Space Weather Research and Activities at USTC, China

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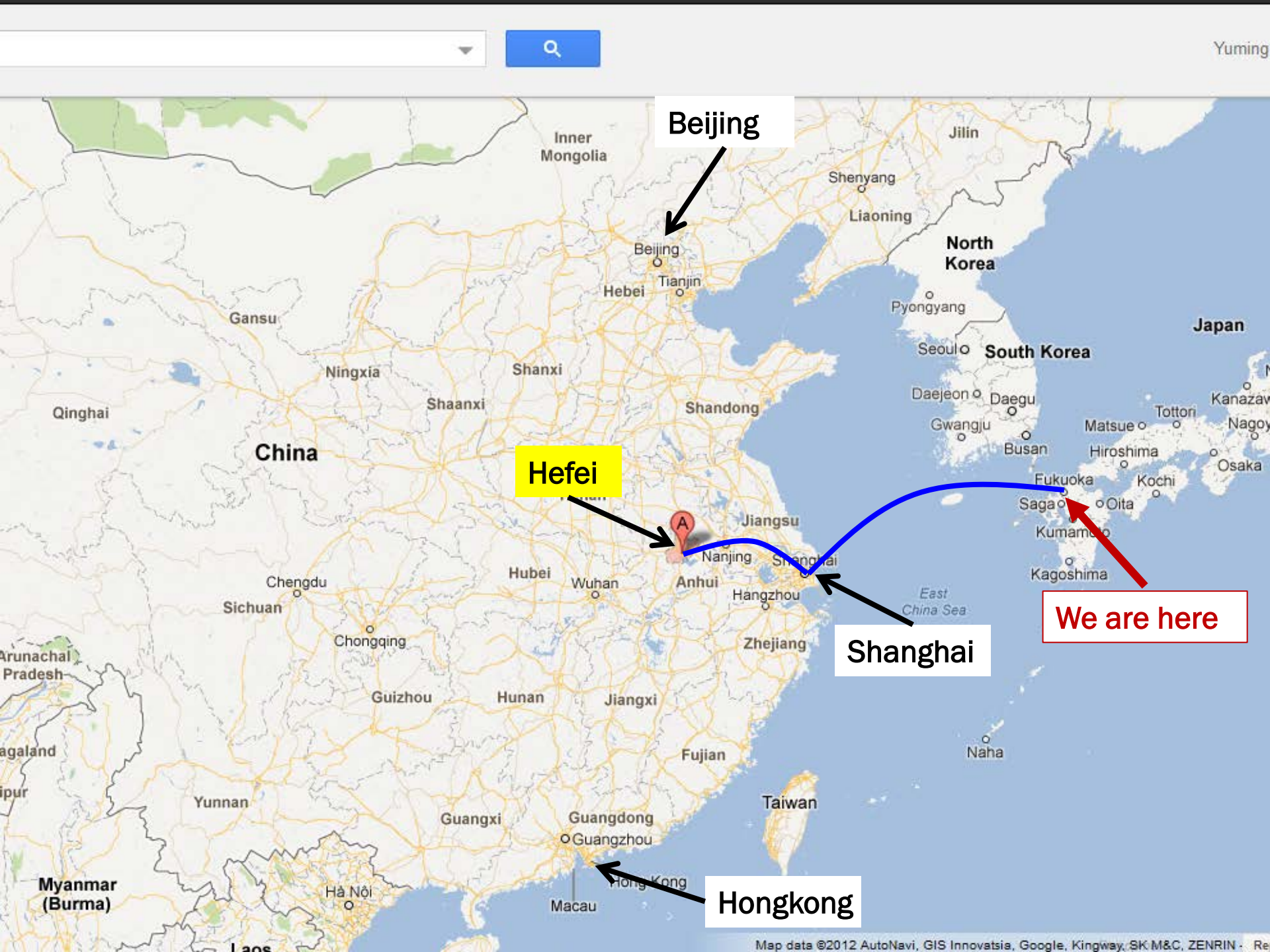
2015.3.3 AOSWA, Japan


