

research highlights

ATMOSPHERIC SCIENCE

Life under an ancient haze

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Titan, the only satellite in the Solar System with a dense atmosphere, is considered to be a proxy for prebiotic Earth, due to its complex organic methane-based chemistry throughout its atmosphere, surface and subsurface. However, how far can this comparison be pushed? Titan is covered in organic orange haze, and a similar-looking haze probably formed on Earth during the Archaean age (3.8–2.5 Gyr ago). But until now models have shown that such haze would have reflected a great part of the Sun's energy and cooled Earth down. With their study, Giada Arney and colleagues cast some doubts on this frozen hell scenario.

The authors simulate the Archaean environment and its haze with a model that couples climatic effects with full photochemistry and microphysics, which are extremely important effects in order to correctly reproduce a haze's behaviour. They find that, although ancient Earth still experienced significant cooling — up to 20 K — it could maintain surface temperatures suitable for keeping the planet habitable, with the added bonus of providing strong UV shielding to protect Earth from the highly UV-active young Sun. The strong UV absorption features could also be useful markers to detect the presence of haze on exoplanets. Future exoplanetary missions could then discover many potentially habitable 'pale orange dots' beyond our Solar System.

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