Laboratory Experiments for Ocean World Exploration

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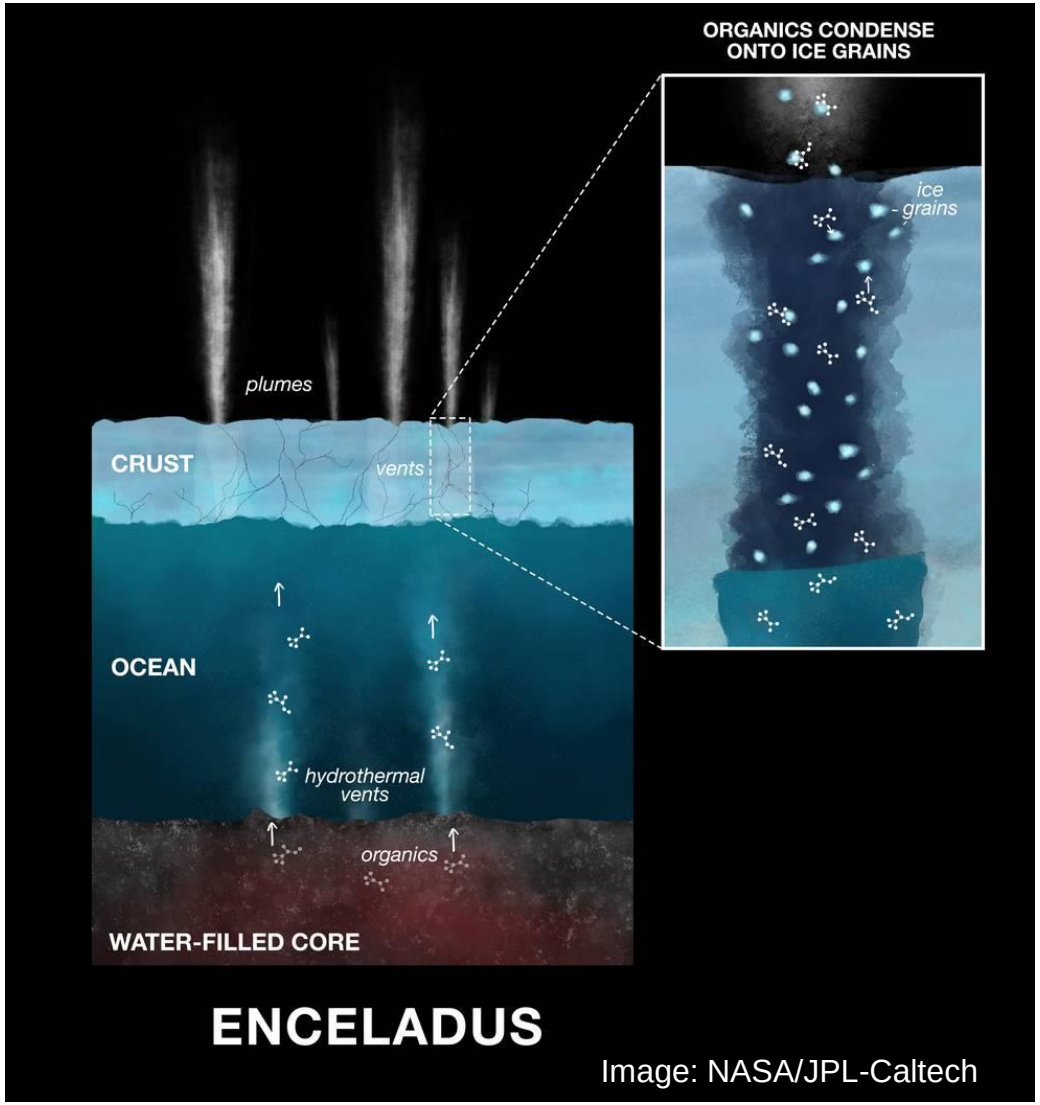
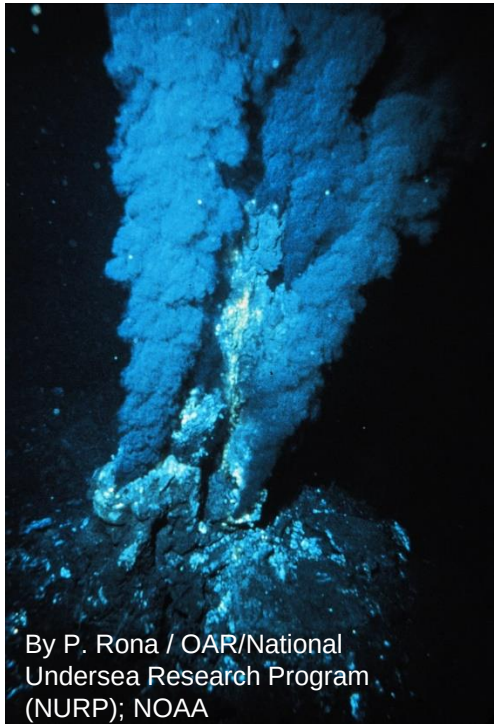


Image: NASA/JPL-Caltech

Image courtesy D. Kelley and M. Elend / University of Washington



By P. Rona / OAR/National Undersea Research Program (NURP); NOAA

Lehrmann et al. 2018, *Minerals* 8(7), 302

Considerations for setting up ocean world lab simulations

- Reactors
  - Volume / pressure / temperature / chemistry drives cost and experiment possibilities
  - All reactors are not equal; the same system can't necessarily be used for all relevant experiments
- Analysis
  - In-line analysis vs. in-situ vs. sampling
  - Method development also drives cost / time
- Safety
  - Certification of a new system can be expensive and time consuming
  - Gases (e.g. H_2) at pressure / temperature
  - Requires high levels of expertise depending on the system (not always suitable for students)
- Versatility of experiments
  - A lot depends on materials choices and initial setup
  - Important to consider ability to upgrade / modify setups for later purposes

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  - **A 5-year proposal option would be very helpful for laboratory work. (Even with same scope / overall budget, but allowing for a longer term experimental plan.)**

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- A centralized information system about instruments / analysis / lab setups that might be available for collaboration for future NASA projects
  - Database of who was funded to build lab chambers, setups, etc. that could be useful for others.
  - An option to make one's lab setup, or analysis instrument, a user-accessible facility that could be accessed by others interested in collaboration on a ROSES proposal?

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  - **Suggestion: a searchable, publicly accessible NASA database listing laboratory facilities, instruments, and individual lab setups that are available for outside users and/or collaboration.**
    - This might provide a valuable mechanism for underrepresented groups to find collaborators to work with for future NASA proposals.
    - Could be opt-in from ROSES projects (available / not available / available upon request)
    - Individuals / institutions could standardize a user process and cost structure to streamline new collaboration
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  - Suggestion: more outreach to HBCU / MSI / PUI institutions to highlight what NASA resources are available and how to access them
    - Perhaps a Resource Liaison at conferences to help connect new would be NASA collaborators with the appropriate resources / initiatives.

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- It is challenging to fund 'general purpose' equipment that is necessary for most projects.
- One very challenging aspect of experimental work is trying to maintain the long term functionality of facilities / instruments; ROSES funding terms are short compared to the necessary tenure of instruments or experimental chambers.
  - Instruments need service or maintenance after certain periods of time, and this can be expensive
  - Especially since cost needs can not always be known / planned in advance
  - In some cases, without funds for maintenance / upkeep, the lab setup will decline and become unusable (so previous investments are lost)