CM1 v1.15:
- 600 x 400 x 18 km idealized simulation
- 250 m horizontal; 100 m resolution below 4 km
- 00 UTC KOUN 13 March 2003 sounding initialization with cold-pool dam break

OBSERVATIONS:
- Mesohigh pressure surge observed in conjunction with bow echo development in 35 Oklahoma bow echoes (Adams-Selin and Johnson 2010)
- Performed idealized simulation of 13 March 2003 bow echo to determine if mesohigh surge was generated by a gravity wave, and possible effects of gravity wave on bow echo system

MODELED PRESSURE RESPONSE:
- reproduces mesohigh pressure surge as a slow-moving gravity wave
- high-frequency gravity waves (similar to Fovell et al. 2006) trapped around 2 km aloft

GRAVITY WAVE GENERATION:
- Change in temperature \( \Delta T \) due to microphysical cooling

FEEDBACK TO CONVECTION:
- pressure surge and high-frequency gravity waves together increase pre-system CAPE

UPDRAFT STRENGTH:
- updraft tilt represented by
  \[ \frac{C^2 - u'^2}{\Delta z} \]

CONCLUSIONS:
- Low-level cooling generates a gravity wave, appears at the surface as a mesohigh surge
- Lifting associated with wave increases CAPE immediately ahead of bowing convective line
- As a result, convective updraft in bowing segment strengthens despite increased tilt

REFERENCES: