Defining habitability: The geochemistry of the nearest extrasolar terrestrial planets

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Rocky planet formation appears to be a robust result of star formation. The orbit of these planets is usually the only variable used to identify whether the planet is within its host star's habitable zone. The mass of the host star is also used to define the continuously habitable zone. Habitabililty however, is probably also determined by a planet's mass, atmosphere, chemical composition and magnetic field. I will describe a framework for the many variables plausibly associated with habitability and introduce the concept of a chemical habitable zone. The bulk chemical composition of the Earth and the other terrestrial planets of our Solar System is largely the devolatilized composition of the Sun. With devolatilization likely to be a universal feature of terrestrial planet formation, the bulk chemical compostion of terrestrial planets orbitting other stars can be estimated from the observed chemical abundances of stars. We apply this reasoning to the nearest and most Earth-like rocky planet which may be orbiting in the habitable zones of α-Centauri A or B ("α Earth").

Rise of oxygen in Ediacaran shallow sea

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The later Neoproterozoic ocean witnessed naissance of animals, which was believed being stimulated by rise of oxygen in the ocean. However, other than this animal evidence, little evidence has been found for the rise of oxygen in the shallow sea, although evidence for oxygenation near the end of the Neoproterozoic of the anoxic deep sea which was believed being prevailing in the rest of the Proterozoic has been increasing. Here we present evidence for oxygen rise in shallow sea by analying Ce anomaly of plateform carbonate from excellently preserved successions deposited at the Neoproterozic Yangtze Plateform in the Yangtze Gorges area.

The $\delta^{13}C$ evolution of the Doushantuo Fm at the Jiulongwan section by this study is consistent with published data. The negative excursion of the cap carbonate was consistent with release of methane. We suggest that the negative excursions at upper Doushantuo Fm of the Jiulongwan section and upper Yanjiahe Fm of the Wuhe-Yanjiahe section may reflect upwelling of deep water, which is also supported by the weak Ce anomalies. The Dengying Fm and the lower Yanjiahe Fm show different Ce anomlies from the lower and middle Doushantuo Fm, although these strata have almost constant $\delta^{13}C$ values. We suggest that the increase of Ce anomaly from lower Dengying Fm to lower Yanjiahe Fm recorded increase of oxygen within the shallow sea rather than reflected change in water depth.

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