Lapan Contribution to the Years of the Maritime Continent (YMC)

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Introduction

- The Centre of Atmospheric Science and Technology of Lapan has long been interested in the dynamics, physics and chemistry of the atmosphere in the continent-maritime region, and its research programme has been dedicated to contribute to the national effort to better understand and predict the atmosphere in the region.
- The YMC is relevant to the research programme and Lapan is planning to participate in the area of atmospheric observation (ground, radar, airborne & satellite), research and prediction in the continent maritime.

About Lapan

- The National Institute of Aeronautics and Space (LAPAN) is a government research & development agency under the President and coordinated by The Ministry of Research and Technology.
- Lapan activities include:

Aerospace Technology:
- Rockets
- Satellite
- Aircraft

Remote Sensing:
- Data & Technology
- Application

Science:
- Space Science
- Atmospheric Science
- Space Policy

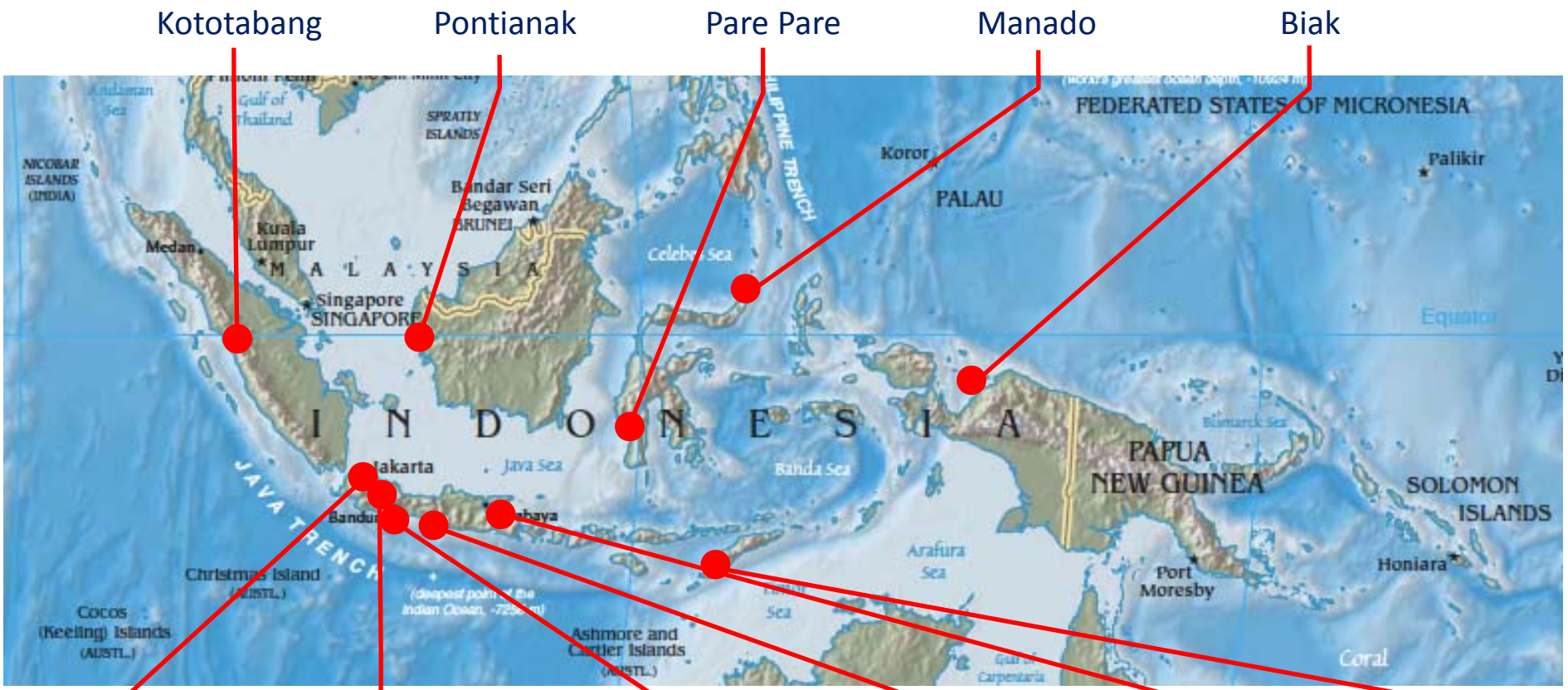
Lapan Contribution to the YMC

- Ground & radar observation at Lapan Stations (Kototabang, Pontianak, Bandung).
- Satellite Observation (MTSAT, TERRA, AQUA, METOP, NPP).
- Routine daily 24 hours NWP over Indonesia region (95°E-140°E, -10°S-10°N) with 5 km resolution (400,000 grids) for research.
- Possible use of Lapan Aircrafts for Airborne Observation.
- Maritime-continent atmospheric research programme.

