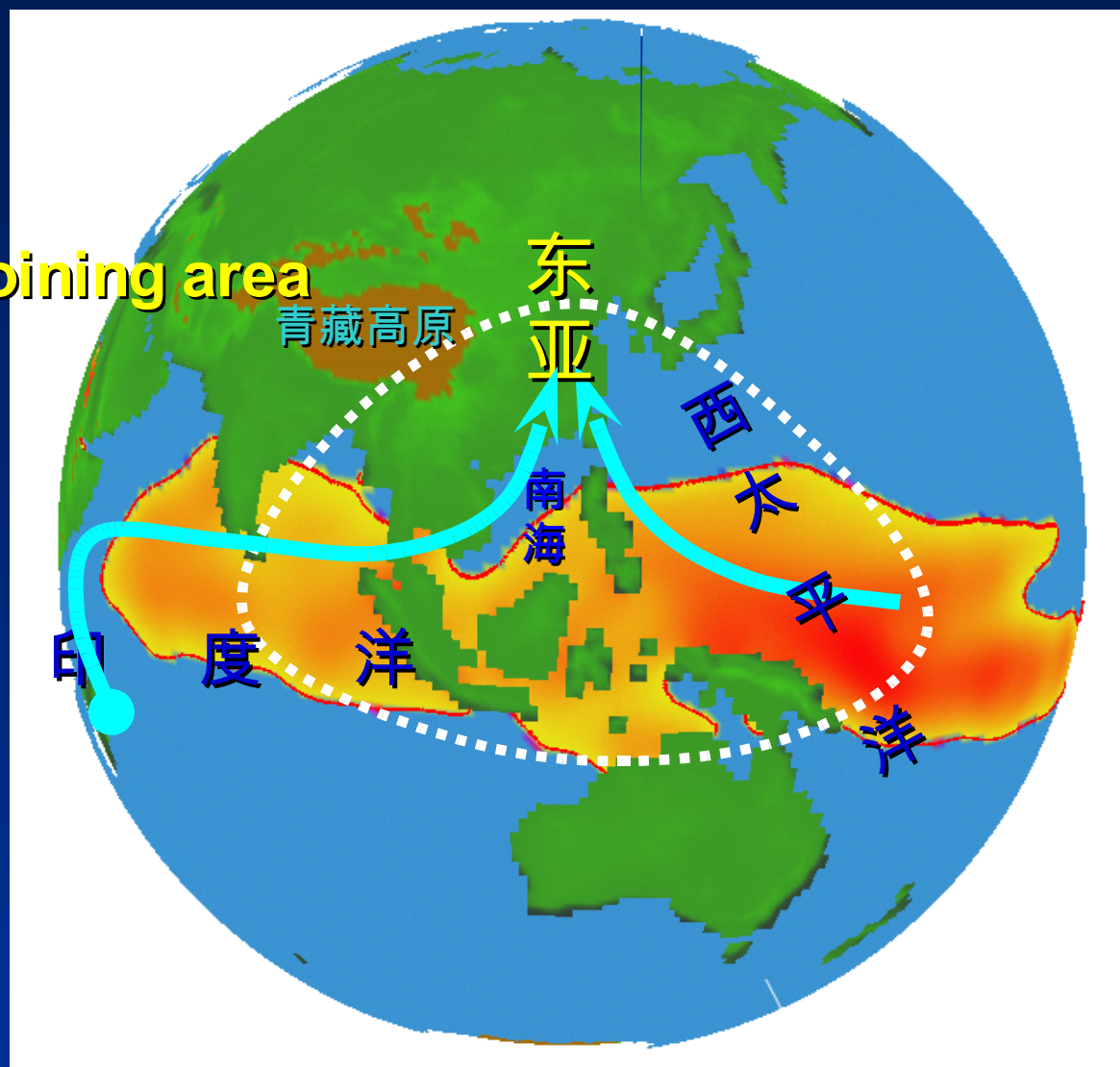
长江流域特旱月环流异常



长江流域特涝和特旱月西太平洋低空的环流异常完全相反

这里有世界上范围最大、海表温度最高的大“暖池”，  
是全球热带对流最强、水汽含量最多的区域

The AIPO joining area





# EXPECTED OBJECTIVES

The long-term strategic goal related to this project is to study the climate variation over China and provide the physical background for improving short-term climate prediction from the perspective of multi-sphere/air-land-sea interaction. This project intends to focus on the air-sea interaction in the AIPO joining area and to reveal its influences on the short-term climate variation in China. Specifically, we expect to achieve the following specific objectives:

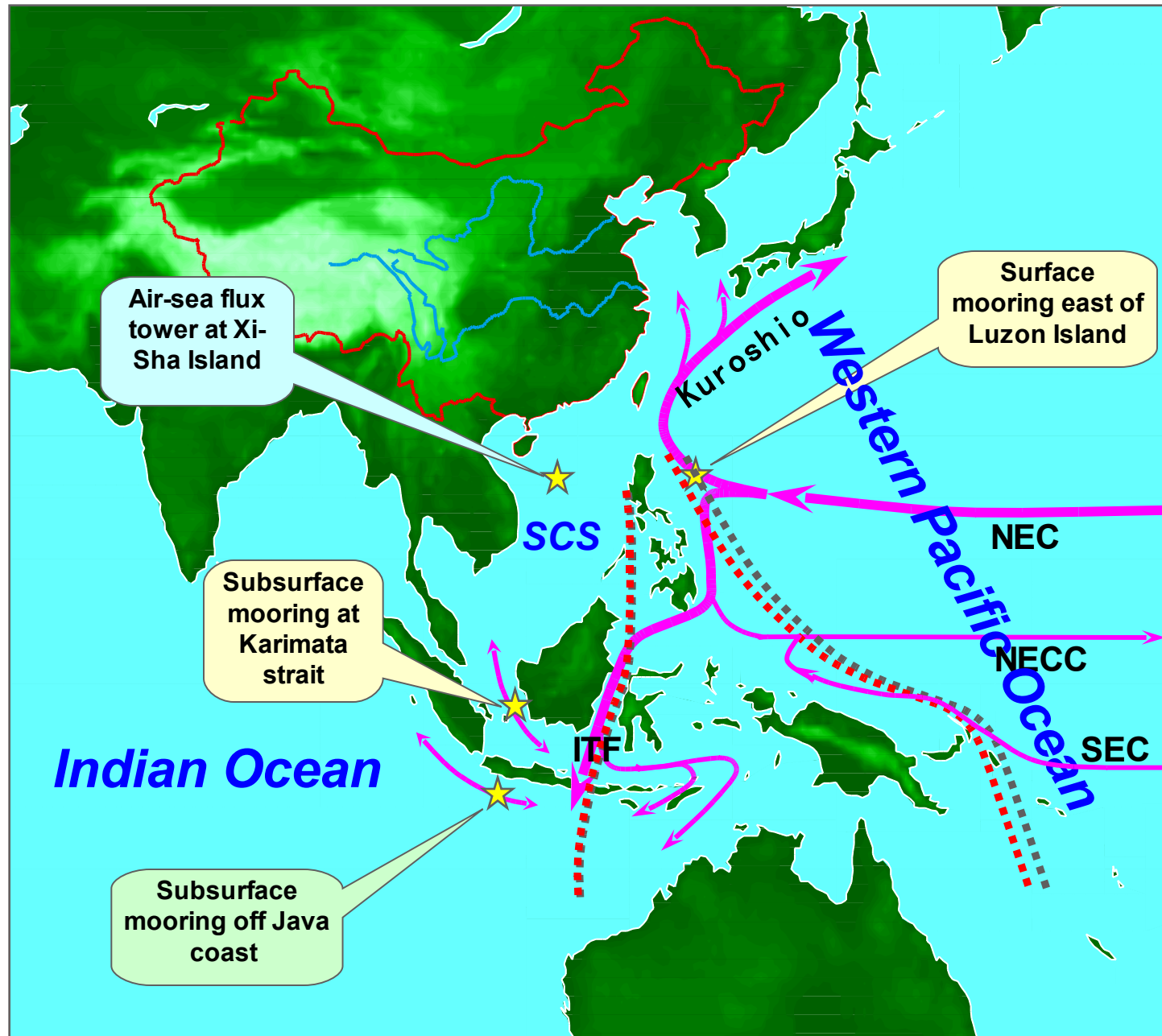
- Reveal the characteristics of seasonal to inter-annual time scale air-sea interaction in the AIPO joining area, propose a theoretical framework about the impacts of these processes on the short-term climate variation in this area;
- Develop a new-generation OGCM and its coupled climate model, and propose theories and methods for improving the East Asian climate variation prediction on seasonal to interannual scales;
- Construct a fine spacial resolution ocean data assimilation system for the AIPO joining area, obtain significant advances in the field of ENSO and East Asian monsoon predictability, and also provide a set of high-quality ocean re-analysis data in this



