Social and Environmental Synthesis toward Urban Sustainability: GIS, Satellite Remote Sensing, and Unmanned Aerial Systems

Wasit Wulamu, PhD, Assistant Professor
Center for Sustainability at Saint Louis University
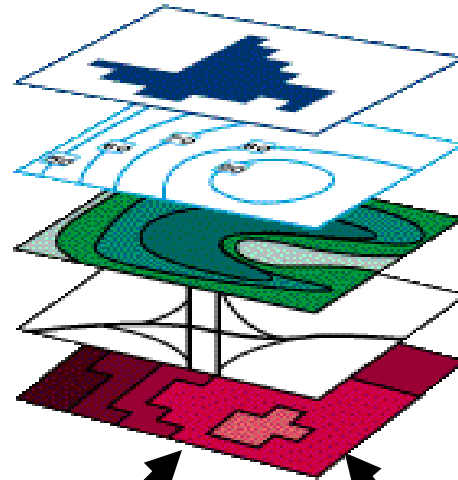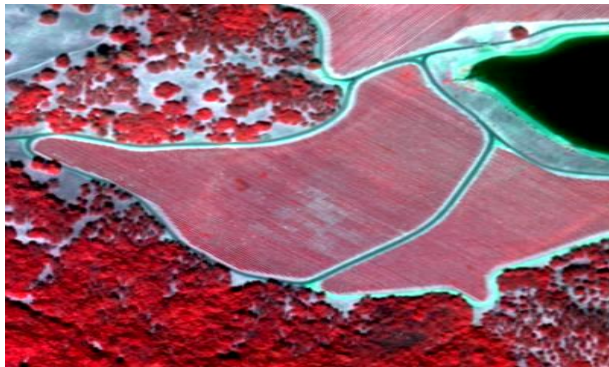*April 9, 2017*
awulamu@slu.edu

SAINT LOUIS UNIVERSITY™ — EST. 1818 —

Agenda

- **What does remote sensing measure?**
- **Geographic Information System**
- **Unmanned Aerial System**
- **Case studies**

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Geospatial Methods

GIS (Geographic Information Systems)

RS (Remote Sensing)

GPS (Global Positioning System)

Source: Google.com

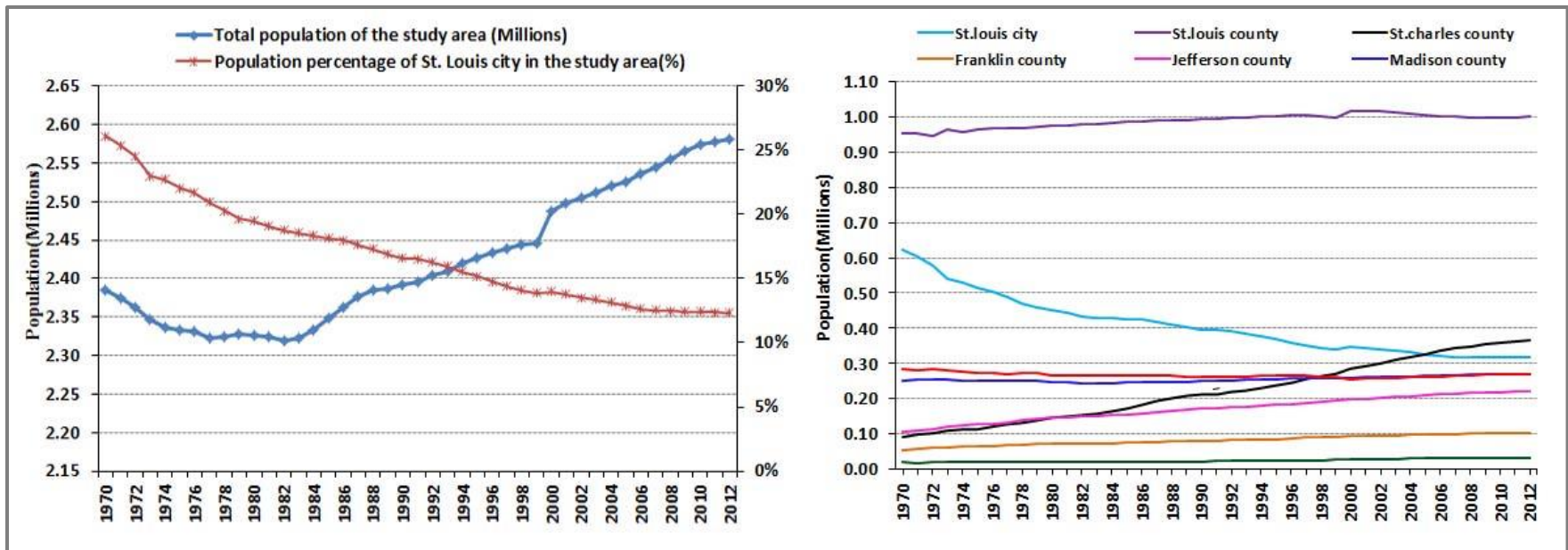Minority Science and Engineering Improvement Program (MSEIP) Conference 2017

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What is remote sensing?