Lapan Centres Involved in the YMC

- Centre of Atmospheric Science and Technology (Bandung).
- Centre of Aircraft Technology (Rumpin).
- Collaboration and Public Relation Bureau (Jakarta).
- Atmospheric Observation Stations (Bandung, Kototabang & Pontianak).

Location of Lapan Stations



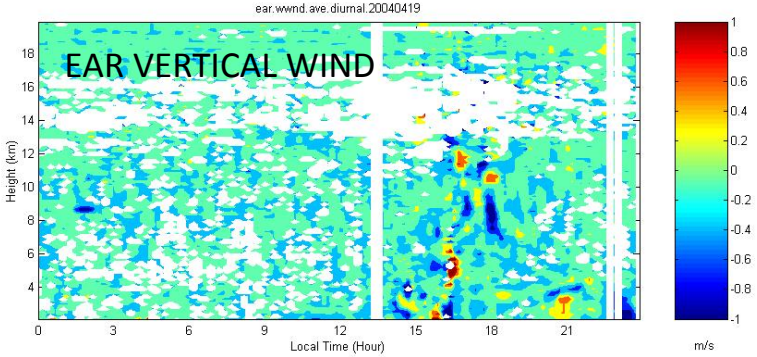
Available Atmospheric Observation Instruments

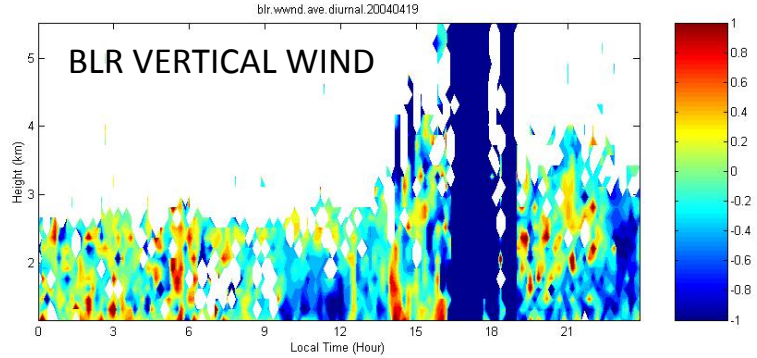
- Kototabang
  - EAR
  - RASS
  - X-Band Radar
  - MRR
  - Radiometer
  - Ceilometer
  - Disdrometer
  - ORG
  - AWS
  - Lidar
- Pontianak
  - BLR
  - AWS
- Bandung
  - Mobile Radar
  - AQMS
  - AWS
  - Lidar

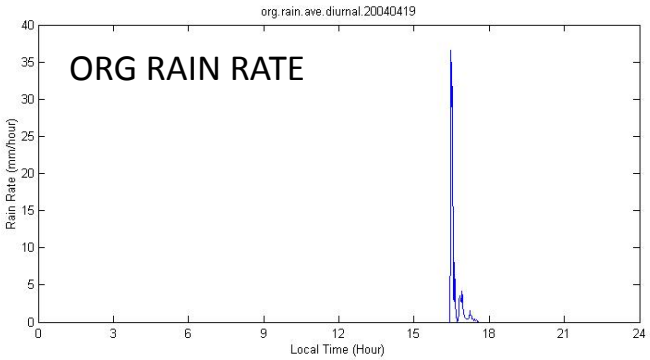
Equatorial Atmosphere Radar @Kototabang

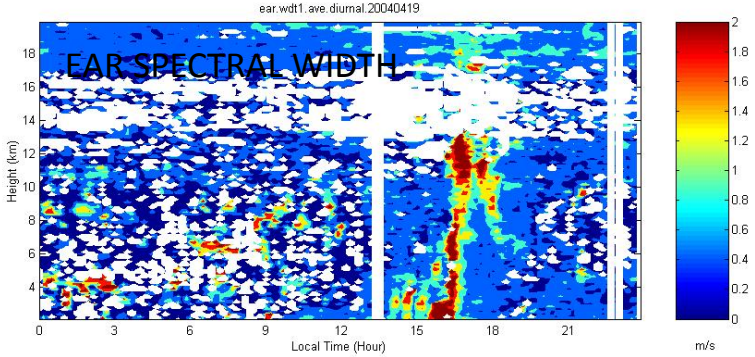
Collaboration between LAPAN – RISH Kyoto University Japan

