Recent activities on SSA in the Republic of Korea

NSSAO / MICT
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NSSAO NATIONAL SPACE SITUATIONAL AWARENESS ORGANIZATION
KASI Korea Astronomy and Space Science Institute
Ministry of Science and ICT

Legislation on SSA in Korea

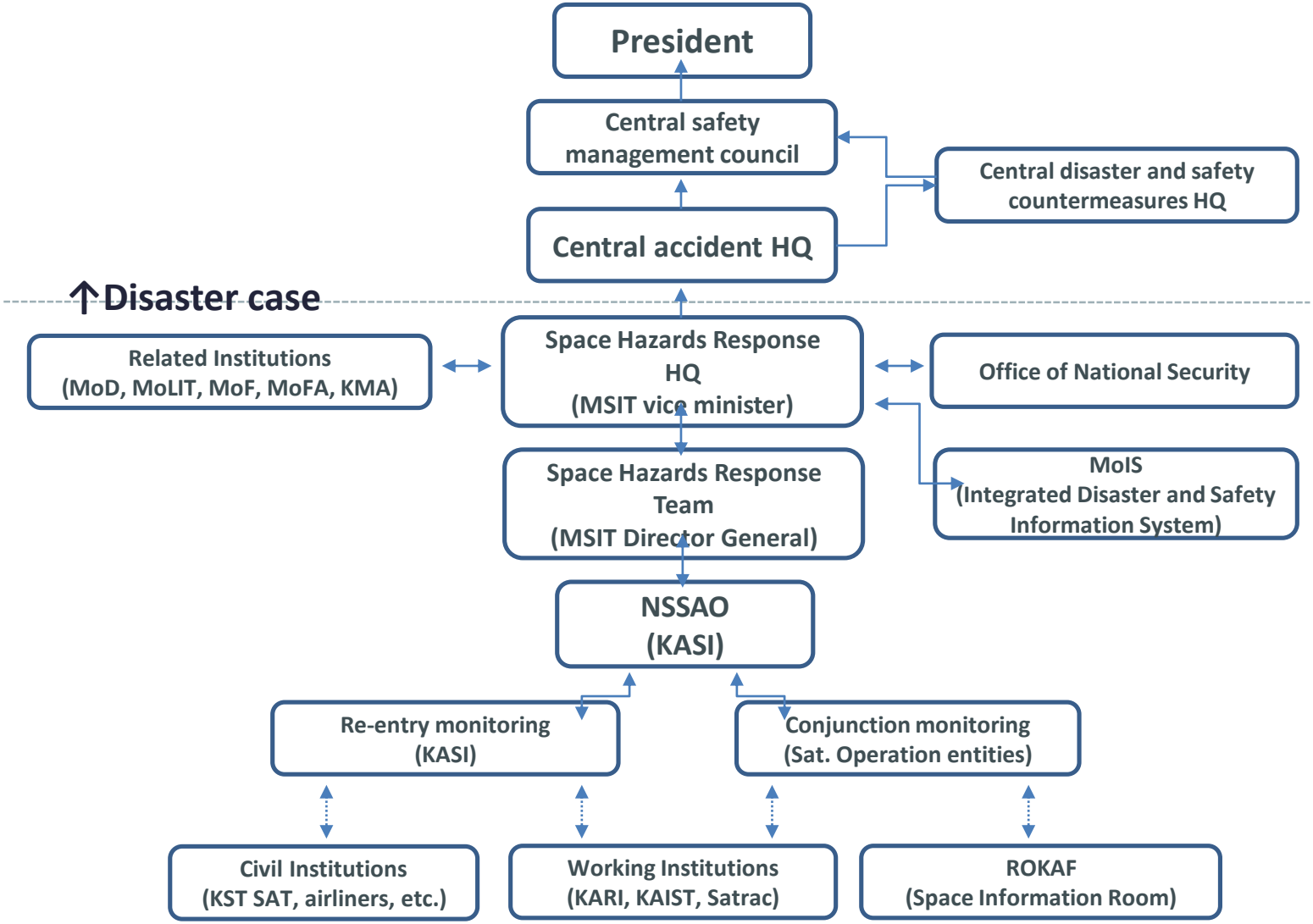
- **Space Development Promotion Act (May, 2014)**
- **National basic plan for space hazards (May, 2014)**
  - **Authority: Ministry of Science and ICT (MSIT)**
- **Enforcement decree of the framework act on the management of disasters and safety (Jan, 2017)**
  - **Disaster by natural space object (Asteroid)**
- **National SSA Organization (Jan, 2015)**
  - **Korea Astronomy and Space Science Institute (KASI)**
  - **Acting entity of planning and execution of basic plan**