wikipedia.org

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OSTM/Jason 2

Jason

QuikSCAT

ACRIMSAT

Landsat-7

EO-1

SORCE

TRMM

Aqua

GRACE

Terra

ICESat

CALIPSO

CloudSat

Aura

Minority Science and Engineering Improv
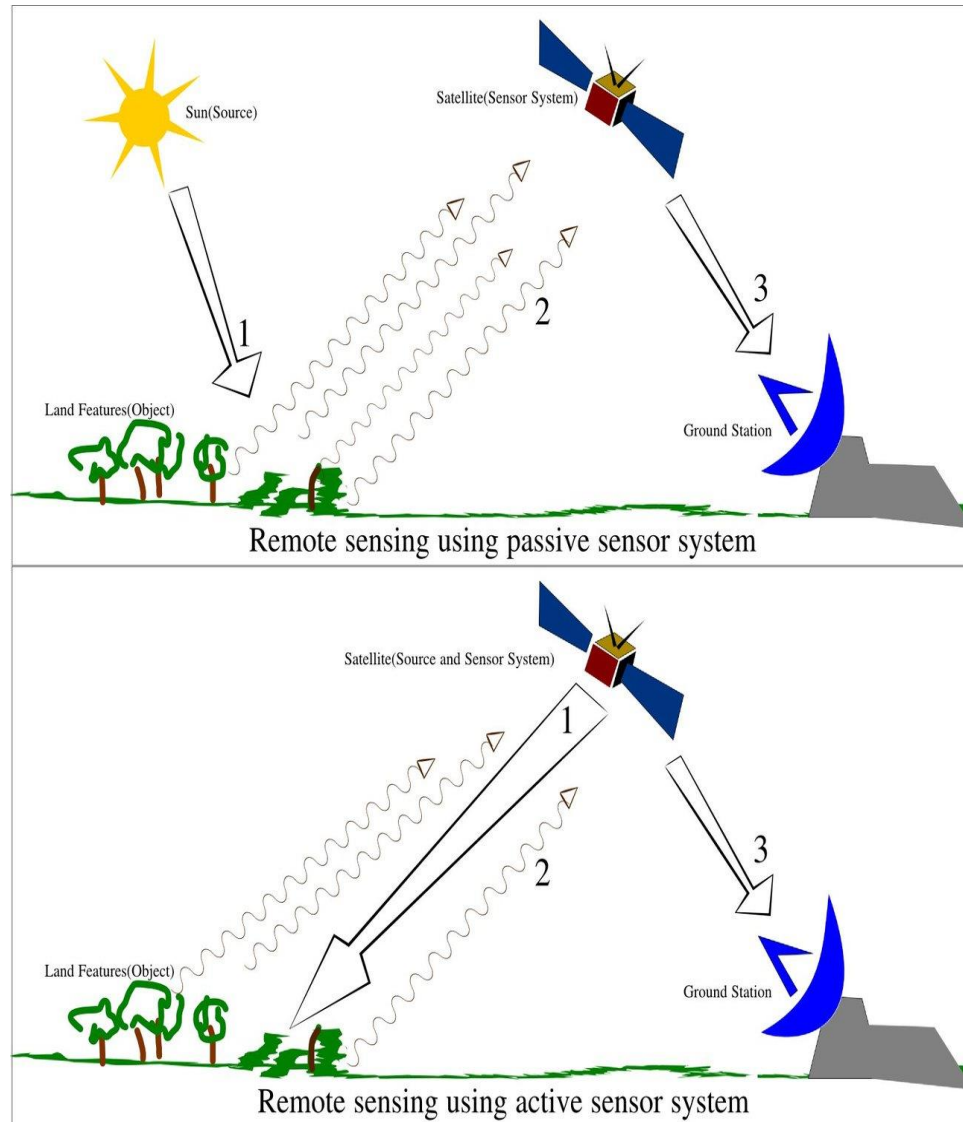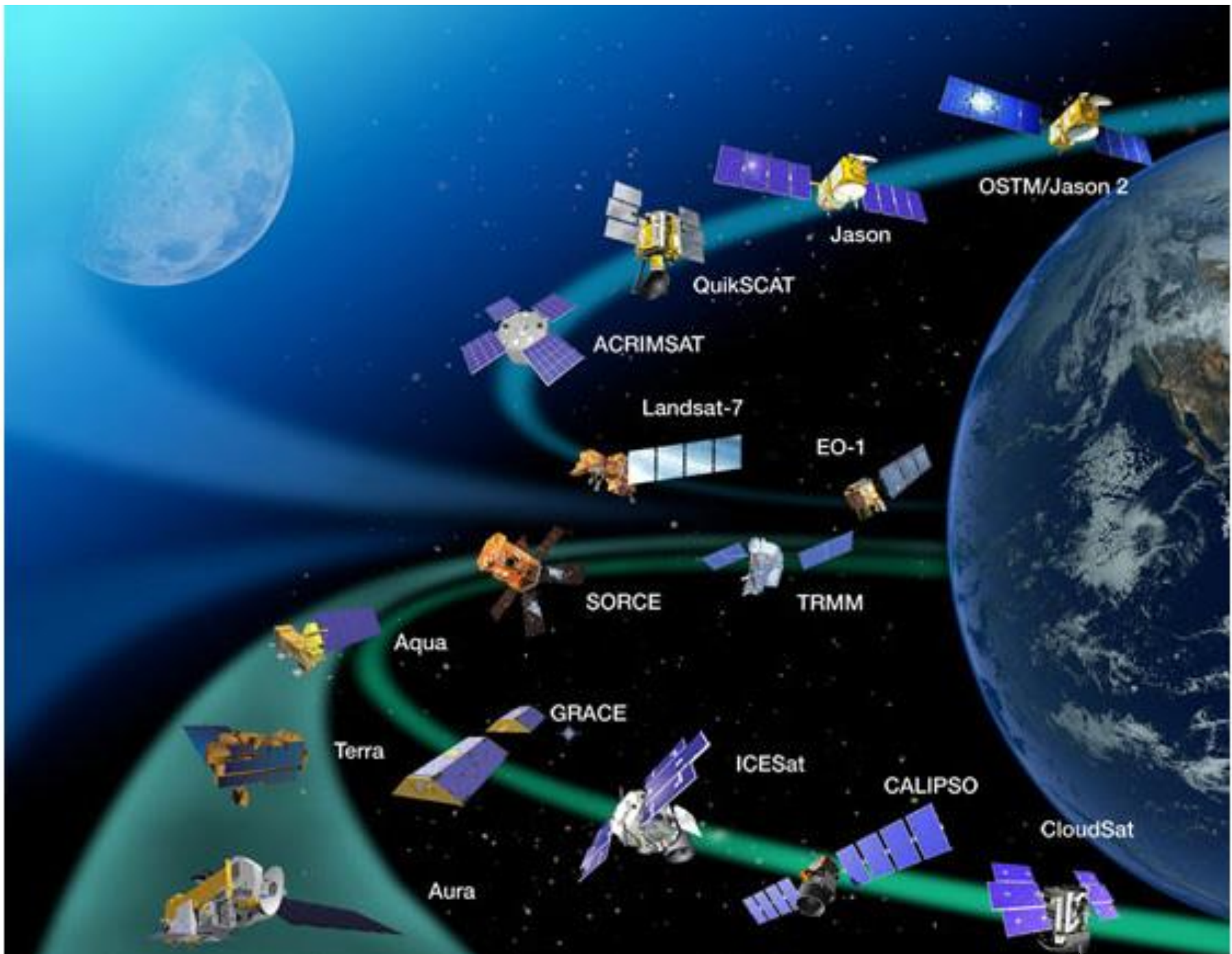
Saint Louis

In 1904, 3rd largest city in US, hosted summer Olympics

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Abandoned urban infrastructure

