

Prognosis and Modeling

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Prognosis and Modeling

- help to understand uncertainties
- help to understand complex systems
- test our understanding of the process (validation)

Prognosis

Implications

Predictions

Forecast

Projected outcomes

Qualitative

Plausible Futures

Modeling

Projections

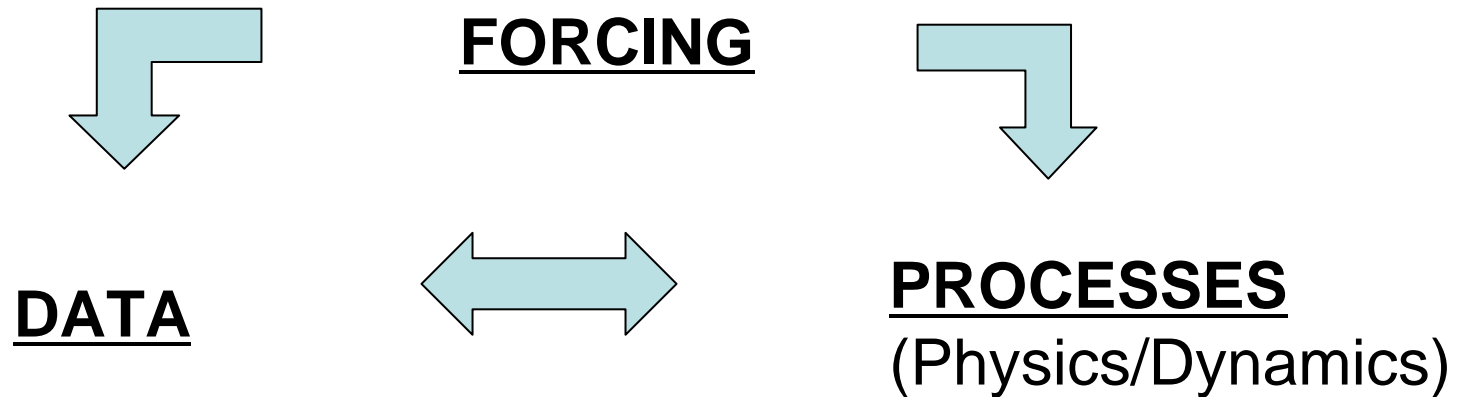
Scenarios

Sensitivity to B.C.'s

Thresholds

Quantitative

Predictions



Arctic tends to be data poor (accessibility, density, limited long time series, downscaling, representation)

Problems in Arctic with Forcing Functions (human, physical, biological drivers; e.g., Discharge)

Processes not fully understood (missing physics, nonlinearities)

Processes - 3 types of models



Physical

Ocean circ.
Hydrological
Met./climate
Sed. Transport
Morphodyn.
Wave dyn.
Tides (internal)
Storm surge
Permafrost
Unknown

Ecosystem

Driven by Phys.
Various levels of
sophistication
(box to sys. dyn.)
nutrients
temperature
snow cover
predation
sea ice
productivity

Economics

resources
fisheries
Oil & gas
Hard minerals
aquaculture
tourism
infrastructure
pollution

Scenarios

- Involves 1) climate, 2) social economics 3) physical/ecosystems, 4) governance
- Interpretation of model results
- Tendency toward conservative scenarios (in hindsight, more severe)
- Scientist worried about being alarmists
- Short-term weather events a notable exception (e.g., hurricanes)

Risk Assessment

- Risk Aversion
- Uncertainty (in data, forcing, physics, representation)...really important but not done enough
- Validation with data (hindcasts, re-analysis, but short record lengths)

Gradualism vs. Tipping Points (thresholds)

