

国際宇宙探査における戦略的火星探査の位置付け

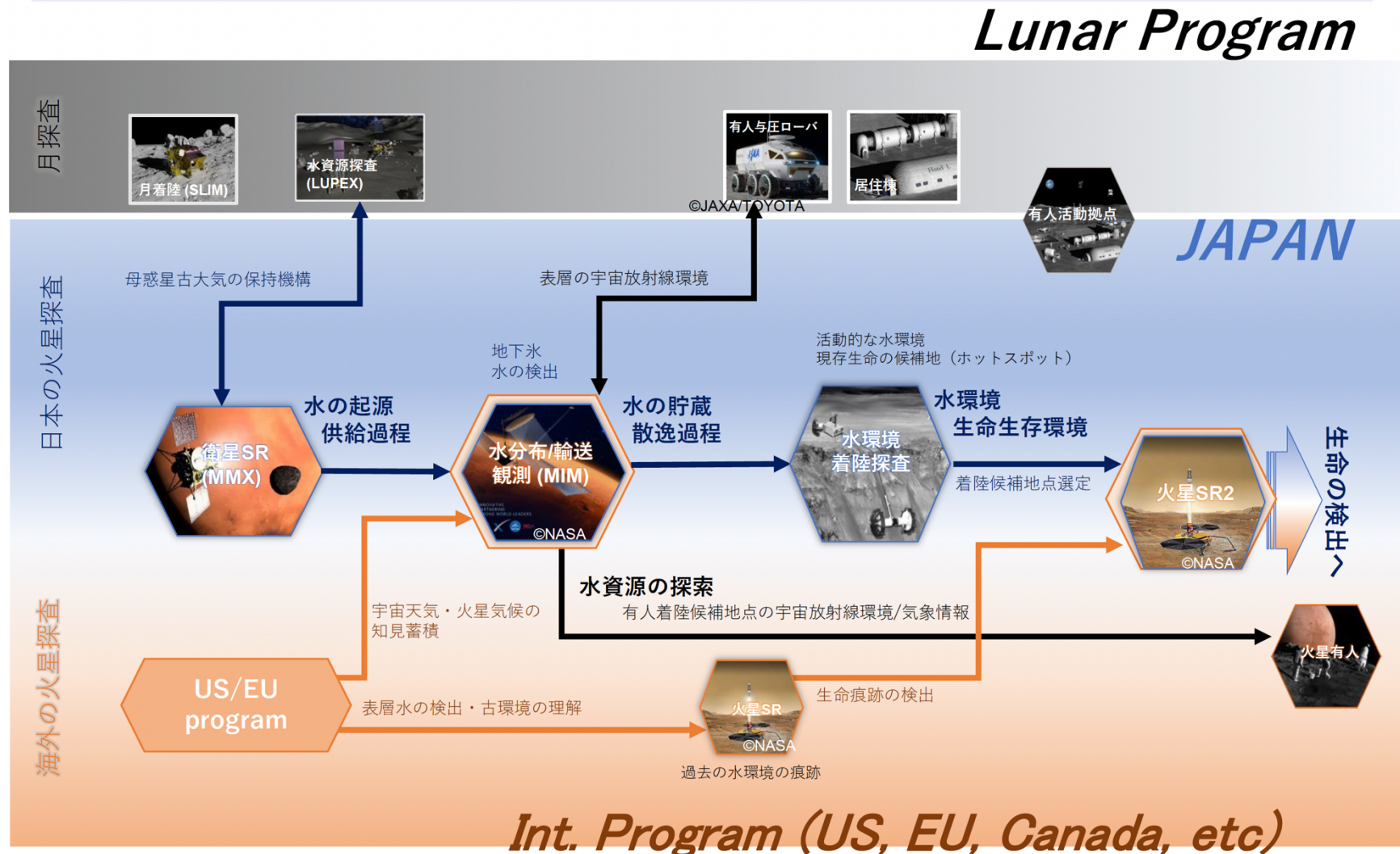


図1. 日本の戦略的火星探査(JSMEP: Japanese Strategic Mars Exploration)の概要(JAXA 国際探査センタープログラム会議資料より)。

Potential Japanese contribution to Mars Ice Mapper

Synergy Science: Provision of sub-science payloads for MIM orbiter consistent with JSMEP

Two Science Payloads Packages to answer key questions:

- To what extent surface/subsurface water reservoirs interact with the atmosphere and have changed with time?
- How is “water” transported from surface to upper atmosphere where it photo-dissociates and escapes to space?
- What is the effects of intrinsic magnetic fields on space radiation environment and atmospheric escape from Mars?

◎ Vertical Atmospheric Coupling Package (with focus on water)	orbiter
<ul style="list-style-type: none"> ✓ THSS (Terahertz Band Heterodyne Spectroscopy Sensor): 3D water map and wind ✓ HRMS (High Resolution Mass Spectrometer): Atmospheric isotopic composition ✓ IDA (Ion Drift Meter and Retarding Potential Analyzer): In-situ wind and temperature 	<p style="color: red; font-weight: bold;">The first vertically-resolved measurement of wind and water vapor in atmospheric boundary layer near surface.</p>
◎ Martian Space Weather Package (with a focus on space radiation environment)	orbiter
<ul style="list-style-type: none"> ✓ MAI (Mars UV aurora/dayglow imager) Map of space radiation penetration & ionospheric irregularities ✓ Space Environment (SE) Sensors (MAG: magnetometer, EPD & ESA: electron detectors) In-situ measurement of space environment & source of irregularities 	<p style="color: red; font-weight: bold;">Visualization of space environment to clarify effects of crustal magnetic fields on space radiation environments and atmospheric escape.</p>

EDL demonstration: Acquisition of pin-point landing technology for future missions

Objectives of I-MIM Lander (EDL demonstration)

Science targets: Formation of Mars and origins of its volatiles

- When & how fast did Mars form? – Did terrestrial planets form early in the solar nebula?
- How & when have volatiles, including water, supplied to Mars’ surface?

◎ Neon isotope measurement	demo lander
<ul style="list-style-type: none"> ✓ Mass spectrometer coupled with a Ne-Ar separation system: Determining ²²Ne/²⁰Ne ratio in the atmosphere 	<p style="color: blue; font-weight: bold;">The origin of Ne in Martian mantle → Timing & process of Mars’ formation, degassing, & redox state of mantle</p>

Reconnaissance objectives: Acquiring useful information for SAR and future human exploration

◎ Space weather and planetary protection	SAR calibration	planetary protection	orbiter
<ul style="list-style-type: none"> ✓ Ionospheric variations during solar events/Transport of key elements in atmosphere 	<p style="color: red; font-weight: bold;">Ionospheric irregularities, contamination assessment</p>		
◎ Weather Package (temperature, pressure, wind speed, dust density, & water vapor)	demo lander		
<ul style="list-style-type: none"> ✓ Meteorological observations on ground in a middle latitude region 	<p style="color: blue; font-weight: bold;">Weather info at candidate future human landing site</p>		
◎ Surface images with highest resolutions	demo lander		
<ul style="list-style-type: none"> ✓ Highest resolution images taken during landing: 3-D structure of possible permafrost region on Mars ✓ Visible & near IR imaging on the surface: In-situ characterization of soils & salts 	<p style="color: blue; font-weight: bold;">Characterization of geological signatures of permafrost. Chemical info of salt & clays at landing site</p>		

図2. 日本から国際 MIM 計画への提供を検討している sub-payloads の概要。