

Turning up the heat on urban temperature data

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Risks of urban heat island

breaking news

Qld construction worker dies in heatwave

DECEMBER 7, 2016 5:51PM

Australian Associated Press

Heat Wave Picking Off Pakistan's Urban Poor

By Zofeen Ebrahim

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Experts warn against underestimating heatwave threat

AM By Will Ockenden
Nov 2016, 3:58pm

er and already the
heatwave



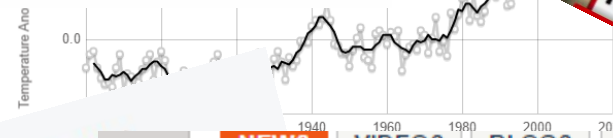
Deadly heat wave scorches central and eastern U.S.

By Azadeh Ansari and Farida Fawzy, CNN
Updated 1:46 PM ET, Mon July 25, 2016

Story highlights

Temperatures close to 100 degrees are expected across dozens of states

Five elderly Michigan residents died due to record heat and humidity



NEWS

VIDEOS

BLOGS

PERSONALITIES

Dangerous heat wave to scorch France in

By [Eric Leister](#), Meteorologist

August 25, 2016, 10:21:35 AM EDT

Intense heat will continue to build across France this week with temperatures approaching 38 C (100 F) in many locations.

"A large area of high pressure will funnel hot air from Africa into France,"



Risks of urban heat island

- Most deadly
- Vulnerable
- Increase risk with global temperatures

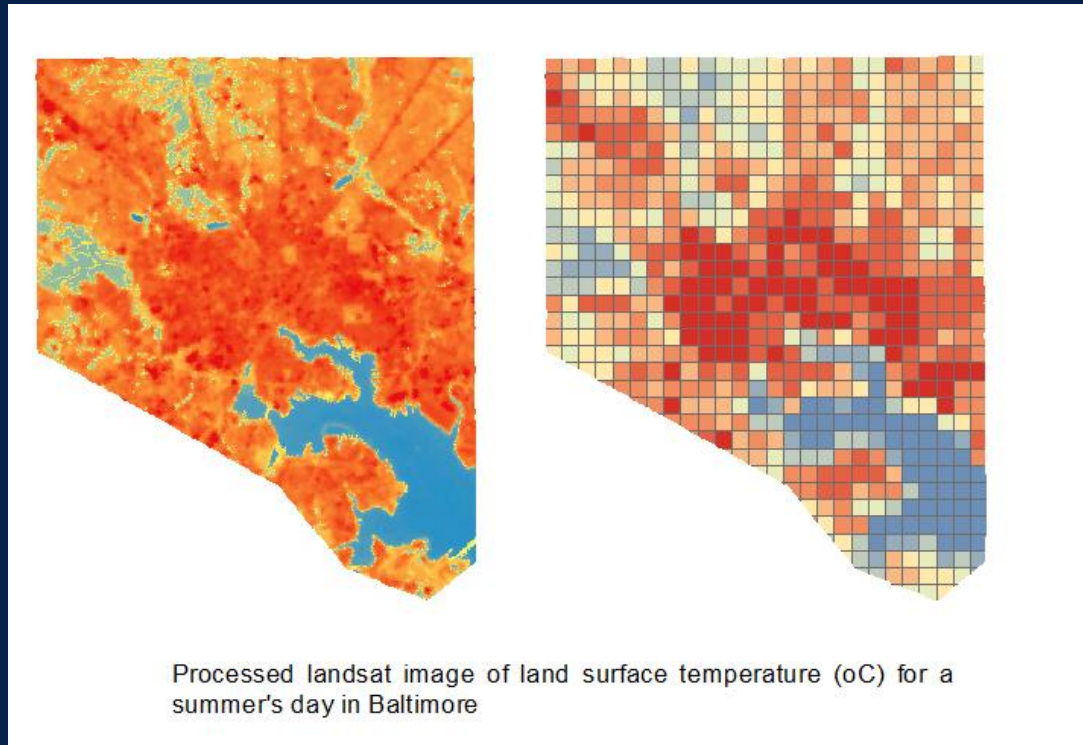


Aim

- Using data from five US cities:
- Test fundamental hypothesis of land surface temperature and biophysical parameters
- Explore relationships between land surface temperature and biophysical parameters
- Predict land surface temperature using biophysical parameters