Yuming
Beijing
Inner Mongolia
Jilin
Shenyang
Liaoning
North Korea
Beijing
Tianjin
Hebei
Pyongyang
Japan
Gansu
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South Korea
Ningxia
Shanxi
Daejeon
Daegu
Kanazav
Qinghai
Shaanxi
Shandong
Tottori
Nagoy
Gwangju
Matsue
China
Busan
Hiroshima
Osaka
Hefei
Fukuoka
Kochi
Saga
Oita
Jiangsu
A
Kumamo
Nanjing
Hubei
Wuhan
Anhui
Kagoshima
Chengdu
Hangzhou
East China Sea
Sichuan
We are here
Chongqing
Zhejiang
Shanghai
Arunachal Pradesh
Guizhou
Hunan
Jiangxi
Naha
agaland
Fujian
ipur
Yunnan
Taiwan
Guangxi
Guangdong
Guangzhou
Hong Kong
Myanmar (Burma)
Hà Nội
Macau
Hongkong
Laos
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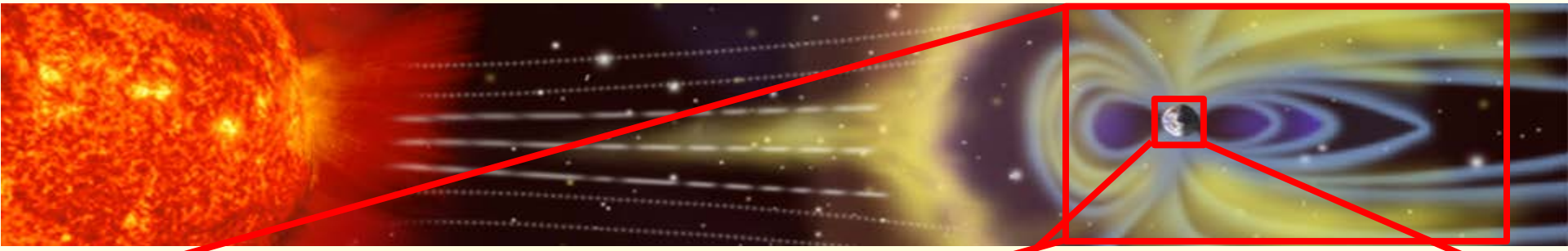
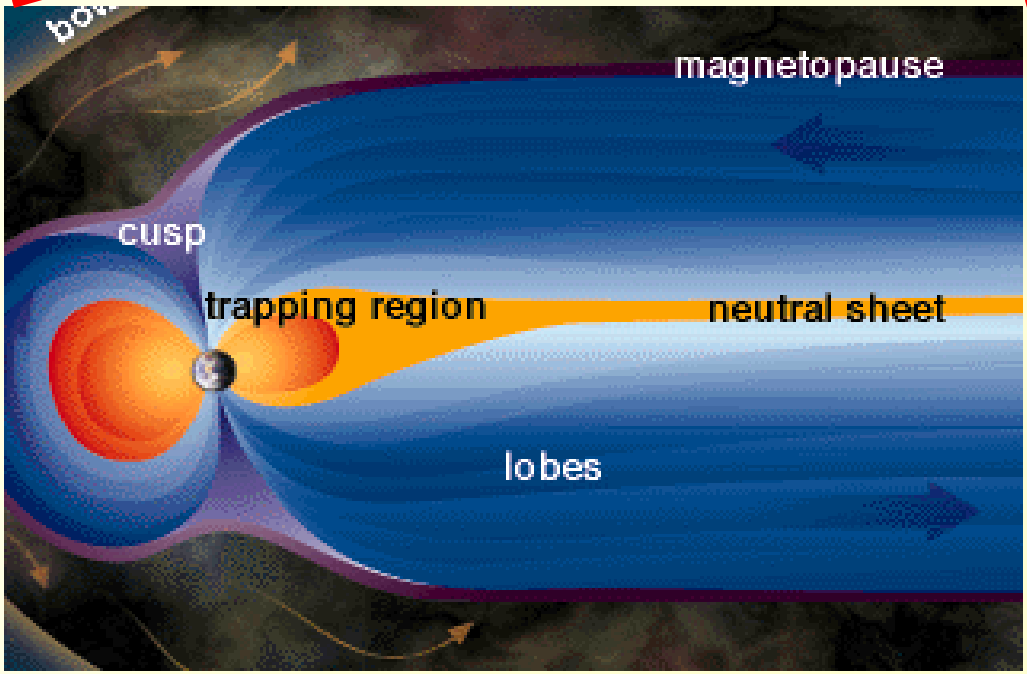
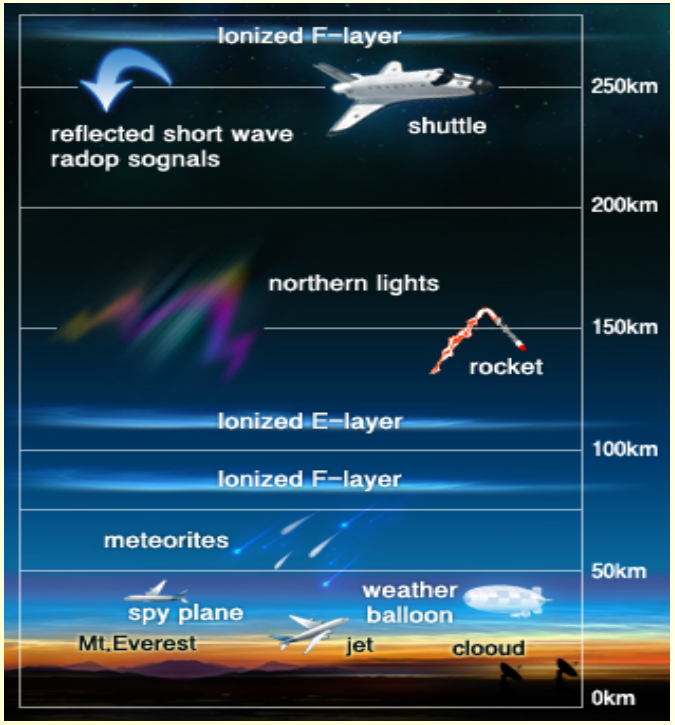
Chinese Academy of Science

Key Laboratory of Geospace Environment (KLGE)

