

SPATIOTEMPORAL MODELS

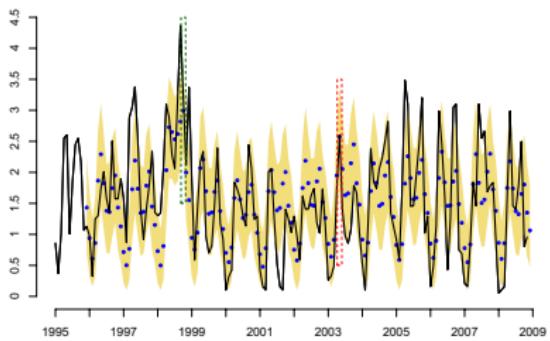
Dexter Barrows

Edgar González

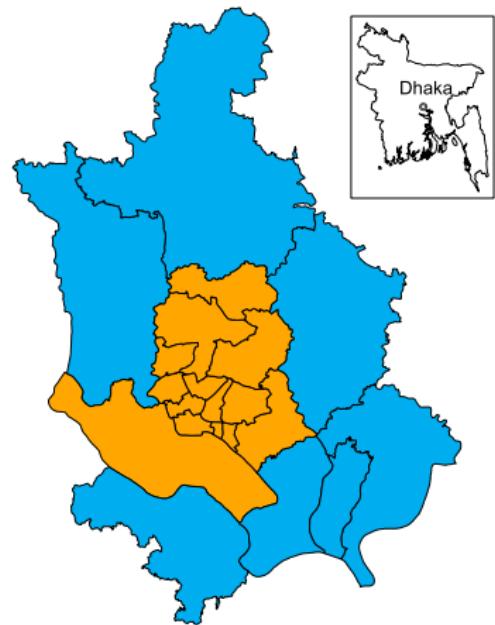
1. What are they?
2. Applications
3. Spacial Data and Model Classes
4. Static Spatiotemporal Models
5. Dynamic Spatiotemporal Models
6. Cholera in Dhaka
7. Spatial SEIR
8. Making Waves

What are they?