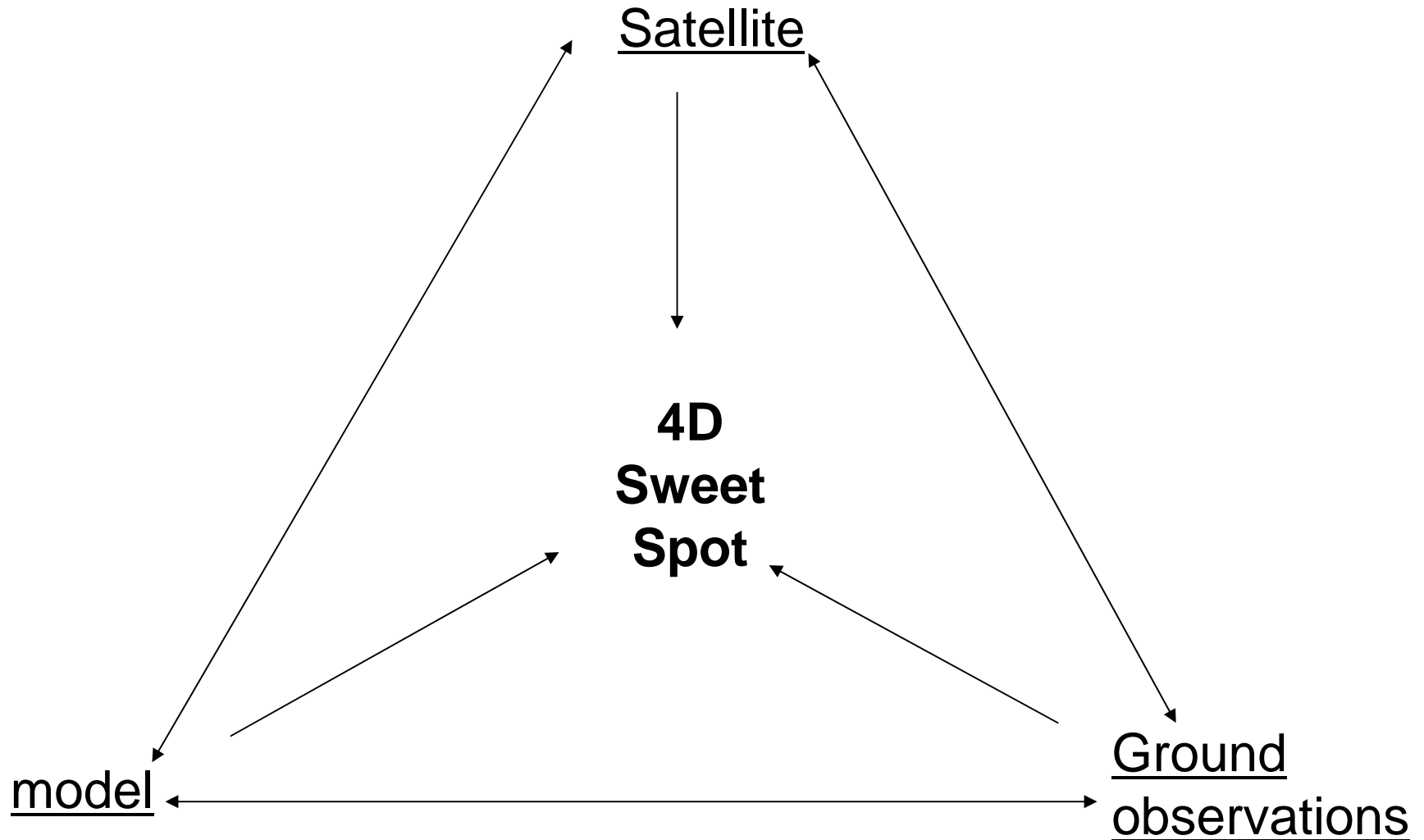
Engineering Time Scales (days - years)

vs.

Longer-term Morphodynamics (decades
- centuries)

4-D Data Assimilation

(Inversion algorithms, conditional simulations)



How should the Arctic Coastal Community proceed w.r.t. Prognosis and Modeling?

Concerns:

- Indigenous peoples/historical knowledge/capacity building
- Coastal management
- Village level modeling vs. big system earth science modeling
- Enforcing the “South’s” will on the “North” not accepted locally
- Recommendations (collaboratively found rather than prescriptive/imposed)
- Two-way communication
- Education & outreach

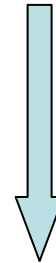
Prediction

Generic modeling
Or
Impact-oriented
(local policies)



Prognosis

With level
Of uncertainty



Recommendation
vs. policy statements

???????