Norwegian Meteorological Institute

Task 2.3
Utilizing seasonal atmospheric forecasts as forcing in sea ice prediction models

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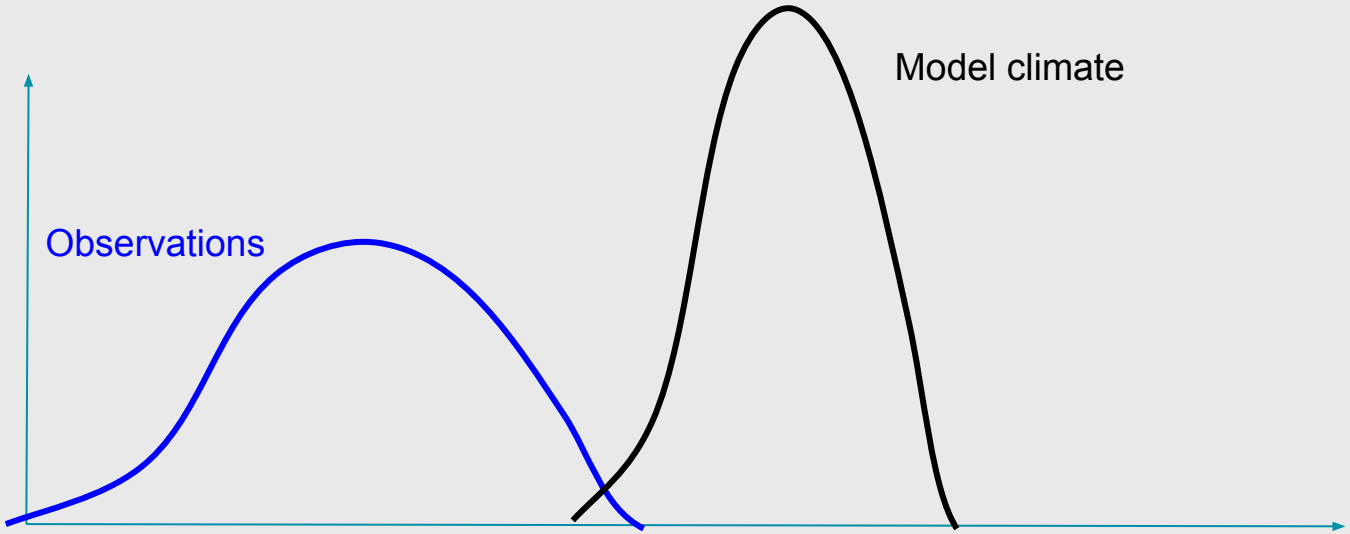
Background

- Inherent coupled problem
- Time-frame relevant for a global feedbacks.
- Possible teleconnections from autumn sea ice minimum to Eurasia winter circulation.

- Strong near surface coupling.
- Skill of regional models with diverse atmospheric forcing
- Mostly interested in the influence of sea ice surface properties on seasonal development of the ice cover
- Need for simplification

- Use seasonal forecasts from ECMWF as a source of "realistic(?)", atmospheric variability. Relies on a hope for better skill in the seasonal forecast for large scales than we could get from a climatology based on reanalyses.
- Assumes no influence from the regional model on large scale atmospheric circulation.
- Could be useful if we have "better" information about SST and sea-ice than the global forecast model.
- The regional model should allow for higher horizontal resolution than the global model.

“All models drift”



$X_m = X_o(t=0)$

$X_m = X_m(t)$

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The drift occurs over different time-scales

Spin-up time for typical components of the climate system (based on typical figures from NorESM).

- Weather: ~14 days
- Atmosphere: 1-2 years
- Ocean mixed layer - atmosphere: ~20 years
- Arctic sea ice: ~10 years (depending on amount of ice).
- Deep ocean: ~1000 years.
- Land: ~1000 years.

For seasonal forecasts the drift and the predicted anomalies are often of the same size.