Saint Louis
bronwfield

	0
	1-2
	3-5
	6-9
	10-74

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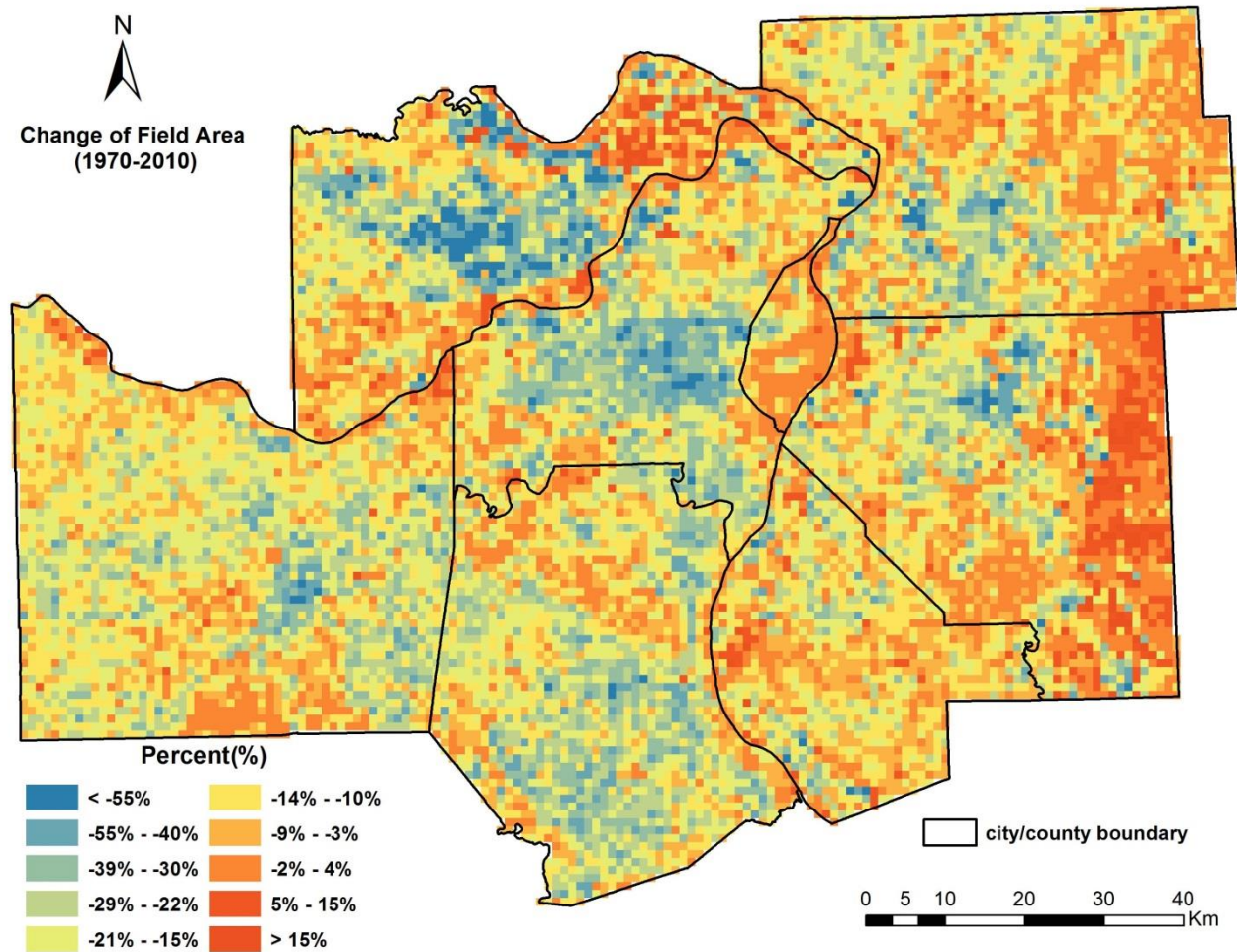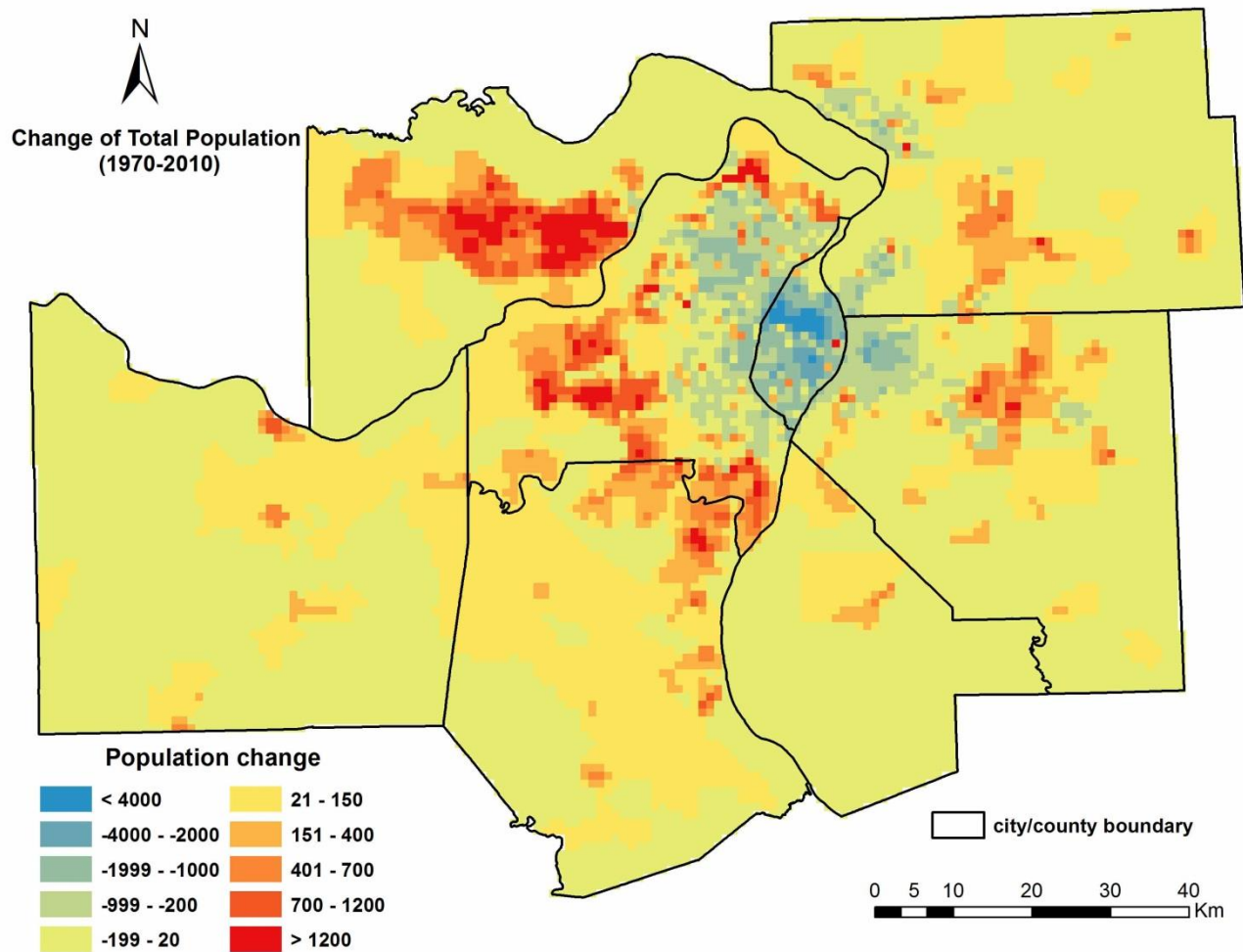4/22/2017
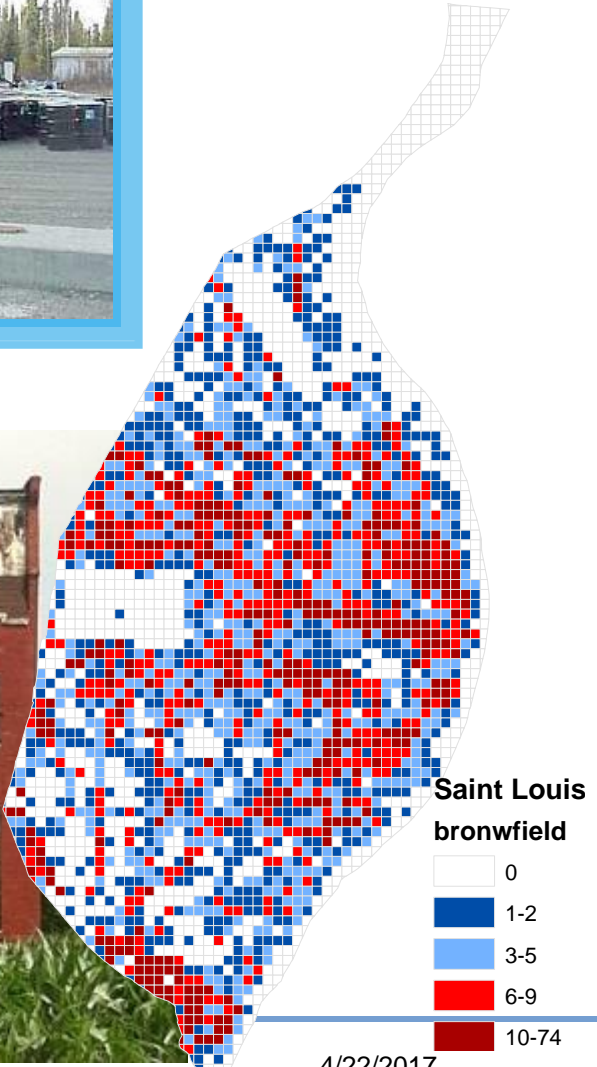
Urban area change from 1970 -2010
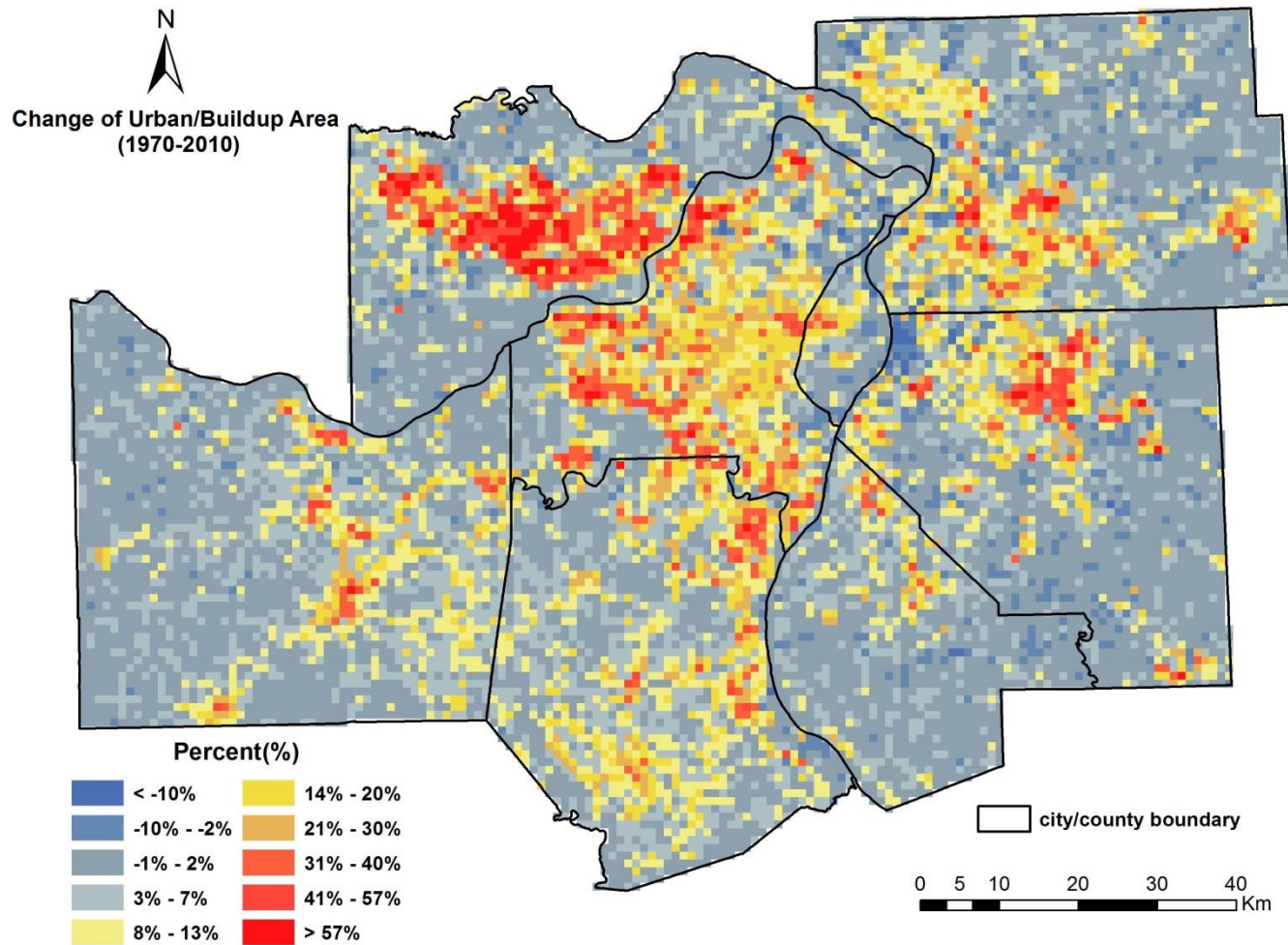