National basic plan

VISION	**Safety and Protection from Space Hazards**
GOAL	◈ Prompt Action and Forecasting about Space Hazards ◈ Building up of National Space Hazards Monitoring System ◈ Enhancement of Preparedness Capability for Space Hazards

Subject	Projects
System	- Establishment and management of National Space Hazards Headquarters - Designation and management of Space Environmental Monitoring Agency - Establishment of Meteorite Management System
Technology	- Space risk identification and integrated analysis - Monitoring and warning of potential Earth impactors - Prediction of potential collisions between space objects - Advanced system for solar activity monitoring
Infrastructure	- International cooperation to prepare in case of space hazards - Research and development for technology - Education for enhancement of Human resources

Governmental structure for SSA



National SSA Organization *(NSSAO)*

- **Secure national safety and space assets from space hazards**
  - **Rapid response on space hazards**
  - **Development of SSA sensors and analysis capability**
  - **Operation and support of the national SSA structure**

SSA Activities

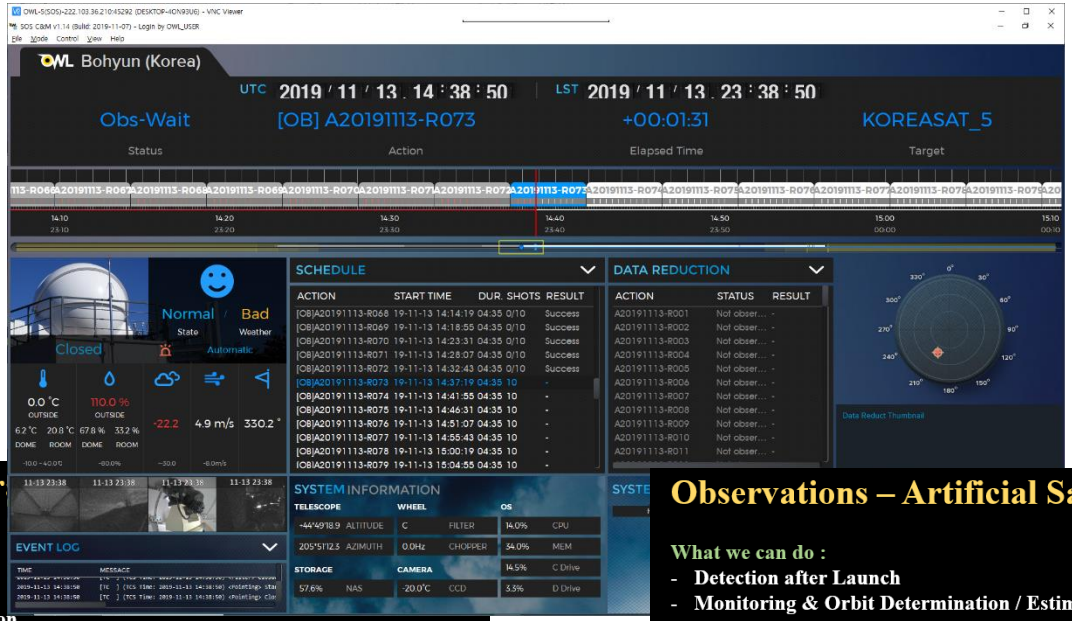
- **Operation of national SSA facilities**
  - OWL-Net (Optical Wide-field patroL Network) : Optical tracking of LEO, MEO, GEO
  - KMTNet(Korea Microlensing Telescope Network) : NEO research
  - Satellite Laser ranging (SLR) facilities (0.4m, 1m) : Space geodesy research
  - Space hazards monitoring and analysis system : space object catalogue, re-entry and conjunction analysis
- **Research and development**
  - Development of 1.5m wide field optical NEO survey telescope
  - Development of SSA radar sensor technology (active array radar)
  - Development of space hazards analysis system
  - Development of all sky optical survey network
- **International Cooperation**
  - UN COPUOS
  - IAWN(International Asteroid Warning Network) & SMPAG(Space Mission Planning Advisory Group)
  - IADC (Inter-Agency Space Debris Coordination Committee)

Space Objects Tracking and Monitoring

- **Owl-Net (Optical Wide Field Patrol)**
  - 5 Global observation network (Mongolia, Morocco, Israel, USA, and Korea)
  - LEO, MEO, GEO space object tracking