Present forcing fields in metroms

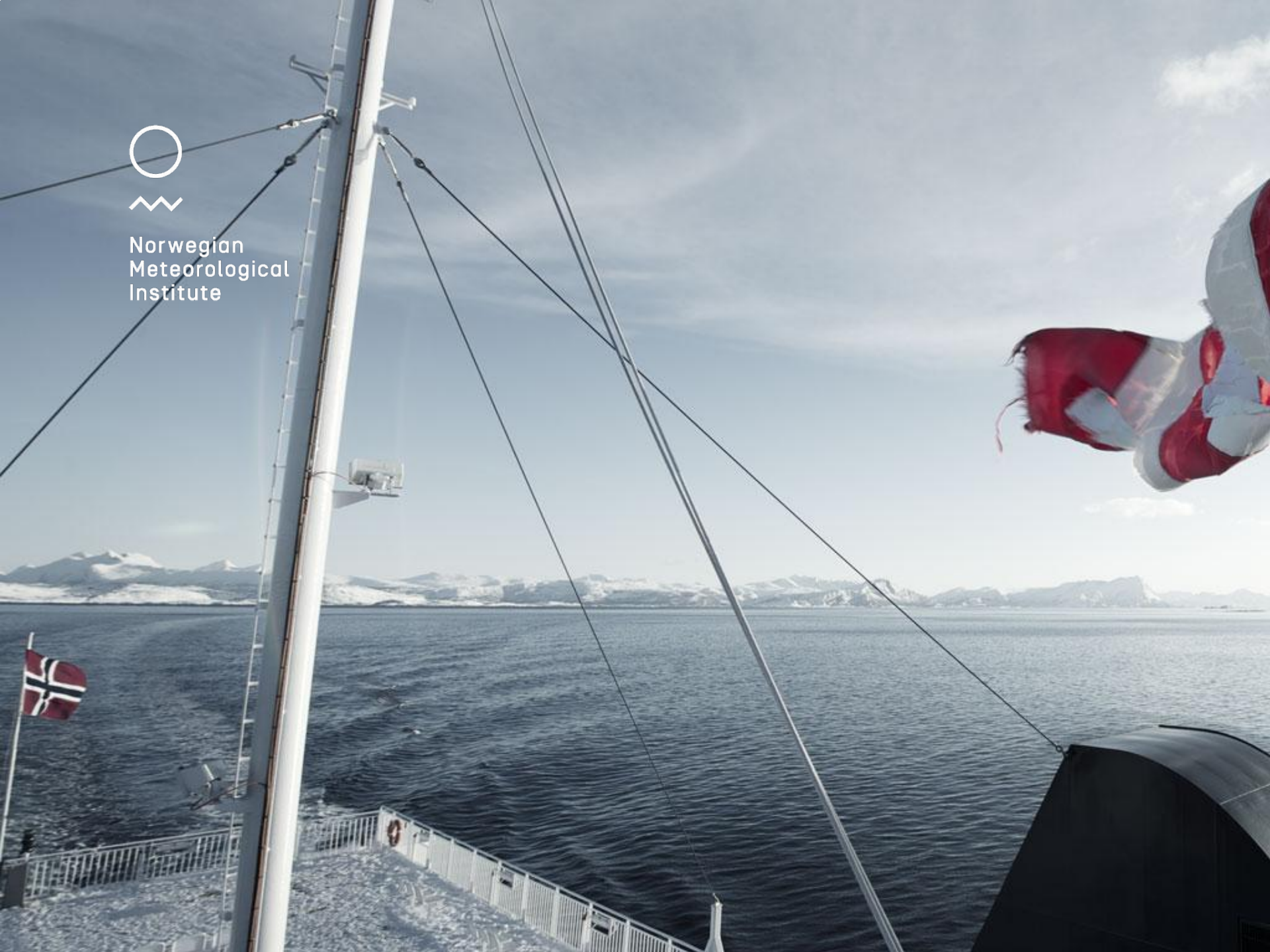
- Typically, regional ice-ocean models are forced with near-surface atmospheric fields.
  - 2-meter temperature
  - 2-meter humidity
  - 10-meter wind
  - Clouds and precipitation from atmosphere model, or alternative data-products.
  - Downward longwave radiation parametrized or from atmosphere model.
  - Downward solar radiation parametrized or from atmosphere model.
- Surface fields are strongly influenced by the lower boundary condition (analyzed ice cover, or forecast from a large scale model).
- Works fine when using reanalysed products based on good SST and sea ice estimates.

Alternative in forecast mode?

- Would it be better to use atmospheric fields from higher up in the atmosphere?
- How high? Upper part of the boundary layer?
- What about clouds? Low level clouds very important in the Arctic
- Radiation? Parametrized or from forecast?

- Easier to do bias correction in the free atmosphere?
- If clouds and temperature are bias corrected then radiation should be parameterized based on the new fields.

- The Method needs calibration by using historical reforecasts.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