

Storms, Forms, and Complexity of the Urban Canopy: How Land Use, Settlement Patterns, and the Shapes of Cities Influence Severe Weather

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The people of the US live predominantly in urban areas

According to the 2010 US Census, 81%* of us live in urban areas. That is an increase of 13% over 2000 and it accompanies a 19% increase in urban land area.

Do urban areas affect severe storm behavior?

Yes, big urban areas affect storms:

Changnon 1981; Hjelmfelt 1982; Bornstein & Lin 2000; Shepard & Burian 2003; Niyogi *et al.* 2006; van den Heever & Cotton 2007; Lei *et al.* 2008; Shem & Shepard 2009; Zhang *et al.* 2009; Niyogi *et al.* 2011; Snow, Zeng *et al.* 2012

How about smaller urban areas?

Are there thresholds?

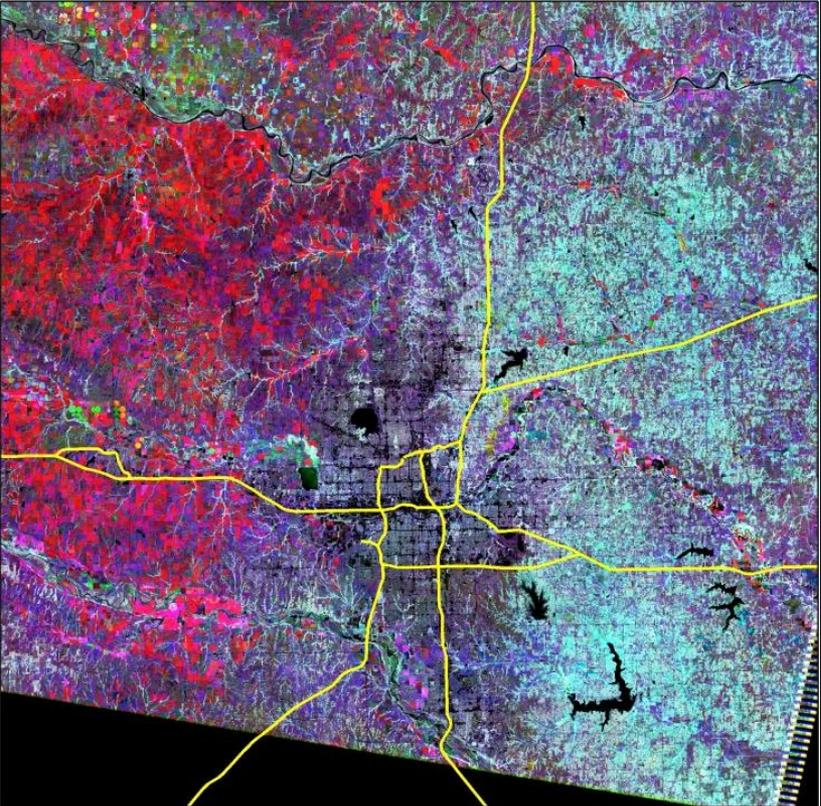
Does shape matter?

How about pollution state?

What lessons can we pass on to urban planners?