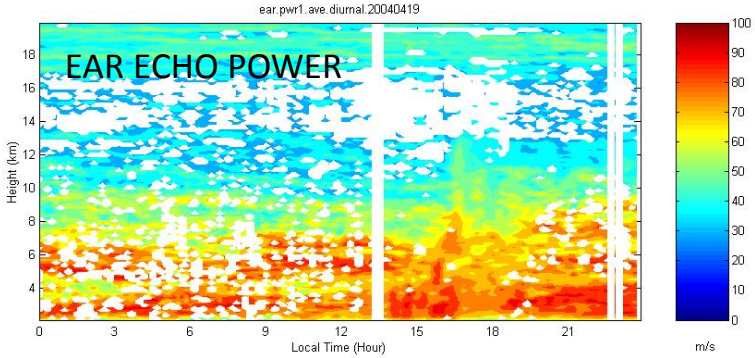
Sample of Observation @Kototabang

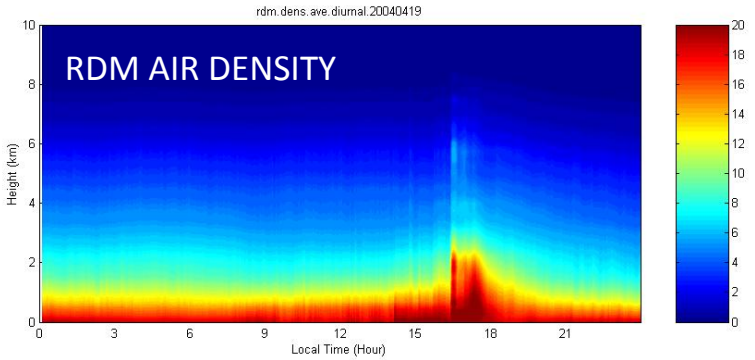








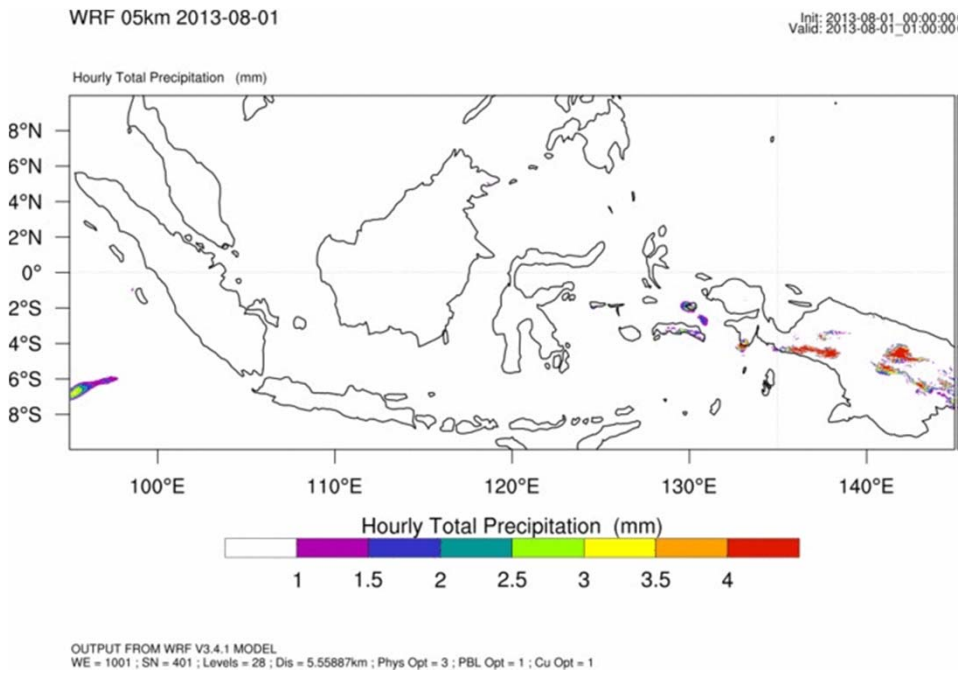




High Performance Computing (HPC)