Maimaitijiang, M., **Ghulam, A.**, Sandoval, J. S. O., Maimaitiyiming, M. (2015). Drivers of land cover and land use changes in St. Louis Metropolitan area over the past 40 years characterized by remote sensing and census population data. *Int. J. Appl. Earth Obs. Geoinf,* 35: 161-174.
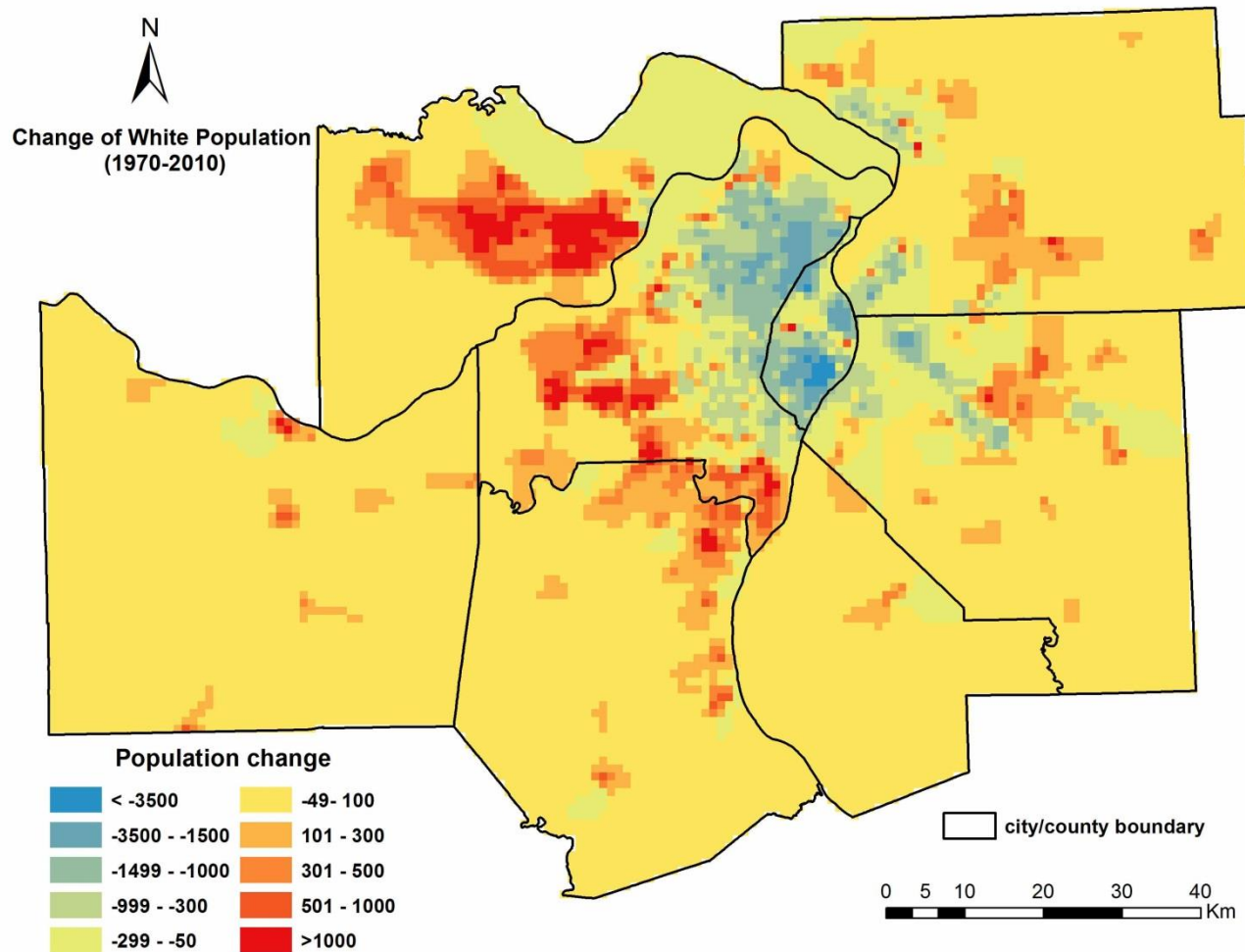
Green space change from 1970 -2010

