

Advancing Space Weather Science and Services Toward Full Operational Capability

Can space weather kill astronauts?

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Questions to kick off

- *What is the Space Weather?*

Space Weather refers to the changing conditions in space caused by the Sun's activity and how it interacts with Earth's surroundings.

Questions to kick off

- *What is the Space Weather?*

Space Weather refers to the changing conditions in space caused by the *stellar* activity and how it interacts with *planetary* (*lunar, cometary, etc.*) surroundings.



science



technology



services

Questions to kick off

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Questions to kick off

- *Can space weather kill astronauts?*

Yes, if you know about it.

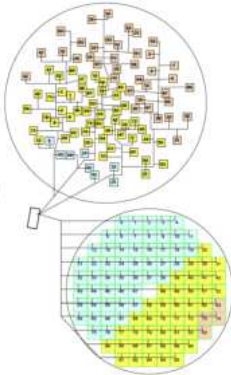


Contradiction of Previous Beliefs



SEPs with energies above 25 keV access the Moon through magnetotail field lines open to the solar wind, challenging earlier studies that suggested the magnetotail effectively shields the Moon from high-energy SEPs as measured by ARTEMIS probes from THEMIS mission, orbiting the Moon since 2011 (Liuzzo+,2023).

LOFAR



LBA: 10- 80 MHz:

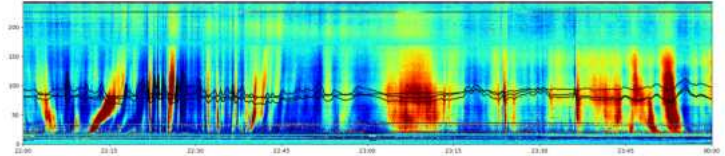
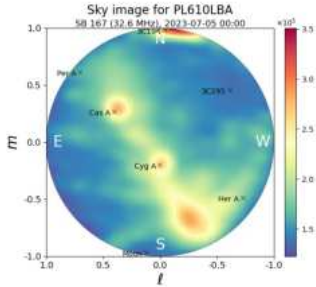
- Dipole: all-sky
- Station beam: 10 degrees

HBA: 110-240 MHz:

- Tiles of 4x4 antennas:
20 degree beam
- Station beam: 4 degrees

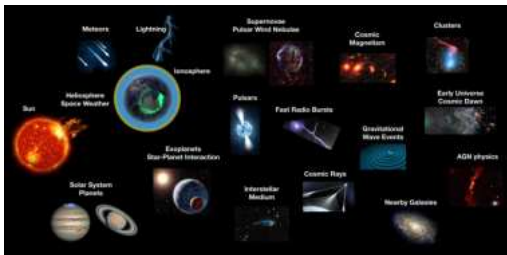
SW with LOFAR

Ongoing LOFAR upgrade to LOFAR 2.0 will allow for continuous monitoring of the ionospheric properties above the station, along astronomical observations.



LOFAR Science Case

13 international stations across Europe: 100-2000 km



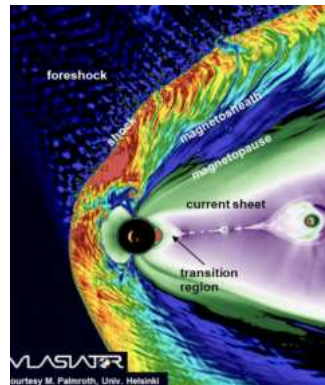
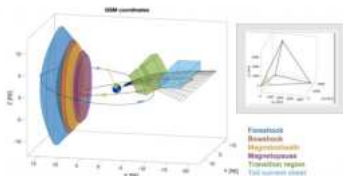
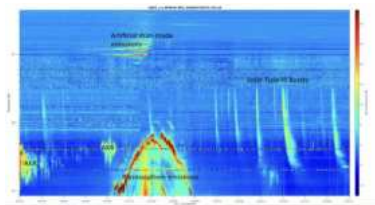
LOFAR cruise to the Moon

"The lunar far side is the only radio-quiet zone in the Solar System."¹



¹Jack Burns, NASA Is About To Put A Radio Telescope On The Moon, BBC Sky at Night Magazine, Feb 2024

Think wide



Farewell



We, scientists, are explorers, driven by curiosity to push beyond horizons.

*By advancing our knowledge of space weather, we want to uncover the unknown, improve our technology, and expand human presence in space **so we can become a multi-planetary species.***

Thank you!!