

Generalizing agent-based models of land use change

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CCI/IA Workshop XVIII

Complex Human-Environment Systems

Feedback and surprise



Agency and heterogeneity

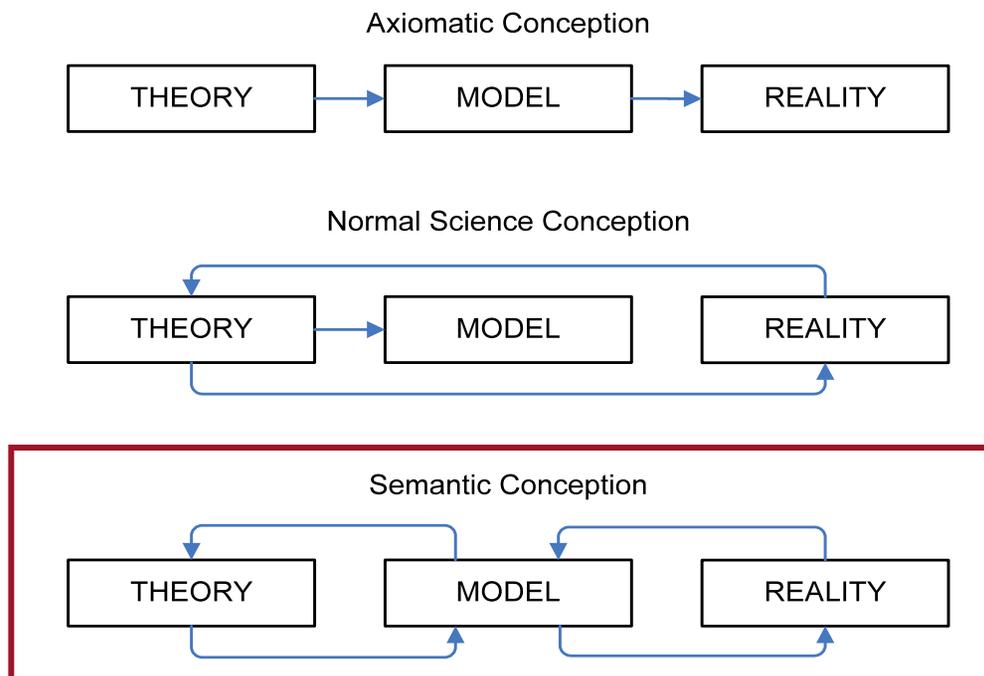


Spatiotemporal lags, thresholds, and scaling



Modeling Complex Systems

- Modeling \approx defacto complexity epistemology



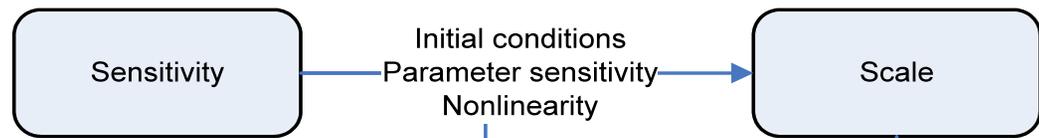
Model Evaluation and Generalization

- Evaluation → Replication → Generalization
 - Calibration, verification, validation
- Evaluation → Universality → Generalization
 - Porting results across space, time, scale, systems

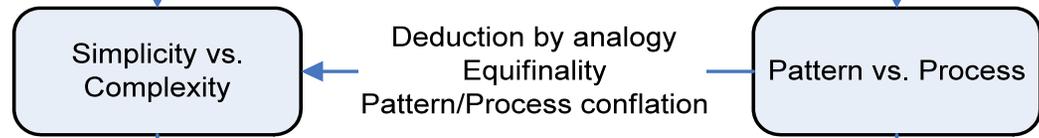
...but our capacity for building spatiotemporal models outstrips our ability to evaluate them