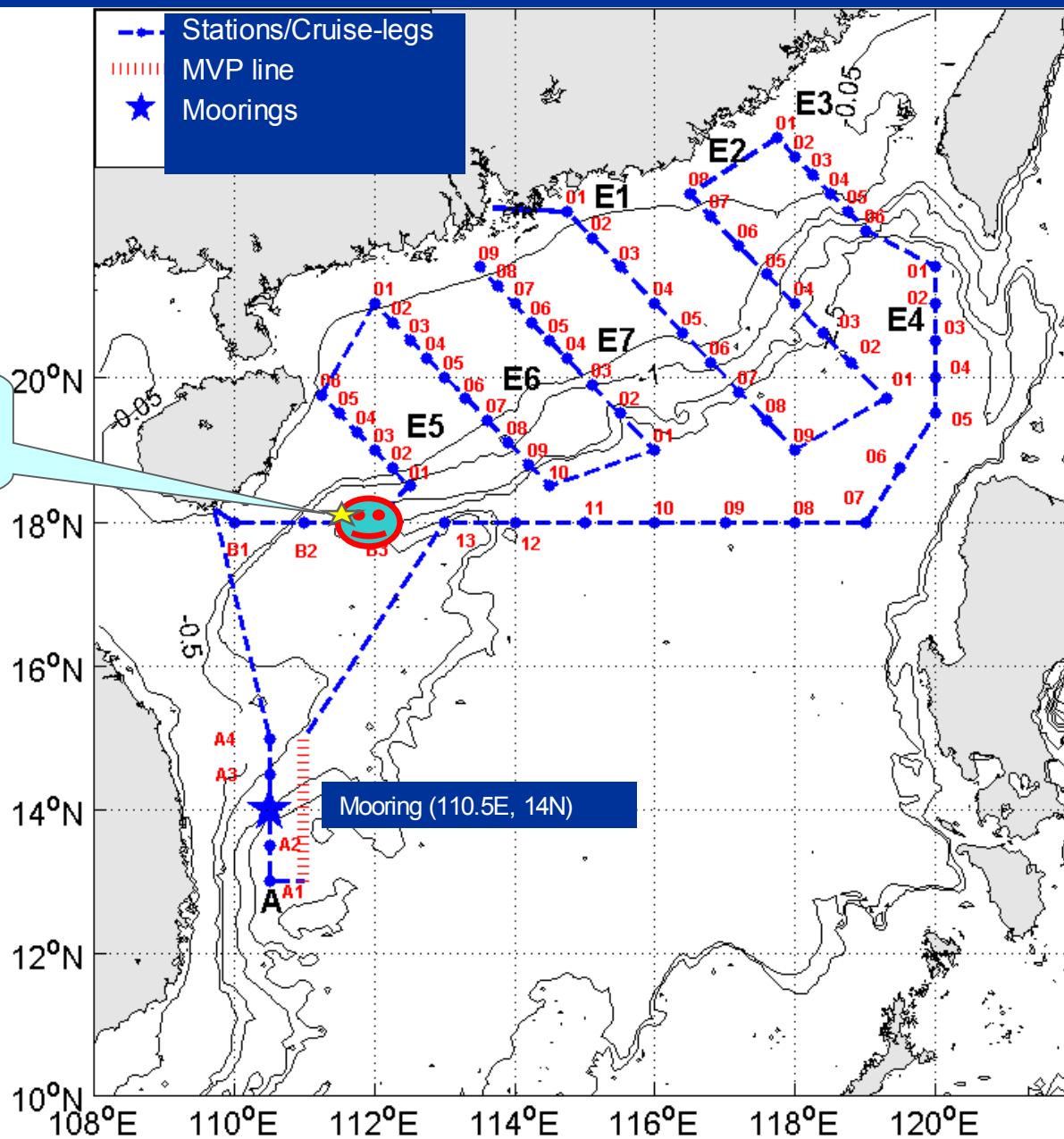
# 3. RESEARCH CONTENTS

- 1 Supplementary observation experiments
- 2 Western Pacific gyre interaction between tropics and subtropics and its relationship with subtropical high
- 3 The air-sea interaction over Indian Ocean and its impacts Asian monsoon variation;
- 4 The impacts of air-sea coupling process over Western Pacific and East Indian Ocean warmpool on the climate in China;
- 5 Water cycle and its variation over the Asian monsoon areas
- 6 The development and improvement of CGCM
- 7 Development of oceanic data assimilation in the area and study on East Asian climate predictability.

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



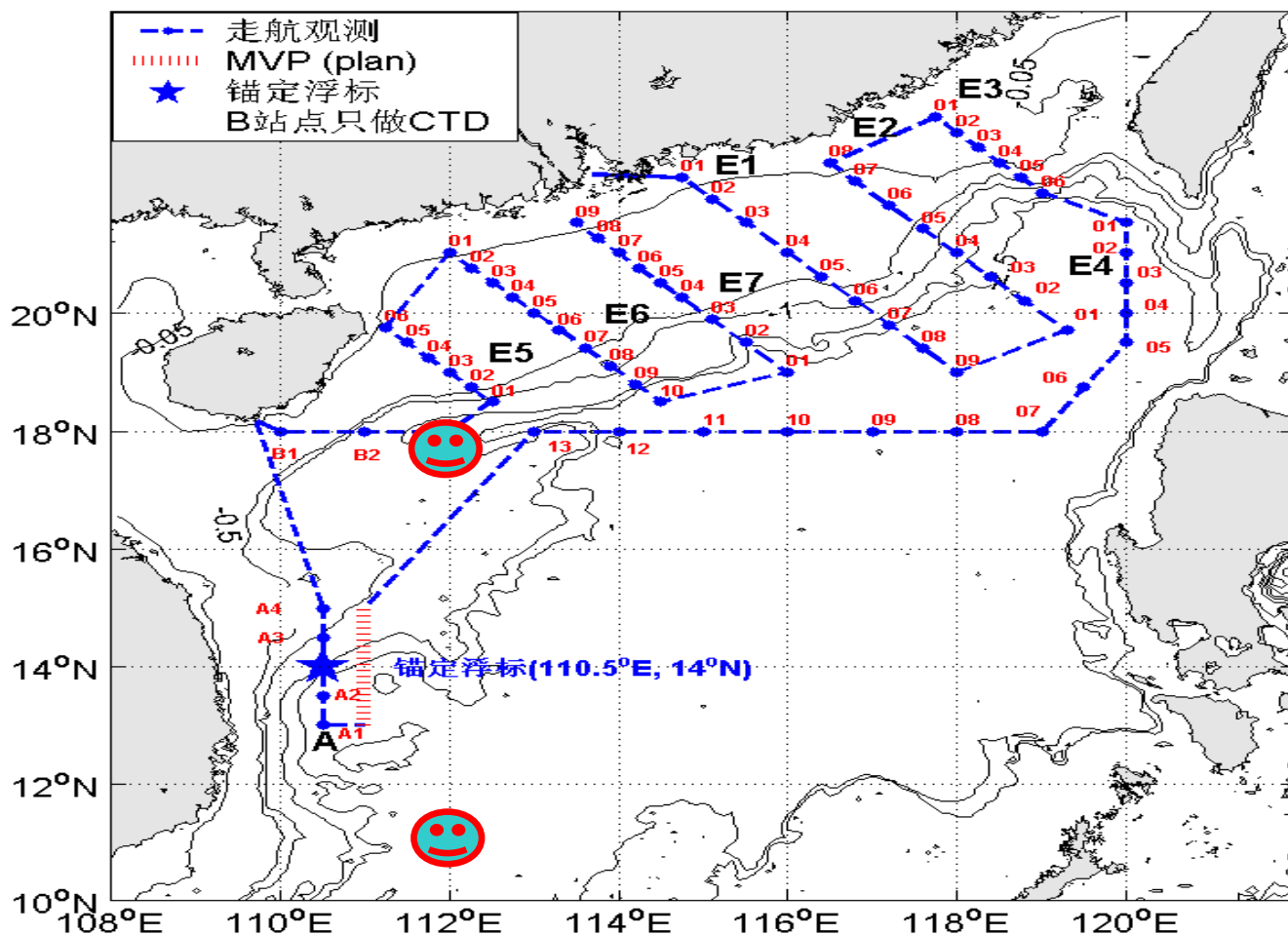
# Observation stations of the Northern SCS cruise





