



For information on our Ph.D. program in Geospatial Science & Engineering, visit <http://globalmonitoring.sdstate.edu>



Urbanization Viewed in the Middle Infrared: East Asia Scenes from 2003 and 2010

Geoffrey M. Henebry (geoffrey.henebry@sdstate.edu) & **Valeriy Kovalskyy** (valeriy.kovalskyy@sdstate.edu)

Geographic Information Science Center of Excellence (GIScCE), South Dakota State University, Brookings, SD, USA



NASA LCLUC, GOCF-GOLD, MAIRS Workshop on Land Cover Land Use Change in South East Asia: Hanoi, Vietnam, 7-9 NOV 2011

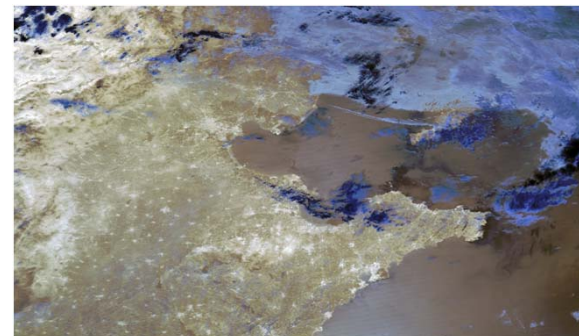
1. Introduction Much study of urbanization and its effects has relied on sensing solar reflectance (0.4-2.5 μm) and thermal emittance (10-13 μm). The middle infrared (MIR) region spans 3-5 μm , involves a mixture of solar reflectance and thermal emittance, and offers some distinct advantages for sensing patches of human settlements in a matrix of the vegetated land surface (Henebry 2006).

Here we explore how the MODIS MIR channels 20-23 can be used to detect urban areas even over targets frequently obscured by haze, smog, and smoke. We focus on two years—2003 and 2010—and on three areas with different urbanization patterns—eastern China, northeast Vietnam, and Taiwan.

2. Data MODIS Aqua Level 1B calibrated radiance 1km data from DOY (day of year) 172 to DOY 242 were ordered through LAADS Web (<http://ladsweb.nascom.nasa.gov/data/search.html>) for MODIS MIR bands: 20 (3.660-3.840 μm); 21 (3.929-3.989 μm); 22 (3.939-3.989 μm); 23 (4.020-4.080 μm). Selected low-cloud scenes were mapped into R-G-B as 23-22-20.



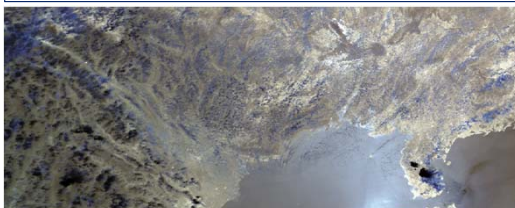
2003 DOY 210



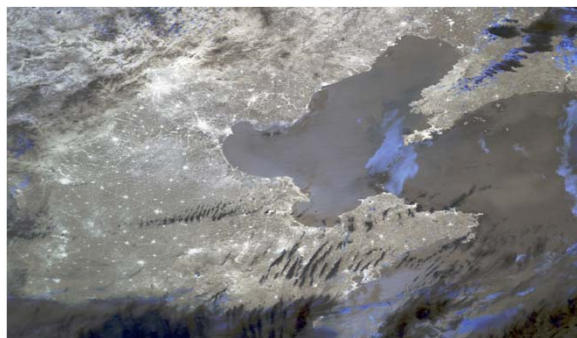
2010 DOY 210



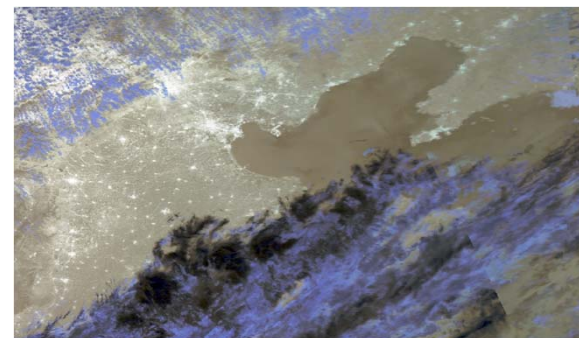
2003 DOY 182



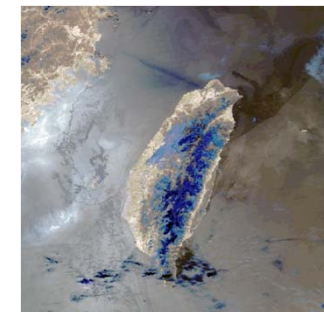
2003 DOY 197



2003 DOY 216



2010 DOY 227



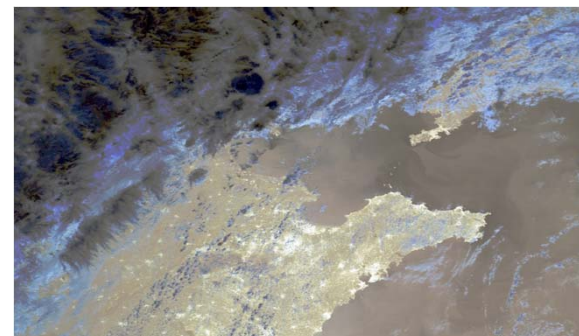
2010 DOY 215



2003 DOY 216



2003 DOY 219



2010 DOY 233



2010 DOY 189

3. Observations: Building materials, pavement, and bare soils are MIR-bright. Green vegetation is MIR-dark. Certain cold clouds are very MIR-dark. Other clouds are highly reflective only at the shorter end of the MIR spectrum and thus appear blue (higher values in band 20 only).

Band 21 appeared too noisy for this application. Sun glint is an issue for coastal zones and even inland. Quantitative change detection in urban environments appears feasible, pending the development of an effective compositing scheme that can exploit the differential sensitivities of the three MODIS MIR bands.

4. Reference: Henebry GM. 2006. *Mapping human settlements using the mid-IR: advantages, prospects, and limitations*. Chapter 16, pp. 339-355, in: *Urban Remote Sensing* (Q. Weng and D. Quattrochi, eds.). CRC Press: Boca Raton, FL.