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**Topics:** Planetary Geophysics, Physical Chemistry, and Habitability

**Questions:**

How does ocean chemistry (Na,Mg,Ca,Cl,SO<sub>4</sub>,NH<sub>3</sub>...)

- influence circulation, ice stability, water-rock reactions?

- change with pressure exceeding 10,000 bar(1GPa)?

What are drivers for geochemical cycling on Europa, Ganymede, etc...?

Vance et al. 2007, 2014, 2016

**Goals:**

Extend aqueous chemistry models (GSW,PHREEQC,FREZCHEM) in P, T, m  
by developing equations of state based on **sound speeds**.

Vance and Brown 2010, 2013

Contribute to future exploration of habitability: -seismic,

-chemical and isotopic

Don Davis