# 南海所现有的开放航次及扩展

2004年9月南海北部海洋观测开放航次计划站位图



**18°N断面观测:** 对18°N向东延伸, 并在开放航次期间同步实施定点浮标或潜标观测(3-4个航次)

## 2. KEY SCIENTIFIC ISSUES

The theme of the program is to identify the characteristics, patterns, and causes of air-sea interactions over the AIPO joining area and the intrinsic mechanisms of their impacts on the short-term climate anomalies over China.

- ❖ Reveal the physical processes of air-sea interaction, heat and water vapor transports, and the feedback and excitation mechanism of air-sea coupling on the scale of seasonal to inter-annual over the three sub-sectors of the AIPO joining area, i.e. the Asia-Pacific (AP), Asia-Indian (AI), and Indian-Pacific (IP) sub-areas; and look for the possible mechanism by which these processes affect the short-term climate in China.
- ❖ Improve the parameterization of cloud-radiation feedback, upper layer ocean mixing, and exchanges at air-sea interface over the East Asian monsoon region; and develop a global Oceanic General Circulation Model (OGCM) and a Coupled (Ocean and Atmospheric) General Circulation Model (CGCM) with better simulation ability, and construct a data assimilation system.
- ❖ Propose some new theories and methods helpful to improve the ability to predict climate on seasonal to inter-annual scales.



