Regional and Global Urbanization Dynamics from Multi-temporal Nocturnal Lights Data

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Urbanization & Global Change Group

Yale
DMSP/OLS

Inter-sensor calibration
... the digital number (DN) values are not strictly comparable from one year to the next.

--- http://www.ngdc.noaa.gov/dmsp/readme_v4.txt
Country level calibration
Annual growth rates
Pixel level calibration:

Modified Ridge method
A ridge in the real world

http://www.winddrinkers.org/BRR/BridgerRidge.html
Adjusted Ridge

\[ Y = -0.009X^2 + 1.5914X - 0.9408 \]

\[ R^2 = 0.9986 \]
Urbanization Clusters – Hotspot Analysis with LISA
LISA -- Local Indicators of Spatial Association

Spatial autocorrelation: Tobler’s first law of geography

\[ I_i = \frac{Z_i}{m_2} \sum_{j}^{N} W_{ij} Z_j \]

\[ Z_i: \text{ distance from the global mean;} \]
\[ W_{ij}: \text{ matrix of weight;} \]

\[ m_2 = \frac{\sum_i Z_i^2}{N} \]

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Types of Clusters or Hotspot

- **High-High**
  - + + + +
  - + + +
  - + + +

- **High-Low**
  - - - -
  - - + -
  - - - -

- **Low-High**
  - + + +
  - + - +
  - + + +

- **Low-Low**
  - - - -
  - - - -
  - - - -
\[ \Delta = \sum_{i} \text{NDVI}_i - \sum_{j} \text{NDVI}_j \]
Questions?