

Moons

Icy moons

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The icy moons of the outer solar system are a group of small bodies that orbit the giant gas planets from Jupiter, to Saturn, to Uranus, and Neptune. And out actually into the Kuiper Belt. There's a large number of icy bodies out there as well.

And these are medium to small sized bodies about a thousand kilometres across or smaller, generally composed of at least 50% of water ice. Because the temperatures in that region of the solar system were colder when the solar system formed. So ice was stable. It wasn't burned off by this intense sunlight when the sun formed, for example. Where we would not have an icy satellite around the Earth for example.

The ices in the outer solar system are actually a mix of ices. It's mostly water ice, that's true. But there's a lot of other, what we call low temperature melting materials, including carbon dioxide, carbon monoxide. In fact, in the outermost satellites, like on Triton which orbits Neptune, for example, nitrogen gas is so cold, it'll freeze out onto the surface as an ice layer.

The reason that we get so excited about these moons is that they have this water ice which is, again, frozen on the surface because the surface temperatures are so cold. But in the interior, it warms up. And the interiors of the larger icy satellites namely Europa, and Ganymede, and Callisto, and Titan, and almost certainly Triton as well, which orbits Neptune, the interior temperatures are warm enough that it'll actually melt those ices.

If you can melt water ice, you can get an actual ocean which would be buried underneath the frozen glacier that we see on the surface that covers these bodies.

Our spacecraft that have gone to these bodies have actually detected the magnetic signature of the liquid water oceans that lie deep in the interior.

In the case of Europa, it's particularly interesting because this liquid ocean lies on top of a silicate rocky core, which means it can interact chemically with it. If you've got a large body of water in the interior of these icy bodies, then that's something that is of interest because that's where a lot of

life could exist. Life likes water. At least life as we know it.

The fact that these oceans are deep underground, under this ice cap, means that there's probably not a lot of sunlight there. It would have to rely on chemical energy, like some of the black smokers we have in Earth's oceans, for example.

So what the form such life would take is very difficult to predict. It's probably going to be a primitive form, like bacterial or other small microscopic life forms. But beyond that, it's difficult but fun to speculate on.