

Utilizing a FAMOS hierarchy of sea ice models to identify their physical limitations

What is the main goal of a FAMOS sea ice modeling effort:

To improve synoptic to seasonal hindcasts and forecasts?

To better understand limitations on longer term coupled simulations and projections?

Or to gain a better understanding of physics that affect them both?

Constraints within a FAMOS sea ice model hierarchy

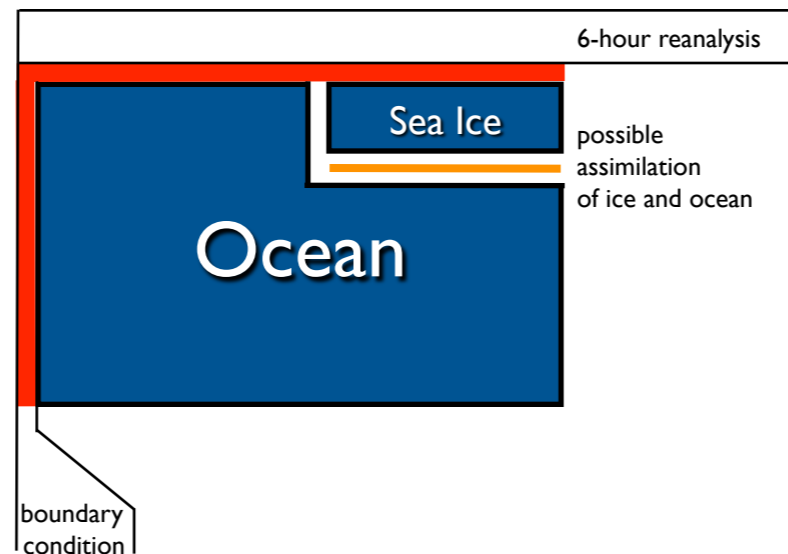
Stand-alone regional ice-ocean model




Most constrained ice-ocean system

assimilated
regional
ice-ocean

stand-alone
regional
ice-ocean

constrained at the coupling channel



-  -Oceanic constraint
-  -Coupling channels between component models
-  -Component models

