

Astrobiology News September 2023: Biological Activity on Exoplanet K2-18b?

I want to make it absolutely clear at the outset that I am not reporting the detection of extraterrestrial life (ETL) in this month's news. Having said that, recent results from the JWST suggest that exoplanet K2-18b may possess an environment with life-harboring potential, including tantalizing hints of possible biological activity. Classified as "superterran," this intriguing world is 8.6 times as massive as Earth and orbits in the habitable zone of a cool red dwarf star 120 light-years away (so don't expect any prospective communication with intelligent aliens!)

Included in the Planetary Habitability Laboratory's Optimistic Sample of Potentially Habitable Exoplanets,¹ K2-18b is among a large class of candidate Hycean worlds – worlds thought to possess hydrogen-rich atmospheres and water ocean-covered surfaces. Although the search for ETL has focused mostly on smaller rocky exoplanets, larger Hycean worlds are much more conducive to atmospheric studies.² The new JWST observations demonstrate the abundance of methane and carbon dioxide in the atmosphere of K2-18b. The preponderance of these carbon-bearing molecules, together with a shortage of ammonia, supports the hypothesis that K2-18b may harbor a water ocean under a hydrogen-rich atmosphere.

The JWST observations hint at an even more exciting prospect – the possible detection of dimethyl sulfide (DMS), a molecule that, on Earth, is only produced by life. Specifically, the bulk of DMS in Earth's atmosphere comes from phytoplankton in marine environments. The possible detection of DMS needs further validation, something upcoming JWST observations should be able to provide. While the initial results come from observations with JWST's near-infrared instruments (NIRISS and NIRSpec), upcoming observations with JWST's mid-infrared instrument (MIRI) will be able to confirm the presence of DMS through the detection of a spectral feature predicted to be stronger than those tentatively identified at near-infrared wavelengths.³ What an exciting time in the ongoing search for ETL!

Until next month,

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¹ <https://phl.upr.edu/projects/habitable-exoplanets-catalog>

² <https://www.nasa.gov/goddard/2023/webb-discovers-methane-carbon-dioxide-in-atmosphere-of-k2-18b>

³ <https://arxiv.org/pdf/2309.05566.pdf>