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Tidally-driven ocean circulation in close-in Super-Earths

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Léger et al. (2004) and Küüchner (2003) hypothesised that Ocean planets, Super-Earth planets with liquid-water oceans covering their whole surfaces may exist. Some may have already been discovered, such as GJ 1214b.
However at this time we need predictions of observables to uniquely identify ocean planets. On such planets, the climate will be dominated by the nature of the ocean, which is currently poorly understood.

However, Super-Earths which orbit close-in to dwarf M-stars will have very large tidal forcings, several orders of magnitude larger than Earth. The current work explores the effects of such a tidal forcing on the ocean circulation of such a planet. In particular, we aim to answer two questions:
(1) Is there a deep circulation connecting the surface to the ocean floor, and
(2) what is the scale of heat redistribution in the ocean.

The nature of the circulation is crucial for determining the composition of the ocean. In the lack of a connecting circulation, most solids would be expected to precipitate to the ocean floor, hence inhibiting life.

We examine the case of GJ-1214b, and evaluate the prospects for a liquid-water ocean.
For a air-liquid phase transition to exist, a high albedo and hence cloud cover is required. We investigate the heat transfer required to generate cloud cover with a water ocean and H/He dominated atmosphere, and make preliminary predictions on the observables in such a climate, in particular the albedo from cloud layers and thermal emission profile.