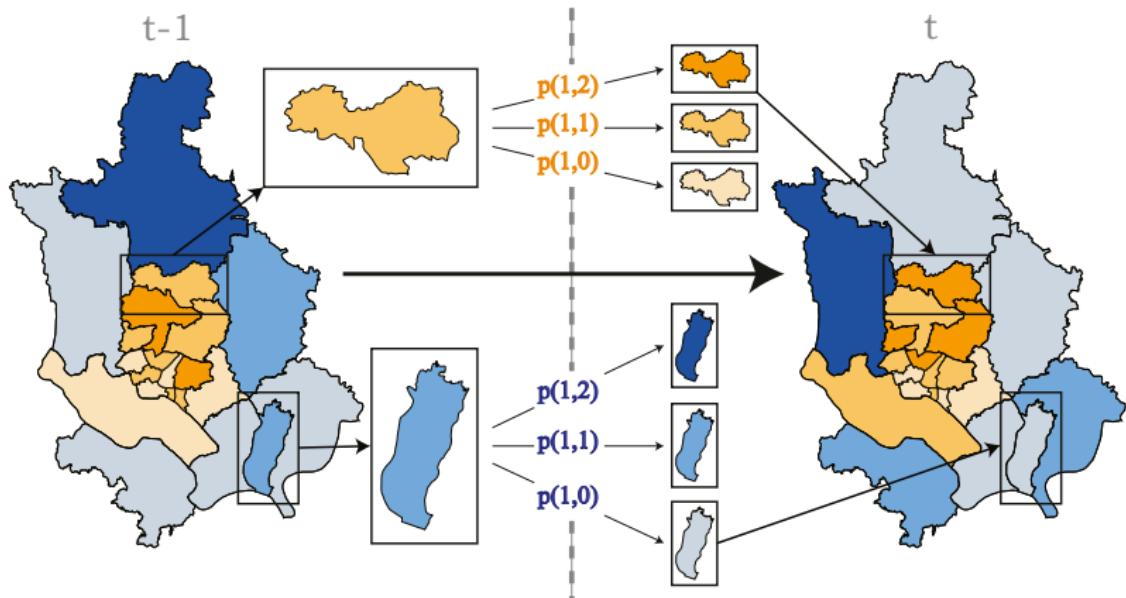
+



TIME

SPACE

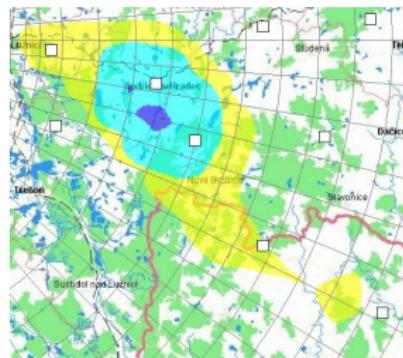
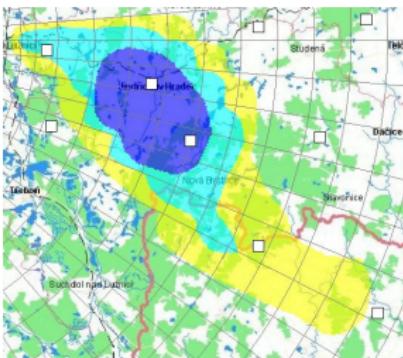
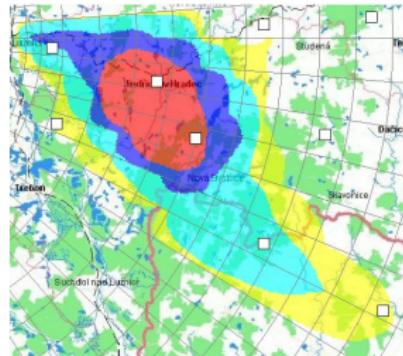
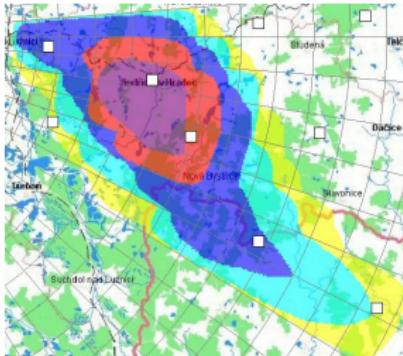
Reiner et al., 2012