Challenges to Generalization

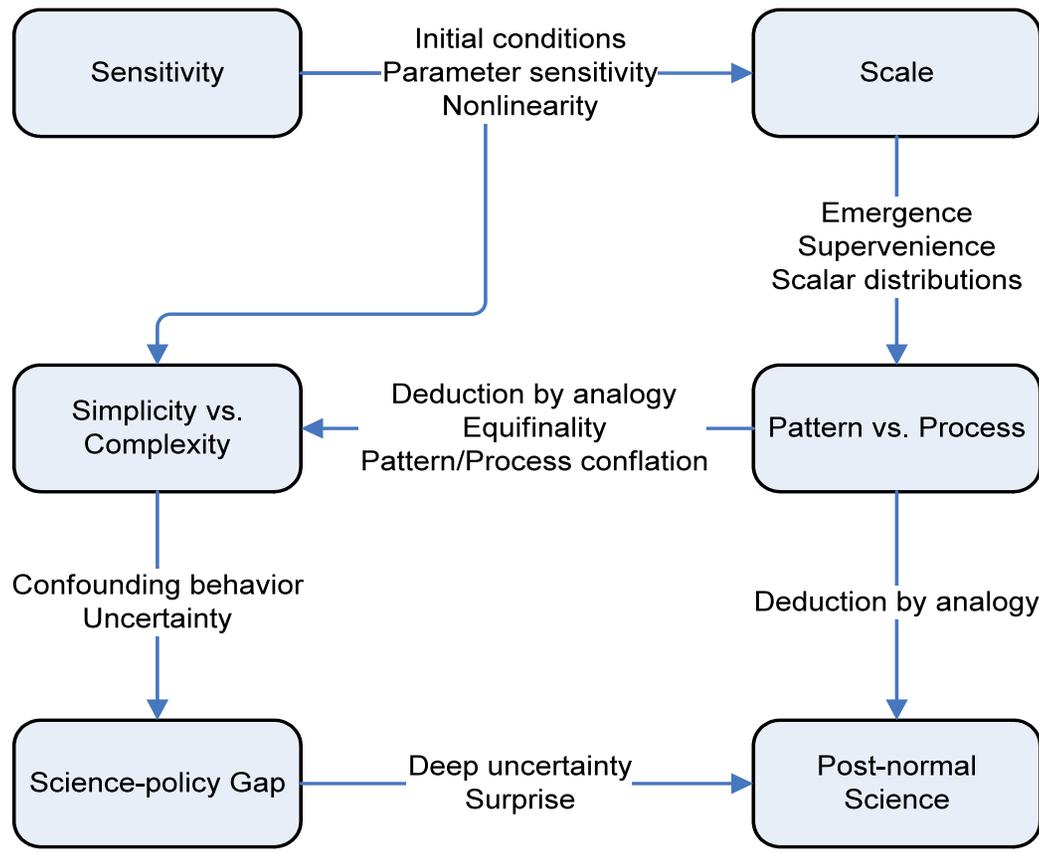
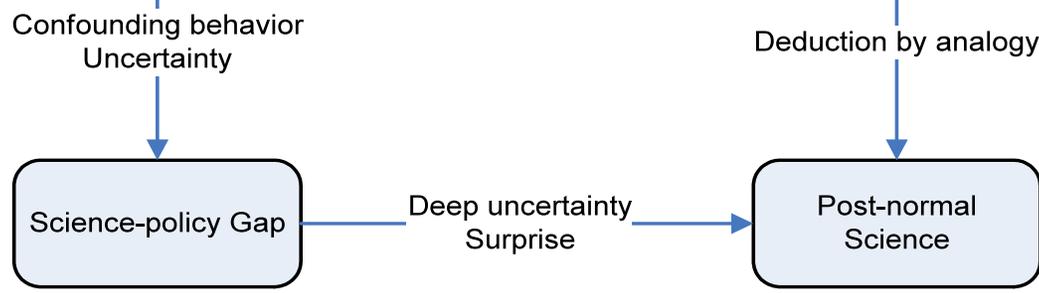
Methods



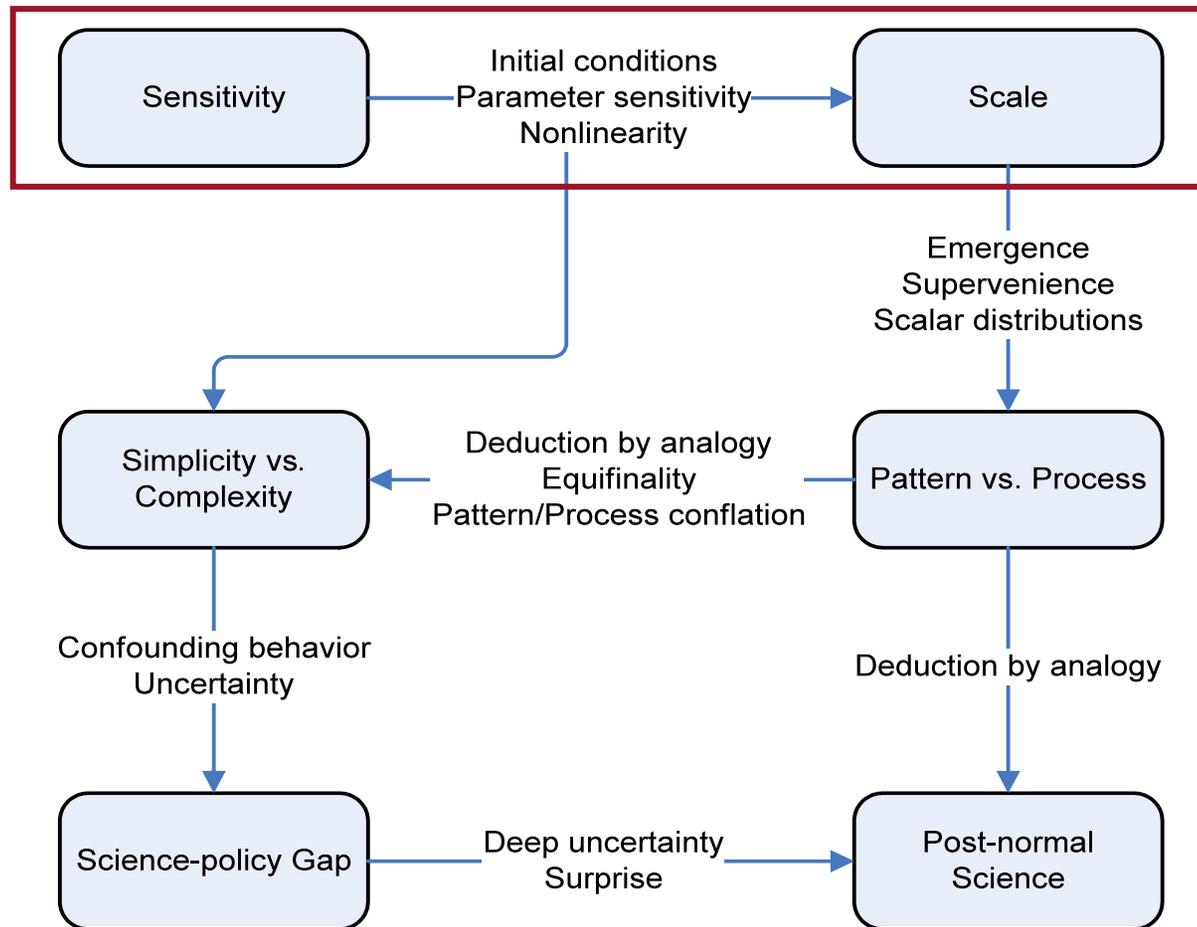
Concepts



Policy



Methodological Challenges



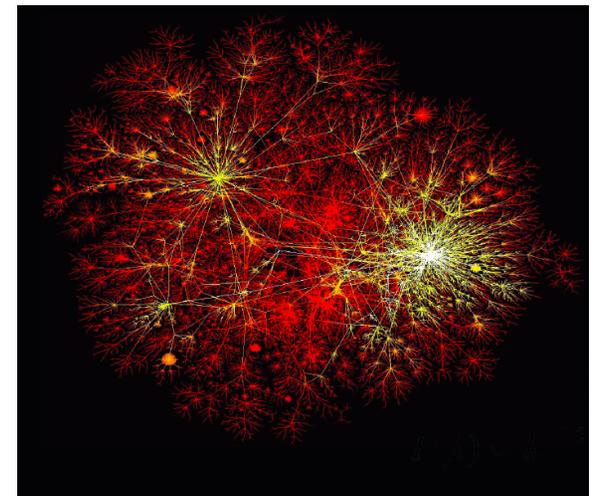
