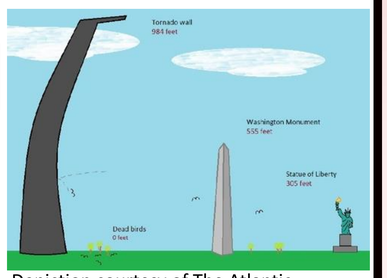
Would “tornado-preventing” walls work?

Brice Coffer
North Carolina State University

Introduction

Recently, Tao (2014) proposed that the tornado threat in the central United States could be eliminated if east–west walls (300 m high) were built to prevent “the clash between the northbound warm air flow and the southbound cold air flow”.

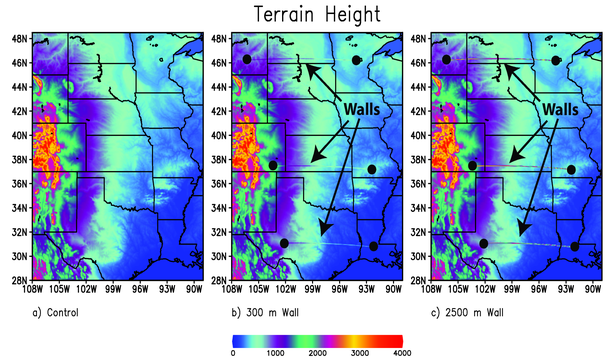
Since the proposal has received a considerable amount of publicity, it is worth briefly exploring this hypothesis in more detail.



Depiction courtesy of The Atlantic

Methods

- Using the WRF model (version 3.5.1), three simulations using the 31 May 2013 convective episode were performed—one with natural terrain, one with 300 m tall walls as proposed, and another with walls much taller than proposed (2500 m).
- The “tornado-preventing” walls were created by adding a constant to the model’s surface elevation in three locations (southern Texas and Louisiana, the Kansas and Oklahoma border, and in North Dakota).

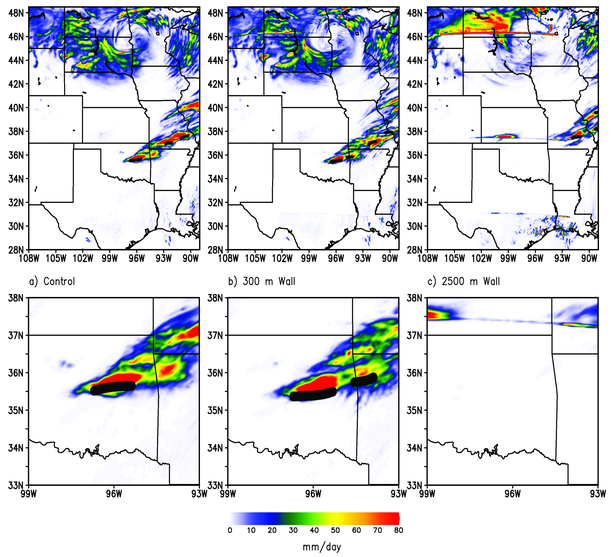


Citation

Coffer, B. E., 2014: Would "tornado-preventing” walls work? Electronic J. Severe Storms Meteor., **9** (4), 1–13.

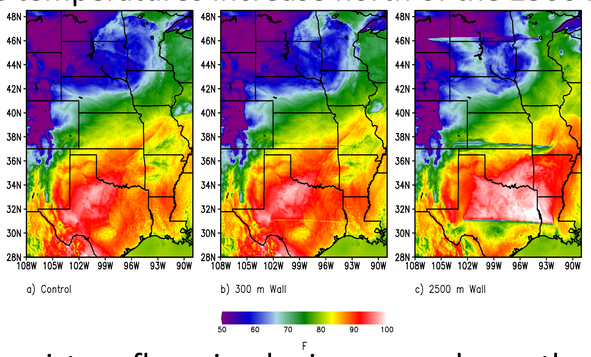
Precipitation and Storm Tracks

- The control and 300 m simulations produced similar values of accumulated precipitation and tracks of 1–6 km updraft helicity.
- The 2500 m simulation shifted the supercells east.

