GFD 2019: Forced dissolution with stratification

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Many environmental flows are controlled by the interactions between a flow and a dissolving surface. The dissolution rate is determined by properties local to the surface and these can be modified by a flow. For example, some planets have solid cores that are surrounded by a convecting outer layer. The solid core can dissolve into the outer layer and the convection will affect the rate at which the core dissolves. The behaviour is also affected by the time at which the convection starts. If a stratification has built up before the convection can set in, then this could affect the final state and resulting dissolution rate.

This project will use experiments to examine the effect of an initial stratification on forced convection. Mechanical forcing from above will interact with an existing stratification (which will be set up to be initially either linear or constant) above a dissolving surface. Experiments will measure the dissolution rate and the evolution of the stratification above the dissolving surface.

Previous research into forced dissolution has studied the effect of an imposed flow on the shape and rate of dissolution of a candy sphere [e.g. 1, 2, 3]. The effect of buoyancy-driven flows that are generated by the dissolution of the solid surface have also been examined [4, 5, 6]. There has also been much research into the related case of a melting surface [7]. For example, the melt rate of a surface will be affected if the adjacent layer is convecting, with the results strongly affected by whether the melt was more or less dense than the ambient fluid [8].

- More information about **Megan Davies Wykes**.
- More information about **Pascale Garaud**.

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