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Earth as a Terrestrial exoplanet - putting the mineralogy of our planet in a galactic context

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The integration of astrophysics and the teaching of Earth science has been enabled with the discovery of exoplanets. Over 4000 exoplanets have been found in our galaxy. The detection of these planets allows us to see Earth in the context of other rocky planets. The chemical abundances in a star have direct correlation with the structure of the planets formed. [1] [2] Abundances of elements such as sodium can even infer whether the planet will form a crust able to sustain plate tectonics or not, therefore deciding whether a carbon cycle could exist on the planet. [3]

Planets such as 55 Cancri e have suggested that planets that form in high carbon environments (parent stars enriched in carbon relative to oxygen) may form mantles made of silicon carbide and diamond, with layers of graphite. [4] This planet creates much discussion of how changes in elemental ratios in minerals and pressure can create vastly different planet compositions.

The ESA ARIEL mission will further bring the astrophysical and mineralogical/geological spheres together, as its mission is to investigate the composition of around 1000 exoplanets using spectroscopy. (https://arielmission.space/) I am part of the ExoClock community – an opportunity for ground-based telescopes to undertake observations of exoplanet transits. https://www.exoclock.space/

In this talk I present methods and materials of how to communicate the alliance of the astronomy and geochemical worlds to a wide range of audiences.

[1]Teske, J. K., Cunha, K., Schuler, S. C., Griffith, C. A., & Smith, V. V. (2013). Carbon and oxygen abundances in cool metal-rich exoplanet hosts: A case study of the C/O ratio of 55 cancri. *Astrophysical Journal*, *778*(2).

[2]Moriarty, J., Madhusudhan, N., & Fischer, D. (2014). Chemistry in an evolving protoplanetary disk: Effects on terrestrial planet composition. *Astrophysical Journal*, *787*(1).

[3]Unterborn, C. T., Hull, S. D., Stixrude, L., Teske, J. K., Johnson, J. A., & Panero, W. R. (2017). Stellar chemical clues as to the rarity of exoplanetary tectonics. *ArXiv*.

[4]Madhusudhan, N., Lee, K. K. M., & Mousis, O. (2012). A possible carbon-rich interior in super-earth 55 cancri e. *Astrophysical Journal Letters*, *759*(2).