ULTRAVIOLET ASTRONOMY IN THE XXI CENTURY

e-Workshop 2020 – October 27-29

JcUVa

EarthASAP: A lunar exploration/Earth observation mission

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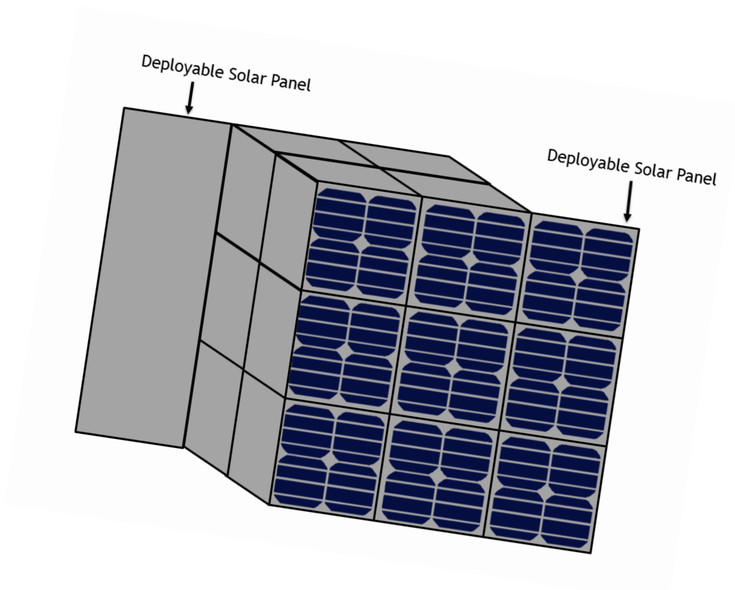
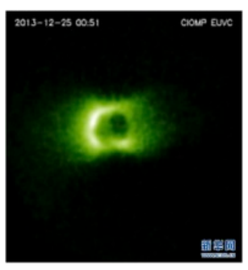
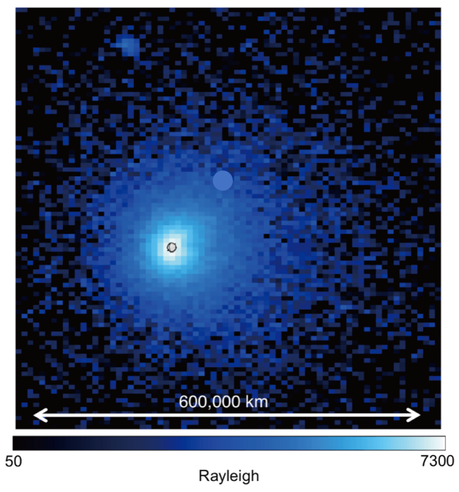


GOALS:

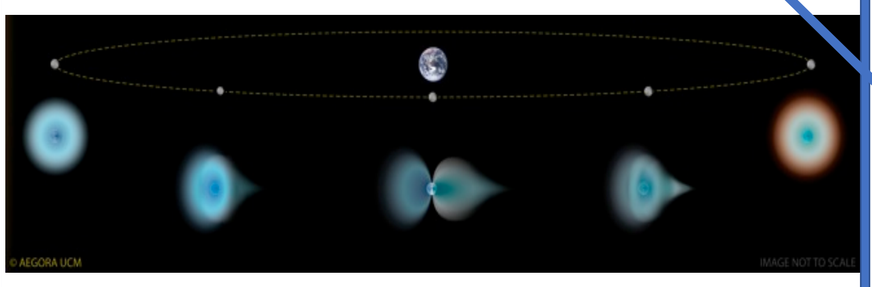
- Production of the first **3D map of the Earth exosphere from outside** by monitoring the Earth Lyα emission.
- Study the interaction between the Earth magnetosphere and the interplanetary medium/solar wind.
- Systematic **survey of the heliosphere in Lyα**, investigating the distribution of diffuse matter within the heliosphere.
- **Monitoring of the water content** and the space weather in the Moon poles

MONITORING EARTH'S EXOSPHERE AND ITS INTERACTION WITH THE SOLAR WIND



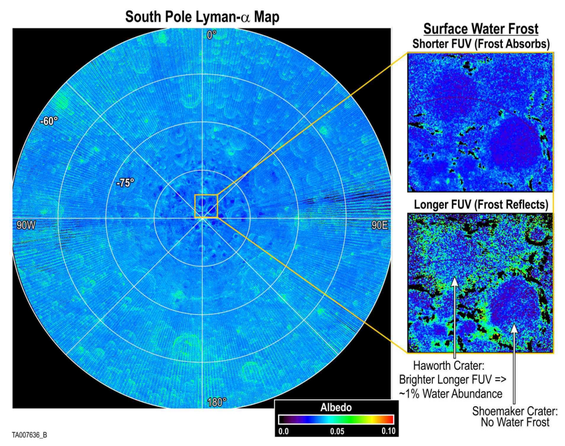


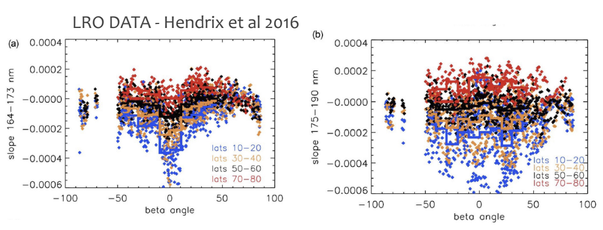
- **Mapping the distribution of Neutral gas with Lyα**
- **Mapping ENA interaction in He II**
- **Chemical abundance of O I**
- **Interaction with solar wind**
- **Follow up of ionization waves from flares**
- **Magnetotail reconnection phenomena**
- **Tracking aurorae**



