# A numerical investigation of the impact of aerosol-induced warming on deep convective updrafts with varying slope and width

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An idealized but accurate numerical approach is utilized to examine changes in updraft velocities in deep convective updrafts due to differences in updraft slope, updraft width, and aerosol-induced warming, i.e., invigoration. Because updraft width and slope are tightly coupled to the ambient environmental conditions, this approach provides a rigorous way to examine potential indirect impacts of changes in aerosol loading on updraft velocities relative to those expected from changes in environmental conditions, which vary both spatially and temporally. We show that the updraft slope and width parameter space is complex, whereby changes in updraft width have little to not impact on updraft velocities for a given slope, and vice versa. The results also indicate that prior idealized modeling results of the effect of aerosol-induced warming on updraft velocities are overestimated by as much as 100% due to neglecting the buoyant perturbation pressure field. We show that the impacts of aerosol-induced warming on convective updraft strength is largely outweighed by small changes in updraft width and slope, and we relate the changes to changes in environmental conditions.