Least constrained ice-ocean system

Constraints within a FAMOS sea ice model hierarchy

Stand-alone global ice-ocean model

Most constrained ice-ocean system

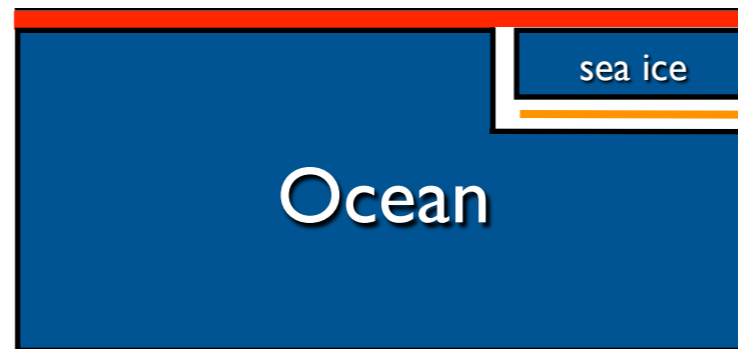
assimilated
regional
ice-ocean

stand-alone
regional
ice-ocean

global
ice-ocean

constrained at the coupling channel

6-hour reanalysis



 -Oceanic constraint

 -Coupling channels between component models

 -Component models

Least constrained ice-ocean system

Constraints within a FAMOS sea ice model hierarchy

Coupled regional model

Most constrained ice-ocean system

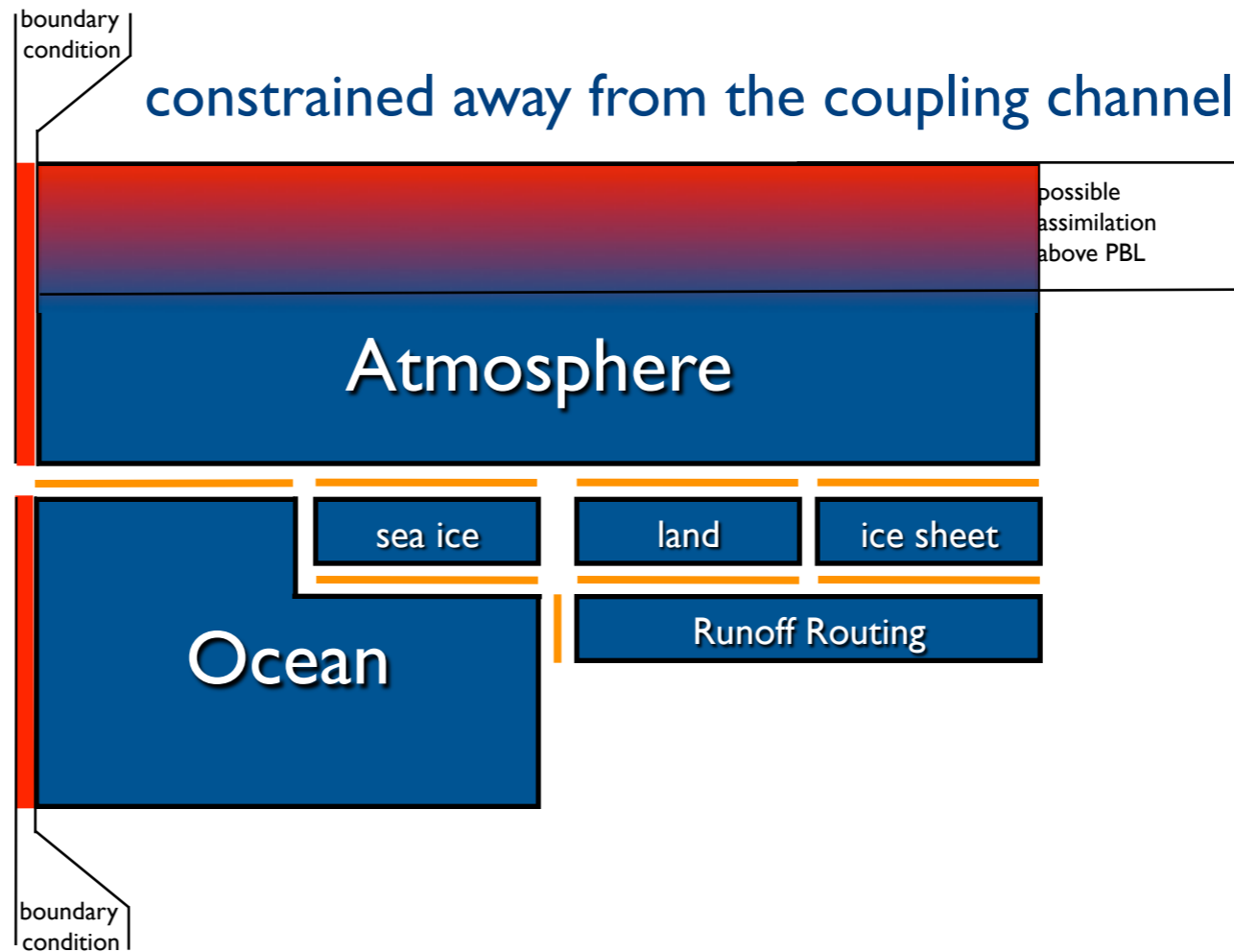
assimilated regional ice-ocean




stand-alone regional ice-ocean

global ice-ocean

coupled regional model

Least constrained ice-ocean system



-  - Atmospheric and Oceanic constraints
-  - Coupling channels between component models
-  - Component models