Space Objects Tracking and Monitoring

- OWLNet Head Quarter in Daejeon, Korea remotely operates all 5 telescopes

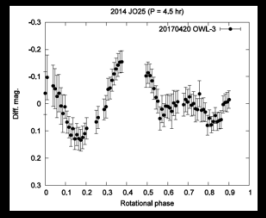


Observations – Natur

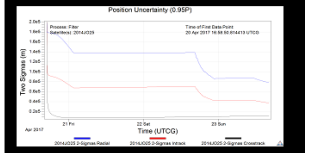
What we can do :

- Detection & Monitoring
- Brightness Variation
- Orbit Determination & Estimation

PHA 2014 JO25
(2017/04/20, OWL-3)



Light Curve of PHA 2014 JO25



Orbit Calculation of PHA 2014 JO25
Position Uncertainty (ODTK)

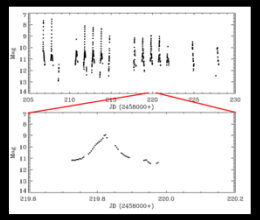
Observations – Artificial Satellites

What we can do :

- Detection after Launch
- Monitoring & Orbit Determination / Estimation
- Brightness Variation of GEO/MEO Satellites

Koreasat-7 after launch
(2017/05/21, OWL-5)

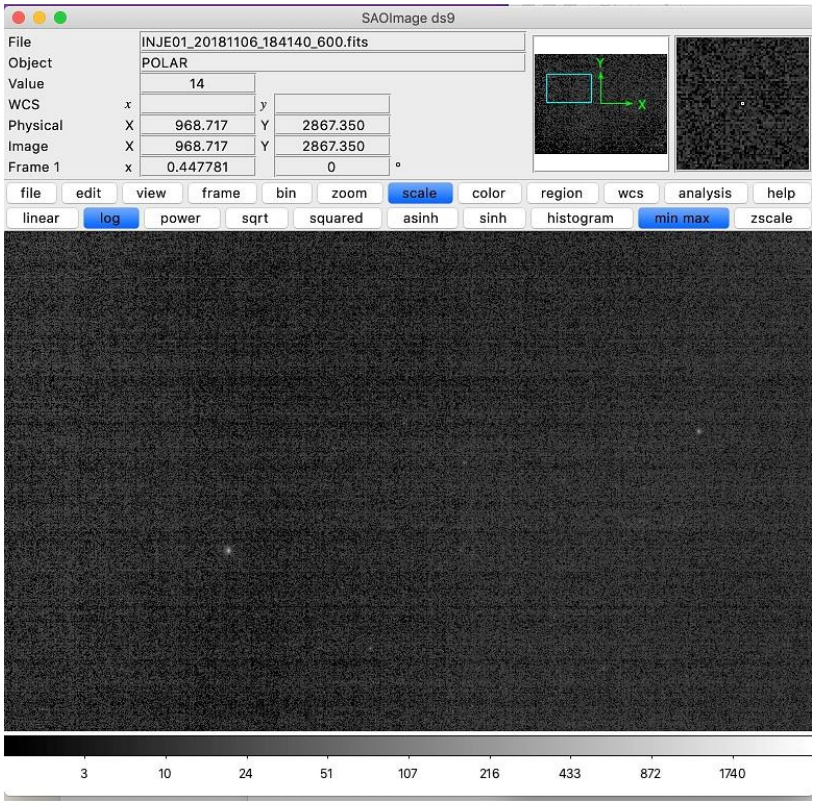
Tiangong-1 before reentry
(2018/03/28, OWL-4)



Light Curve of GEO Galaxy-18
(2018/03/28~04/18, OWL-4)

Space Objects Tracking and Monitoring

- **All sky Monitoring Camera network(under development)**
  - **Fly eye type multiple camera observation system for large artificial space object monitoring**