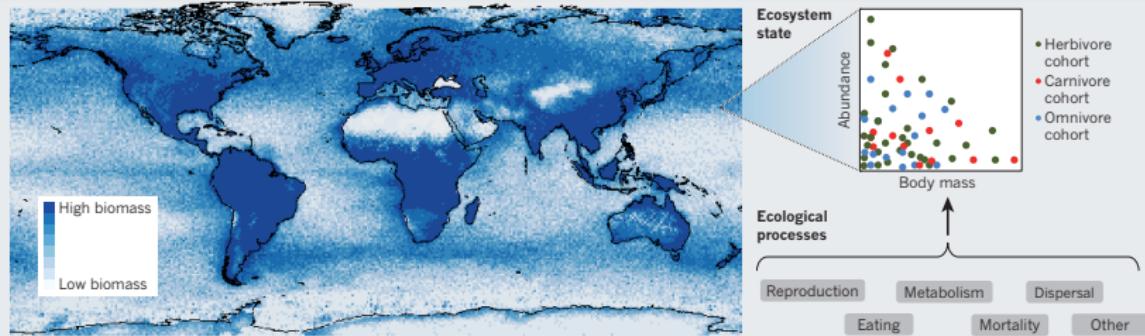
Reiner et al., 2012

Applications

2

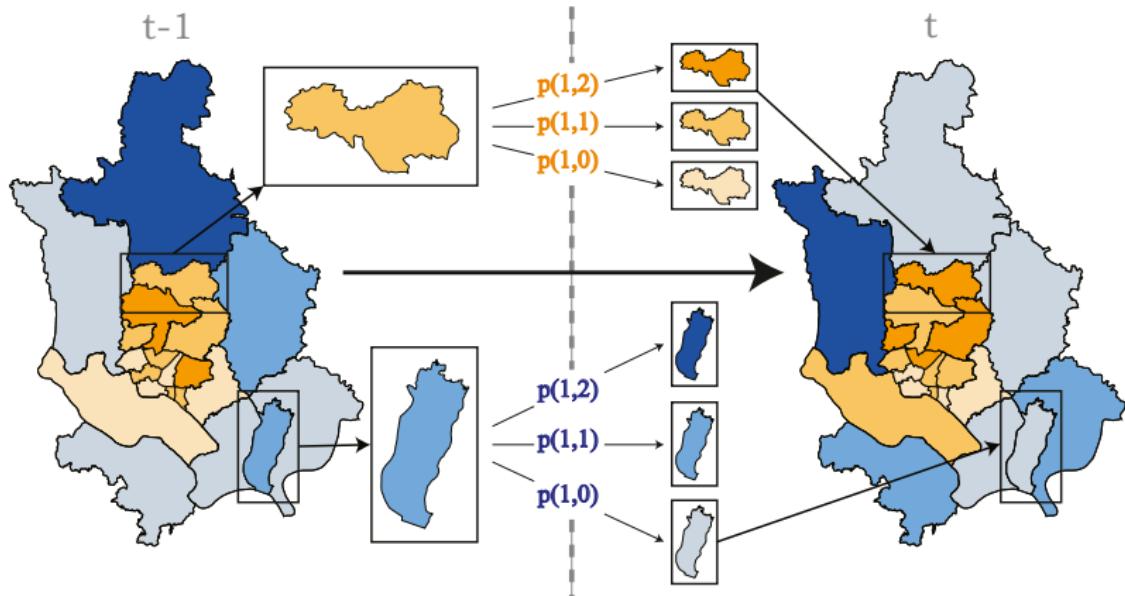


Pollution
Hofman, 2008

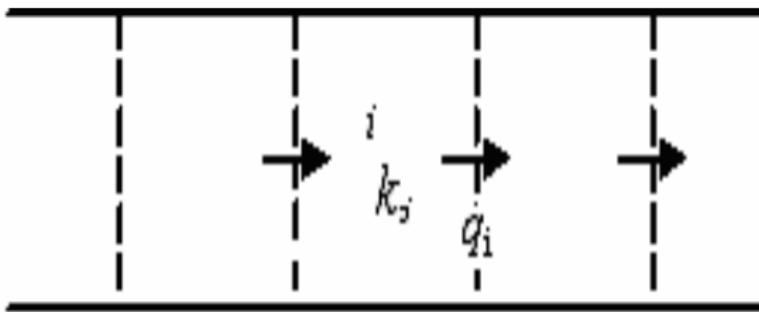


Ecology / Migration

Drew Purves et al., 2013



Epidemics
Reiner et al., 2012



Traffic
Sau et al., 2007

Spacial Data & Model Classes



Temporal

Time

State

Process

Continuous

Continuous

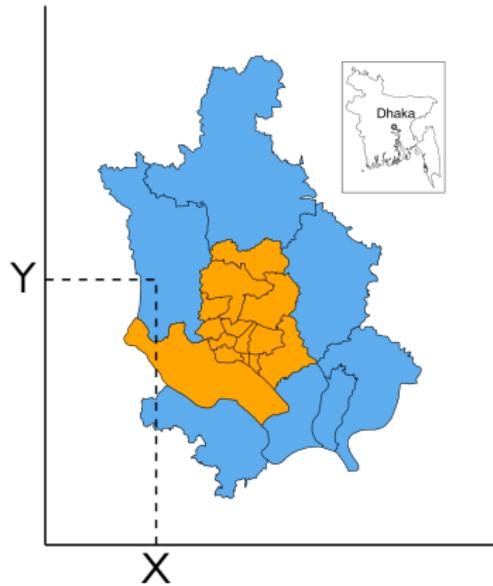
Deterministic

Discrete

Discrete

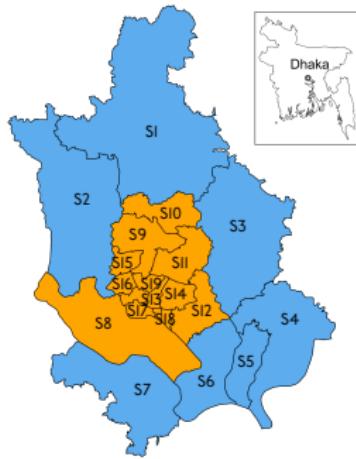
Stochastic

Temporal		Spatial	
Time	State	Process	Space
Continuous	Continuous	Deterministic	Point
Discrete	Discrete	Stochastic	Cell Area



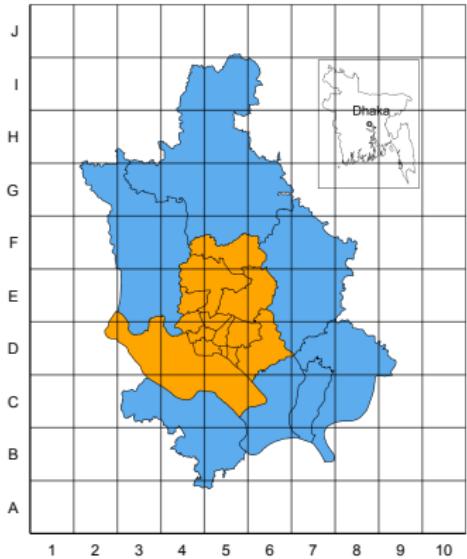
Location		Incidence		
x	y	$z_l^{(x_l, y_l)}$...	$z_n^{(x_n, y_n)}$