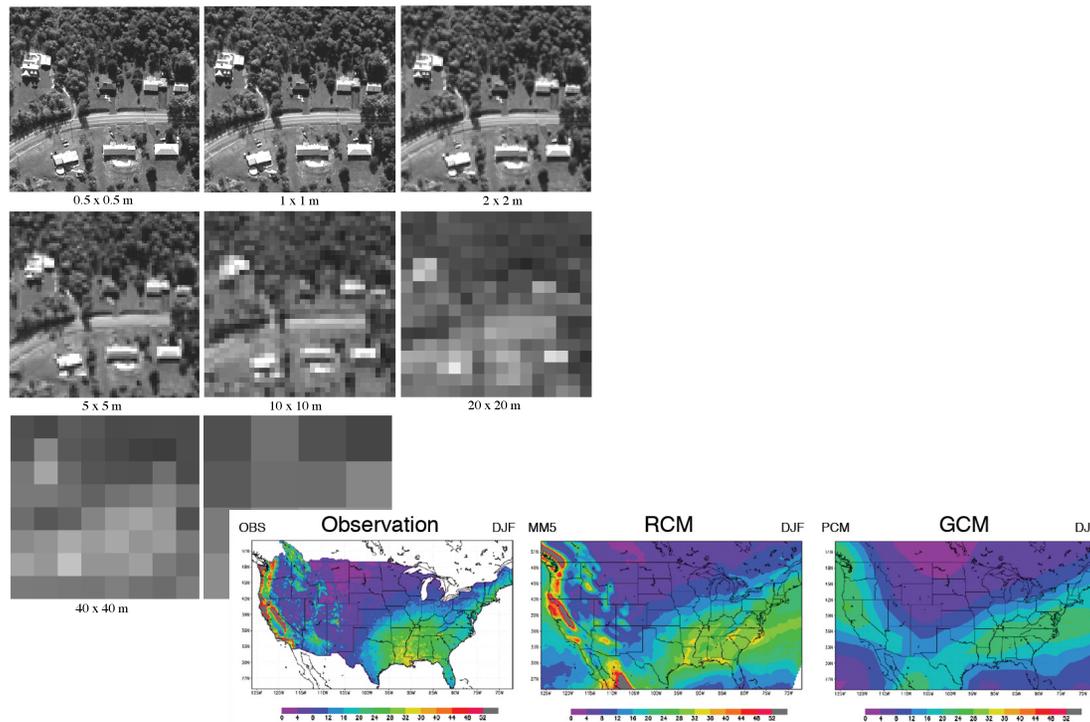
Sensitivity

- Sensitivity to initial conditions
- Thresholds and tipping points
- Nonlinearity