Maimaitijiang, M., **Ghulam, A.**, Sandoval, J. S. O., Maimaitiyiming, M. (2015). Drivers of land cover and land use changes in St. Louis Metropolitan area over the past 40 years characterized by remote sensing and census population data. *Int. J. Appl. Earth Obs. Geoinf,* 35: 161-174.

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Population change from 1970 -2010

Change of Total Population (1970-2010)

Population change

- ![] < 4000
- ![] -4000 - -2000
- ![] -1999 - -1000
- ![] -999 - -200
- ![] -199 - 20
- ![] 21 - 150
- ![] 151 - 400
- ![] 401 - 700
- ![] 700 - 1200
- ![] > 1200

☐ city/county boundary

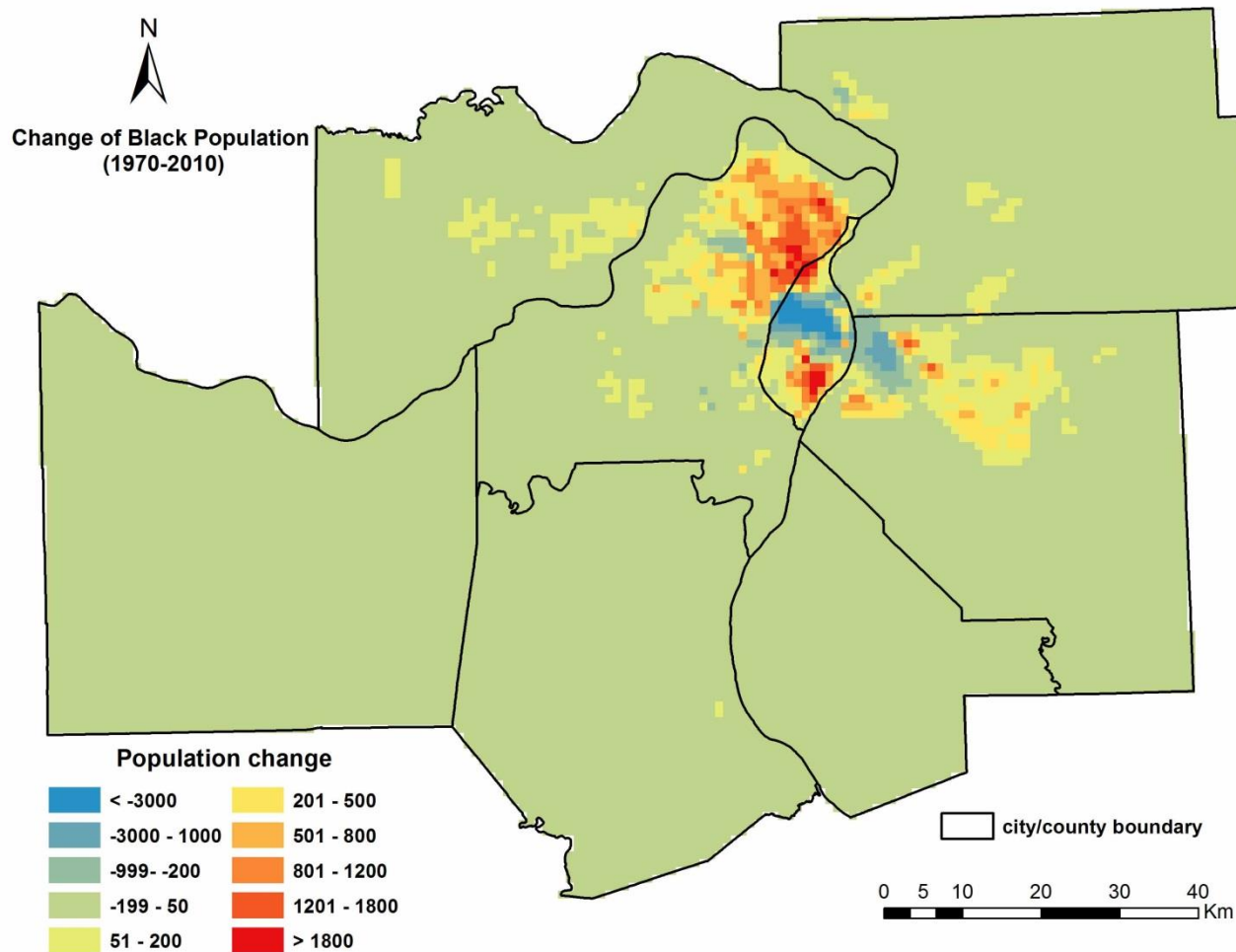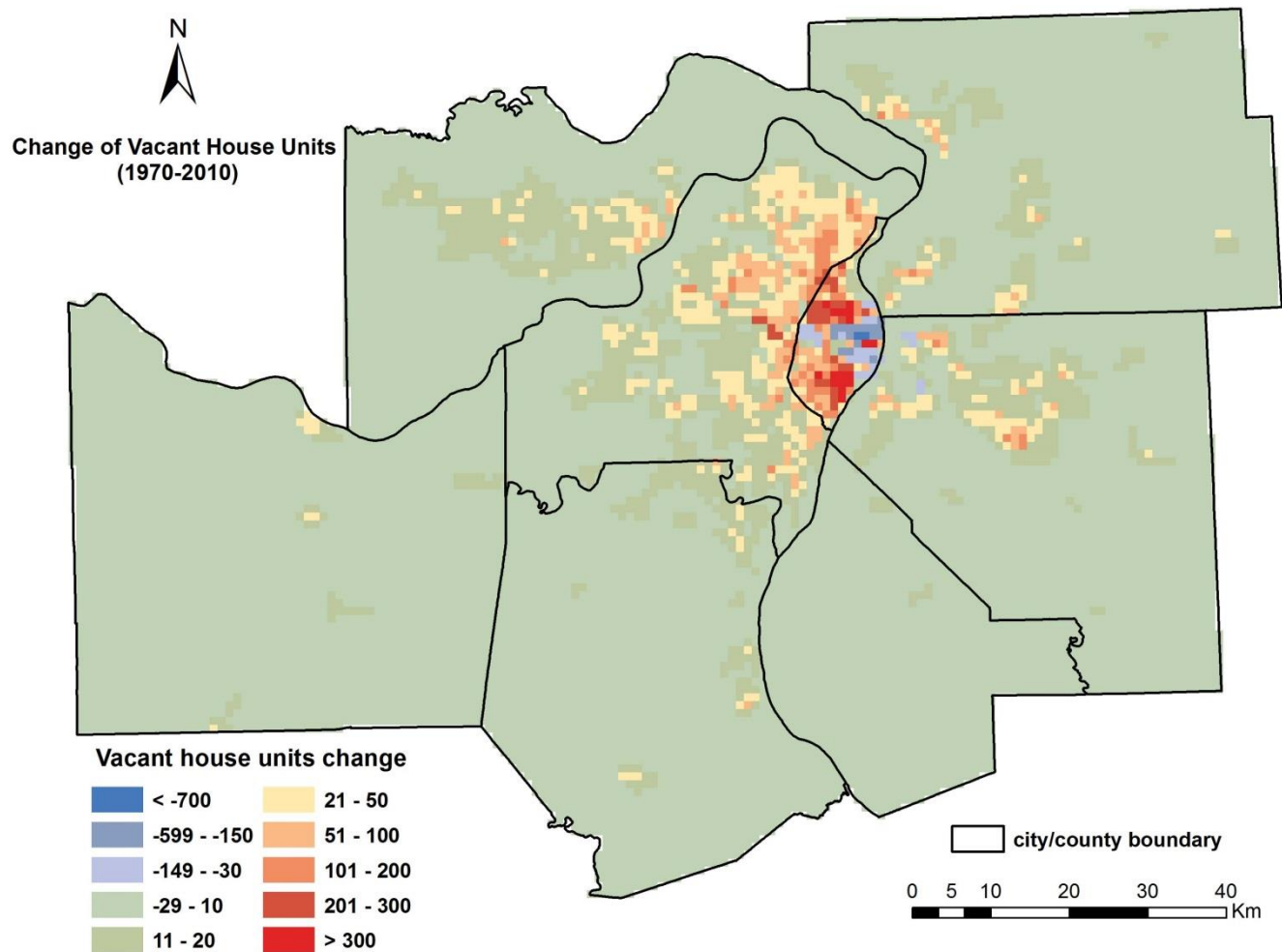0 5 10   20   30   40 Km

