Synopsis:
To resolve or not to resolve?
To nest or not to nest?
Seems best not to.
(in some cases at least)

Intro: Coastline Change: many scales
Where to start??
- Action during storms!
- Transport starts w/waves, grains, ripples, millimeters—meters, seconds—hours
- Ripples affect currents, bars, etc.
- For large scale, long term, w/small
- Observations: Large is different than small

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Results
small scales (< ~ km): var. independent of duration
larger scales (kms): change increases w/time; var. maxima, 4 – 8 km; scale of max. increase w/time; scaling consistent w/diffusion (4 km -> T ~ 3 yrs; 10 km -> T ~ 16 yrs)

Results black = 1996  red = 2005

Shoreline smoothing — at large scales

Conclusion:
Treat emergent dynamics when available
(like fluid dynamics vs. molecules)
More insight, and large-scale results may not depend on small-scale processes
(e.g. could be worms or ice lenses...)

Interpretation: Coastline diffusion at large scales
- Behaviors differ w/ scale
- At smaller scales, timescales < yrs, independent undulations
- At larger scales, diffusion dominates (change ~ curvature)

Modeling large scale dynamics directly:
diffusion, antidiffusion, and finite amplitude behaviors
- Discretize alongshore sediment flux, C. of mass
- Variables limited to:
  - Shoreline orientation (on scales ~ km)
  - 'Deep-water' wave height, direction
  - (No ripples, bars, channels...)
- Partly rule-based (wave shadowing; coupling wave models soon)

e.g.:

Terrestrial example: modeling hillslope evolution
Terrestrial analogy:
Hillslope evolution:
Sediment flux = e(t, x) (e.g. present)

With Explicit Numerical Reductionism:
What if sub model for worm behaviors isn’t just right...
And what about other hillslopes (e.g. dominated by small girls)?
Or:
empirically based, mathematically rigourous, modeling of hillslopes directly?