# RECOMMENDED BY:



中国科学院  
CHINESE ACADEMY OF SCIENCES



国家自然科学基金  
委员会

National Natural Science Foundation  
of China



中国气象局

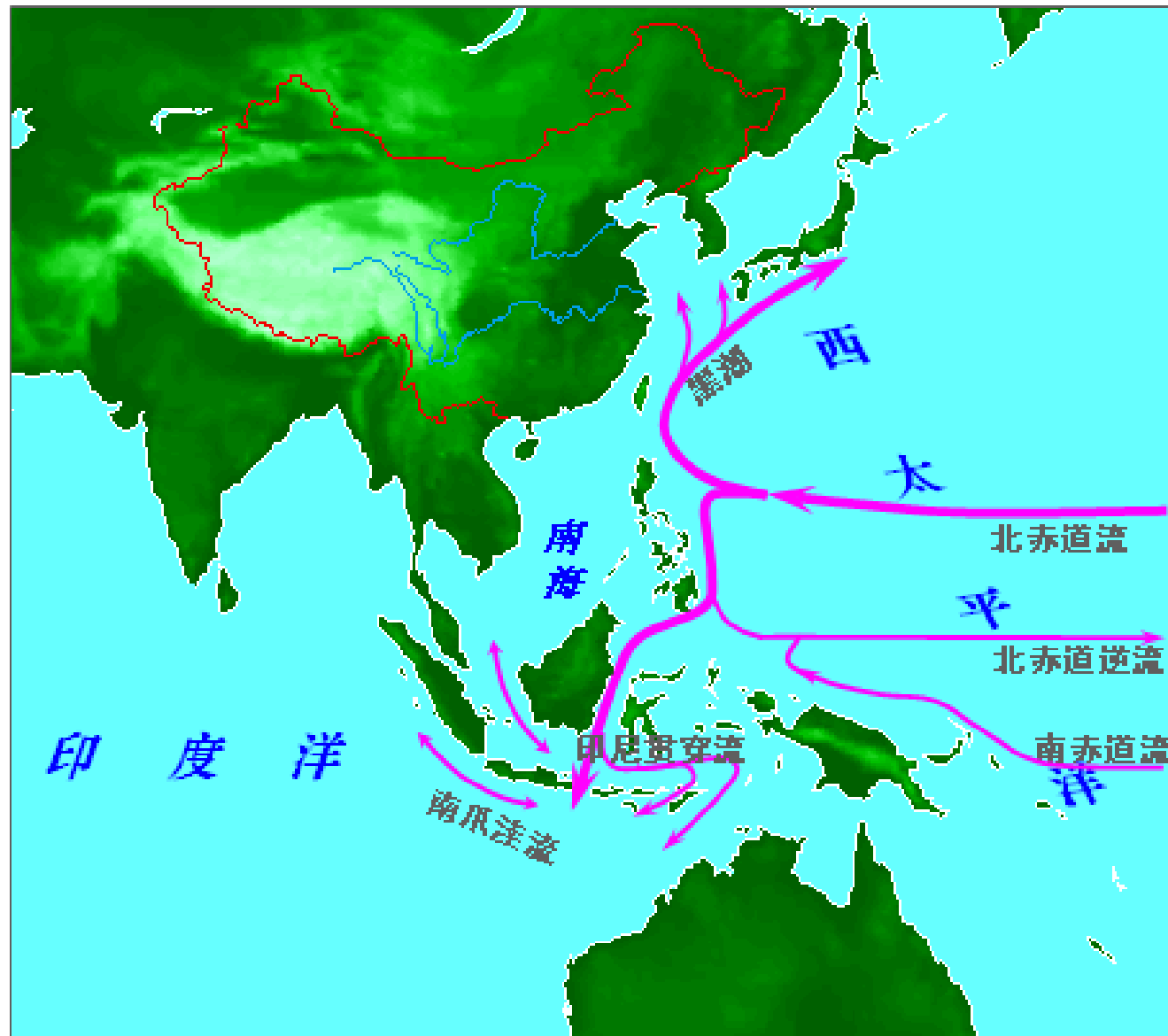
Chinese Meteorology Administration



国家海洋局

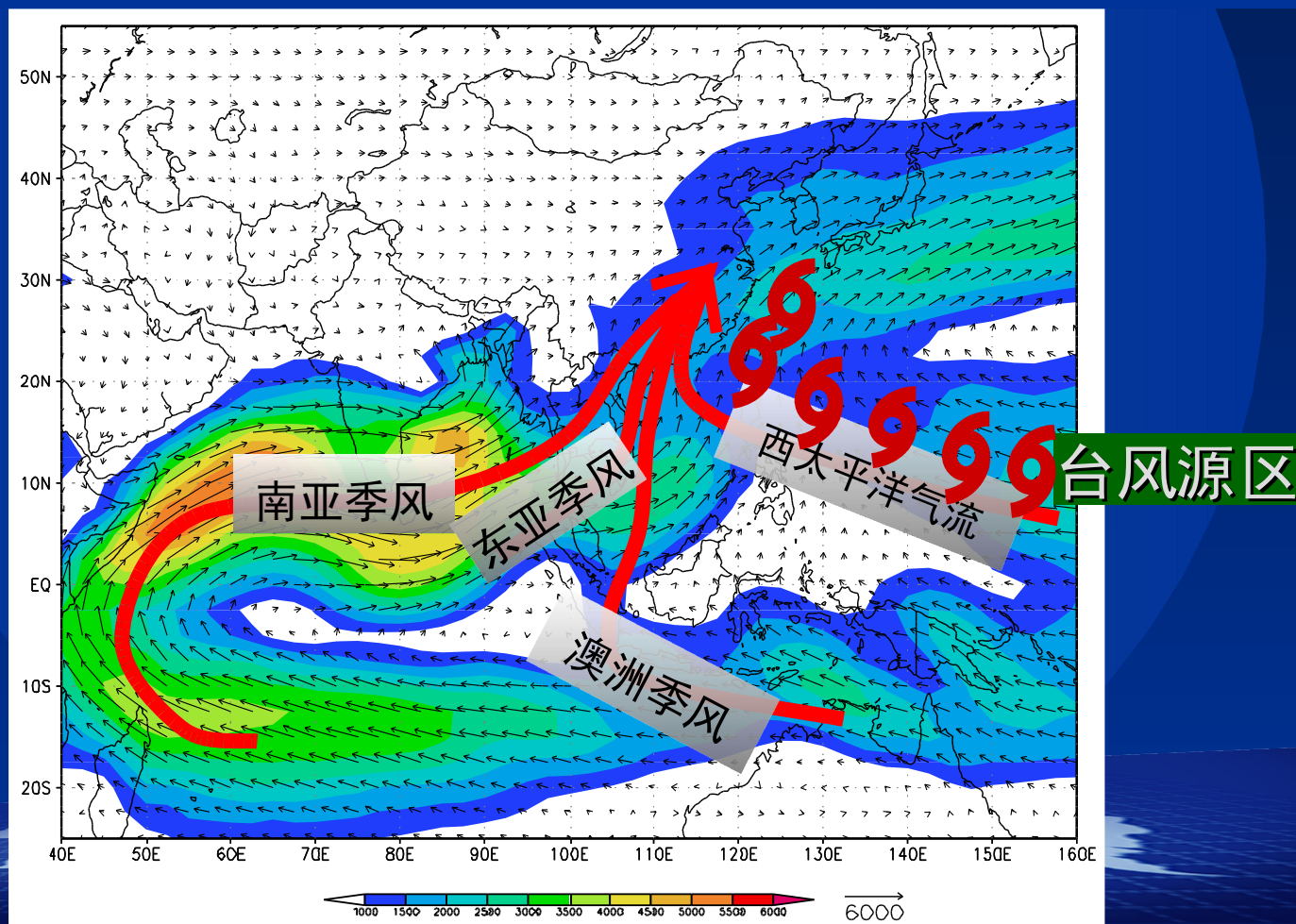
State Oceanic Administration

# 印度洋和太平洋流系在此连接、贯通、融汇



南亚季风、澳洲季风和东亚季风等三大季风系统在此交辉跌宕，水汽输送经此交汇后流向亚洲大陆，调控着中国的旱涝灾害。该区域还是台风源地。

“亚印太交汇区”海陆气相互作用复杂，  
与我国气候变化密切相关