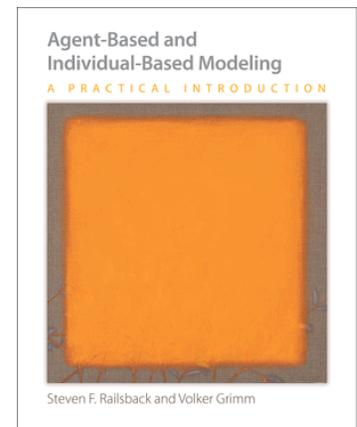
Scale

- Artifacts such as MAUP or resolution/extent
- Emergence and supervenience

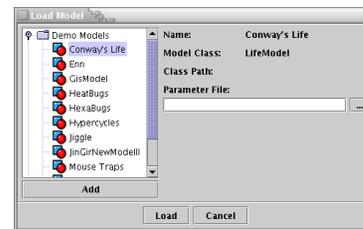


Methodological Strategies

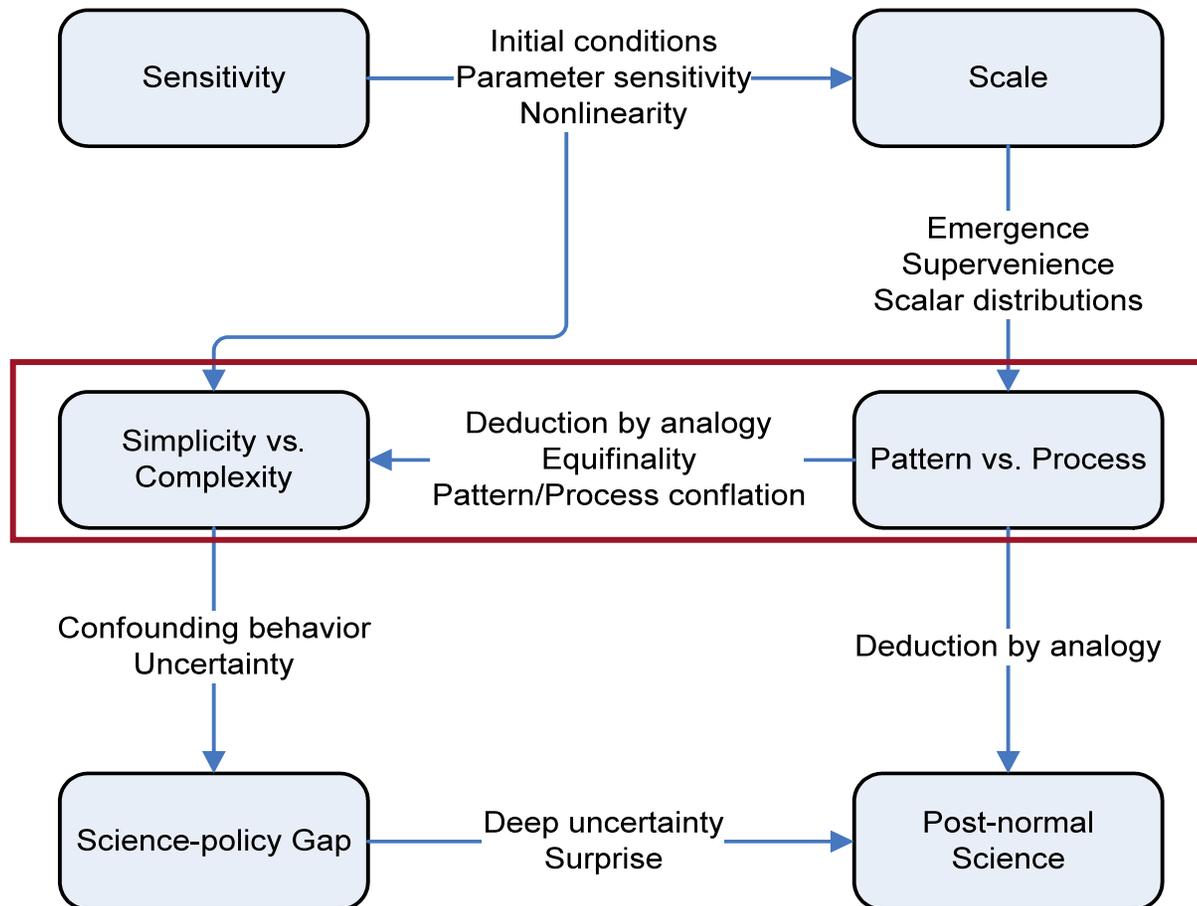
- Balance sensitivity and metastability
- Ongoing model improvements
- Common data, models, schemas
 - REPASt, Swarm, NetLogo
 - ODD, MR. POTATOHEAD
 - Open ABM