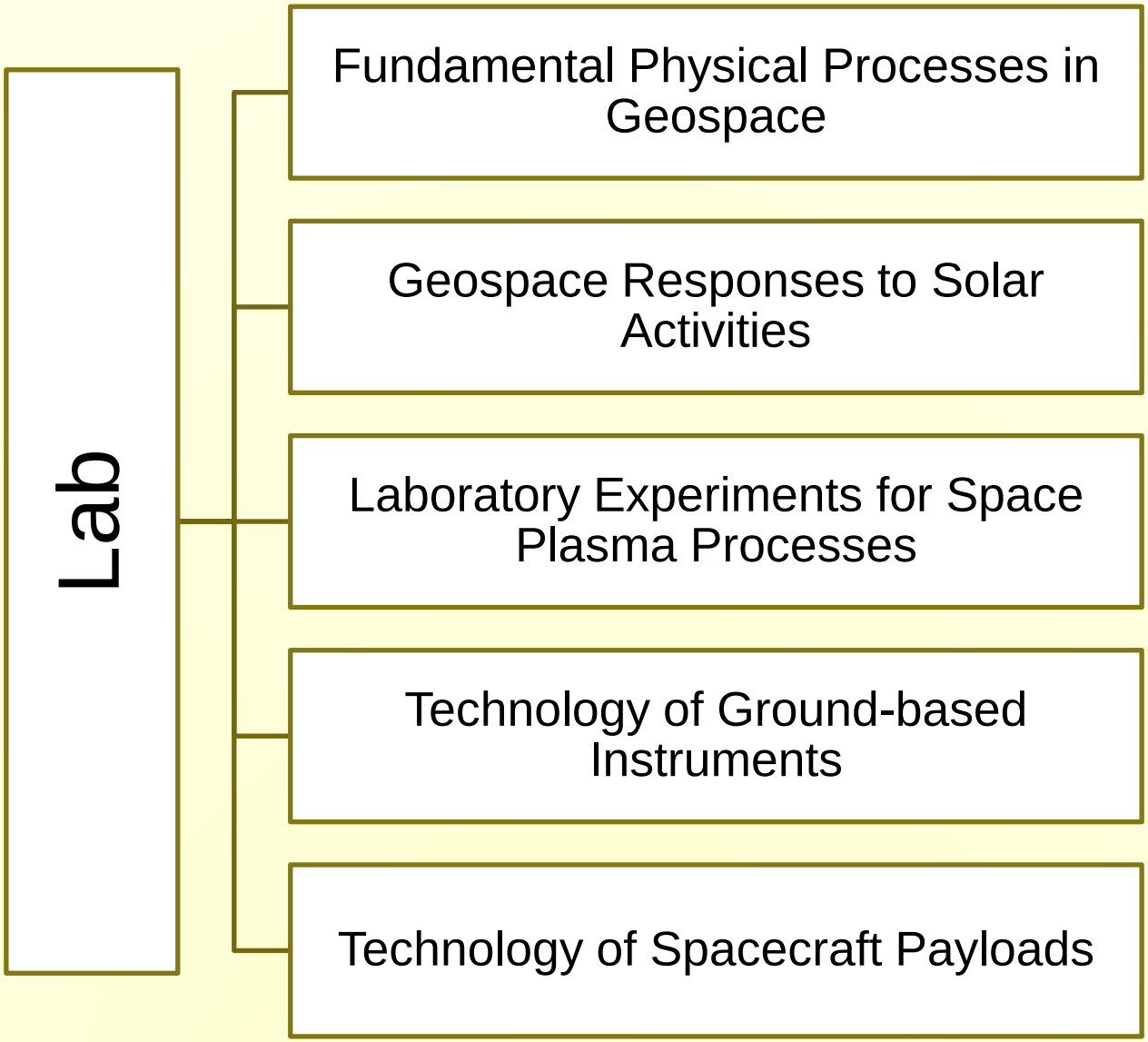
Objective




magnetopause
cusp
trapping region
neutral sheet
lobes


Ionized F-layer
reflected short wave
radop sognals
shuttle
250km
200km
northern lights
rocket
150km
Ionized E-layer
100km
Ionized F-layer
meteorites
50km
spy plane
weather
balloon
Mt.Everest
jet
clooud
0km

