1. Introduction
A CRM is coupled to a reference column using the weak-temperature gradient (WTG) approach. Under uniform surface forcing, a large-scale circulation with descent in the test column develops no matter the choice of the relaxation profile and the initial conditions. This is similar to the equilibrium state found in some other studies, but not all. Two columns of the CRM are fully coupled. This configuration is energetically closed in contrast to the reference column configuration. No mean large-scale circulation develops over uniform surface forcing, regardless of the relative area of the two columns. For columns of very different areas, the coupled-column approach behaves very similarly to the reference column approach. Differences in the behaviour do however remain for small changes in the surface forcing.

3. Model description
The Met Office Large Eddy
Model at version 2.4
• \( Y \times Z = 128 \times 20 \) km and \( Y = 500 \) m
• Fixed sea surface temperature (SST)
• Fixed radiative cooling profile
• Fixed wind speed \( U = 5 \) m/s

Radiative-convective simulations
• The model is run for different SST
• The control integration has an SST of 302.7 K
• The profiles at equilibrium of the control integration are used to define the reference column profiles in the reference column experiments

4. WTG calculations over uniform surface conditions
\[ \text{SST} = 302.7 \text{ K and } U = 5 \text{ m/s in both columns and } \tau = 2 \text{ hr.} \]

Reference column approach

Coupled-column approach
Column 1 and 2 are initialised to the RCE profiles at 302.7 and 304.7 K respectively.
\[ \varepsilon = 0.5 \quad \text{and} \quad \varepsilon = 0.01 \]

At day 10, the import of moist static energy into the test column by the WTG circulation is not enough to balance the reduction in evaporation

Why the test column cannot sustain large-sale ascent?

5. Transition from shallow to deep convection
WTG circulation even for small \( \varepsilon \). However, the timescale of adjustment of the columns increases as \( \varepsilon \) approaches zero.

6-Summaries
• A WTG circulation with descent in the test column is a robust result of the reference column simulations performed under uniform conditions. This situation is associated with net transport of moist static energy into the test column by the WTG circulation with a small compensating reduction in surface evaporation.
• Under uniform surface forcing, the coupled-column system reaches an

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