open
abm

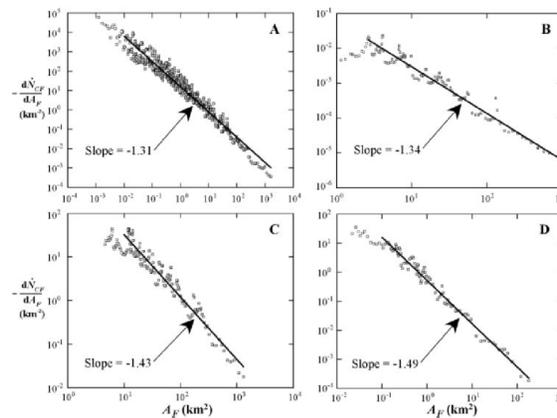
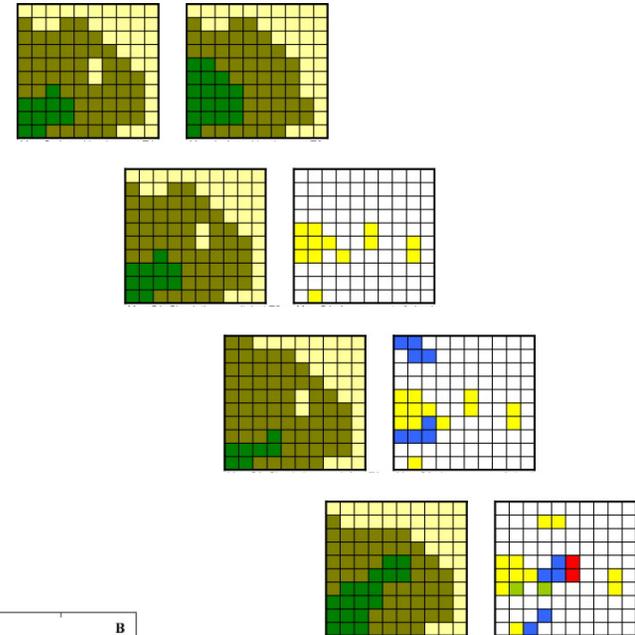


Conceptual Challenges



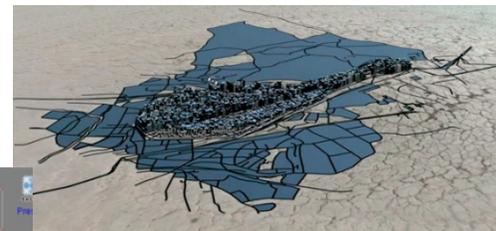
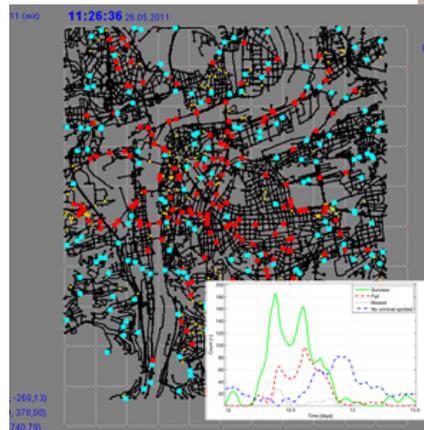
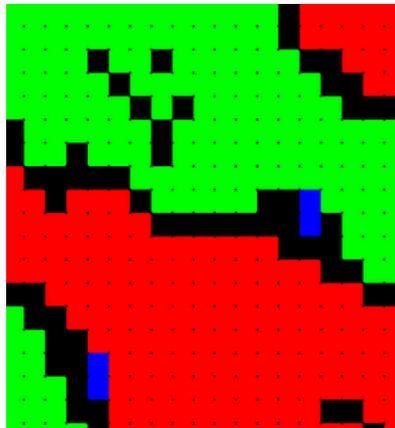
Pattern vs. Process

- Much focus on pattern
- Deduction via analogy
- Equifinality



Simplicity vs. Complexity

- Simple/general vs. complex/specific
- Reconciling simplicity with real complexity



Conceptual Strategies

- Focus on real world process-pattern linkages
- Model comparisons and nesting
- Interdisciplinarity