Maimaitijiang, M., **Ghulam, A.**, Sandoval, J. S. O., Maimaitiyiming, M. (2015). Drivers of land cover and land use changes in St. Louis Metropolitan area over the past 40 years characterized by remote sensing and census population data. *Int. J. Appl. Earth Obs. Geoinf,* 35: 161-174.

Population change from 1970 -2010

Maimaitijiang, M., **Ghulam, A.**, Sandoval, J. S. O., Maimaitiyiming, M. (2015). Drivers of land cover and land use changes in St. Louis Metropolitan area over the past 40 years characterized by remote sensing and census population data. *Int. J. Appl. Earth Obs. Geoinf,* 35: 161-174.

Population change from 1970 -2010

Maimaitijiang, M., **Ghulam, A.**, Sandoval, J. S. O., Maimaitiyiming, M. (2015). Drivers of land cover and land use changes in St. Louis Metropolitan area over the past 40 years characterized by remote sensing and census population data. *Int. J. Appl. Earth Obs. Geoinf,* 35: 161-174.

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Vacant Housing Units from 1970 -2010

Maimaitijiang, M., **Ghulam, A.**, Sandoval, J. S. O., Maimaitiyiming, M. (2015). Drivers of land cover and land use changes in St. Louis Metropolitan area over the past 40 years characterized by remote sensing and census population data. *Int. J. Appl. Earth Obs. Geoinf,* 35: 161-174.
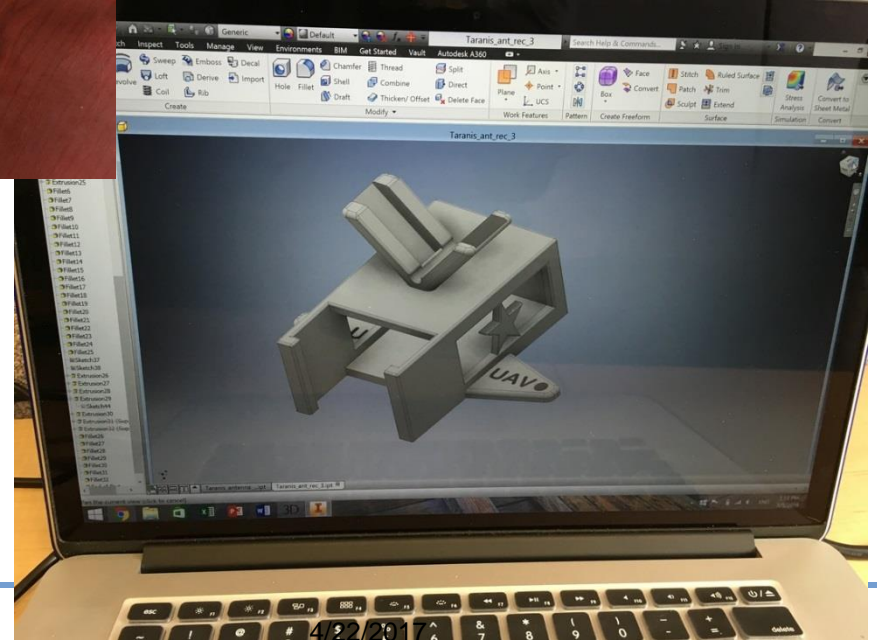
Redefining remote sensing

wikipedia.org

https://www.planet.com

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What is an Unmanned Aerial System (UAS)?

- **What are they called:**
  - **Unmanned Aircraft System (UAS) (FAA and Congress)**
  - **Unmanned Aerial Vehicle (UAV)**
  - **Remotely Piloted Aircraft Systems (RPAS) (ICAO and Air Force)**
  - ***Drones***

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Emerging technology

4/22/2017

Grass roots efforts to UAS
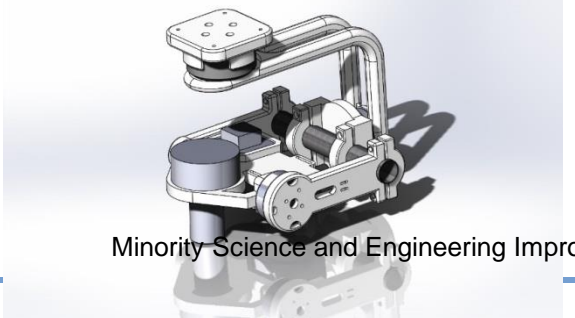
Minority Science and Engineering Improvement Program (MSEIP) Conference 2017

