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## Scale growth is an inherent property of shallow cumulus convection

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## In LES, shallow convection self-organises into mesoscale clusters without cold pools or radiation anomalies



## Following Bretherton & Blossey (2017), we diagnose a positive moisture-convection feedback



# We frame the model as a linear instability, whose conditions are satisfied by the convection itself

Model for column-integrated mesoscale moisture anomaly  $\langle q'_{t_m} \rangle$ :

The feedback roots in small-scale energetics, making it sensitive to numerical choices



# How does this picture fit observations?

- Circulations present on most EUREC<sup>4</sup>A days (George et al., 2022)
- Transition layers are usually curved,



Any cumulus layer able to sustain itself may be expected to be unstable to scale growth.

convex and possibly due to very shallow clouds (Albright et al., 2022)

Variability in cloud-base mass flux relates to variability in mesoscale vertical velocity (Vogel et al., 2020).

How much of this is due simply to self-induced variability cumulus convection?

### References

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