Solar radiative transfer in a 3D CSRM simulation of a mock-Walker circulation

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1. Numerical Experiments

The model
Dynamical: SAM v6.5
Radiative transfer: solar - Monte Carlo
infrared - 2-stream

The configuration
Domain: 4096x128x28 km, Δx=Δy=1 km
Lower BC: Sinusodial SST
Integration: 60 days (last 30 days for analysis)
Started from spunup 2D run
Radiative transfer: Called every 5 minutes

The experiments
Control - ICA solar radiative transfer
Experiment - 3D solar radiative transfer

2. Offline solar flux biases
In the convective region more solar radiation is absorbed when using 3D solar radiative transfer.

3. Results

Mean vertical velocity and water vapour
Vertical velocity increases by ~10% when using 3D solar radiative transfer.

Cloud occurrence
Distribution of cloud tops and optical thickness similar between the two experiments.

4. Discussion

Using 3D instead of ICA solar radiative transfer has a relatively small impact (over the ocean).

Non-interactive surface may be mitigating effect; potentially larger effects over land.