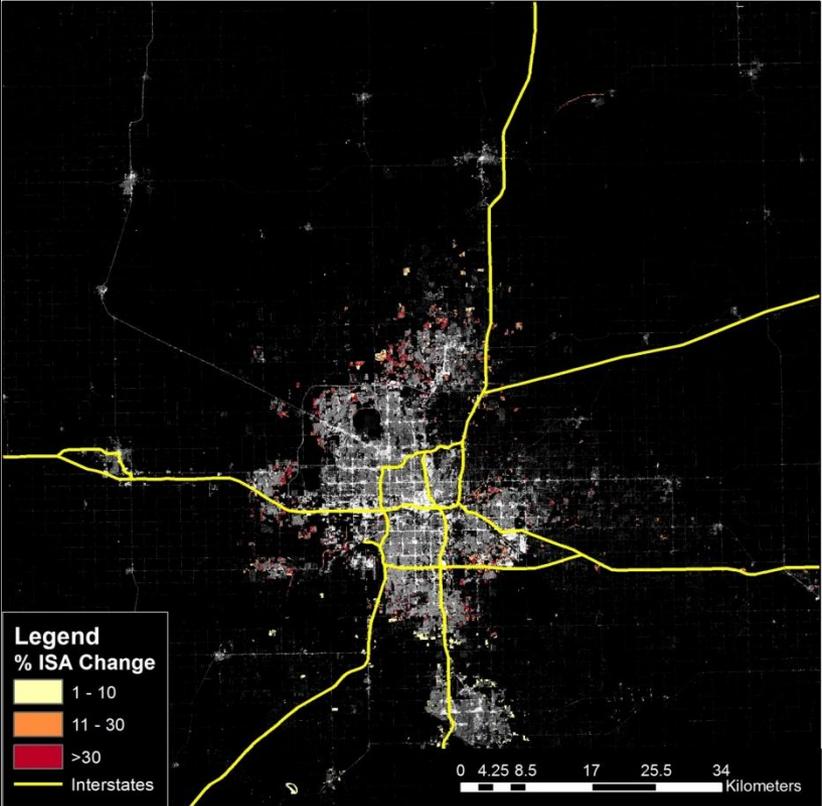
Focusing on the US Great Plains because:

1. Relatively flat terrain
2. Distant from maritime influences
3. Cities embedded in agricultural land use
4. Lots of severe storms in warm season
5. Growing faster than US average



← OKC
 Landsat TM
 NDVI in 2011
 R: 11APR
 G: 01AUG
 B: 19OCT

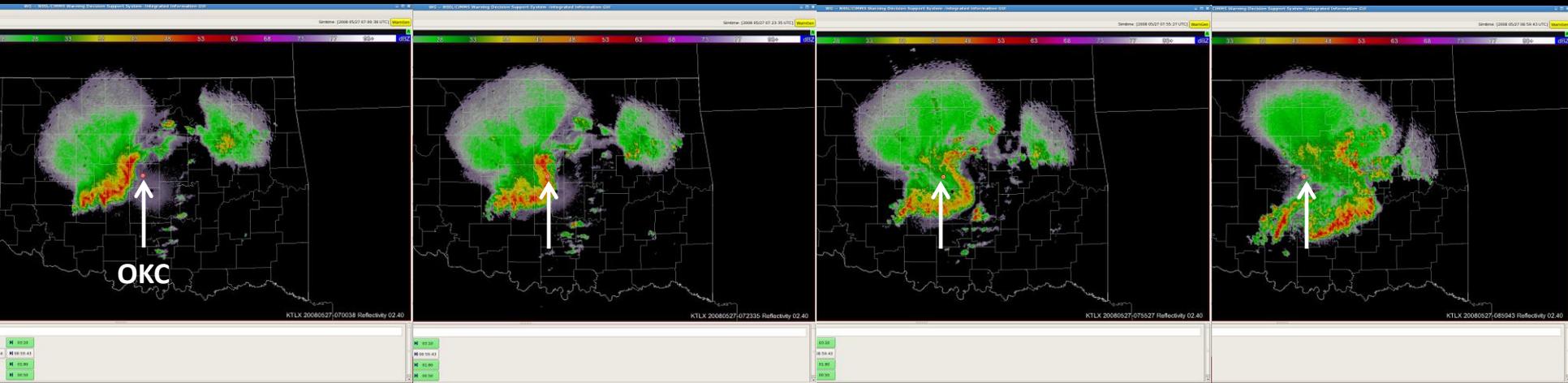
NLCD →
 Percent
 Impervious
 Surface Area
 Change
 in OKC
 from 2001
 to 2006



Legend
 % ISA Change
 1 - 10
 11 - 30
 >30
 Interstates

0 4.25 8.5 17 25.5 34 Kilometers

Composite WSR-88D reflectivity of thunderstorms encountering Oklahoma City on May 27, 2008



OKC

KTLX 20080527-070038 Reflectivity 02.40

KTLX 20080527-072335 Reflectivity 02.40

KTLX 20080527-075527 Reflectivity 02.40

KTLX 20080527-085943 Reflectivity 02.40