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Regenerative and Multifunctional Water Management for Exploration Missions

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Human exploration of space and planets requires protection from the harsh environmental conditions encountered, and affordable provision of vital resources. Water is critical for human life, and can be even exploited for protecting humans from solar radiation. The International Space Station (ISS) has taught us to store, monitor and regenerate water. Thanks to Automated Transfer Vehicle (ATV) flights, Europe has provided more than 2 tons of potable water to the ISS, and we learned how to tackle water quality issues and keeping water disinfected with different biocides. Exploiting our know-how and the ISS as a test bed, we are preparing for the future beyond Earth orbits, strengthening our capabilities for safe, affordable and multifunctional water management. For Cislunar and transfer missions scenarios we are researching and developing new storage tanks, flexible bags for personal astronauts protection from solar radiation, regeneration technologies for condensate and urine management, water and nutrient delivery systems for plant cultivation: all these efforts are critical enablers for Mars exploration.