4/22/2017
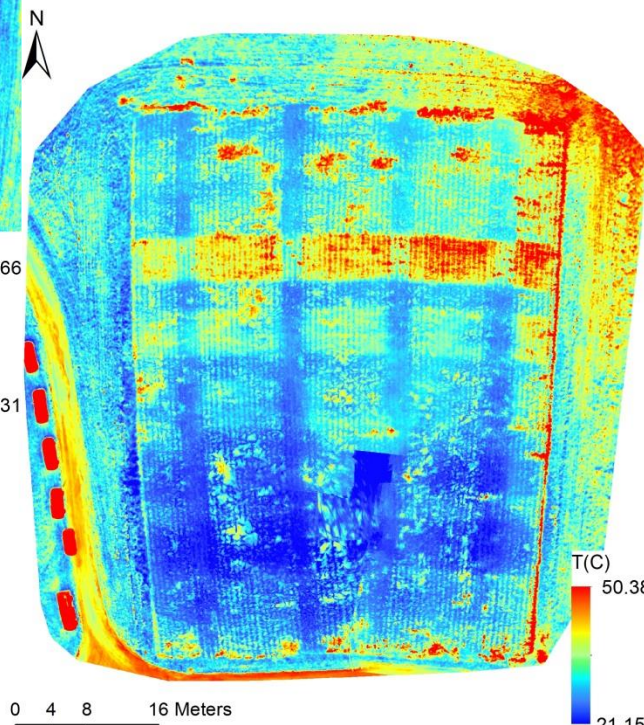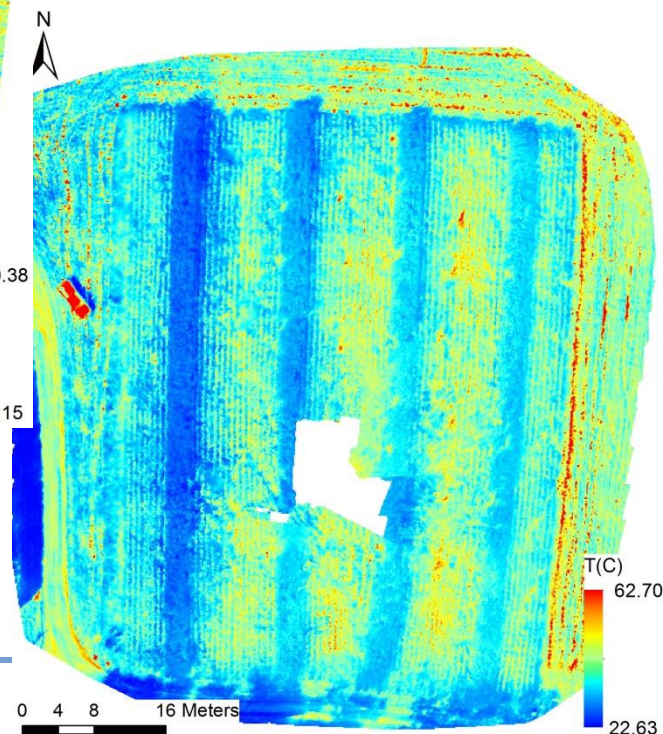
Case studies

DRONES FOR URBAN AGRICULTURE

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RGB imaging

**Minority Science and Engineering
Improvement Program (MSEIP)
Conference 2017**
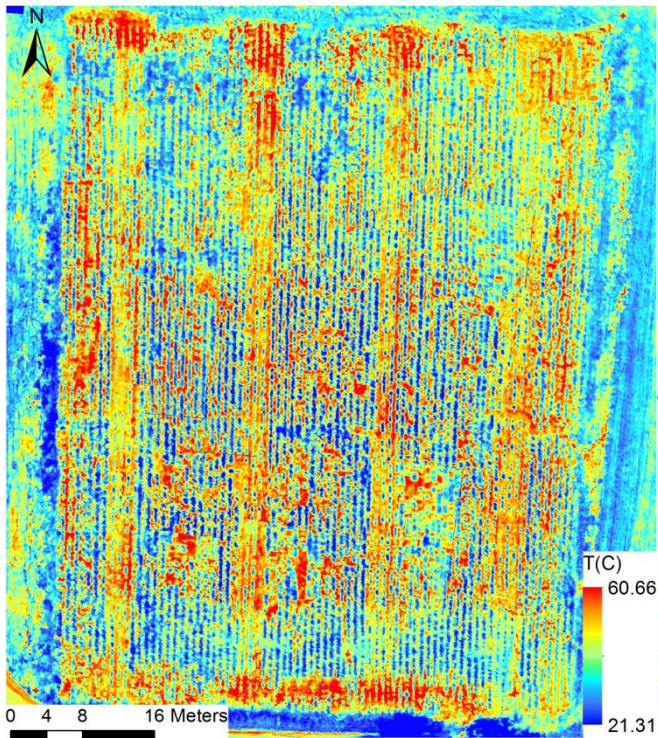
Corn Field Thermal Orthomosaic

Jun.02, 2016 Cornfield

N

T(C)
60.66
21.31

0   4   8   16 Meters

Jun.28, 2016 Cornfield

N

T(C)
50.38
21.15

0   4   8   16 Meters

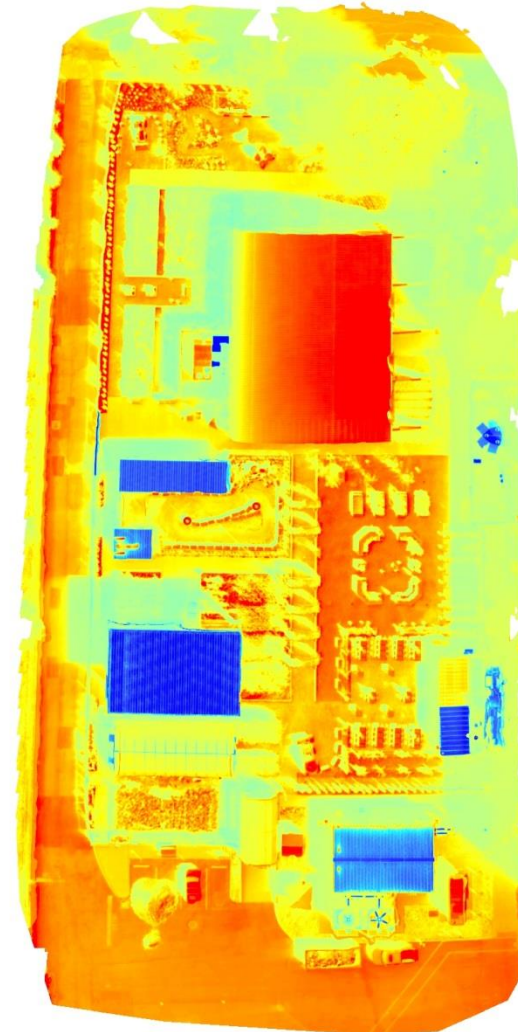Sep.02, 2016 Cornfield

N

T(C)
62.70
22.63

0   4   8   16 Meters

Robots and Drones at Saint Louis Science Center

Minority Science and Engineering Improvement Program (MSEIP) Conference 2017

Saint Louis Science Center Grow Exhibit (Sep.22, 2016)

Thermal

T(C)

63.36

-9.63

T(C)

