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## Conditions for the Compost Bomb Instability

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Under global warming, soil temperatures are expected to rise. This increases the specific rate of microbial respiration in the soils which in turn warms the soil, creating a positive feedback process. This leads to the possibility of an instability, known as the compost bomb, in which rapidly warming soils release their soil carbon as CO<sub>2</sub> to the atmosphere, accelerating global warming. Models of the compost bomb have exhibited interesting dynamical phenomena: excitability, rate induced tipping and bifurcation induced tipping. We examine models with increasing degrees of sophistication, to help understand the conditions that give rise to the compost bomb. We clarify the role an insulating moss layer plays and demonstrate that it has a 'most dangerous' thickness. We also use JULES, a land surface model, to examine where a compost bomb might occur and what affect other processes such as hydrology might have on the compost bomb.