Centre of Atmospheric Science and Technology HPC Cluster in Bandung:

- 1 Master, 23 Nodes Server
- Total 1264 cores processor
- Disk Array 270 TB
- Model: WRF, COSMO, CCAM



Transportable Radar

SPECIFICATION	
Frequency	9.4 GHz
Antenna	Parabolic
Wavelength	3.19 cm
Beamwidth Azimuth	1.7^{o}
Beamwidth Elevation	1.7^{o}
Range	50 - 100 km
Resolution (default)	250 m
Production	GAMIC
Signal Processing	ENIGMA Linux based
Software	FROG/DWD-Muran

Mobile Air Quality Monitoring System (AQMS)

Lapan Aircrafts

- Lapan Surveilance UAV (LSU)
- Lapan Surveilance Aircraft (LSA)
- Cessna 206
- N-219

Lapan Surveilance UAV (LSU)

LSU-02 SPECIFICATION	
Vstall	10.8 m/s
Thrust	40 N
S Take Off	36.6 m
Rate of Climb	4.6 m/s
Endurance	5.3 hours
Range	408.68 km
Service Ceiling	500 m

Lapan Surveilance Aircraft (LSA)

Payload weight 2 x 80 kg under wing
Cruise Speed 200 km/hour
Altitude 7500 m
Max Range 1300 km
Flight Duration 8 hours

Cessna 206

Altitude 20,000 ft
Payload 894 lb
Cruise Speed 146 knt
Max Range 550 nm

Lapan – PTDI N219

Transport Aircraft
Capacity 19 Passengers
2 engine Turboprop
Rollout August 2015
Flight Test December 2015
Also planned to be used as flying laboratory

Research in Atmospheric Science

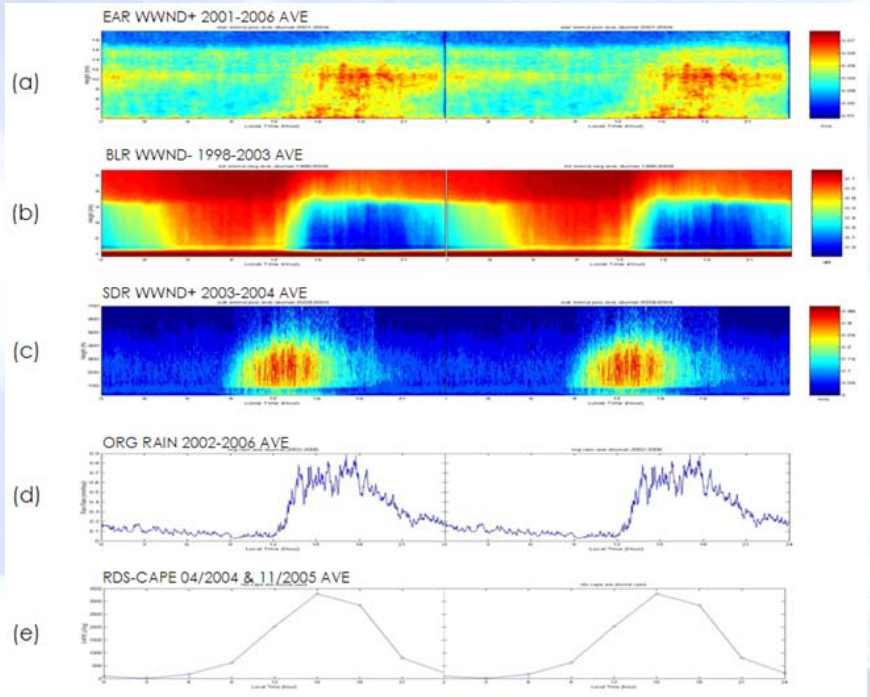
- Atmospheric Convection (including MJO, monsoon, diurnal cycle)
- Aerosol-Cloud Interaction.
- Upper troposphere – lower stratosphere interaction.
- Air-sea interaction.
- Prediction.

Study of Convective Triggering Based on Observation at Kototabang Station

In a highly infuential report, “ Atmospheric Science Entering the 21st Century”, the US National Academy of Science (1998) concluded that prediction of tropical convection and understanding its trigger is the most important and outstanding problem in atmospheric science until today.