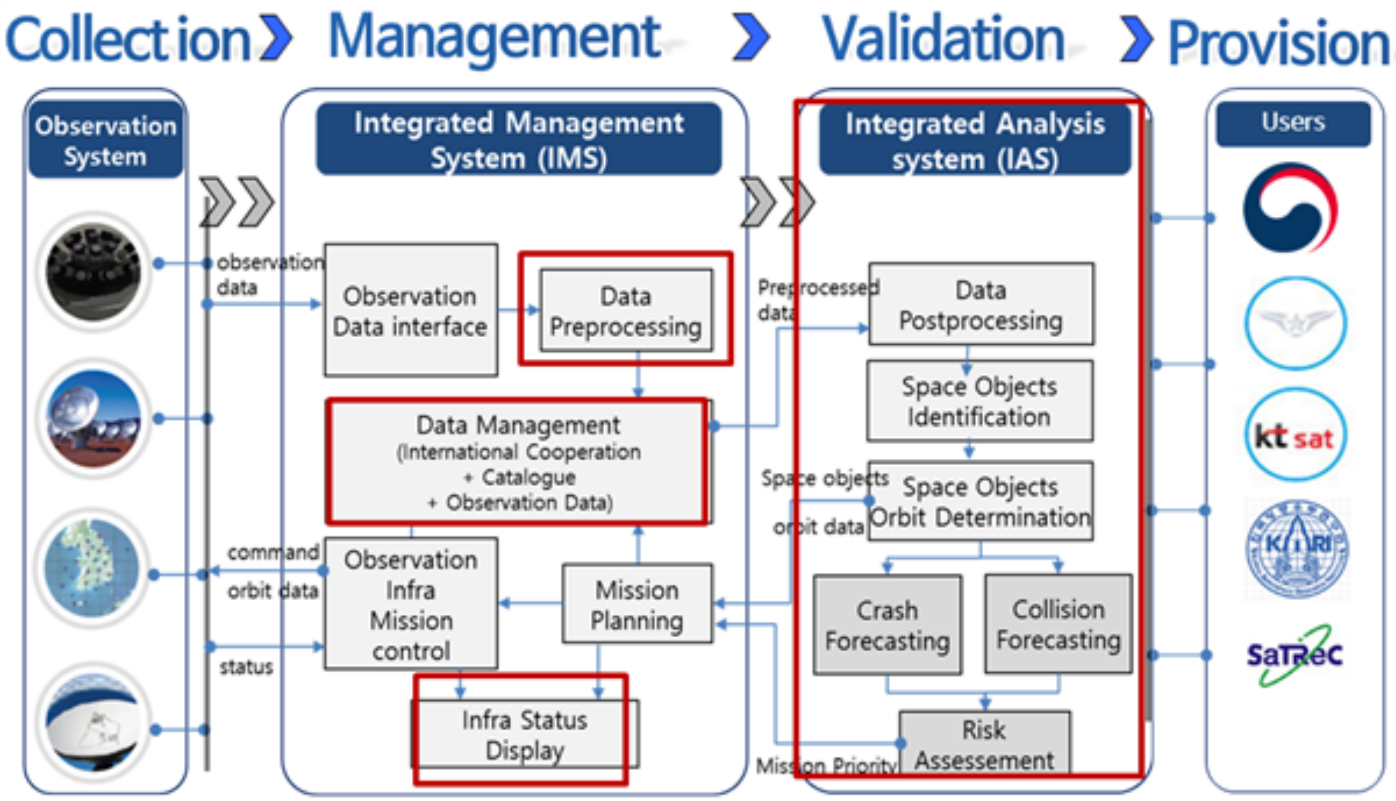


Space hazards Analysis

- Space debris catalogue (TLE level)
- Near earth asteroid catalogue (MPC, JPL)
- Conjunction analysis
- Re-entry prediction