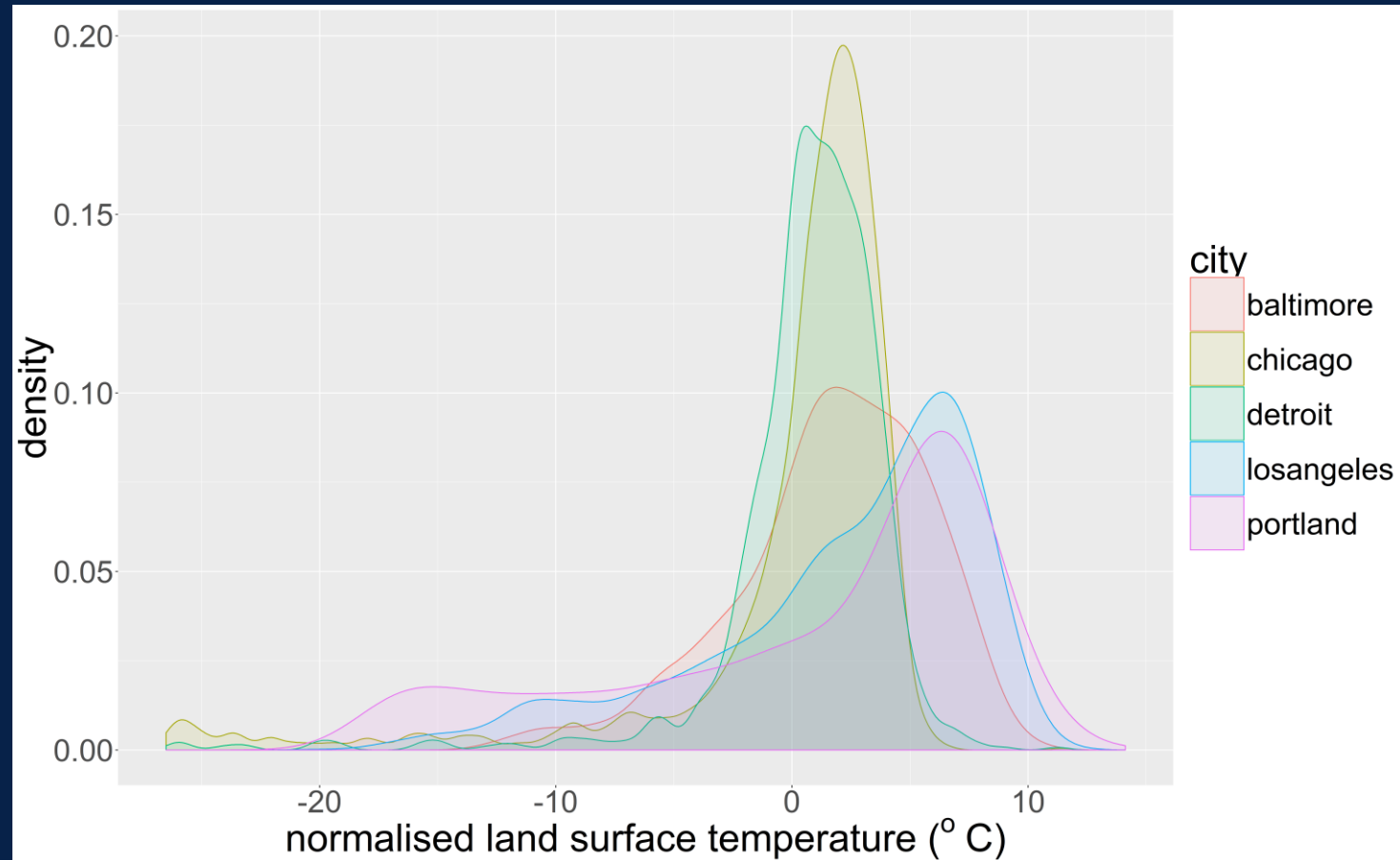


The data



- Each city is gridded into squares of 37 hectares / 92 acres / $(2000 \text{ ft})^2$ / $(610 \text{ m})^2$
- Cities: Baltimore, Chicago, Detroit, Los Angeles, Portland
- Four land satellite images averaged
- For each grid cell the mean, max, and min is calculated
- Variables:
 - Land surface temperature (normalized by city mean)
 - Impervious surface
 - Tree canopy
 - Elevation
 - Land cover
 - Vegetation index
 - Albedo

