

Methods to identify planetary biosignatures: A network science case study

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Network science is an academic field which studies complex environments considering distinct entities and the relationships between these entities. Using networks can help view existing chemical, geological and biological information systems from a purely mathematical perspective, and infer new relationships or new information about existing relationships. In addition to this, networks are the perfect way to represent, analyze and find patterns in chemical reaction data from various planetary atmospheres.

In this presentation, we examine atmospheric chemical reaction networks of planets in our solar system using reaction lists from Caltech/JPL photochemical model KINETICS, which has been extensively validated against Earth and planetary data. We show through our explorations that there are differences in the network topologies of planets in our solar system and additionally quantify these differences using network metrics, community detection methods and an examination of the communities formed in these networks. Through our explorations we were able to find the Earth atmospheric network is distinctly different to other planetary atmospheres, so in this talk we will also discuss the possibility of using network science to create a method for identifying planetary biosignatures.

