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Opinion Article

Exploration of Extraterrestrial Planets as Potential Habitable Zones

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DESCRIPTION

The planets beyond our solar system are known as exoplanets and they range in size from gas giants larger than Jupiter to small, rocky planets about the size of Earth or Mars. They can be hot enough to boil metal or freeze solid. Only in the last two decades have we received unequivocal evidence for the existence of extrasolar planets. Titan's thick atmosphere and rich, low-temperature hydrocarbon chemistry point to a highly complex surface environment similar to some of the conditions on early Earth and possibly offering alternative pathways for complex phenomena such as life. The project entails observing around 100 Sun-like stars and measuring even minute changes in their relative position in the sky in order to search for habitable Earth-like planets nearby. It will be the first space mission specifically designed to search for habitable Earth-like planets nearby. The Universe is focused on planets in the so-called "habitable zone" which are worlds with the potential for liquid water oceans. These planets are the best places to look for extraterrestrial life. Over 4,000 confirmed exoplanets have been discovered with a small number of those worlds orbiting at a safe enough distance from their host star to have liquid water on their surfaces.

The host stars shine brightly and masses of the discovered planets can be determined using radial velocity observations made at ground-based observatories; both mass and size are required to characterise the new discoveries. It is unknown to what extent other planets conditions must resemble Earth in order to be habitable. Since the possibility of in situ solar system exploration habitable conditions on planets and moons with liquid water oceans beneath a layer of ice have been considered. Solid exoplanets with masses up to ten times that of Earth are thought to have interior structures and bulk compositions similar to terrestrial bodies in the solar system. As a result, a multi-dimensional, highly complex, geophysical-based comprehensive planet classification would be required. Furthermore, planets are not static objects, but rather go through an evolutionary process in which their habitability parameters can change dramatically.

CONCLUSION

Exoplanet interior structure models are critical for interpreting observations of their masses, radii and atmospheres, as well as understanding the physicochemical diversity of planetary systems. Earth-like planets with the potential for life as we know it as well as other types of Earth-mass planets (hydrogen-rich Earths, ocean planets) that challenge our current understanding of habitability. Many of the environmental limits to life, such as pH and salinity, are unlikely to be extreme over an entire planet. They would shape the distribution of life on a world but not its possible occurrence, as they do on Earth and are thus not considered further. Water temperature and state of water availability, Light and redox energy sources, UV and ionizing radiation, Nitrogen- the amount of N_2 for fixation or fixed nitrogen present and O_2 are the key parameters that could be extreme over an entire world and the order in which they may limit any life on an exoplanet. Given the lack of largely barren Polar Regions, a planet slightly warmer than Earth would be more habitable but that planet would also need to be wetter than Earth so that deserts do not dominate the landmasses.

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