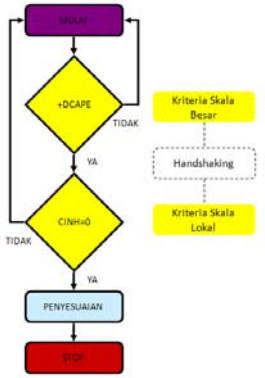
Research have been conducted at LAPAN to investigate convection trigger based on observation using the Equatorial Atmosphere Radar (EAR), Boundary Layer Radar (BLR), Acoustic Radar (SODAR), Optical Rain Gauge (ORG), and Radiosonde Campaign.

Equatorial Atmosphere Radar in Kototabang, West Sumatera



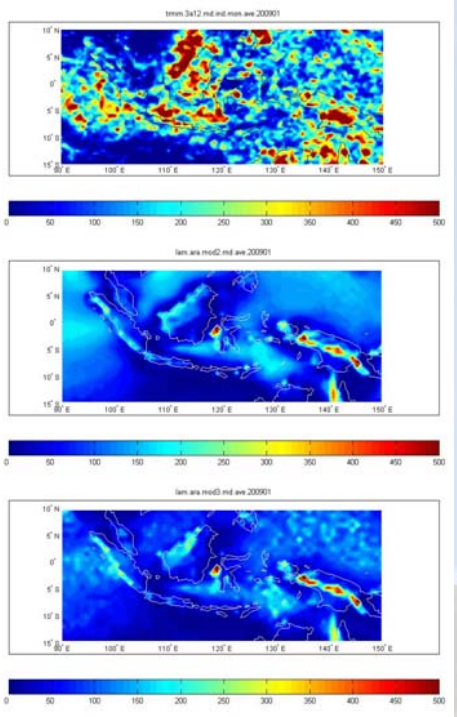
Long term diurnal average vertical wind according to EAR (a), BLR (b), SODAR (c), rain according to ORG (d), and CAPE according to Radiosonde (e)

The results indicated that the most suitable convective trigger is a combination between increase of instabilities (CAPE) and small convective inhibition (CINH).



Simulation with DCAPE > 70 J/kg gives better rainfall distribution (bottom) compared to TRMM observation (top) than the original model (middle).

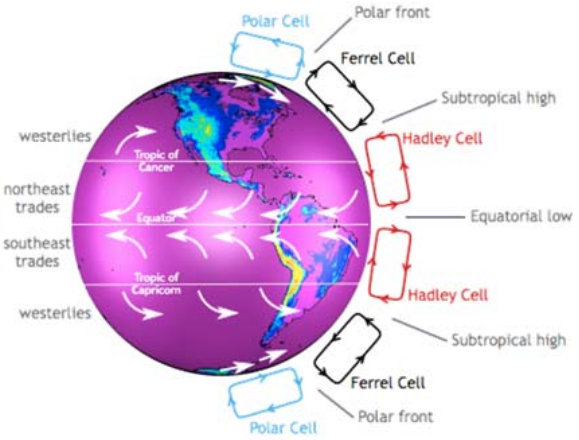
Observation at Kototabang has improved simulation results.

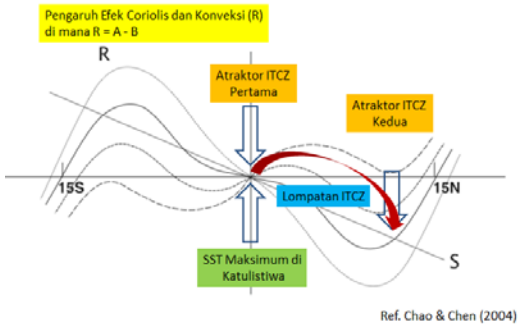


ITCZ Jump and Monsoon Onset: Theory, Observation & Simulation

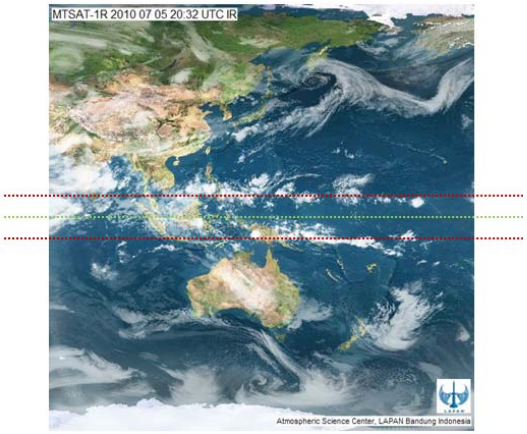
Research have been conducted at LAPAN to investigate ITCZ latitudional movement based on MTSAT satelite observation and General Circulation Model (GCM).

