THE
ATMOSPHERIC RESERVOIR
Examining the Atmosphere and Atmospheric Resource Management

"Water is Out of this World"

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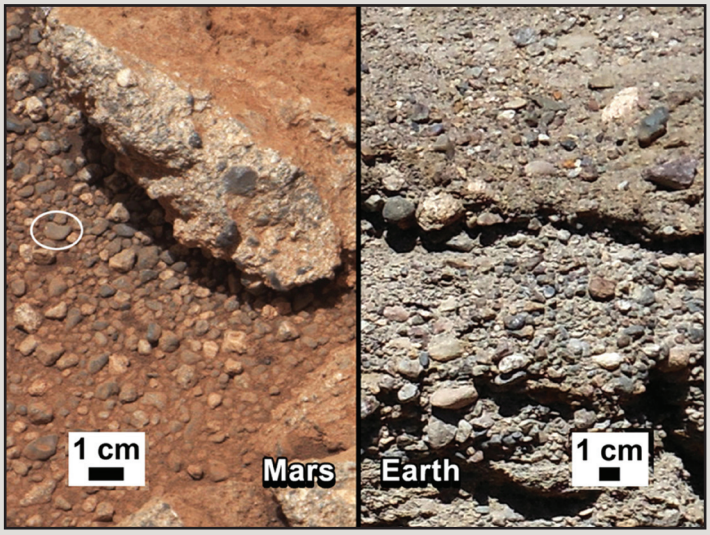

Credit: NASA/JPL-Caltech/MSSS and PSI

We are quite knowledgeable about Earth's water resources because they're essential to all life here on our planet. Recent discoveries in our solar system suggest that we may be able to learn even more about Earth's hydrologic past, present, and future by looking up. Last September, the Mars Curiosity Rover discovered rounded pebbles and gravel on the surface of the planet leading scientists to believe that there was in fact water present for thousands or possibly millions of years. The sedimentary conglomerate looks identical to what's commonly found here on Earth (see image) and is formed by the deposition of water. Mars' surface contains vast canyons, believed to be ancient riverbeds and this discovery may have relevance to Earth's hydrogeology in ways that aren't currently apparent.

In November, Messenger, the first spacecraft to orbit Mercury, determined that the planet's sun-shadowed north pole contains large quantities of ice. It's possible that asteroids and/or comets colliding with Mercury's surface deposited this ice, because the discovery is located inside of large impact craters. In further reaches of our solar system, Saturn's moon Titan not only contains ice, but also has a thick atmosphere composed of mostly nitrogen with a methane cycle that resembles Earth's water cycle. It's thought that about two and a half billion years ago our Earth's atmosphere was very similar to Titan and that methane, which is a greenhouse gas many times stronger than carbon dioxide, may have played a key role in warming the Earth.

Similar to the Light Detection And Ranging (LIDAR) mapping that's been done over our state to produce detailed topographic maps and products, space probes are equipped with laser altimeters and other instrumentation that enables them to make detailed maps of planetary surfaces. A laser altimeter works by sending repeated beams of light downward to a planet's surface, "looking" for the return of that light, and then calculating the distance from the time it takes to complete a return trip. Besides topographic mapping, properties such as temperature and chemical composition are discerned from probes and satellites. These measurements are taken with spectrometers and infrared sensors using wavelengths of light unique to each individual element. These instruments even make it possible for scientists to "map" parts of our universe that haven't been explored yet by spacecraft.

Small deposits of ice are mostly attributable to asteroids and comets impacting the surfaces of planets. Large areas of ice were formed over great lengths of time and involve geological processes that scientists are hoping to someday better understand. By learning from other planets in our solar system, we may discover important information about the future of our Earth's water resources. A recent announcement by NASA that a new Mars robotic science rover will be built and launched by 2020 for further exploration of the planet ensures that we're making a continued effort to understand our surroundings. Even if the surroundings we're interested in are millions of miles away.

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