Draft

OJH

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Abstract

1 Results

Throughout this results section, we present model data for the vertical velocity, w, and potential temperature, b fields, since both are influential in the organisation convection. Any region with positive w, and high b is likely to trigger convection, with the opposite likely to suppress triggering.

1.1 The Effect of Raising the Position of the Rigid Lid Upper Bound- ary Condition

Figure depicts the effect of increasing the altitude of the upper lid. We observe the distribution of energy increases aloft, indicating a radiative effect. Quantitative insights into the upward flux of energy may be obtained from this data. For example, it appears that as the lid height increases the vertical flow at the top of plot windows becomes more uniform.

Along with figure we note the horizontal evolution of the w-response, which is characterised by modes with phase speed $\frac{NH}{j\pi}$ (recall j is the vertical harmonic number) is qualitatively unaffected by the process of raising the lid. The vertical structure however varies considerably more between $H_L = 1$ and $H_L = 3$ than it does between $H_L = 10$ and $H_L = 64$ which is indicative of convergence of the w and b solution (at least in the troposphere). We also note that as the height of the lid increases the influences of the heating excite a deeper mode, characterised by a larger horizontal phase speed, as expected. The confining effect of the lid intensifies subsidence in the troposphere, meaning neighbouring convection is unlikely to be triggered. However, continuity considerations suggest enhanced triggered elsewhere. In the present case, we observe the only candidate region for this amplified ascent would be the heated region. We note that the horizontal suppression of convection is more locally intense, but less mobile, in the trapped cases.

One can better understand the time evolution of the system through figure HERE

1.2 Transient Heating

Assigning the time dependence of the heating function to be a simple boxcar function (on/off), we investigate the influence of a transient heat source. Figure

Figure 1:

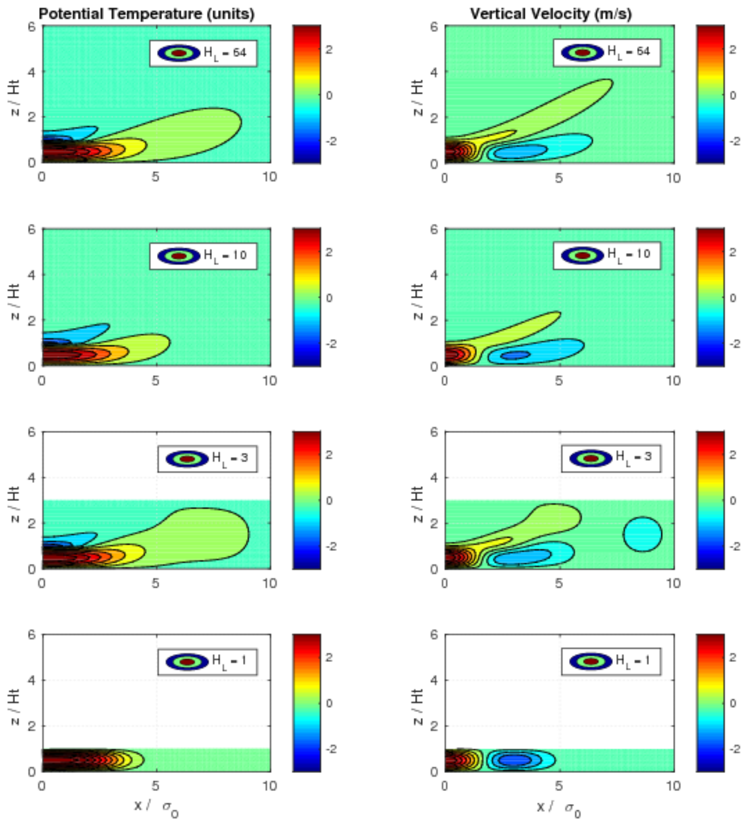
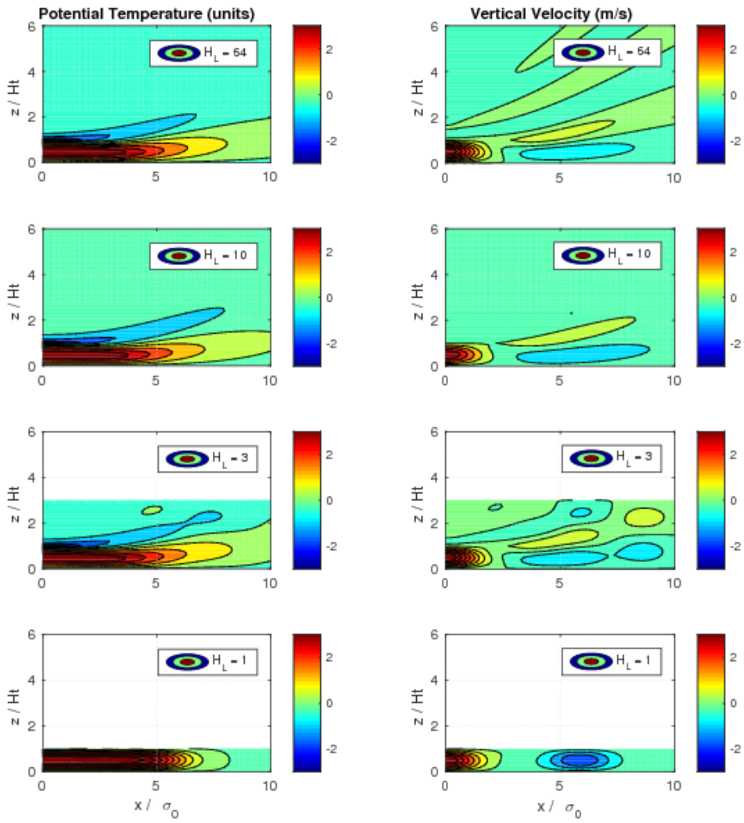
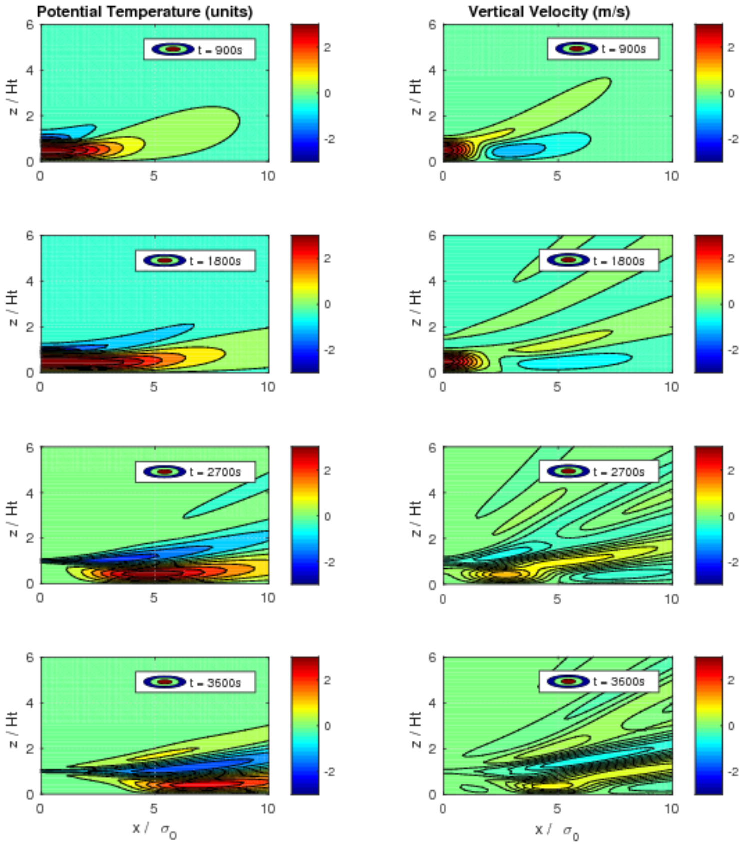

Potential Temperature (units)
Vertical Velocity (m/s)
$H_L = 64$
$H_L = 10$
$H_L = 3$
$H_L = 1$
z / Ht
x / σ_0

Figure 2:



Potential Temperature (units)
Vertical Velocity (m/s)
H_L = 64
H_L = 10
H_L = 3
H_L = 1
z / Ht
x / σ_0

Figure 3:



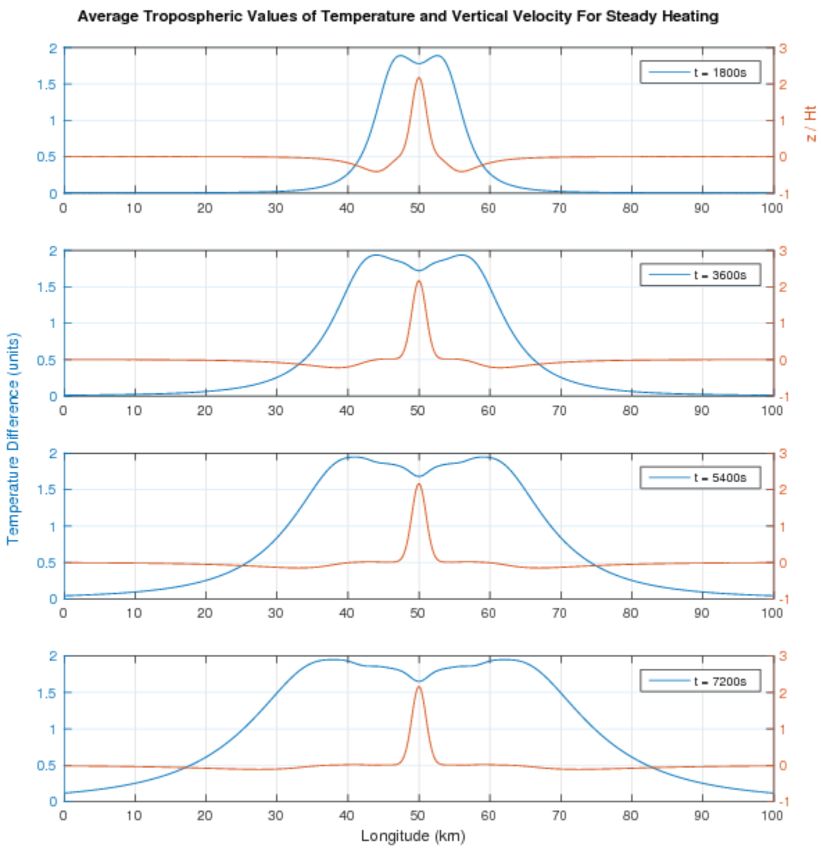
shows the w and b response field to such transient heating which is switched off at a time $t = 30mins$ (a reasonably realistic convection timescale, note). Advancing down the panels, we evolve at a time step of 15 minutes.

The most notable effect of truncating heating is the occurrence a propagating region of ascent in the troposphere (as seen in figure), which is absent in all the steady heating cases considered previously.

HERE The reader is directed to the top right hand panel of figure , in the region of $x = 2$. Counterintuitively, this observation appears to suggest that terminating heating could trigger a weak convective event in the neighbourhood.

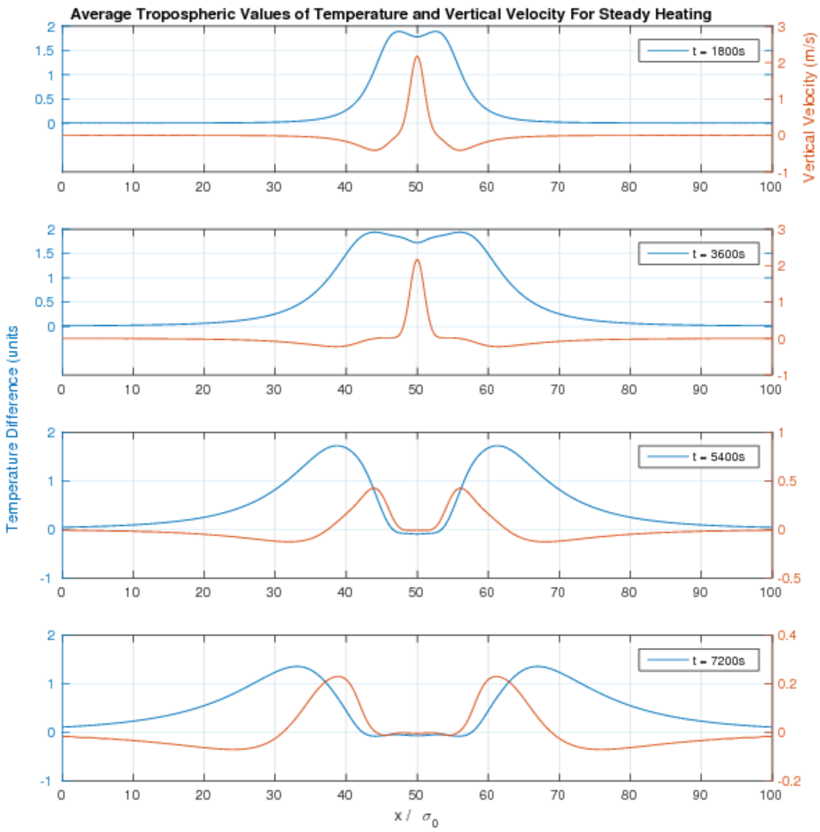
1.3 TO INCLUDE

Figure 4:



Average Tropospheric Values of Temperature and Vertical Velocity For Steady Heating
t = 1800s
t = 3600s
t = 5400s
t = 7200s
Temperature Difference (units)
z / Ht
Longitude (km)

Figure 5:



Average Tropospheric Values of Temperature and Vertical Velocity For Steady Heating
t = 1800s
t = 3600s
t = 5400s
t = 7200s
Temperature Difference (units
Vertical Velocity (m/s)
x / σ0