CPC Roadmap

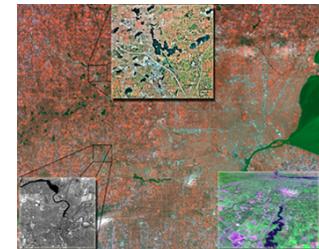


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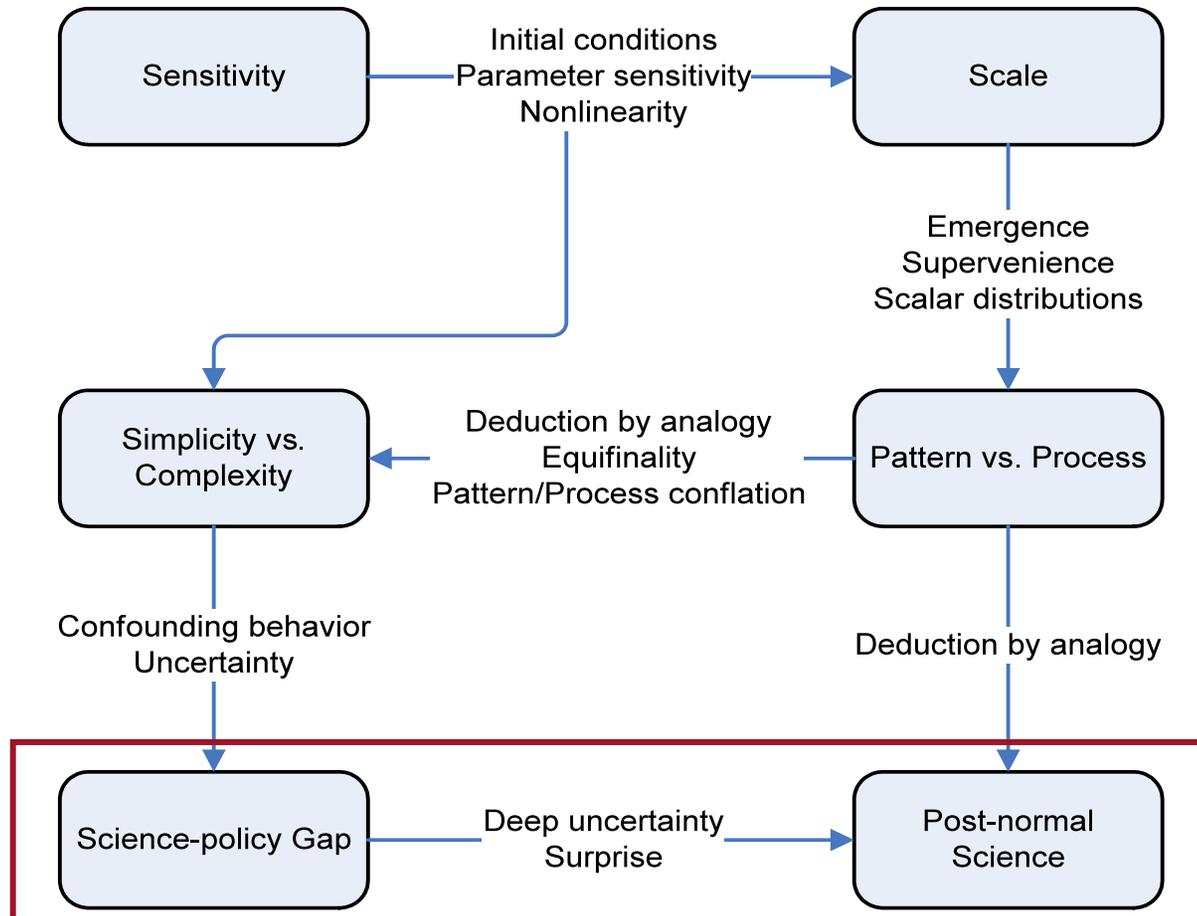
Centre for Advanced
Spatial Analysis



SLUCE 2



Policy Challenges



Science-Policy Gap

- Science swayed by power, politics, and media
- CHES often exhibit confounding behavior
- Model evaluation feeds the gap



Post-Normal Science

- Situations characterized by deep uncertainty, large decision stakes, and disputed values
- CHES increasingly post-normal



Policy Strategies

- Models as heuristic or scenario devices
- Risk communication / social change research
- Inclusion of non-scientists from beginning



CORMAS participatory modeling

ASU Decision Theater



Conclusion

- Exciting times!
- Much to be gained from better integration between IAM and ABM communities



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