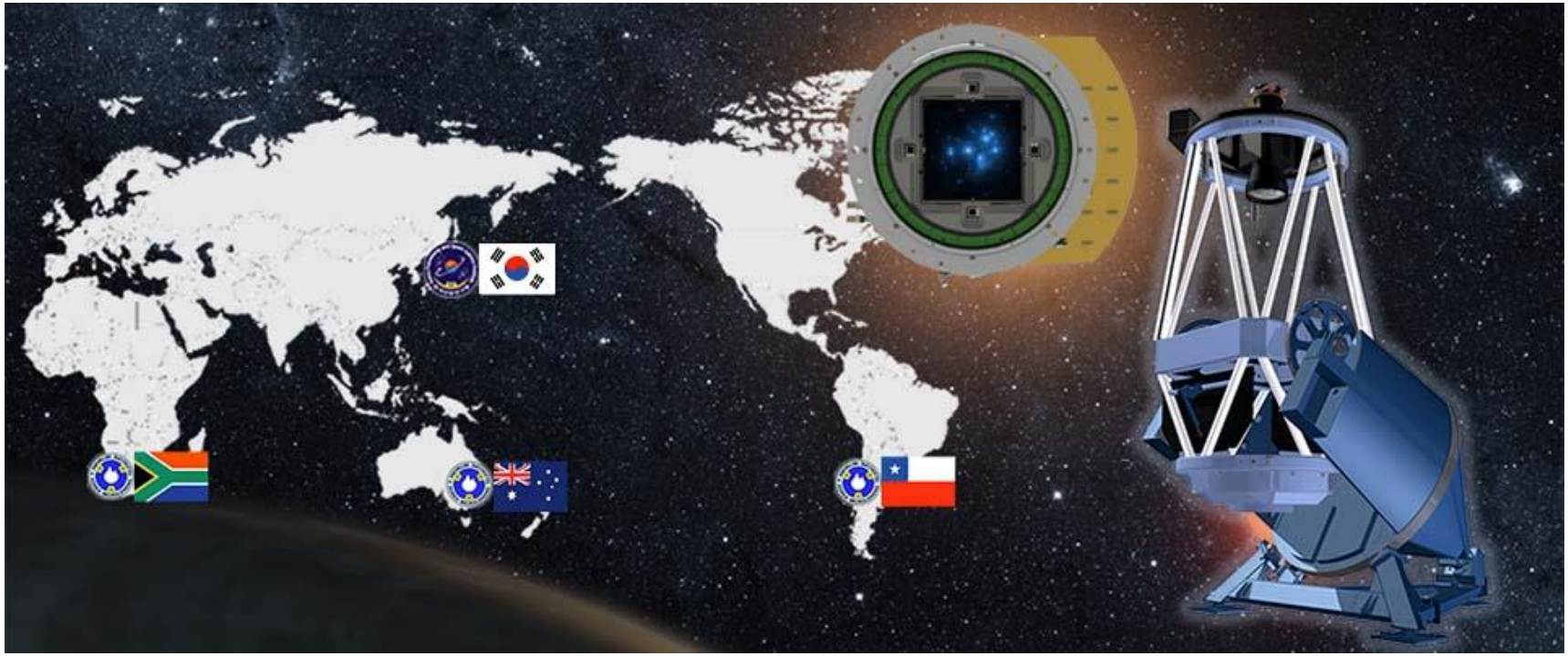
Space hazards Analysis

- Space hazards analysis system (under development)
  - Data management and mission control
  - Identification, orbit determination, reentry analysis, conjunction analysis



Near Earth Object Observation

- KMTNet (Korea Microlensing Telescope Network)
  - 1.6m wide filed optical telescope located in Chile, South Africa and Australia in the southern hemisphere

