Day-night cloud asymmetry prevents the formation of oceans on exoplanets

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Résumé

I will show new results obtained using 3-D Global Climate Model simulations (building on Turbet et al. 2021) of very hot, water-rich dominated planetary atmospheres designed to evaluate the ability of initially hot terrestrial/super-Earth-sized planets (typical of post-magma-ocean conditions) to form primordial surface liquid water oceans. This work shows that a significant fraction of exoplanets located within the so-called "Habitable Zone" (HZ) should be unable to host water oceans, because their primordial water reservoir never had the opportunity to condense at the surface due to day-night asymmetric distribution of water clouds. This defines a surface liquid water "Condensation Zone" (CZ).

I will show – using the inner planets of the TRAPPIST-1 system (b,c,d) as a proof of concept – how to use JWST observations to test this day-night cloud feedback and thus the CZ.

References

Turbet et al. 2021 - https://www.nature.com/articles/s41586-021-03873-w

*Intervenant