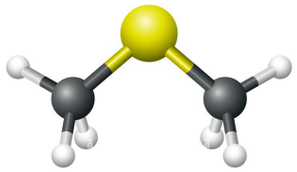
Biosignatures on Sub-Neptune Waterworlds

— Feasibility and challenges with K2-18 b



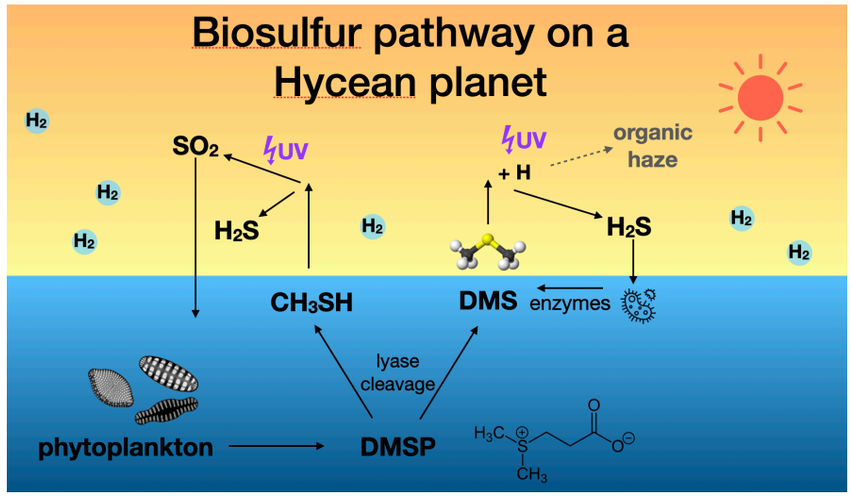
DMS

Shang-Min Tsai[1], Hamish Innes[2], Nicholas F. Wogan[3], Edward W. Schwieterman[1]

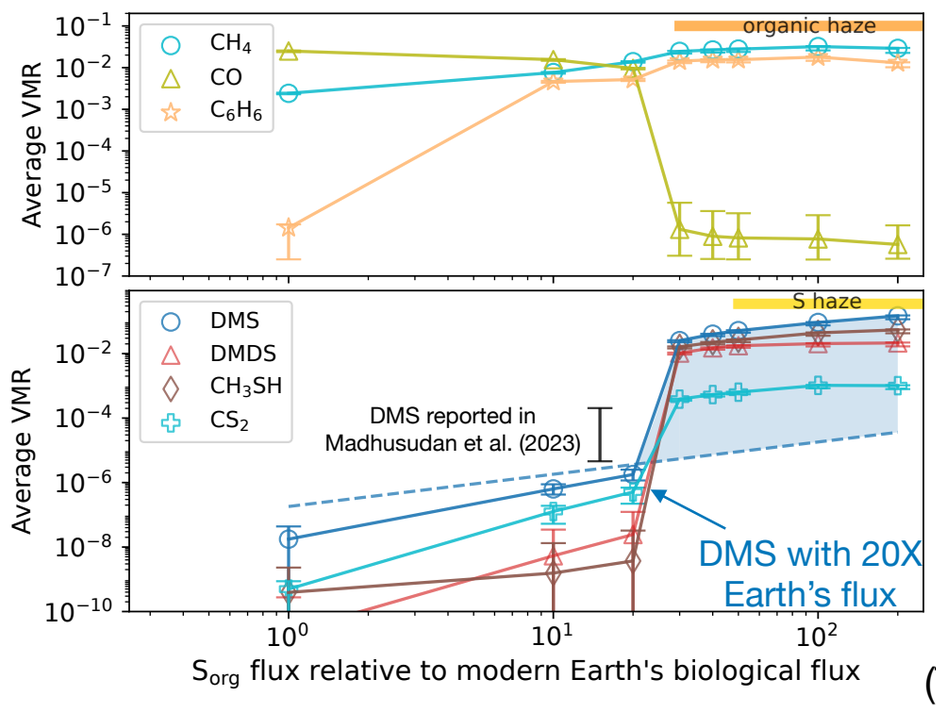
[1]Earth and Planetary Sciences, UC Riverside [2]Freie Universität Berlin, German [3]Space Science Division, NASA Ames Research Center

- Recent JWST/NIRSpec transit observations of K2-18 b reported a tentative detection of a biosignature gas, **dimethylsulfide (DMS)**
- We explore biogenic sulfur produced by marine microbes in various biological fluxes and stellar UV environments
- While biogenic sulfur molecules are readily destroyed on modern Earth, they are more resilient on Hycean worlds around M-stars. We find about **20 times** Earth's biological flux is required to reproduce the reported DMS
- Due to strong **overlapping absorption with CH_4**, it is challenging for NIRSpec to pick out DMS, but MIRI could potentially detect the **joint features (DMS + C_2H_4 + C_2H_6) in the mid-IR** with enhanced biosulfur flux

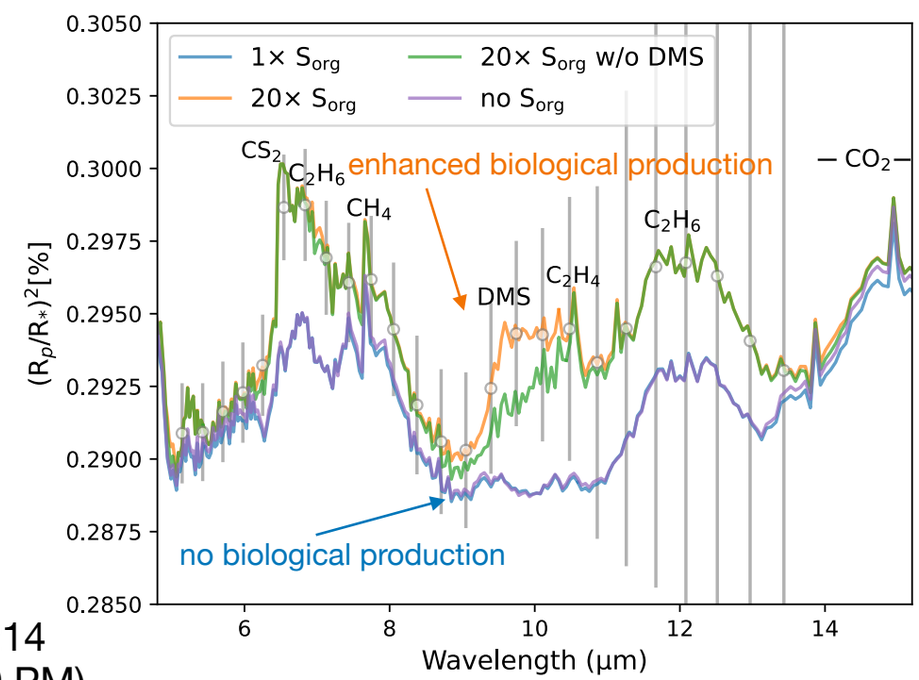
Tsai et al. (2024) ApJL



Average abundance as as a function of biological sulfur flux



Biosulfur features in the mid-infrared



More at my talk # 214
(Tuesday 3 PM – 4:30 PM)