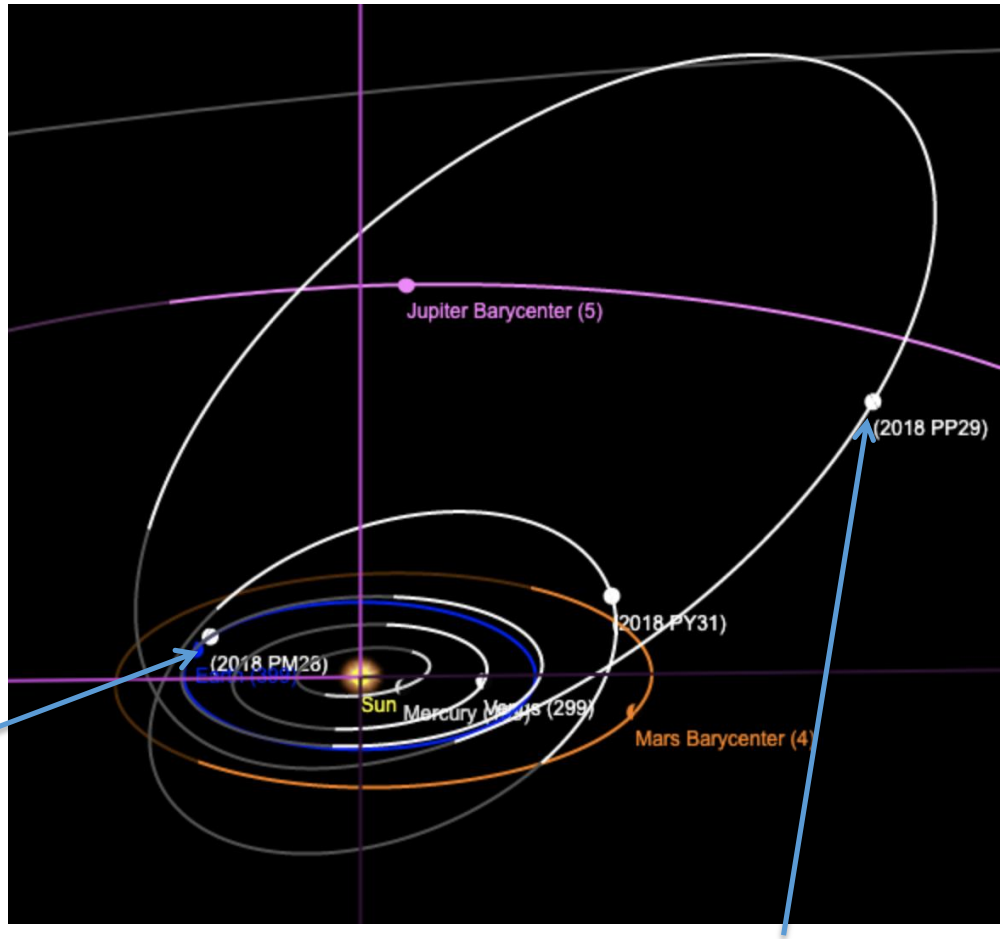


Near Earth Object Observation

- KMTNet (Korea Microlensing Telescope NETwork)

  - Near Earth Asteroid discovery(2019)
    "2018PM28" and "2018PP29"

  - IAWN asteroid observation campaign participation
    "2012 TC4", "1999 KW4", "2I/Borisov"

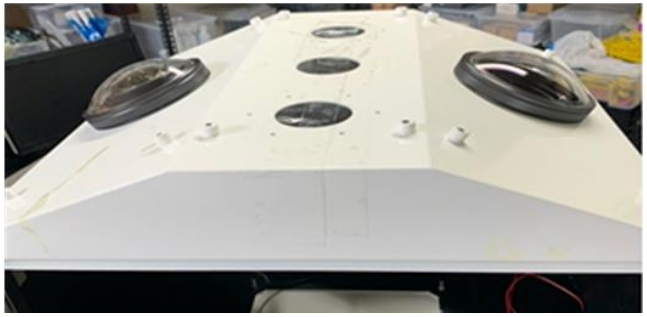


Near Earth Asteroid
(also NHATS target)

Potentially Hazardous Asteroid

Fireball Observation

- **Fireball observation network (under development)**
  - Observation of fireballs above the Korean peninsular

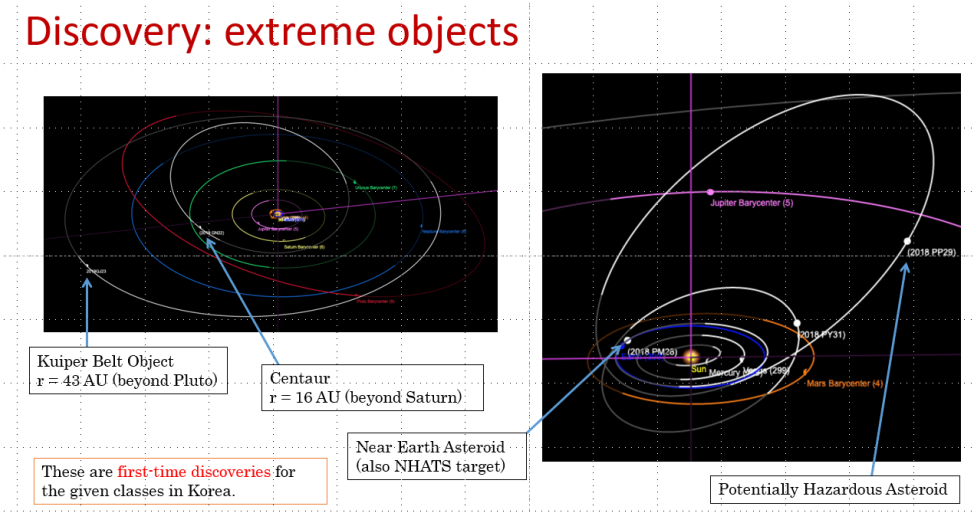


NEO Survey Telescope Development

- **NSOS (Near Space Optical Survey)**

  "Surveying southern sky to find NEO & PHA"

  - 1.5m class telescope in southern hemisphere
  - Benchmarking NASA Catalina Sky Survey (CSS) program
  - 5 year R&D project (2020~2024)



Summary

The Republic of Korea is making a national effort to implement the LTS guidelines and continuing development of technologies for the mitigation of space hazards, space situational awareness, and space traffic management