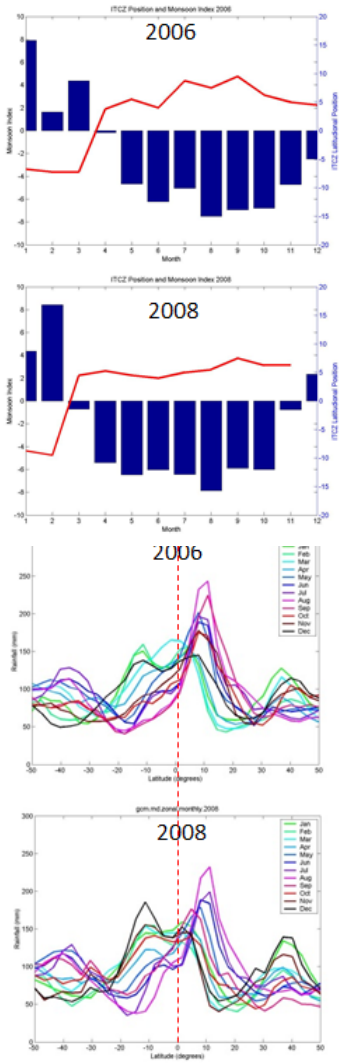
Both observation and model showed ITCZ jump related to Indo-Australian Monsoon Onset.

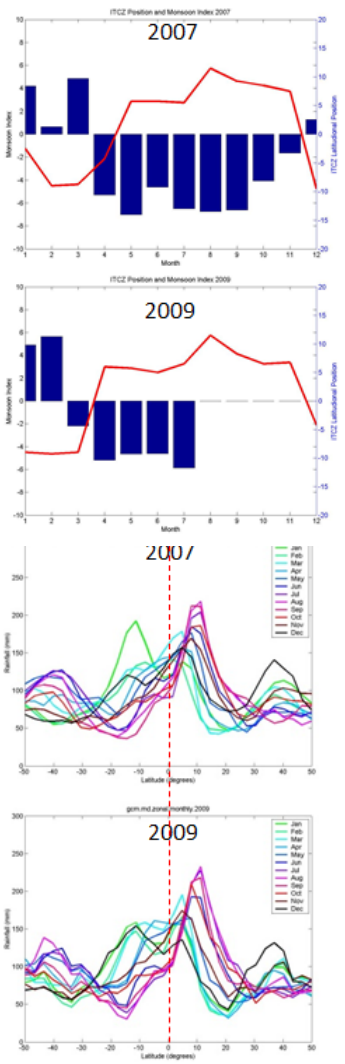




Ref. Chao & Chen (2004)