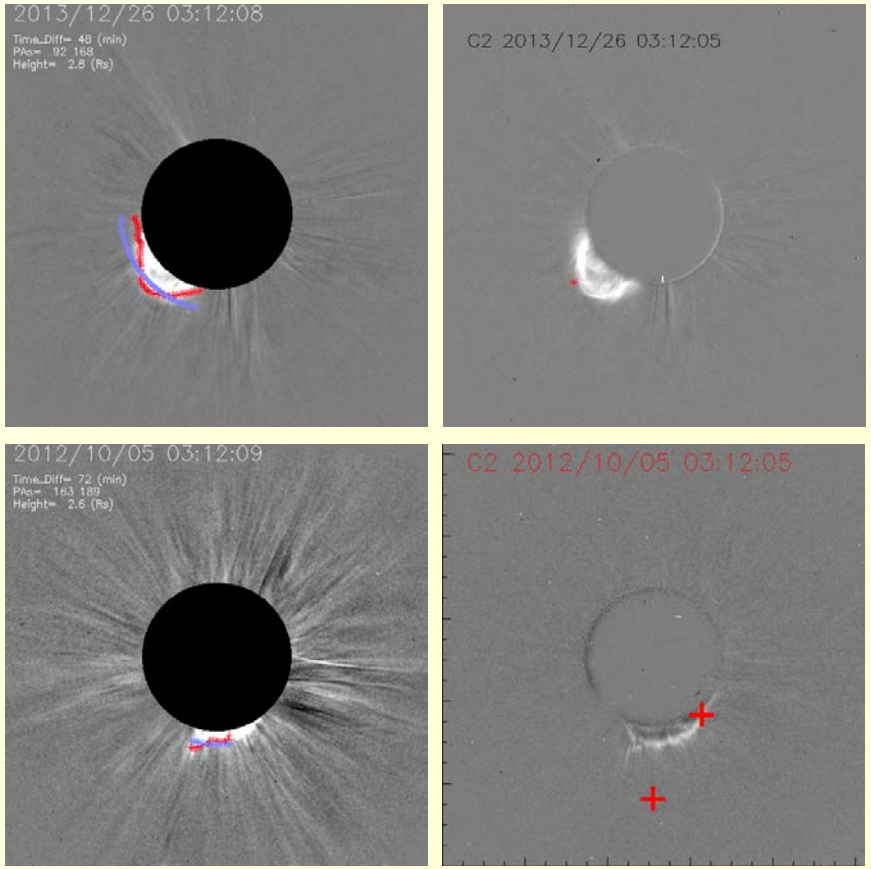
Organization



Space Weather Research at KLGE

1. CMEs from the corona to IP space

CME Autodetection → Ice-Cream Cone Model → Deflection Model / HAFv2.w Model

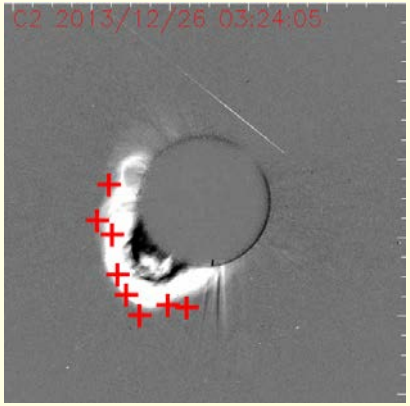


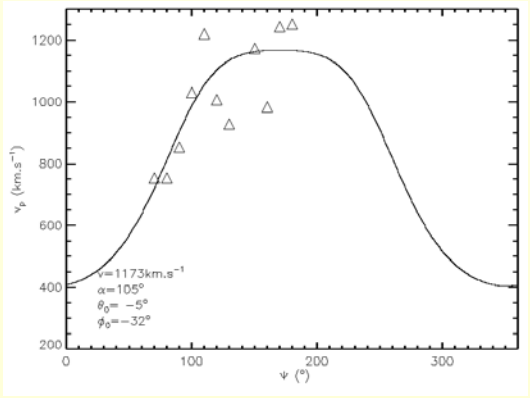
- Using a technique similar to CACTus (Robbrecht & Berghmans, A&A, 2004)
- Automatically recognize a CME from coronagraphs

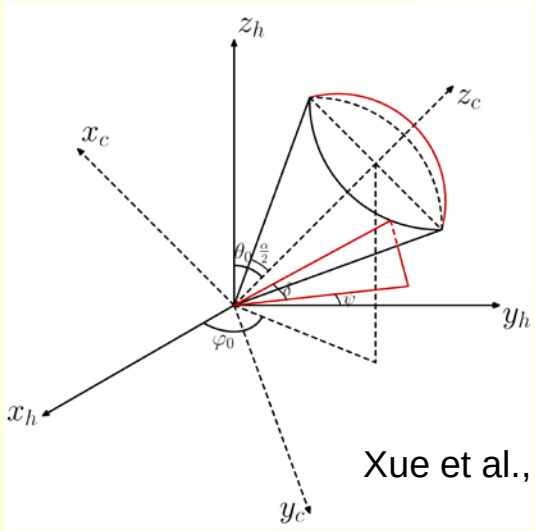
Space Weather Research at KLGE

1. CMEs from the corona to IP space

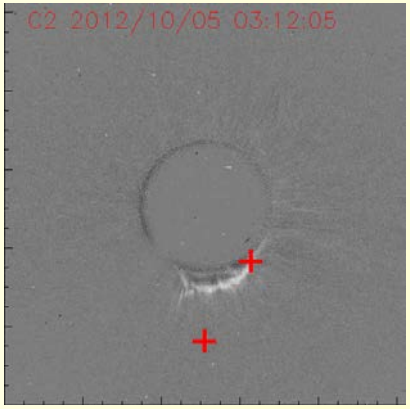
CME Autodetection → Ice-Cream Cone Model → Deflection Model / HAFv2.w Model

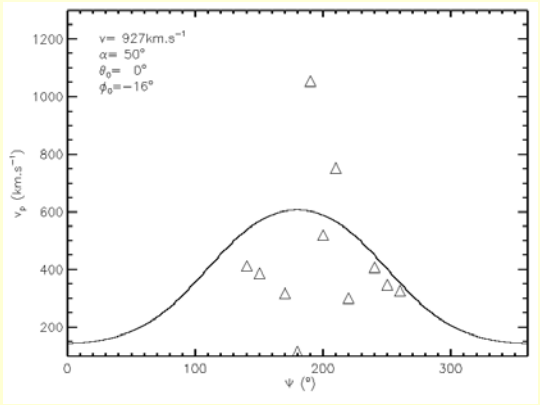






Xue et al., JGR, 2005





- Obtain 3D kinematic parameters

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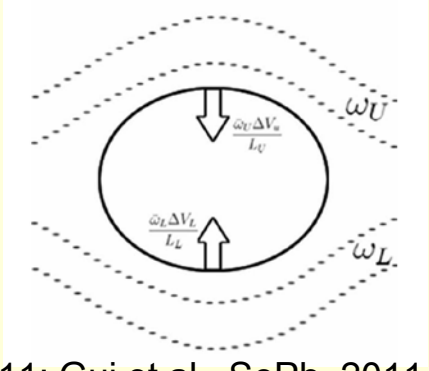
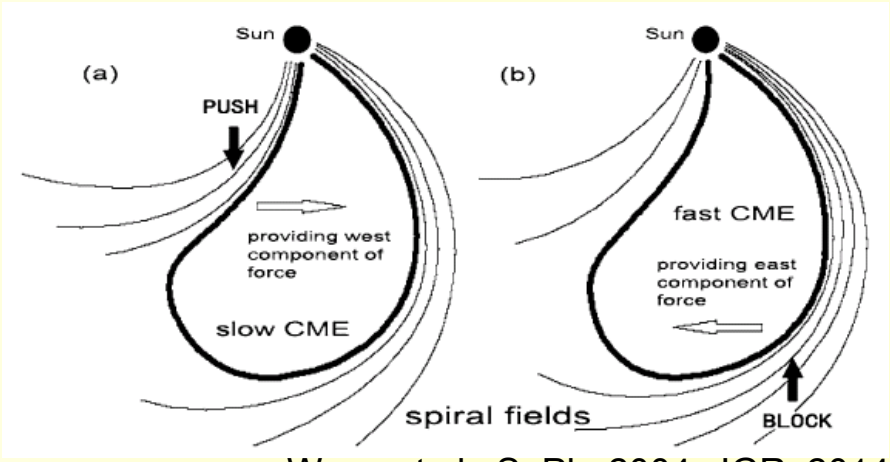
1. CMEs from the corona to IP space

