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The collapsibility of partially soaked crunchy soft matter

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It is commonly known that cereals crush under load or become soggy in fluid over time. But what happens when they are both loaded and soaked at the same time? Surprisingly, this experiment uncovers ‘ricequakes’ – the sudden collapses of columns of wetted brittle porous media that produce perpetual clicking sounds akin to a slowing metronome. To explain this phenomenon we present a simple model of capillary driven crushing steps progressing through the micro-pores. We show that the growth of ricequake delay over time is governed by the ratio between the typical size of micro-pores and the capillary-gravity length. Our model also explains the mechanisms that control the rate of deformation observed in the experiments. Finally, by relating fluid and solid properties to quakes and deformation, our results may be extended to other collapse problems wherein chemically active fluids weaken brittle porous media, such as failures of stockpiles, sinkholes, and ice shelves.

Reference:

I Einav, F Guillard. Tracking time with ricequakes in partially soaked brittle porous media. *Science Advances*. (accepted, 5 August, 2018).