Land surface temperature in our cities



Exploring the data: Bayesian Network

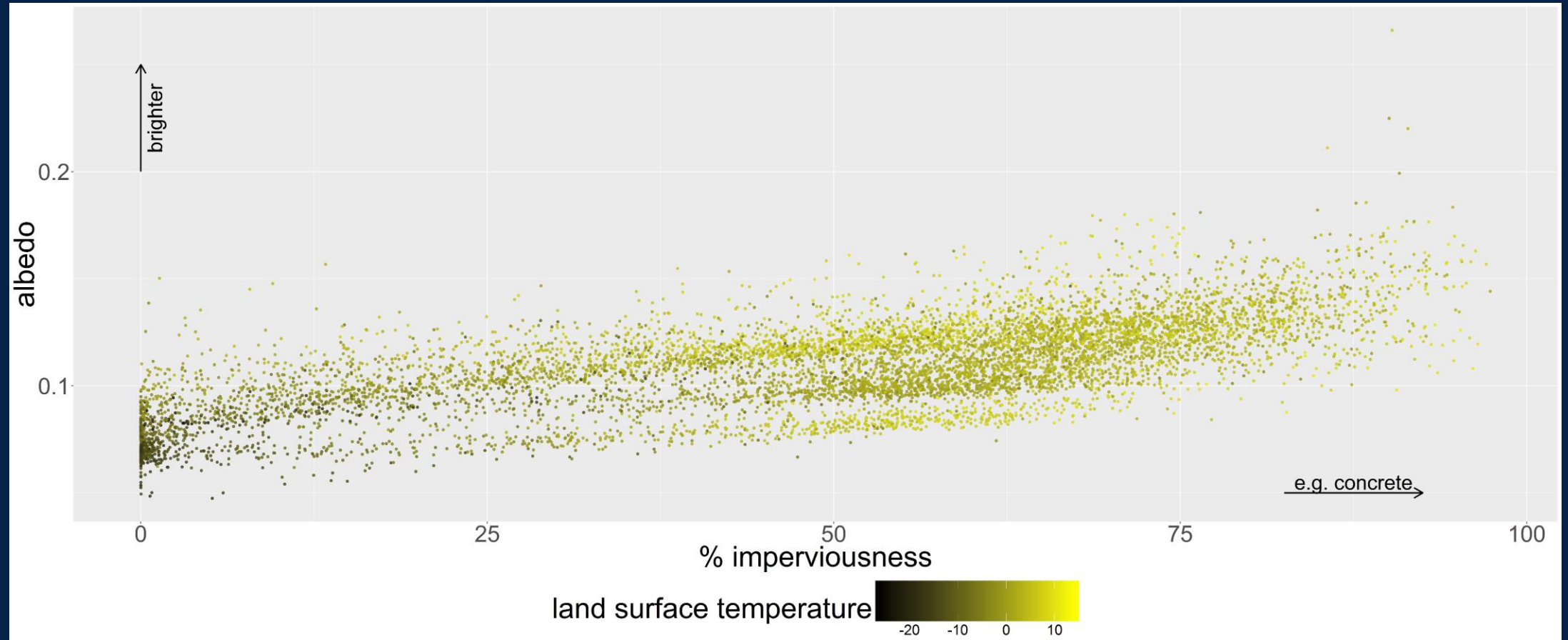


Land surface temperature and impervious surfaces

- [linear model]
- [Hierarchical model between cities to determine if coefficient is the same]
- [mixed effects term in linear model significant?]



Brightness, imperviousness, and temperature



Are darker impervious surfaces hotter than impervious brighter surfaces?

- [Cluster by imperviousness]
- [look at distribution of albedo and LST for each cluster]
- [model albedo and LST]
- [look at the Bayes net for high impervious and high LST. What is albedo?]



Predicting land surface temperature

- [can we predict LST from biophysical factors]
- [leave out city, predict city]
- [leave out part of city]
- [include local change in elevation]
- [compare spatial model vs. non spatial model]



The park effect

- [Probably just with Baltimore data for now]
- [does a higher area of park in a cell decrease the LST?]
- [does distance to nearest park, and park area in cell and surrounding cells decrease LST? Is it significant?]
- [Is there a halo affect? Plot LST and distance to nearest park]
- [Does the size of the nearest park matter?]



The shade of affluence

- [Is LST correlated with property value?]

Harlan, Sharon L., et al. "In the shade of affluence: the inequitable distribution of the urban heat island." *Research in social problems and public policy* 15 (2007): 173-202.



[Further steps?]



References

- Harlan, Sharon L., et al. "In the shade of affluence: the inequitable distribution of the urban heat island." *Research in social problems and public policy* 15 (2007): 173-202.