CME Autodetection → Ice-Cream Cone Model → Deflection Model / HAFv2.w Model

- in the corona
- in IP space



Shen et al., SoPh, 2011; Gui et al., SoPh, 2011



Wang et al., SoPh, 2004; JGR, 2014

- Magnetic field dominant
- Solar wind dominant
- Deflection angle up to tens degrees
- See poster: P-3

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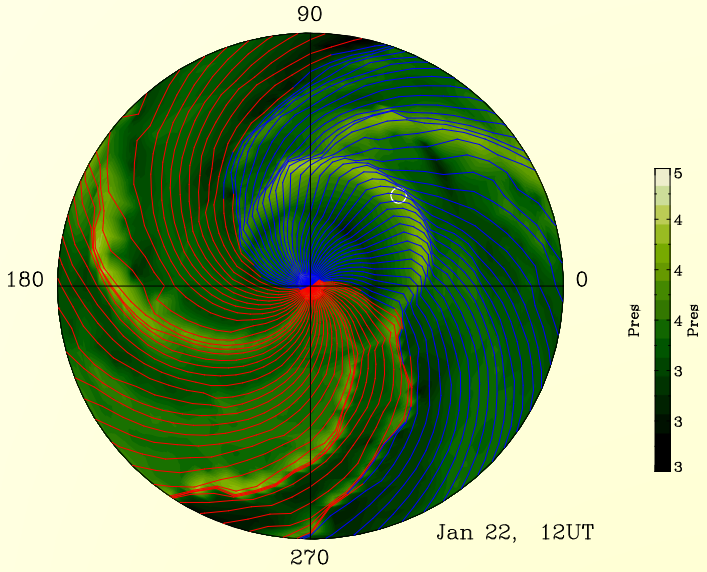
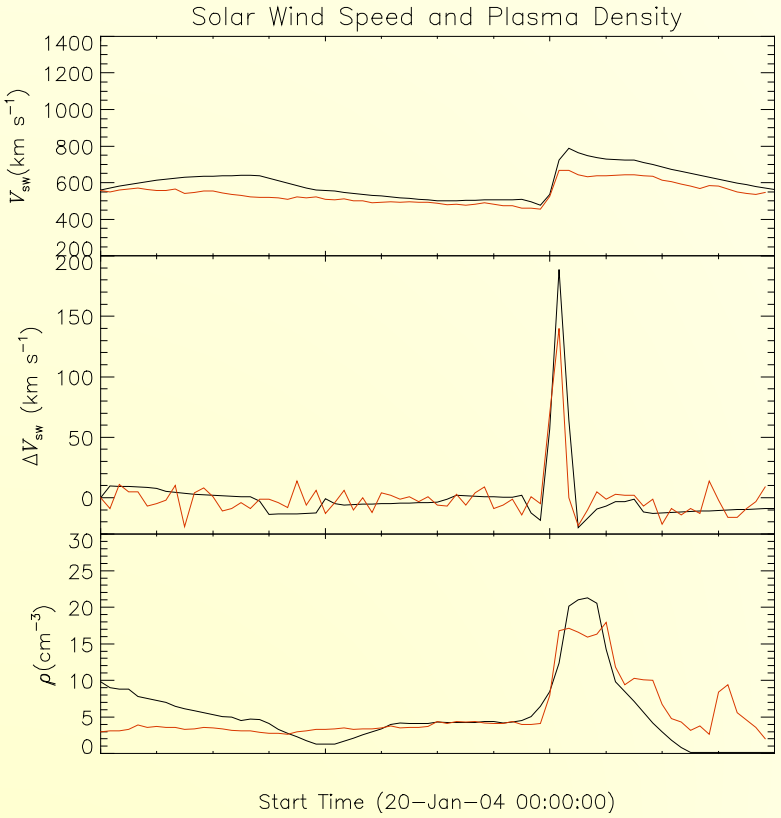
1. CMEs from the corona to IP space

