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Convective flows generated by evaporation: experiments, linear stability analysis and numerical simulations JOCELYN DUNSTAN, Postdoc, KYOUNG JIN LEE, Professor, SIMON PARK, Senior Lecturer, RAYMOND E. GOLDSTEIN, Professor — A novel form of convection was observed in a suspension of non-motile *Photobacterium phosphoreum* bacteria. The pattern resembles classical bioconvection, however this strain has limited if any motility, which excludes this possible explanation. After performing a series of control experiments we found that the convection was actually driven by the evaporation of the salty bacterial medium, and the same kind of plumes were observed using polystyrene beads suspended in water with salt added. A mathematical model was formulated for the process and studied using a linear stability analysis and finite element method simulations, reproducing most of the observed experimental features. From the linear stability analysis, a threshold in salt concentration to observe convective motion was obtained, as well as the wavelength of the pattern at the onset of the instability. This was complemented by finite element simulations, which produced plume dynamics remarkably similar to the experimental observations. Evaporation-driven convection on the millimeter scale has not been studied extensively, and its effect may have been underestimated in other experiments.

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