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Looking for Plate Tectonics in all the wrong fluids

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Ever since the theory of Plate Tectonics in the 1960's, the dream of the geomodeler has been to generate plate tectonics self-consistently from thermal convection in the laboratory. By selfconsistenly, I mean that the configuration of the plate boundaries is in no way specified a priori, so that the plates develop and are wholly consumed without intervention from the modeler. The reciepe is simple : put a well-chosen fluid in a fishtank heated from below and cooled from above, wait and see. But the « well-chosen » is the difficult part... and the interesting one.

Plate tectonics is occuring on Earth because of the characteristics of the lithosphere rheology. The latter are complex to estimate as they depend on temperature, pressure, phase, water content, chemistry, strain rate, memory and scale. As a result, the ingredients necessary for plate tectonics are still debated, and it would be useful to find an analog fluid who could reproduce plate tectonics in the laboratory. I have therefore spent the last 25 years to try out fluids, and I shall present a number of failures to generate plate tectonics using polymers, colloids, ketchup, milk, chocolate, sugar, oils. To understand why they failed is important to narrow down the « well-chosen » fluid.