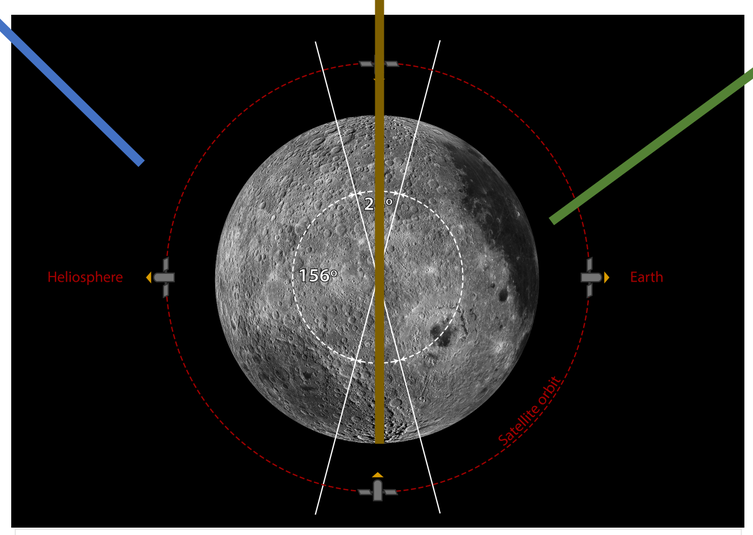
The Moon offers a **stable dynamical anchorage** and a **vantage point for observation** of the Earth-space interface at exospheric and magnetospheric scale

MONITORING THE HYDRATION OF LUNAR POLES





- **Distribution of hydration**
- **Possible variations**
- **Levitating dust clouds**
- **Meteorites impact rate in the areas where Lunar Bases will be settled**

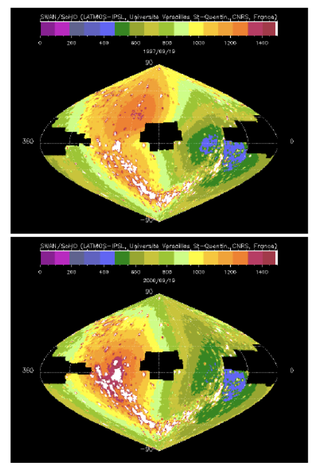


Lunar orbiter at **500 km above the surface** in a **low eccentricity polar orbit**. The orbital **period** is **2.64 hours. Orbital plane** always contains the Moon rotation axis and the center of the Earth.

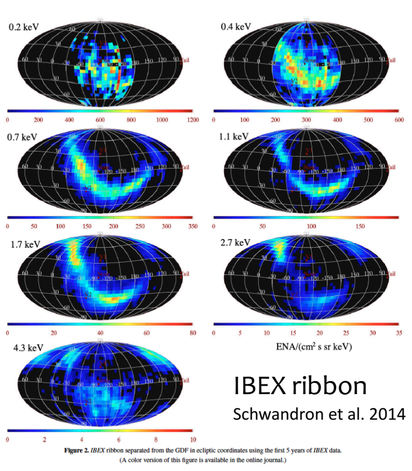
For each orbital period, a basic cycle will be implemented consisting in surveying:

- **64 minutes the Earth exosphere**,
- **12 minutes the South pole of the Moon**,
- **64 minutes the heliosphere**,
- **12 minutes the North pole of the Moon**.

MONITORING THE HELIOSPHERE, MINOR BODIES, COMETS



Heliospheric Lyα emission from SOHO/SWAM
Kountrounpa et al. 2017



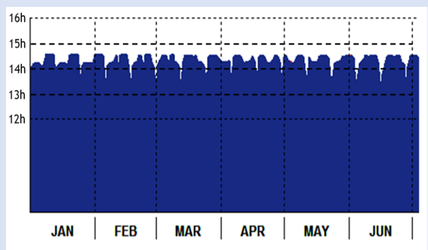
IBEX ribbon
Schwandron et al. 2014

EarthASAP is designed to grow on the experience of SOHO/SWAN providing **higher angular resolution (0.05º instead of 1º) and a wide field of view** to study **comets photo-evaporation** process and the **interaction of the coma with the heliospheric magnetic field.**

Data Management

Data will be **4.2 MB images of 1024×1024 pixels** that will be pre-processed in orbit before being transferred to the Lunar relay.

Protocols will be implemented to detect and track transient events such as solar flares reaching the Earth, solar storms and geo-storms.



FILTERS SET:

Narrow band: Lyα, O I, CI, and He II lines.

Broad band 115-175nm results directly from MCP solar blind detector.

BaF_2 long pass filter. This filter prevents that photons with wavelengths below 140 nm reach the detector; by comparing the images obtained with this filter with those obtained with the naked detector the reddening of the radiation can be derived.

UV telescope inside a **8U cubesat**

a **wide field imager**

with a **field of view of 20º × 30º**

with an **angular resolution of 3 arcmin**

Detector: **solar-blind MCP**

EarthASAP: the payload