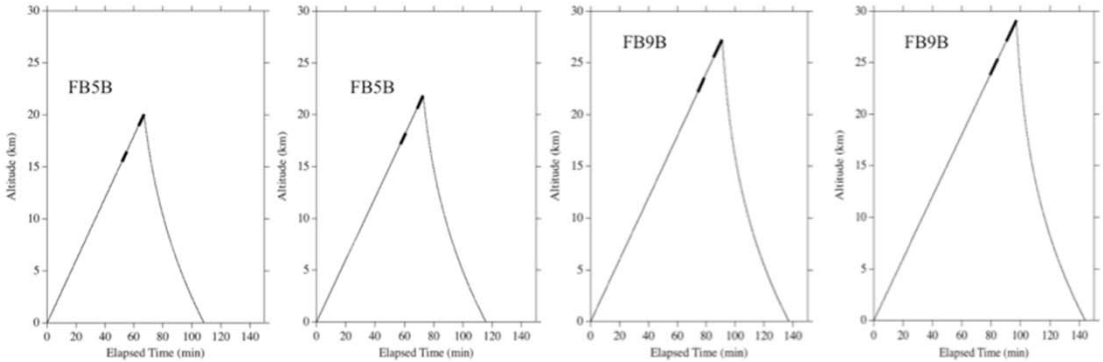




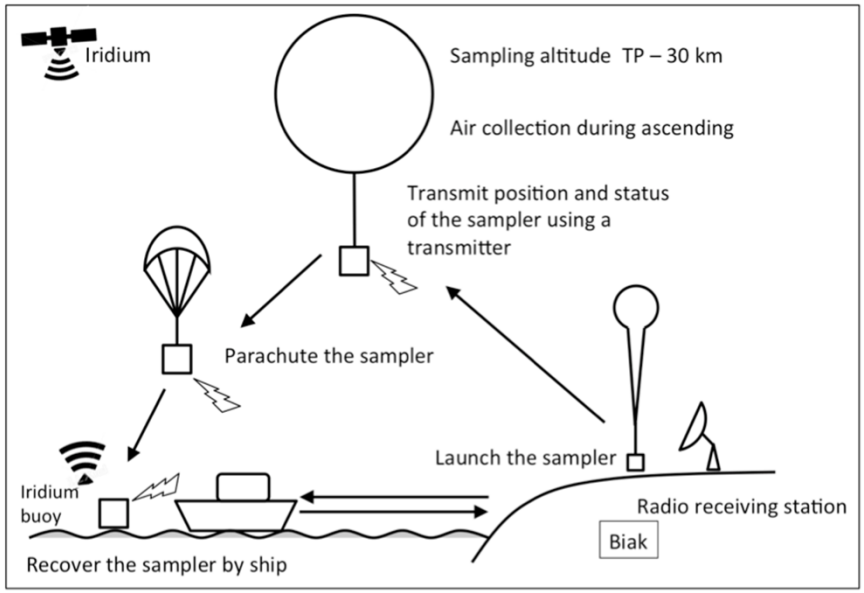


Synthesis of Dynamics and Chemistry to Understand Atmospheric Processes in Tropical Tropopause Layer

Collaboration between LAPAN and JAXA



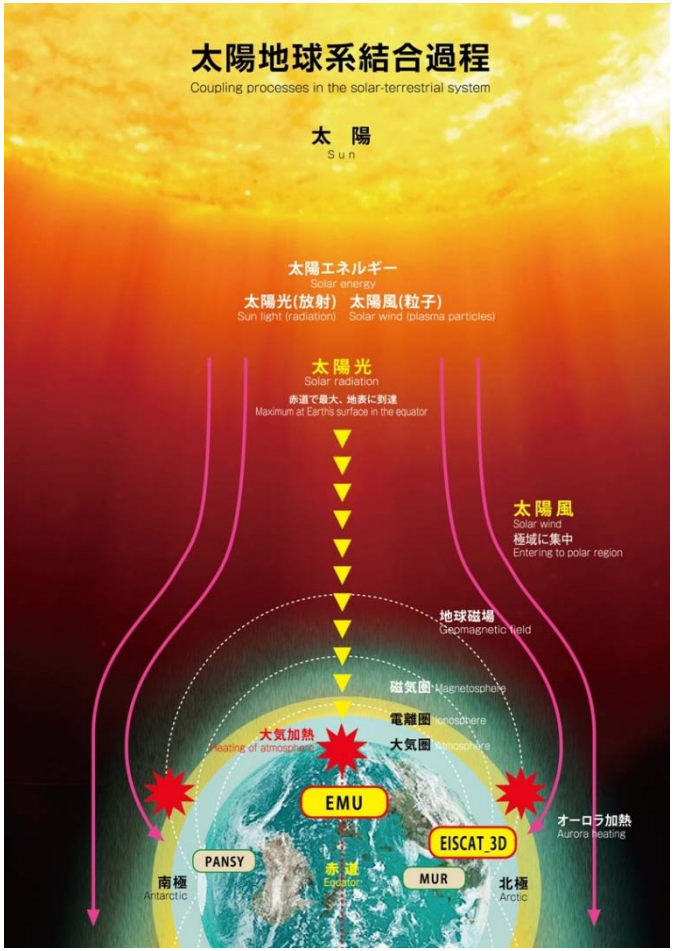
Location in Biak Station



Balloon experiment number	Launch date and time (LT)	Estimated finish date and time (LT)
1	Feb. 12, 2015 08:00~09:00	Feb. 12, 2015 12:00~13:00
2	Feb. 13, 2015 08:00~09:00	Feb. 13, 2015 12:00~13:00
3	Feb. 15, 2015 08:00~09:00	Feb. 15, 2015 12:00~13:00
4	Feb. 16, 2015 08:00~09:00	Feb. 16, 2015 12:00~13:00

Development of EMU Radar

- Development of Equatorial Middle and Upper Atmosphere Radar.
- Collaboration between LAPAN-RISH Kyoto University.
- Coupling Processes in Sun-Earth System.
- Open to international researchers and institutions.



Thank You

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