CME Autodetection → Ice-Cream Cone Model → Deflection Model / HAFv2.w Model



The propagation of the dynamic pressure of the solar wind in the ecliptic



The interplanetary disturbances at 1 AU

Akasofu & Fry, 1986; Wang et al., CJG, 2002

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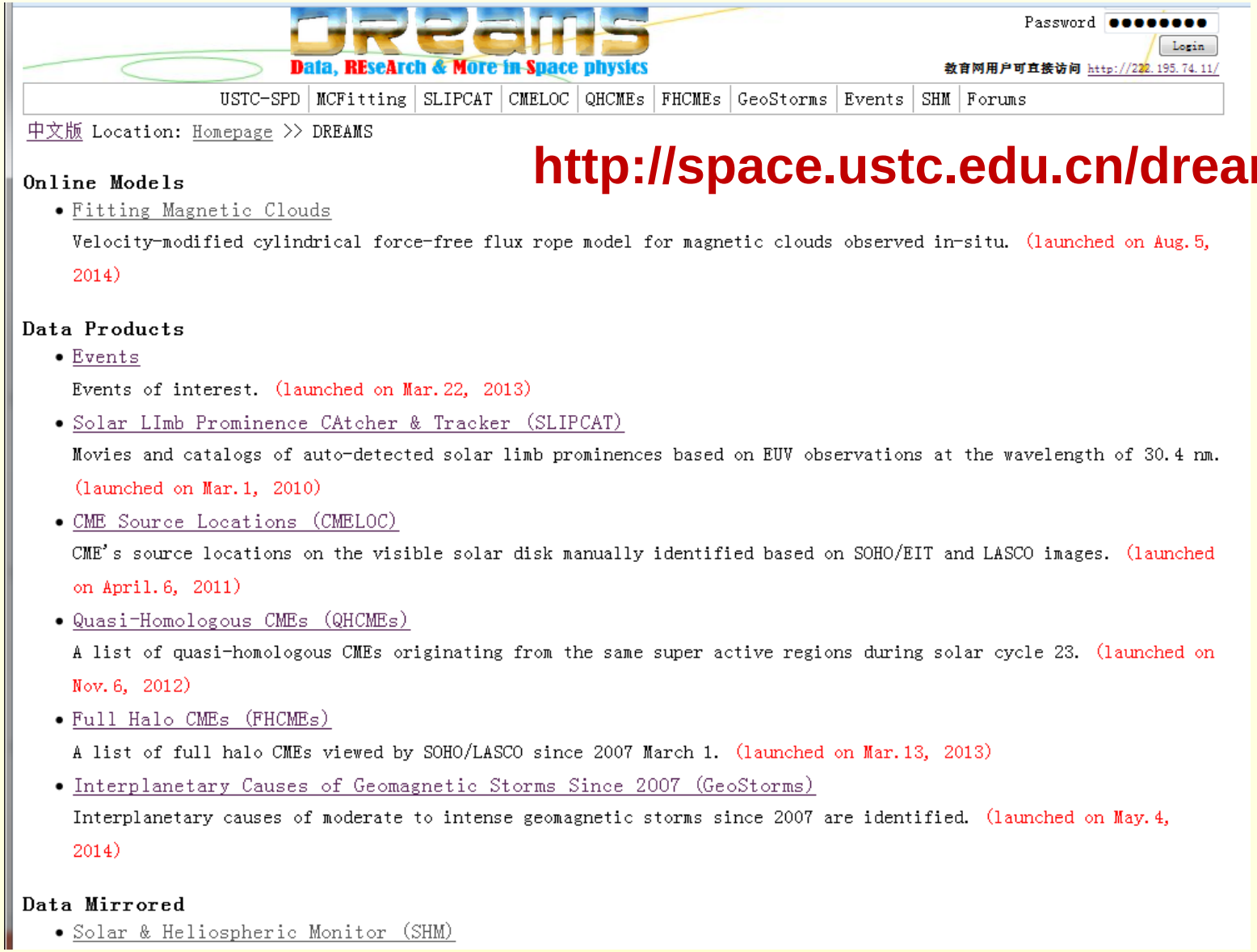

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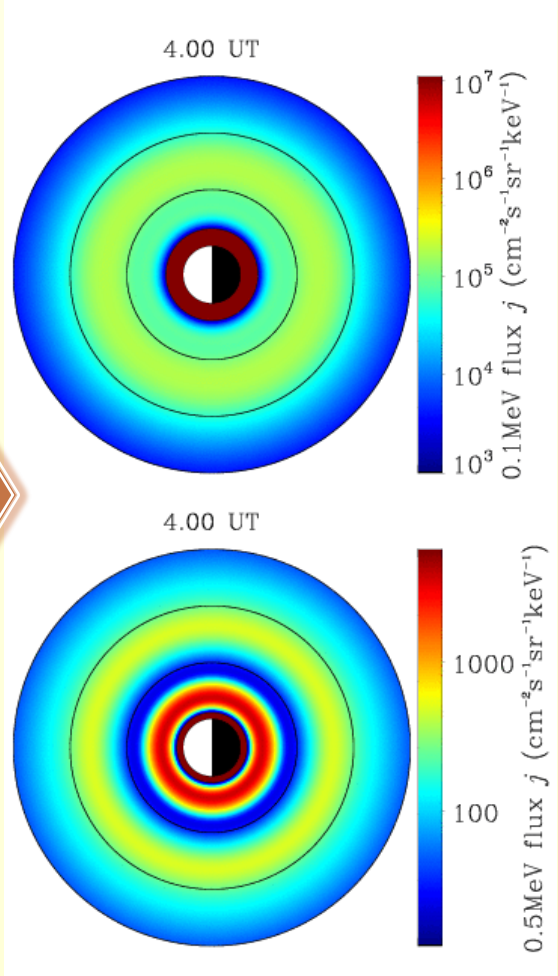
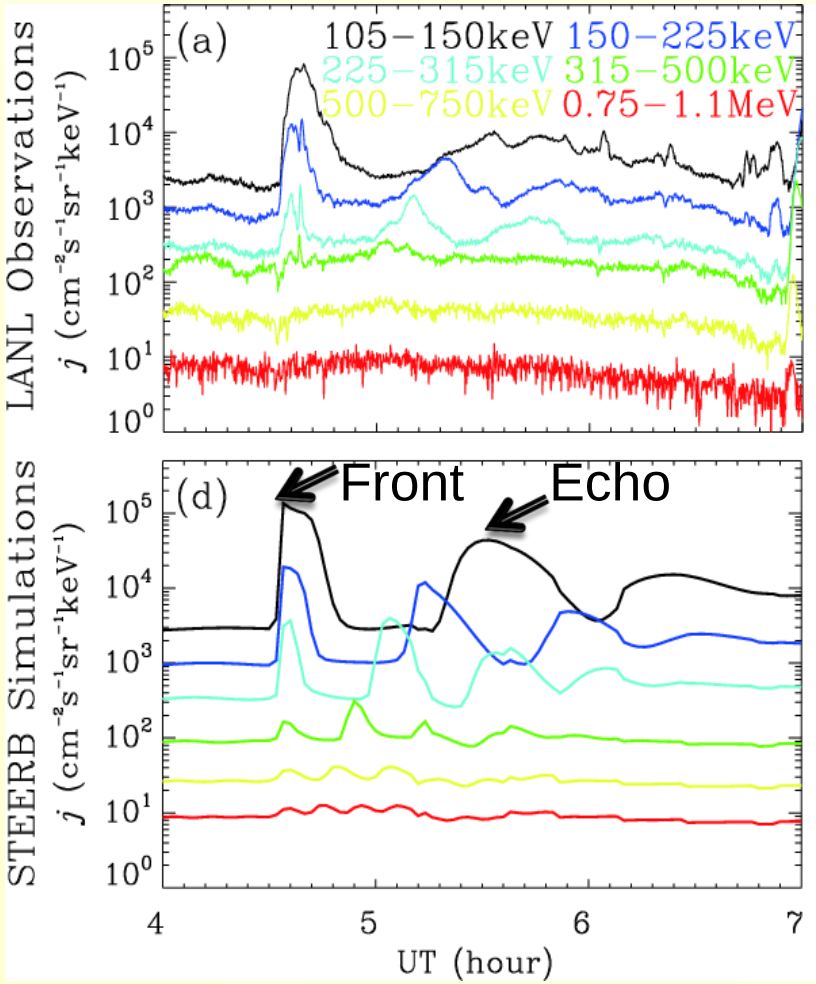
2. Kinetic Model for Radiation Belt (STEERB)

