Addressing Five Science Areas:
1. Can the urban environment be characterized based on physical and measurable parameters such as infrastructures (houses, buildings, factories, etc.) together with high-resolution urban information content (e.g. light/optical data) rather than arbitrary political and administrative units?
2. Can the rate of change in the urban environment be consistently and continuously delineated without spatial and temporal gaps in a decadal timeframe and at the scale relevant to addressing key issues in urban environment as well as social science?
3. How do urban changes, from megacities like in Asia to stable urban areas, impact the environment through processes involving pollution (e.g., NOx, particles (e.g. PM2.5 with size 10−15 μm), greenhouse-gas (GHG) emission (CO2), urban heat island (UHI), urban dome, air and water temperature, and heat waves) in urban and metropolitan areas and their urban-climate interactions?
4. How does urban change affect the socioeconomic spectrum of spatial and structural transformations, including the role of the rural non-farm sector in towns and small cities, rural-urban migration decisions, the dynamics of land markets in peri-urban areas, the degree and nature of specialization in cities of different sizes and at different development stages, and the identification of urban agglomeration patterns and migration-disclosure patterns?
5. Can urban mega change exacerbate water resource problems (e.g., drought and population dynamics in extreme urbanization) as well as natural and man-made disasters (e.g., extreme urbanization in regions prone to wild fire, flood, tsunami; infrastructure failures, etc.)

Satellite Observations:
- WV2 and Landsat Study of New York
- OLS and Landsat Tri-temporal change: Kuala Lumpur, Malaysia
- Scatterometer DSM Ft. Worth-Dallas

Environmental and Demographic Characteristics:
- VuG: CO2 emission
- GOME2: NO2 pollution
- Administrative units and population

The Beijing Case Study [ Nghiem et al., Encycl. Remote Sens., 2012 ]

Urban road and land grid structures in 3D volume and spatial light. Land use data were obtained from the NASA Land Cover and Global Land Use Change Program.

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The Beijing Case Study

- Beijing: Pop. 13,208,318. Core urban area has low population density, consistent with industrial use.
- Air pressure (hPa)
- GMT hour of simulation (starting 12 GMT Aug. 1, 1999)
- Air pressure (hPa)
- Ground water and air quality sites
- E-C Milan: Pop. (2001) 1,381,560. Core urban area has a very high density of buildings, consistent with industrial use.
- Business districts of Milan in Oct 2012
- Vulcano: CO2 emission
- Ground water and air quality sites
- E-C Milan: Pop. (2001) 1,381,560. Core urban area has a very high density of buildings, consistent with industrial use.
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