EGU24 Press Release: Unraveling water mysteries beyond Earth

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The first clue for finding life on other planets is finding liquid water. The moons of Saturn and Jupiter like Enceladus, Ganymede, Europa, and Callisto are suspected of holding oceans of liquid water beneath icy crusts. Similarly, some exoplanets beyond our solar system likely host liquid water, crucial for habitability. But detecting water, when we can't physically access these celestial bodies, poses challenges. Ice-penetrating radar, a geophysical tool, has proven capable of detecting liquid water on Earth and beneath Mars' South polar cap.

Now, this instrument is aboard the JUICE spacecraft and it is on its way to Jupiter's icy moon Ganymede and will also be aboard the Europa Clipper spacecraft, which will be launched to Europa later this year. What can we expect to learn from these missions and how can we use ice-penetrating radar for future planetary exploration? Dr Elena Pettinelli of Roma Tre University, with extensive experience in planetary exploration using ice-penetrating radar, will delve into the utility of this technology in her presentation next week at the European Geosciences Union General Assembly EGU24.

Dr. Pettinelli, who was part of the team that discovered a subglacial stable body of liquid water on Mars, will trace the historical applications of ice-penetrating radar in planetary exploration before she dives into prospective uses of ice-penetrating radar in locating and characterizing liquid water.

Scientists hope to use ice-penetrating radar to determine the depth and chemistry of water beneath the icy surface of Jovian moons. Dr. Pettinelli explains that the radar's penetration depth correlates with ice salinity; saltier ice impedes radar transmission to a greater extent. "Depending on the behavior of the radio waves, we might be able to better tell the distribution of salt," she says, which her team then ground-truths through laboratory experiments.

"We can use all this information to improve our understanding of the distribution of liquid water in the solar system," Dr. Pettinelli says. "There's much more water than we thought 20 or 30 years ago, and it's really interesting to use this technique to try to understand where the water could be."

Accompanying artwork: Artist's conception of plumes of water erupting beneath the icy surface of Europa. Scientists think a liquid ocean lies beneath the frozen exterior.

Credit: NASA, ESA, K. Retherford-Southwest Research Institute

Note to the media
When reporting on this story, please mention the EGU General Assembly 2024, which is taking place from 14-19 April 2024. This paper will be presented in full CR5.4 session at EGU24 on **Friday, 19 April**, at **10:50 CEST**. If reporting online, please include a link to the abstract:
https://meetingorganizer.copernicus.org/EGU24/EGU24-18640.html

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More information
The European Geosciences Union (EGU) is Europe's premier geosciences union, dedicated to the pursuit of excellence in the Earth, planetary, and space sciences for the benefit of humanity, worldwide. It is a non-profit interdisciplinary learned association of scientists founded in 2002 with headquarters in Munich, Germany. The EGU publishes a number of diverse scientific journals, which use an innovative open access format, and organises a number of topical meetings, and education and outreach activities. Its annual General Assembly is the largest and most prominent European geosciences event, attracting over 18,000 scientists from all over the world. The meeting's sessions cover a wide range of topics, including volcanology, planetary exploration, the Earth's internal structure and atmosphere, climate, energy, and resources. The EGU General Assembly 2024 is taking place in Vienna, Austria and online from 14-19 April 2024. For information and press registration, please click here.

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