Water in asteroids

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Asteroid study is a fairly new branch of science and most asteroids have been found in the last two decades. The first asteroid Ceres was found in 1801 and three more were found in a six year time period. It took 40 years for more asteroids to be found. Before 1801 all the celestial objects known to man were stars, planets and comets, but asteroid did not fit any of the previous groups. The discovery of Ceres began the boom in asteroid research. Asteroids are explored due to various reasons such as threats to Earth and gaining knowledge on the history of our solar system bodies. Asteroids are believed to be remnants from the planetesimal that were the building blocks of the planets in our solar system. According to current theories, asteroids and asteroid collisions could be the main source of the water on Earth. Water is a precondition for life on Earth as we know it, but the origin of Earth's water is still unknown.

Asteroids are studied by ground-based observations, space missions and studying meteorites. Ground-based observations are based on the asteroids observed spectra. Different minerals have their own distinct spectral features that can be observed in visible and mid-IR regions. Space weathering alters the surface of the asteroid thus altering the observed spectra. This can be a significant problem in ground-based observations. Space missions can be divided into flyby and sample collecting missions. Flyby missions encounter the same problem with the alteration of the asteroids surface. Flyby missions can only observe the surface of the asteroid, which can be strongly altered by space weathering and other events. Sample collecting missions collect mineral samples from the surface of the asteroid and deliver the collected samples to Earth for closer analysis. This is often done by spectral analysis. Meteorites are shattered pieces from asteroids that have travelled through the Earth's atmosphere and hit the ground. While traveling through the atmosphere and crashing to the ground, these objects sustain changes in their composition which can somewhat change their original composition and mineralogy.

Water can be found throughout the Universe and during the accretion of the planets, Earth could have obtained large amounts of water ice that then would have melted during different alteration processes. A great amount of this water can be found in the Earth's mantle and core but young Earth could have lost almost all the surface water during this period of its evolution. We know that almost 70 percent of the Earth's surface is covered in water and it is possible that this large water reservoir could be from asteroid collisions.