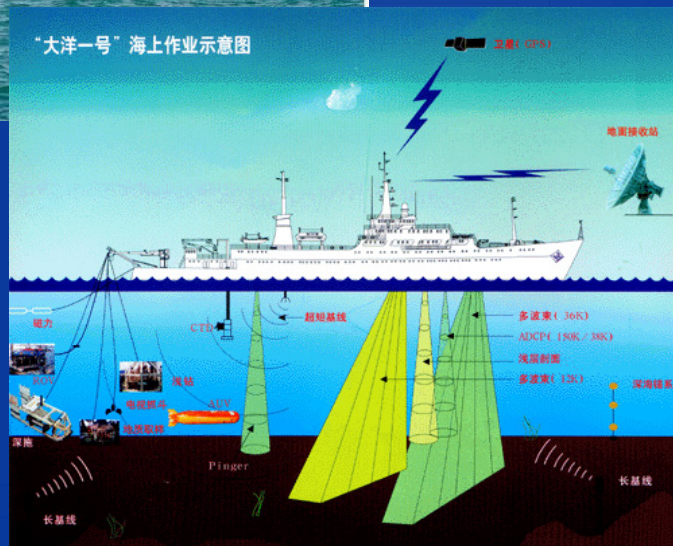


# 项目参加单位拥有的海洋观测调查船

科学1号



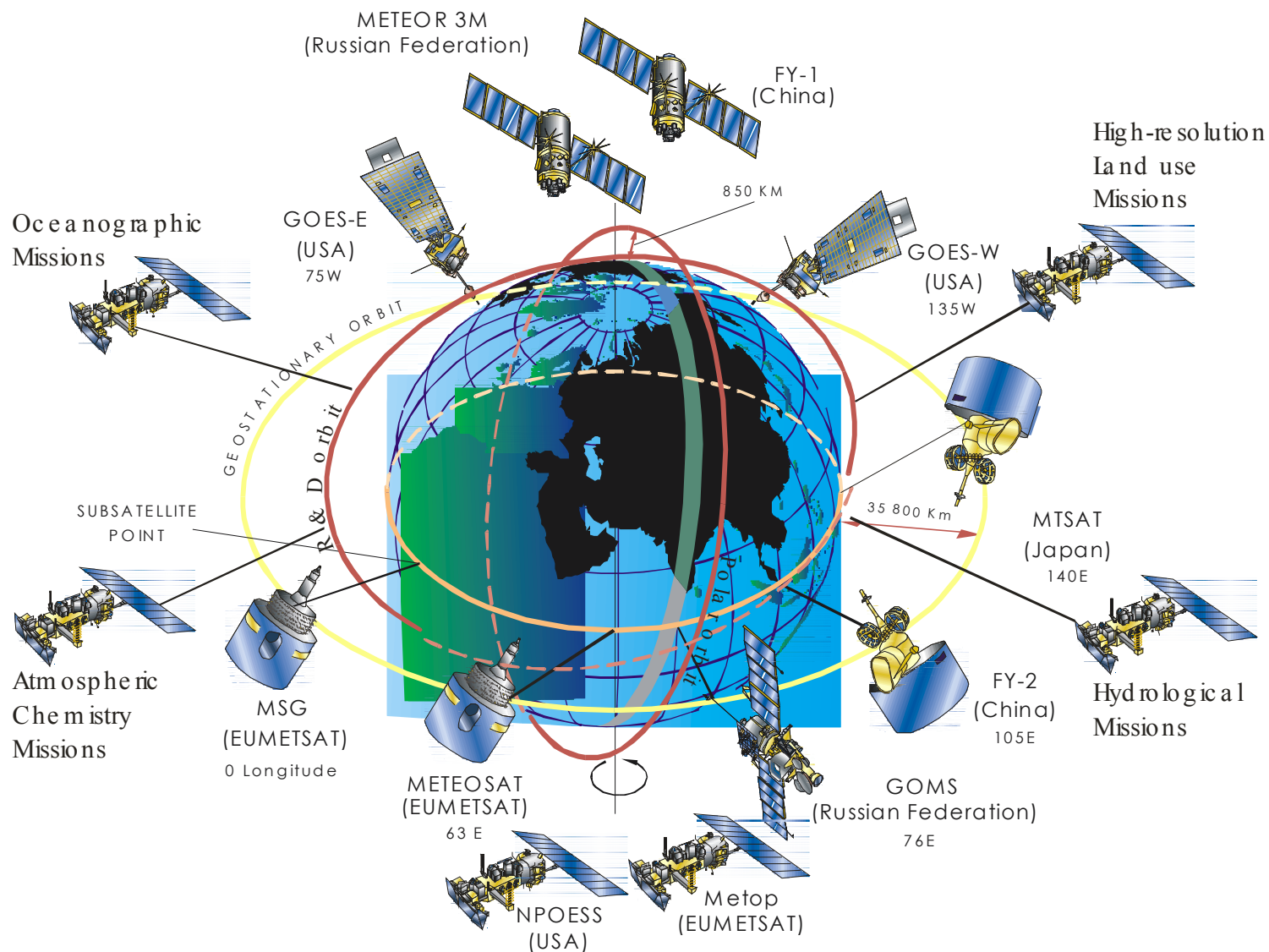
“大洋一号”海上作业示意图



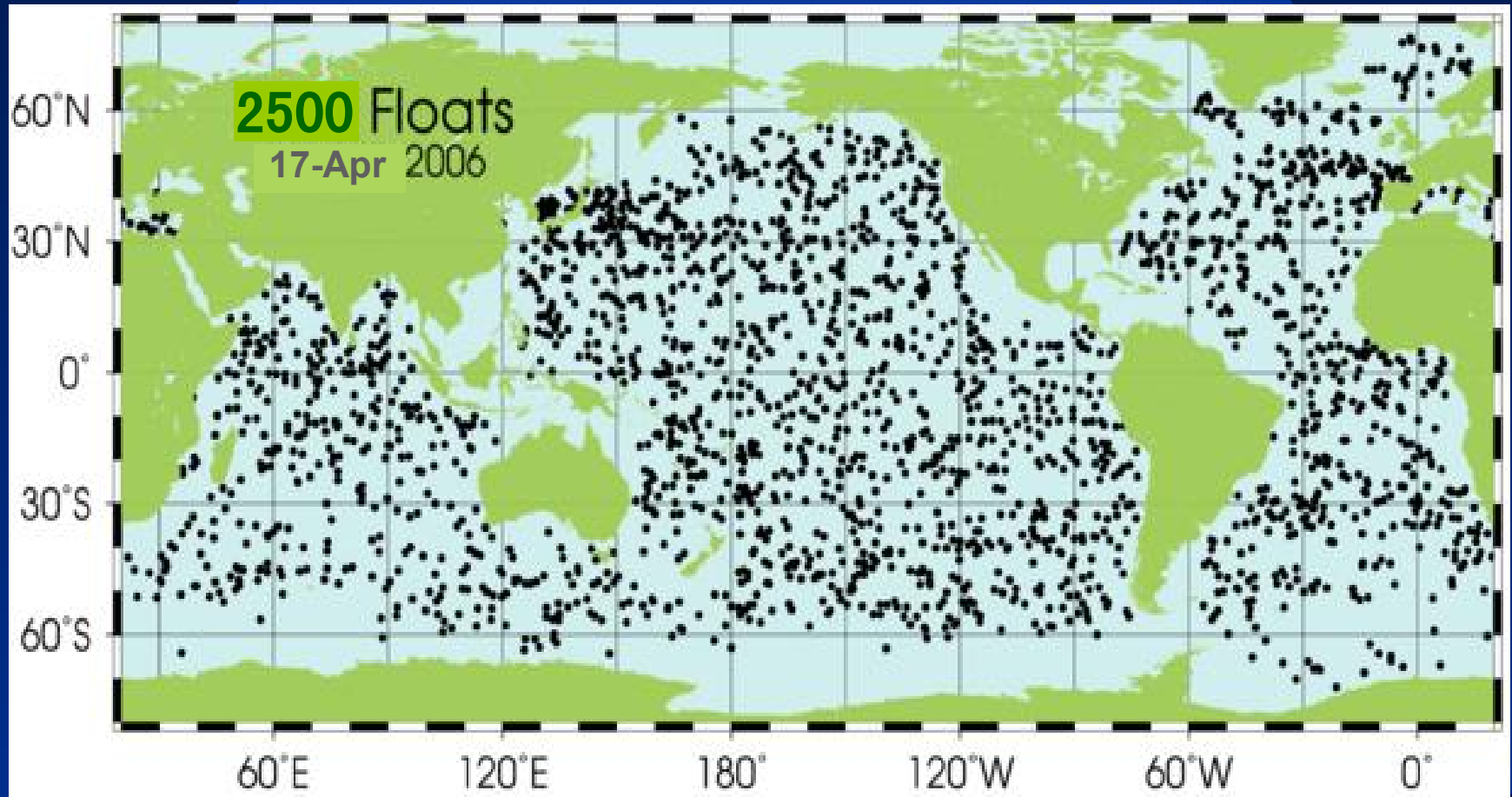
实验3号



# 近年来有关海气相互作用的卫星遥感资料大量涌现



# 实时地转海洋学观测阵列(Argo)观测

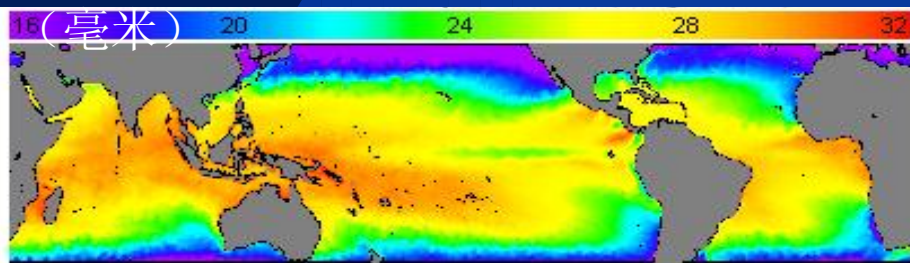


我国在热带东印度洋投放6个Argo浮标

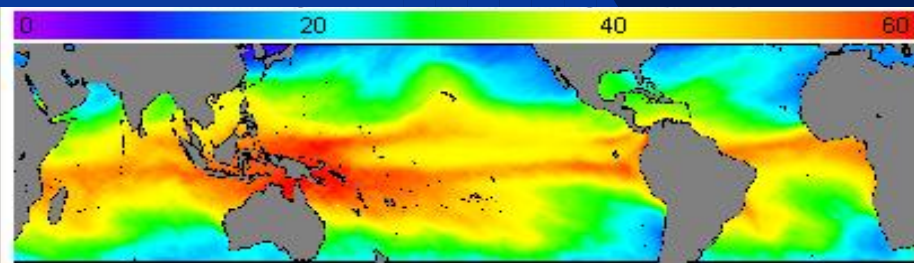


# 2006年4月海气观测要素场

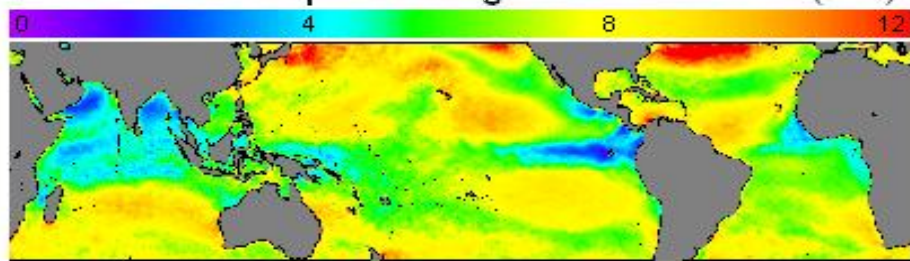
海表温度 (°C)