Impulsive Electro-magnetic Fields





Su et al., 2010; 2011

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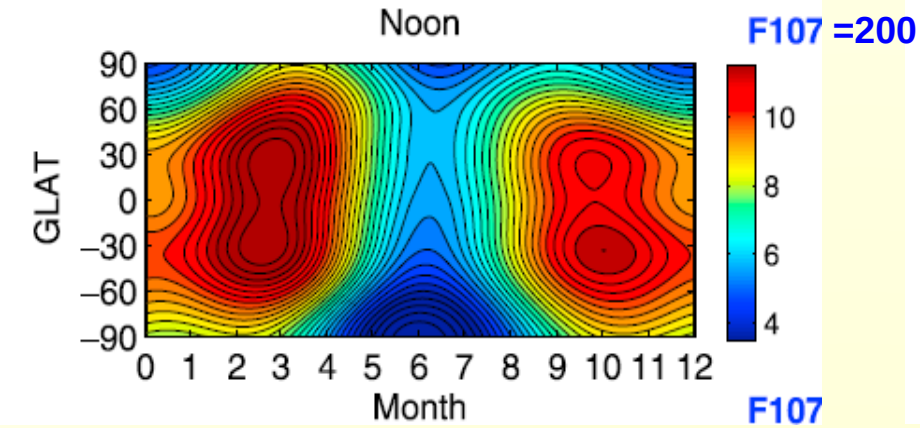
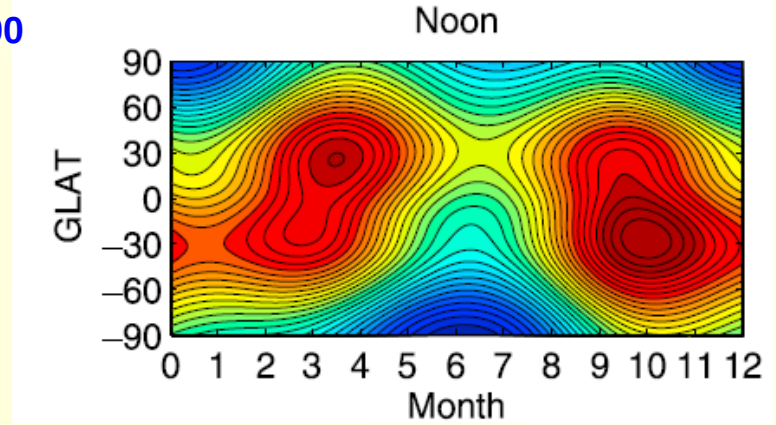
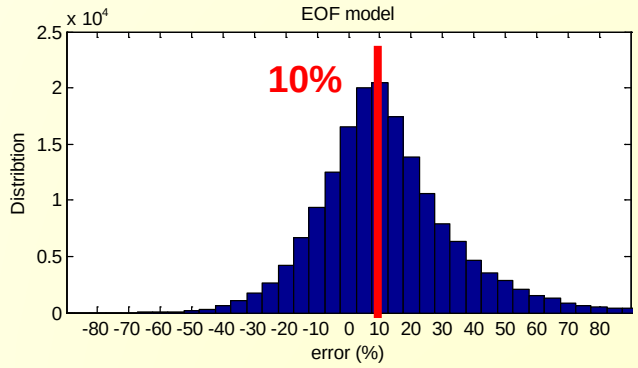
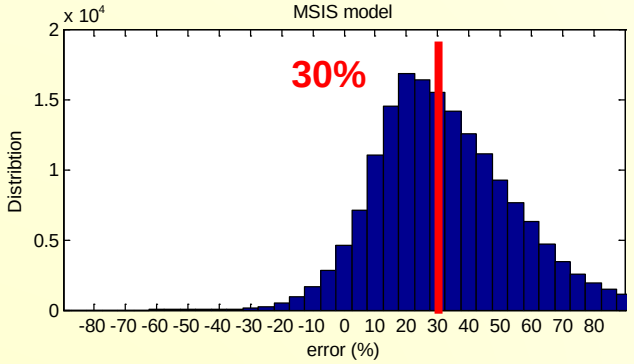
3. Thermospheric density model at 400 km









Our EOF model

Lei et al., JGR, 2012

MSIS model

mass spectrometer and incoherent scatter model (Hedin, JGR, 1991)