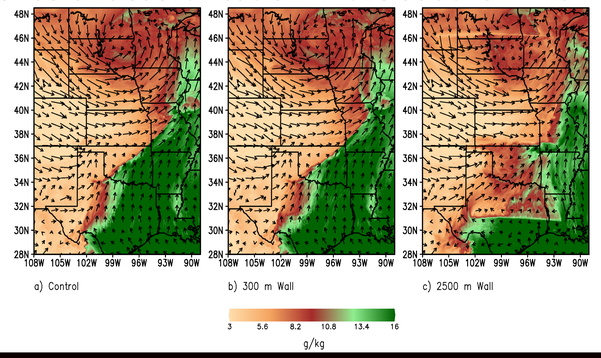


Temperature and Humidity

- The temperature field is unaffected by the 300 m walls, while temperatures increase north of the 2500 m walls.

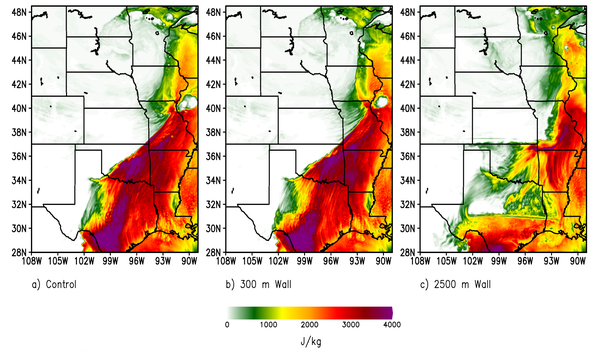


- The moisture flow simply rises up and over the 300 m walls, while it is blocked by the 2500 m walls.
- Evidence of desertification in the southern Plains.

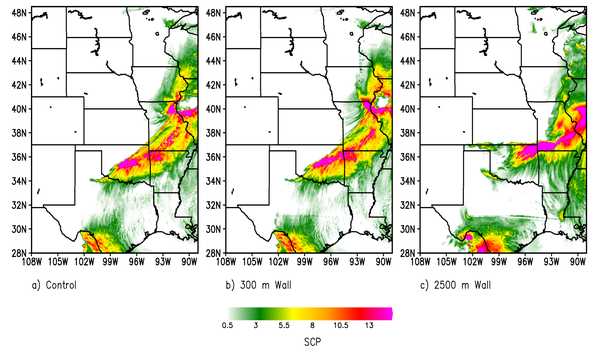


CAPE and Supercell Parameter

- The walls are unsuccessful at impeding the midlevel, westerly winds aloft with steep lapse rates.

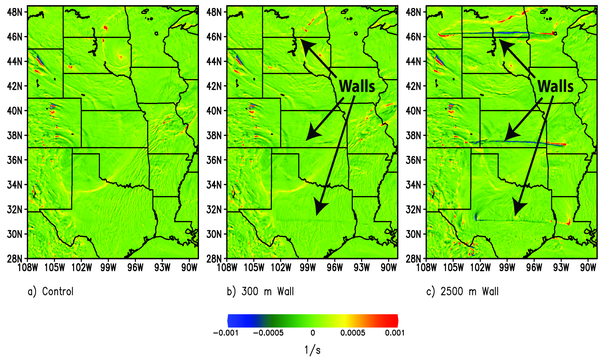


- Instead of eliminating the severe weather threat, the threat was shifted east in the 2500 m simulation.



Surface Vertical Vorticity

- Increased probability of non-supercell tornadoes near the edges of the 2500 m walls.



Future Work

Future work could include seasonal simulations to investigate longer-term storm statistics, but we have no plans to continue this line of work until there is reason to believe the walls would have any effect.