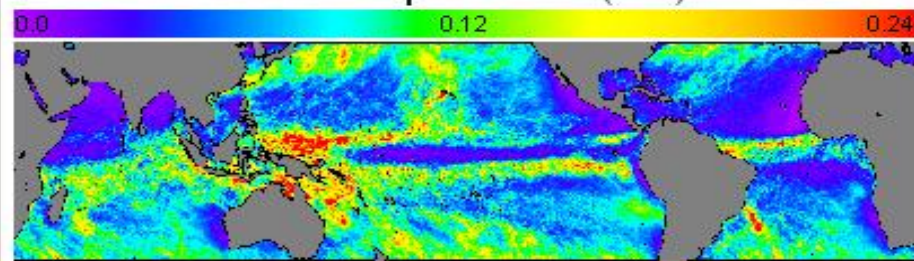
大气水汽含量



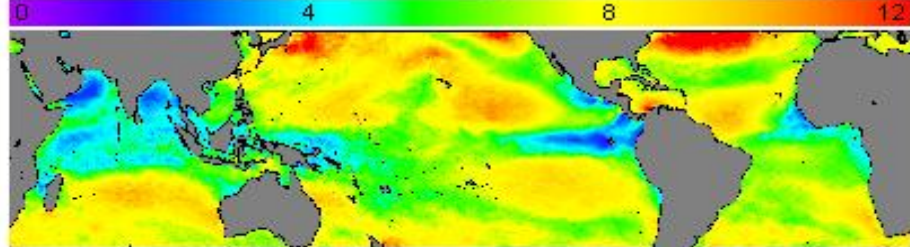
海表风速 11Ghz (米/秒)



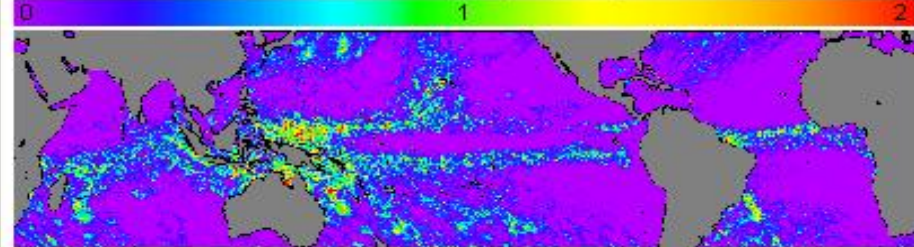
云中液态水 (毫米)



海表风速 37Ghz (米/秒)



大气降水率 (毫米/小时)



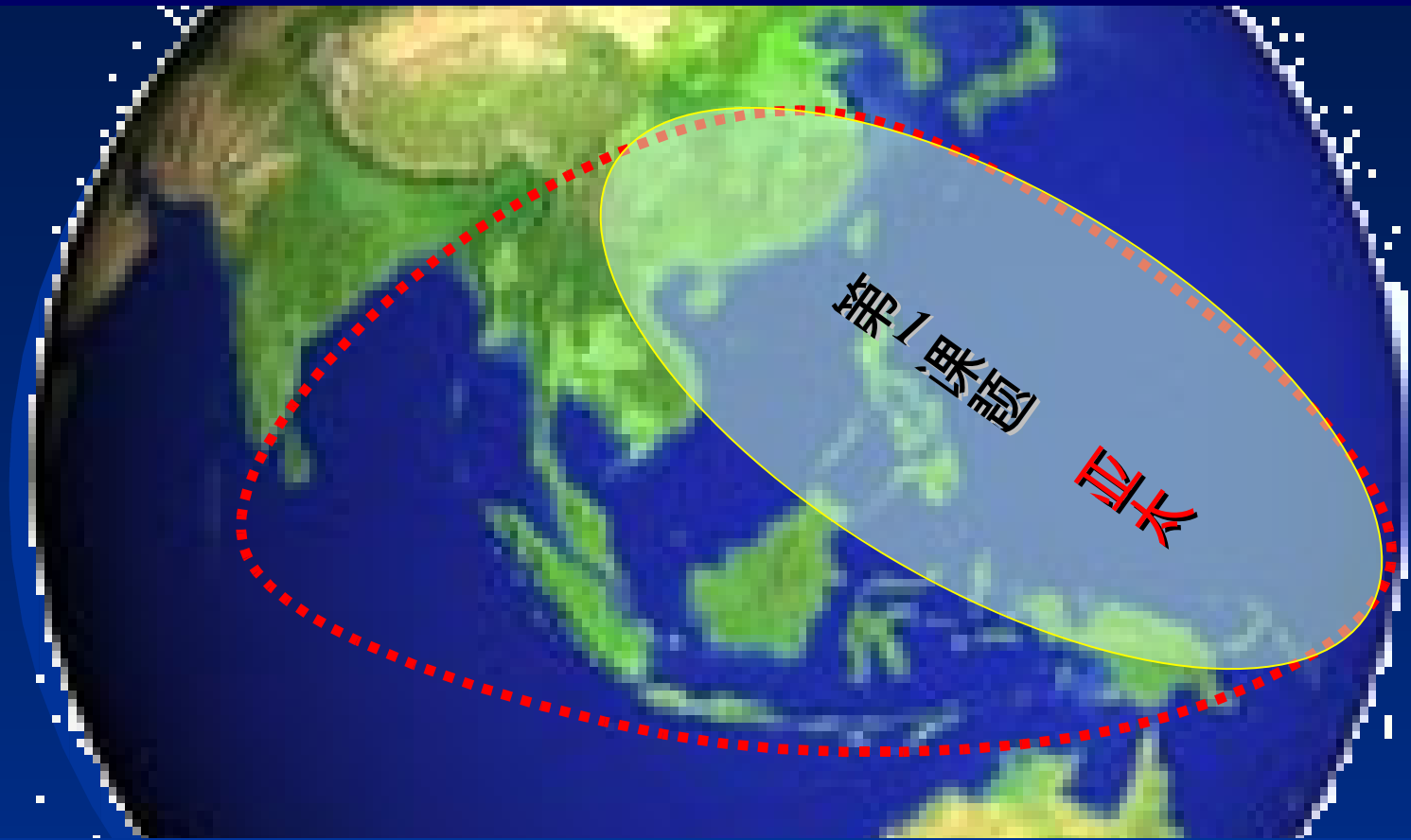
# Sea surface height in LASG/IAP OGCM



# 5. SUBPROJECTS

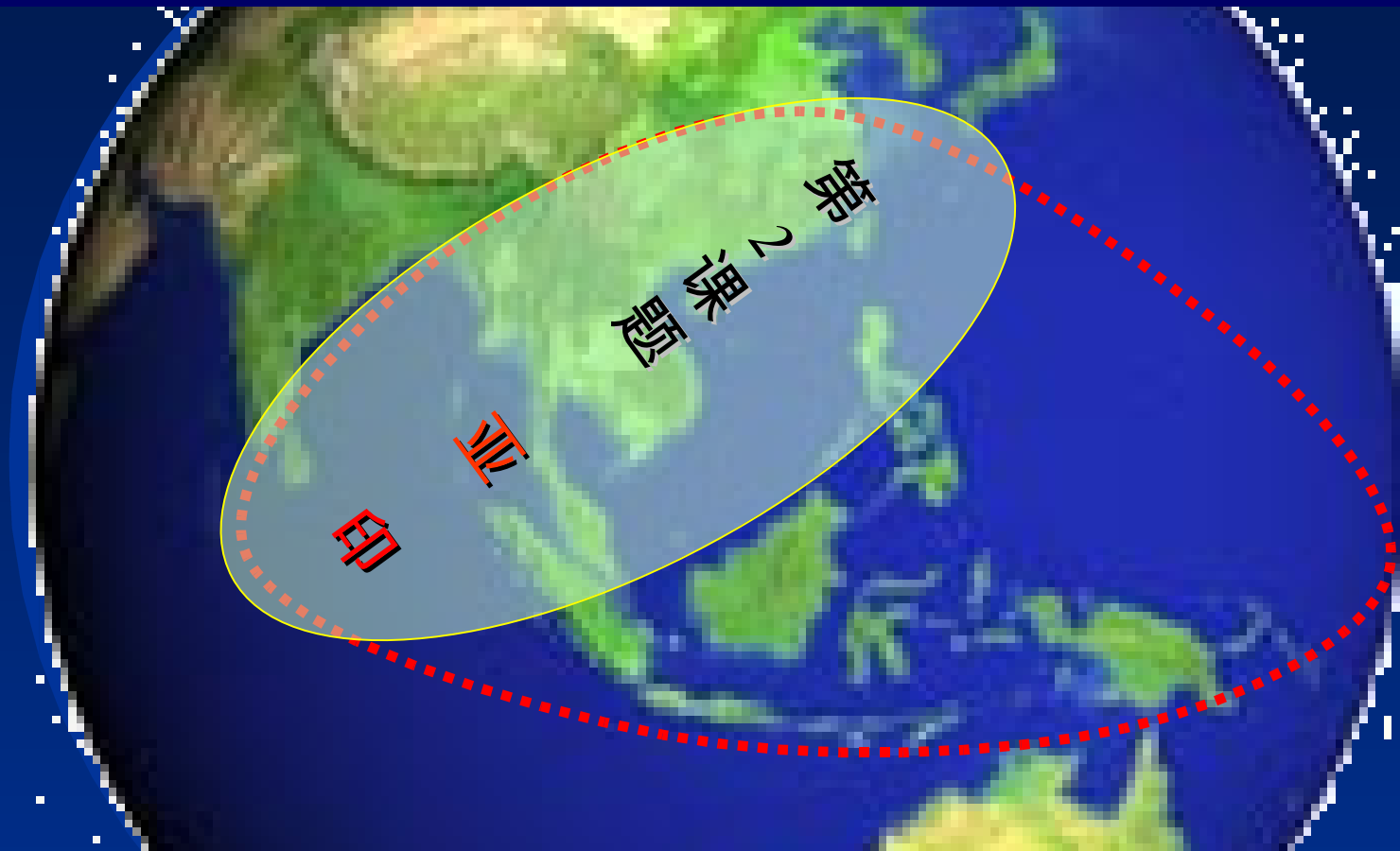
- 1 Western Pacific gyre interaction between tropics and subtropics and its relationship with the western Pacific anticyclone
- 2 Air-sea interaction over the Indian Ocean and its impacts on the Asian monsoon
- 3 Air-sea coupling process over Western Pacific-Eastern Indian Ocean warm pool and its impacts on the climate over China
- 4 Water cycle over Asian Monsoon Area
- 5 Development and improvement of CGCM
- 6 Ocean data assimilation and East Asia climate predictability

1<sup>st</sup> subproject: Western Pacific gyre interaction between tropics and subtropics and its relationship with the western Pacific anticyclone



研究西太平洋，特别是黑潮的热量经向分配过程，太平洋热带-副热带流涡与副热带高压的相互作用，以及海气耦合对台风强度、频数和路径的年际变率的影响。

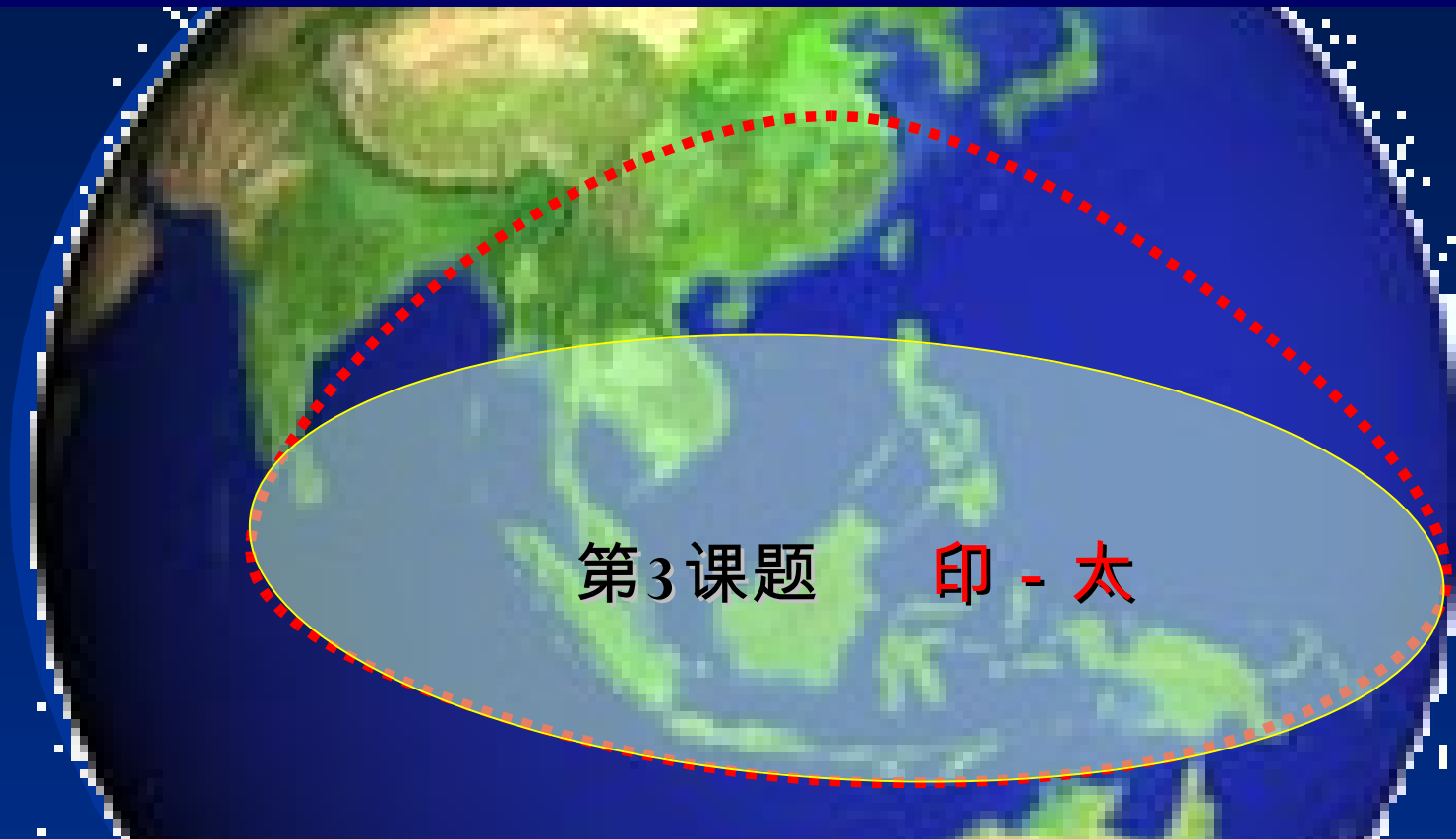
## 2<sup>nd</sup> subproject: Air-sea interaction over the Indian Ocean and its impacts on the Asian monsoon



研究印度洋海气相互作用对亚洲季风及其准两年变化的影响，青藏高原与印度洋热力差异对东亚季风的影响



### 3<sup>rd</sup> subproject: Air-sea coupling process over Western Pacific-Eastern Indian Ocean warm pool and its impacts on the climate over China