x_l	y_l	$z_l^{(x_l, y_l)}$...	$z_n^{(x_l, y_l)}$
:	:	:	..	:
x_m	y_m	$z_l^{(x_m, y_m)}$...	$z_n^{(x_m, y_m)}$

Points



Location	Incidence			
	S	Z _I	...	Z _n
S _I	Z _I ^(S_I)	...	Z _n ^(S_I)	
:	:	⋮	⋮	⋮
S _m	Z _I ^(S_m)	...	Z _n ^(S_m)	

Areas



Location		Incidence		
Alp	Num	z_I	...	z_n
A	I	$z_I^{(A,I)}$...	$z_n^{(A,I)}$
:	:	:	..	:
J	10	$z_I^{(J,10)}$...	$z_n^{(J,10)}$

Cells

Easy(er)

Discrete
Deterministic
Cells

Hard

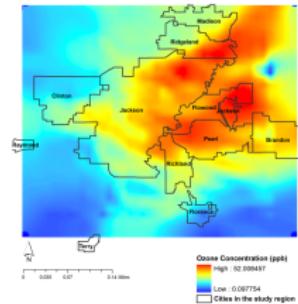
Continuous
Stochastic
Points



COMPLEXITY

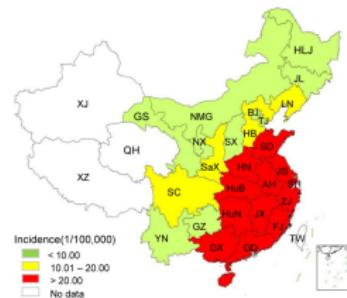
POLLUTION

Discrete Time
Continuous State
Stochastic
Points



EPIDEMIC

Discrete Time
Discrete State
Stochastic
Areas



PDE

Continuous Time
Continuous State
Deterministic
Points

