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Ultraviolet Space Telescope for Astronomy and Planetary Science

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UV technique in solar system science: our heritages

Io's volcanic activity detected by Hisaki



BepiColombo-MPO/PHEBUS (2018-)

lo's volcanic plasma (Sulfur ions)

Earth's hydrogen corona

600,000 km

PROCYON/LAICA (2014-2015)

EQUULEUS/PHOENIX (2019-)

Kaguya/UPI-TEX (2007-2009)

Hisaki/EXCEED (2013-)

ISS-JEM/IMAP-EUVI (2012-2015)

Goal 1: Ocean worlds and plasma environments of Jupiter/Saturn system

- (1) First-ever continuous monitoring of the water plumes erupted from icy moons
- (2) Long-term monitoring of energy flows in gas giants' magnetosphere

→ High sensitivity and high spatial resolution UV spectroscopy by Japan's "own" telescope



[Feldman et al., 2002]

Goal 2: Characterization of Earth-sized exoplanets

UV transit observation to detect extremely expanded Oxygen exosphere
→ Distinguish Earth-like planets from Mars-/Venus-like planets





-Spectral range from <120nm to >135nm (H Ly-α: 122nm, OI: 130nm) -Spectral resolution: <0.3nm -Sensitivity stability: <1%

Goal 3: First Atlas of Gaseous Large-Scale Structures

(1) What is the baryonic structure of the universe today?

- (2) What happened at the beginning of the universe? How did our MW form?
- \rightarrow Combination of Ly α intensity, emitters, and absorptions of backgrounds

---Cosmology and Galaxy Formation Astronomy---



Goal 4: Time-domain astronomy

(1) How are relativistic jets formed in extreme physical environment?

- (2) What happens in the last 10 years of stellar evolution?
- → Detecting the first 1 hour of explosive transients in UV



Future plans and roadmaps

-Analyze each requirement

-Concept study of the telescope system and instruments

-Two designs: for S-class and M-class

-Clarify the key techniques for this mission and future

Target	Goal 1	Goal 2	Goal 3	Goal 4
	lcy moons	Exoplanets	Gaseous	GW/supernovae
	Slitless		Imaging/	
Mode	spectroscopy	Spectroscopy	slitless	Imaging
	(/Imaging)		spectroscopy	
Spectral range	120-160nm	120-135nm	120-190nm	<300nm?
Spectral resolution	<1nm	<0.3nm	TBD	TBD
Spatial resolution	<0.2 arc-sec	-	TBD	TBD
Field of view	>320 arc-sec	-	>0.3 deg2	100 deg2, 23
Effective area	>200 cm2	>200 cm2	TBD	Mag(AB) in 1h

<Key techniques>

-Detector



-Lightweight mirror

-Tip-tilt/defocusing mechanism

UV space telescope with high sensitivity (>1m class)

Demonstrations for Japan's space telescope design/development Participations to large missions (LUVOIR/HabEx)