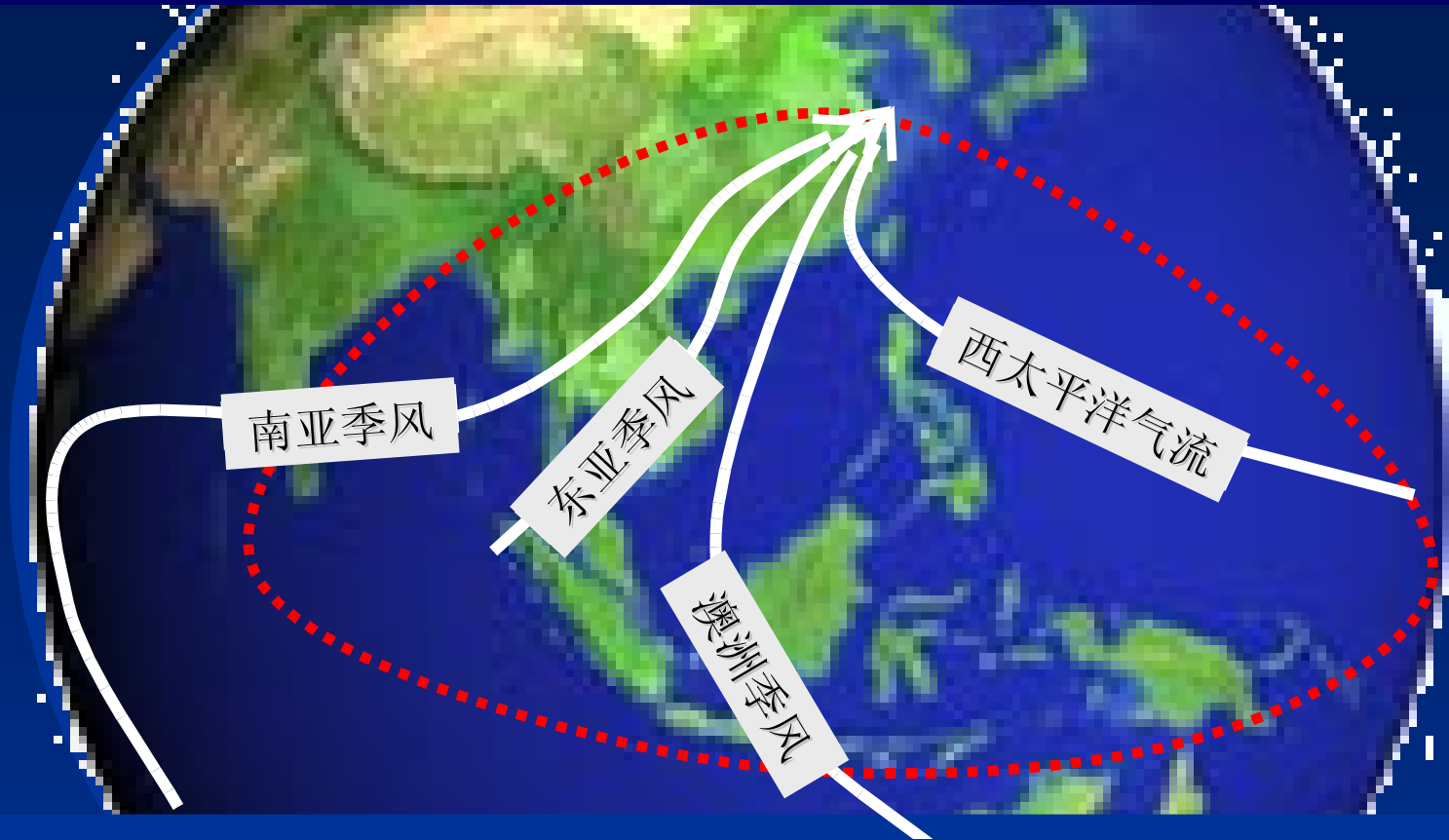


研究暖池演变过程、特征与年际气候异常的关系，印度洋纬向模和ENSO的耦合，以及季节内振荡（ISO）对我国气候的影响及其机理。

## 4<sup>th</sup> subproject: Water cycle over the AIPO Area



## 4<sup>th</sup> subproject: Water cycle over the AIPO Area



研究海洋热力和动力过程对亚洲季风区水分循环的影响，亚洲季风与水汽输送之间的相互联系，以及亚印太交汇区水汽输送异常对中国旱涝灾害的影响。

## 5<sup>th</sup> subproject: Development and improvement of OGCM

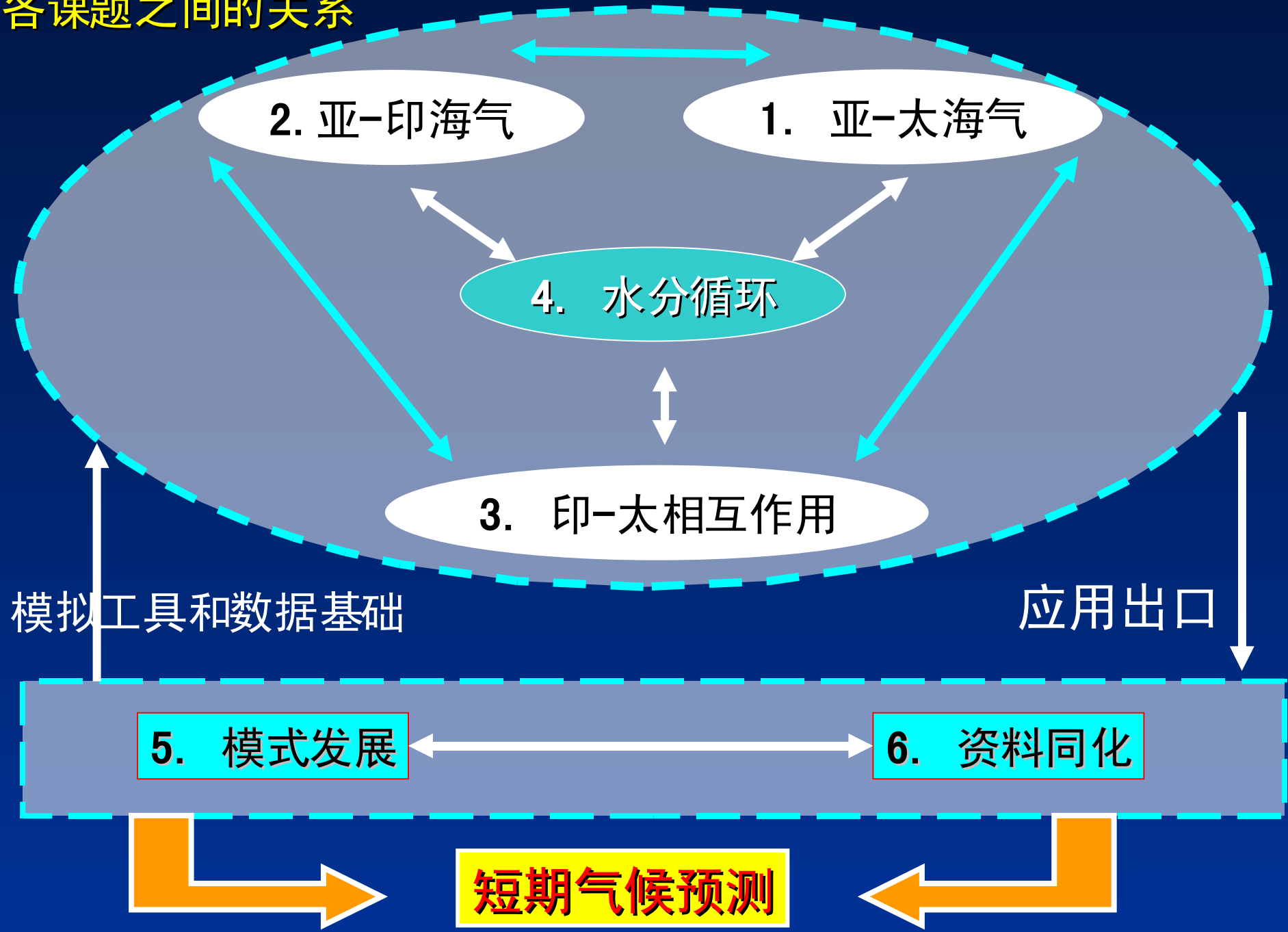
评估现有耦合气候模式的基础上，探索新一代大洋环流模式发展的途径，提高耦合模式在“亚印太交汇区”的模拟能力，并为本项目研究提供数值试验平台。 —

## 6<sup>th</sup> subproject: Ocean data assimilation and East Asia climate predictability

发展一个高分辨率的“亚印太交汇区”海洋资料变分同化系统，建成一套高质量的“亚印太交汇区”海洋再分析资料，为国内外相关研究和业务部门提供数据基础。探索改进ENSO和季风预报的新途径。



各课题之间的关系



# Project Budget

科 目	金额（万元）
人员费	195
设备费	900
管理费	190
国际合作交流费	300
课题其它相关费	2215
合 计	3800
Approval	35,000,000

**Thank You !**