61.20

0.16

T(C)
63.36

-9.63

Minority Science and Engineering Improvement Program (MSEIP) Conference 2017
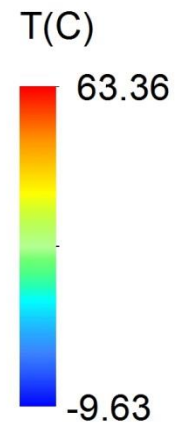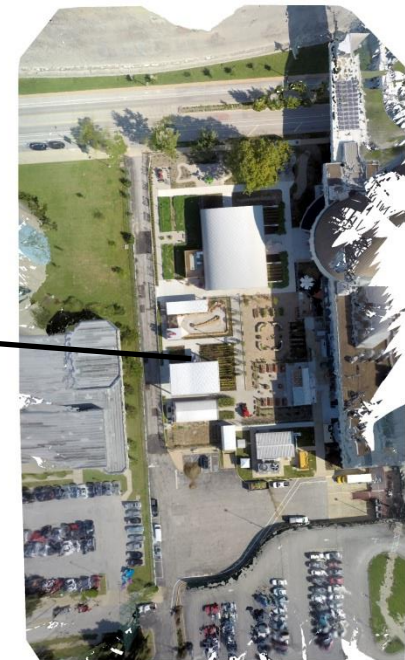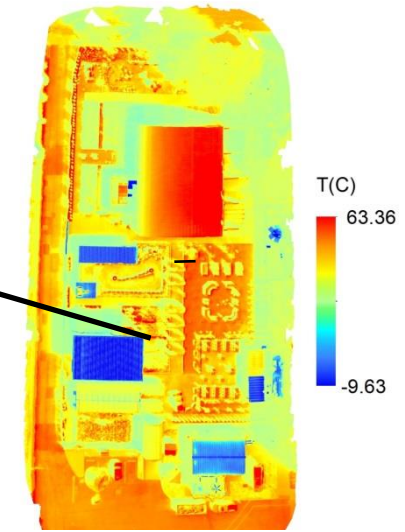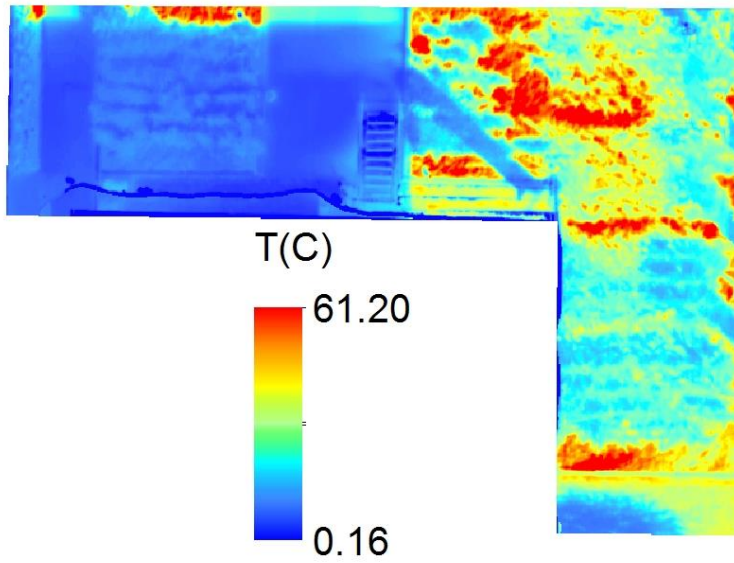
St. Louis Science Center Data collection

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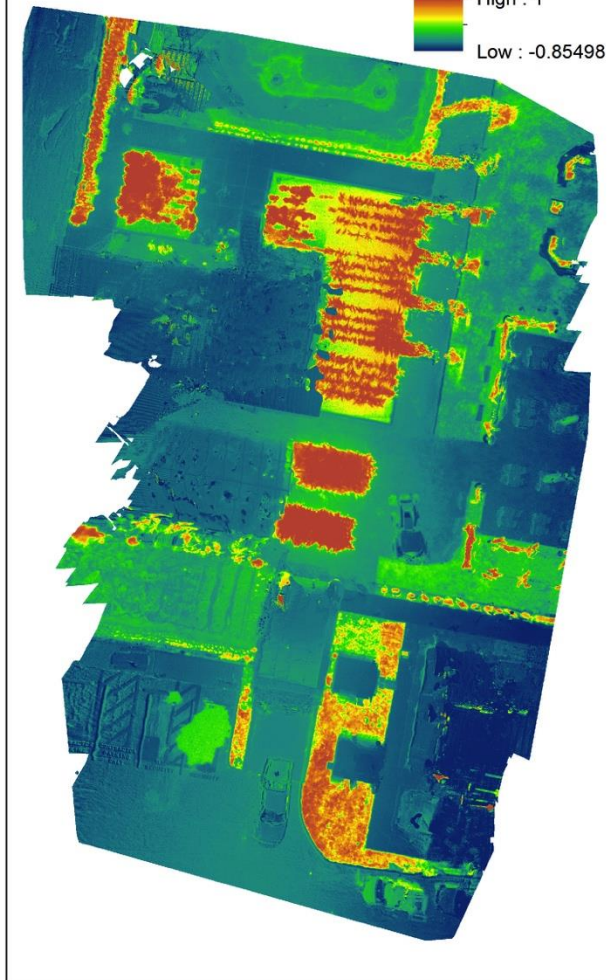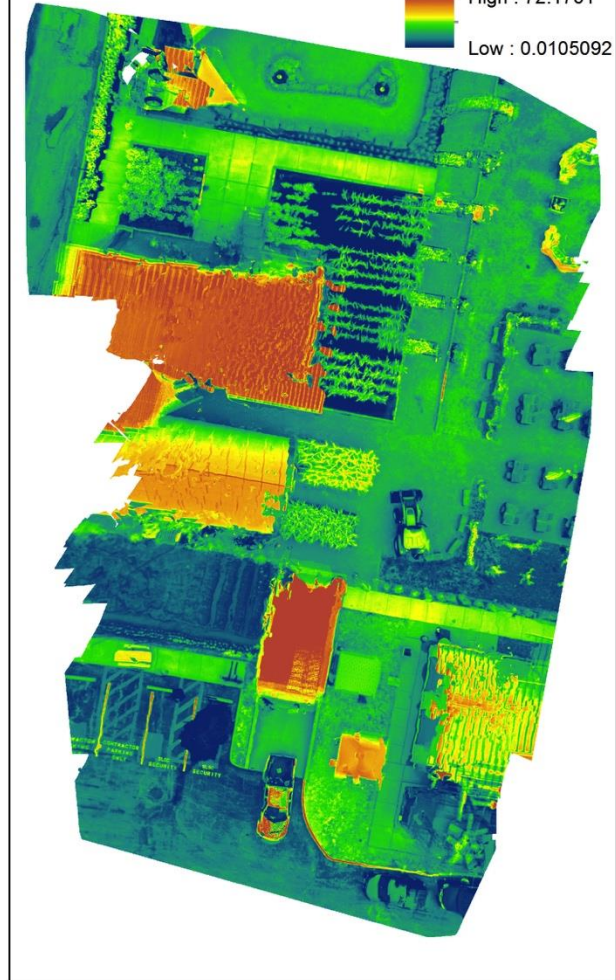
3D Map of the Science Center

Minority Science and Engineering Improvement Program (MSEIP) Conference 2017

Thank you