Constraints within a FAMOS sea ice model hierarchy

Coupled global model

Most constrained ice-ocean system

assimilated
regional
ice-ocean

stand-alone
regional
ice-ocean

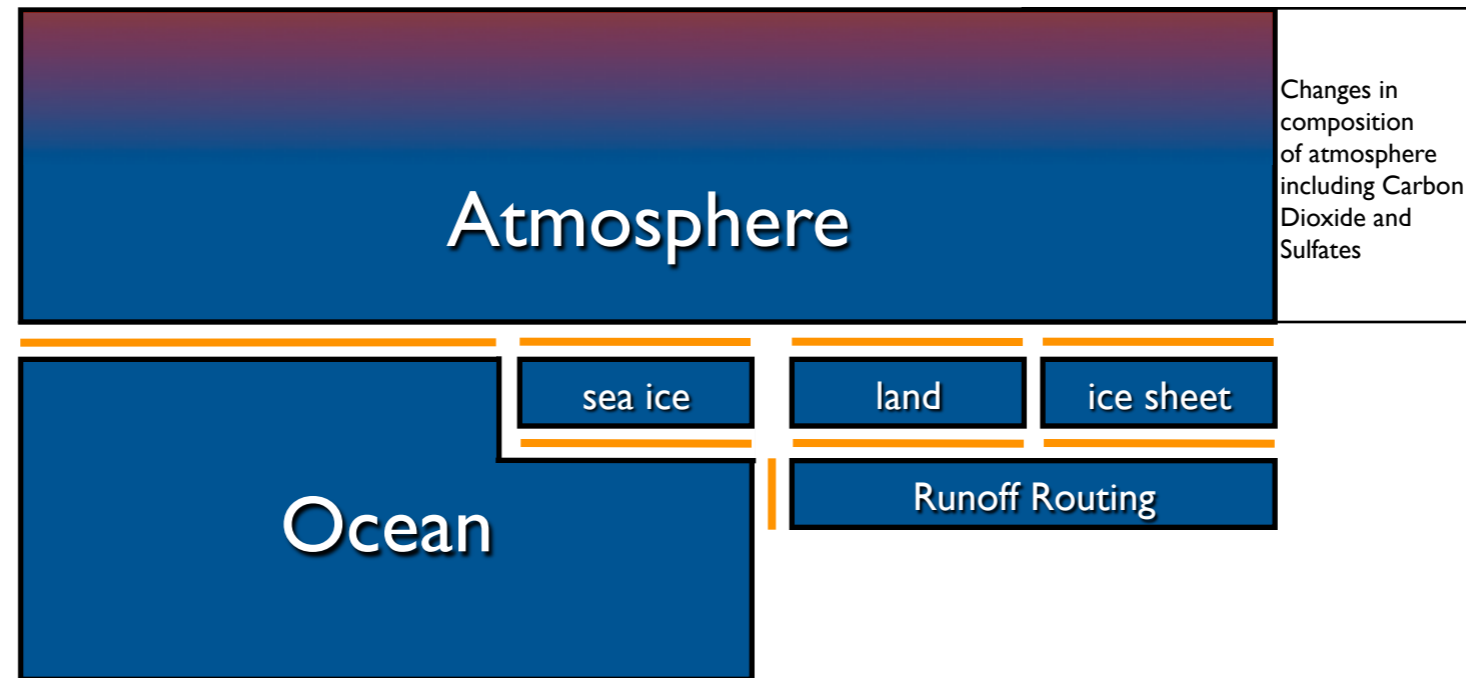
global
ice-ocean




coupled
regional
model

coupled
global
model

Least constrained ice-ocean system

constrained away from the coupling channel

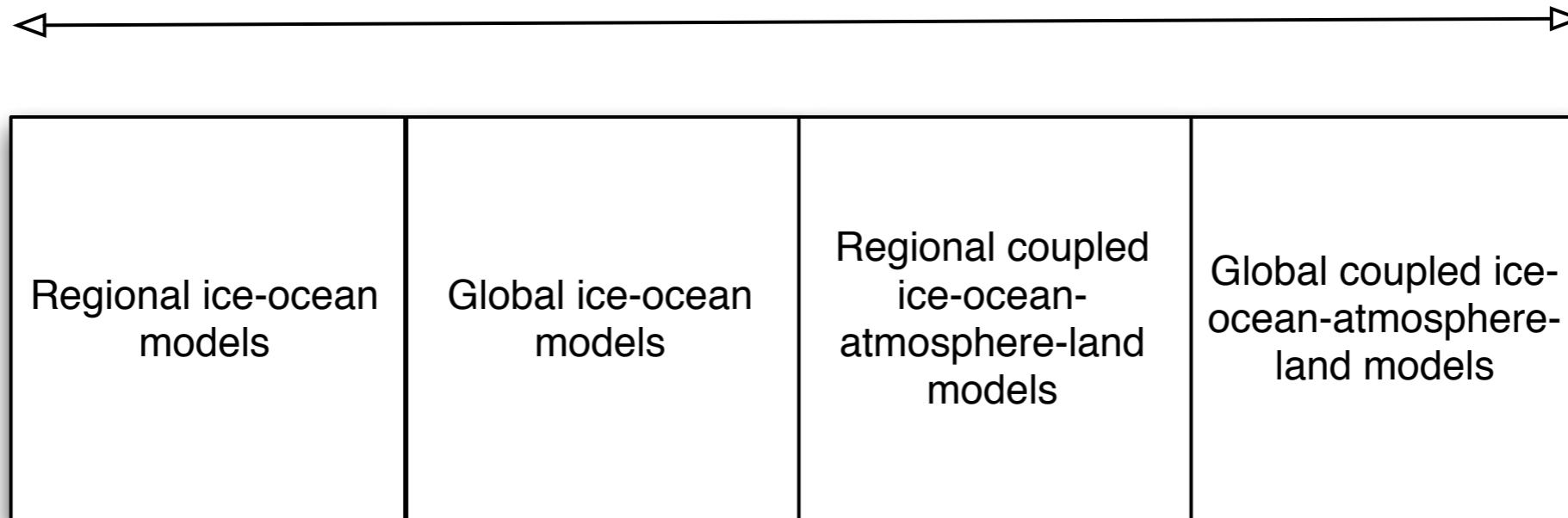


-  - Atmospheric constraint
-  - Coupling channels between component models
-  - Component models

Utilizing a FAMOS hierarchy of sea ice models

More constrained

Less constrained



Associated Sea Ice Model Metrics

← Most able to evaluate against observed synoptic to seasonal events →

← Most indicative of capacity of modeled system on decadal timescales →

← Physically derived metrics of equal relevance across timescales →

Some suggested physically-based metrics for which observations exist

In concert with a sparse set of metric on the basic performance of sea ice simulations, can we identify physically-based metrics meaningful across multiple model configurations, such as:

- Melt timing and melt rate
- Sea ice mechanics scaling
- Ice-atmosphere drag
- ...

What would the combined results from a FAMOS model hierarchy reveal about the underlying physics of extreme events, variability and change using such metrics?

Further consideration

Should a FAMOS sea ice project also consider atmospheric issues known to impact arctic sea ice simulations?

For coupled models, should we include radiation and microphysics considerations?

Is this within the scope of FAMOS?