Development of Instruments at KLGE

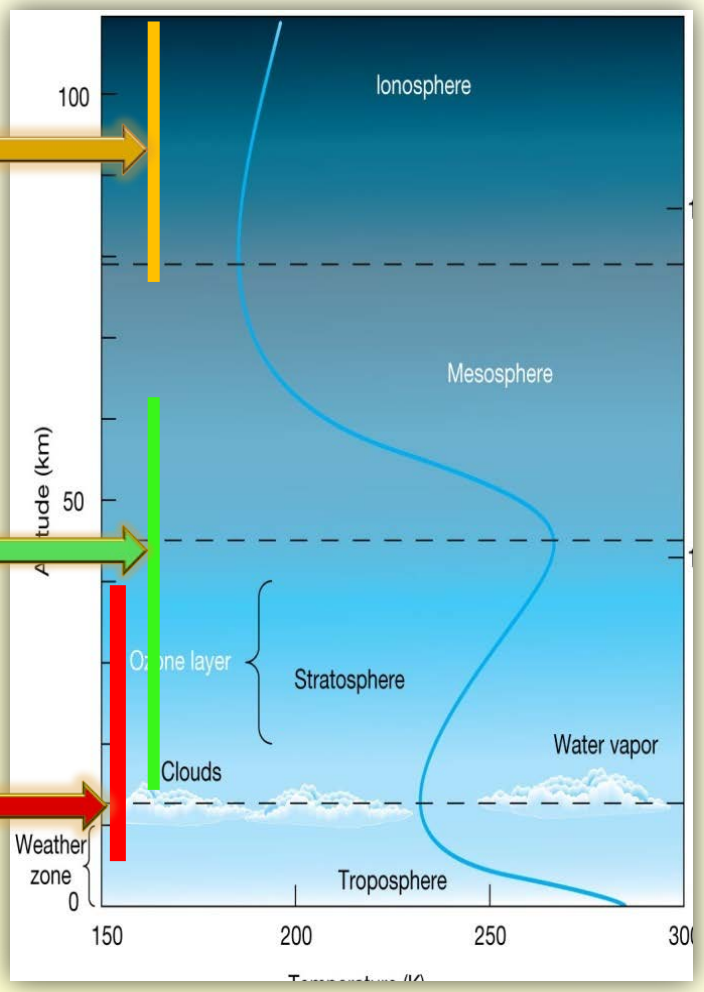
1. Wind Lidar System

Quasi-seamlessly from 5 to 110 km

Narrowband sodium W/T lidar (80 -110km)

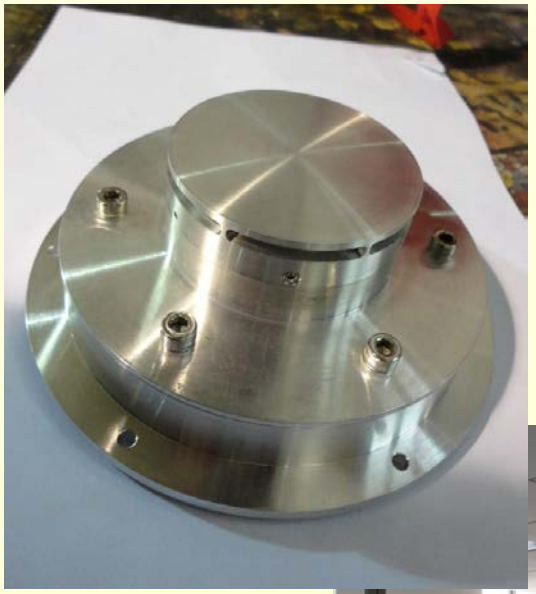
Doppler wind lidar (15 - 60km)

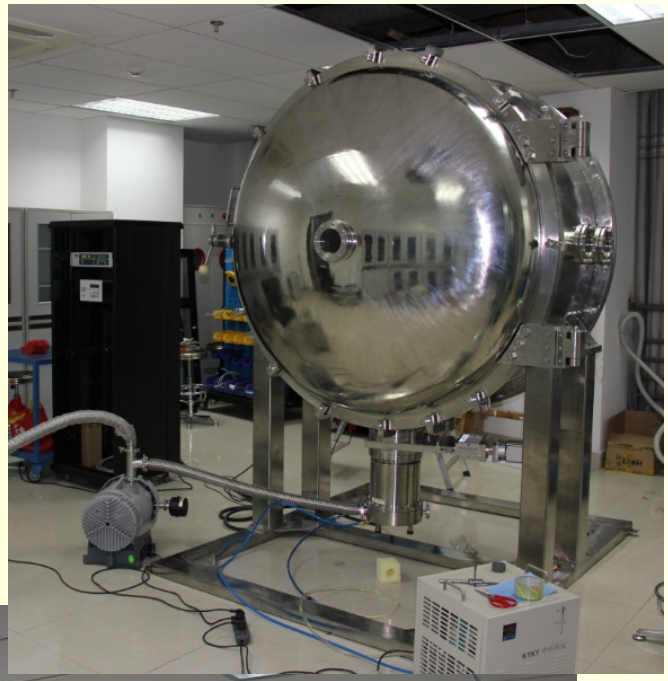
Doppler wind lidar (5 - 40km)



Development of Instruments at KLGE

2. Low-energy Ion Detector (under development)





Development of Instruments at KLGE

3. Laboratory Devices

For basic space plasma physics studies

LMP:
Linear Magnetized Plasma Device

KMAX: Keda Mirror with AXisymmetricity

Summary

Space weather research

- CME propagation and arrival ---- Geomagnetic disturbances
- Radiation belt model ---- Storms & substorms
- Thermospheric density model at 400 km

Instruments

- Wind lidar system ---- middle to high atmosphere
- Low-energy ion detector ---- MIT, IP space
- Laboratory devices ---- fundamental studies

Thank you for your attention!