Dr. Claire Jantz
Associate Professor
Department of Geography-Earth Science
Shippensburg University
cajant@ship.edu
717-477-1399

What are the key urban remote sensing/urban modeling and forecasting issues that you represent?

I work primarily with urban simulation and forecasting, driven primarily by land use/land cover data sets derived from Landsat imagery; and landscape, socio-economic and infrastructure data collected at a variety of scales. Much of my work is set in the Mid-Atlantic region of the United States and I have worked on case studies at broad scales (Chesapeake Bay watershed), medium scales (several counties), and fine scales (single counties). I have worked extensively with the SLEUTH urban growth model, and with my colleagues developed a new version of this model, SLEUTH-3r, that addresses some of the scale sensitivity issues and calibration issues documented in the literature.

With my colleagues, we are working to identify and describe social, economic, policy, and physical "drivers" of urban land cover change, and identify feedbacks among these drivers. Much of this work has involved loosely coupling various models together, for example using a demographic model to inform the allocation of fine-scale urban land cover change within the SLEUTH cellular automata framework; and coupling the SLEUTH urban growth model with hydrological models to identify impacts on hydrology, water quality, and water availability, and to identify feedbacks between urban systems and physical systems.

What are the key challenges, missing opportunities, and exciting developments in your theme and region?

One of the key challenges we face working with satellite-derived data sets is an inability to capture and characterize some aspects of the urban landscape and urban change (i.e. intensification). On the modeling side, we have found it difficult to move beyond descriptive/deterministic models linking observed land cover change to socio-economic drivers. While these models are useful for understanding process, how to take the next step to parameterize process-based models of social systems remains unclear. Development of process-based models of social systems lags behind such models for physical systems.

In terms of monitoring, the release of the free Landsat archive presents a new and exciting opportunity to explore land cover change over multiple temporal and spatial scales. From the modeling perspective, we have had some success with the use of simulation models to identify and describe the effects of social and physical "drivers," and to incorporate data at multiple scales. Likewise, we have been able to identify and describe complexity in urban systems (feedbacks, critical thresholds, phase changes), although successfully modeling these elements is challenging. In some of the local-scale work we have done, the role of experts in identifying and describing drivers—in other words, participating fully in the modeling work—has proved to be invaluable and also opens pathways for local adoption of modeling tools. Finally, in our coupled-

modeling work, we have had success integrating SLEUTH with both demographic models as and ecosystem models, although data integration between models is one of our greatest challenges.

Why are we not seeing more studies on smaller urban areas?

One of the primary reasons is lack of funding opportunities for smaller-scale studies. Funding agencies want the most "bang for their buck" and so many calls for funding seem to focus on larger, regional-scale studies or major urban agglomerations. There also may be a lack of recognition in terms of what can be learned from smaller urban areas, which offer opportunities to gain a fuller understanding of land cover change and incorporation of local knowledge.

What platform/data/access limitations do you currently/frequently encounter?

Landsat does not capture all aspects of the urban footprint and urban change adequately. For example, Landsat-derived products underestimate very low density development, development beneath a forest canopy, abandonment, and intensification. Model coupling requires data transformation so that data from one model can be fed into another model. Likewise, models often have not been developed in tandem with the intention of coupling, so require us to cobble them together, often working across different temporal and spatial scales (i.e. SLEUTH operates at an annual time scale, while a hydrologic model might operate at time scales of minutes, hours, or days).

How do these limitations affect our ability to monitor, model and forecast urban areas?

Using Landsat data alone, we do not fully capture the full suite of urban land cover changes, and we therefore lack the ability to fully understand processes driving those changes. When coupling various models, uncertainties and errors are compounded; to date, little work has been done to identify and characterize these kinds of errors. Finally, forecasts of demographic, economic, and policy changes are poor, as is our understanding of how the relationship between these factors and the urban footprint changes over time.

What do you see as missing in terms of case studies and methods?

We need better models to forecast demographic, economic and policy changes, and we need to do a better job moving towards process-based socio-economic modeling and process-based models of land cover change. We need better methods to enhance descriptions of land use/land cover and landscape changes from satellite data (using ancillary data sources and better classification algorithms). And, we need to develop models that can be applied across multiple scales, that can incorporate data from multiple scales, and that can simulate complex systems (i.e. adapt to phase changes).

My primary collaborators are:
Dr. Scott Drzyzga (Shippensburg University), Dr. Scott Goetz and Patrick Jantz (Woods Hole Research Center), Peter Claggett and David Donato (USGS), Dr. Claire Welty (UMBC), Dr. Glenn Moglen (Virginia Tech), Jim Reilly (Reilly Consulting, Inc.); SU students: Michael Maret, Ben Ritter, Gus Frederick