Question:
Given that the anelastic model permits no slack, which thermal will rise faster – the anelastic or very compressible one?
Hypothesis

• “No slack” means pressure response to positively buoyant thermal will develop more quickly

• A consequence of this response is to produce a downward-directed perturbation VPGF that partially opposes buoyancy

• Therefore, the anelastic bubble should rise somewhat more slowly

• Furthermore, we anticipate the difference will appear first in the wind field, and thus the dynamic pressure
Test with DTDM

• Simulations with
  - ianelastic = 1 (anelastic)
  - ianelastic = 0 & csnd = 30 (very compressible)

• Also iplot = 10 (which means time will be presented incorrectly, as iplot < 60 sec)
Look at compressible thermal

```
 ga-> open thermal.nonanelastic.30
 ga-> open thermal.anelastic
 ga-> set x 40 60
 ga-> set t 40
 ga-> set lev 0 10
 ga-> scripts/thermal.gs
 ga-> set gxout contour
 ga-> d ppmb
 ga-> draw title compressible thermal thp,ppmb

 [following slides contour pbyc and pdyn instead]
```
compressible thermal thp, ppmb
Note contour interval smaller
Thermal comparison at t = 40

ga-> c
ga-> scripts/thermal.gs
ga-> set dfile 2
ga-> scripts/thermal.gs
ga-> set dfile 1
Hovmoller plot for w

ga-> set x 50

ga-> set t 1 121

ga-> d w.1-w.2

ga-> plot xlab time (incorrectly labeled)

ga-> plot ylab height (km)

ga-> plot title vertical velocity at domain center
Hovmoller for THP compressible - anelastic
Forcing terms for W

```plaintext
ga-> set t 40
nga-> set x 50
nga-> set lev 0 10
nga-> set vrange -0.01 0.04
ga-> d dwdtt.1
ga-> d dwdtt.2
```
Dynamic pressure is pushing thermal UP below 4 km (at this time) but opposing ascent above. Anelastic thermal encounters more resistance.
W and DWDTT for compressible thermal

\[ gw \rightarrow c \]
\[ gw \rightarrow \text{set } x \ 40 \ 60 \]
\[ gw \rightarrow \text{set } gxout \ \text{shaded} \]
\[ gw \rightarrow d \ w \]
\[ gw \rightarrow \text{cbarn} \]
\[ gw \rightarrow \text{set } gxout \ \text{contour} \]
\[ gw \rightarrow d \ \text{dwdtt} \]
W and DWDTT for compressible thermal
W for compressible thermal and W difference field (still t=40)

```plaintext
ga-> c
ga-> set gxout shaded
ga-> d w.1-w.2
ga-> cbarn
ga-> set gxout contour
ga-> d w
```
Comp. thermal has higher $W$ aloft but smaller $W$ below. How to interpret?
DWDTT and W difference fields

\texttt{ga-> c}
\texttt{ga-> set gxout shaded}
\texttt{ga-> d dwdtt.1-dwdtt.2}
\texttt{ga-> cbarn}
\texttt{ga-> set gxout contour}
\texttt{ga-> d w.1-w.2}
Answer:
Compressible thermal rising a bit faster, thanks to less resistance from adverse buoyancy pressure gradients.
However, difference between $cs = 30 \text{ m/s}$ and infinity is subtle