

Towards a new Normal Year Forcing (NYF)

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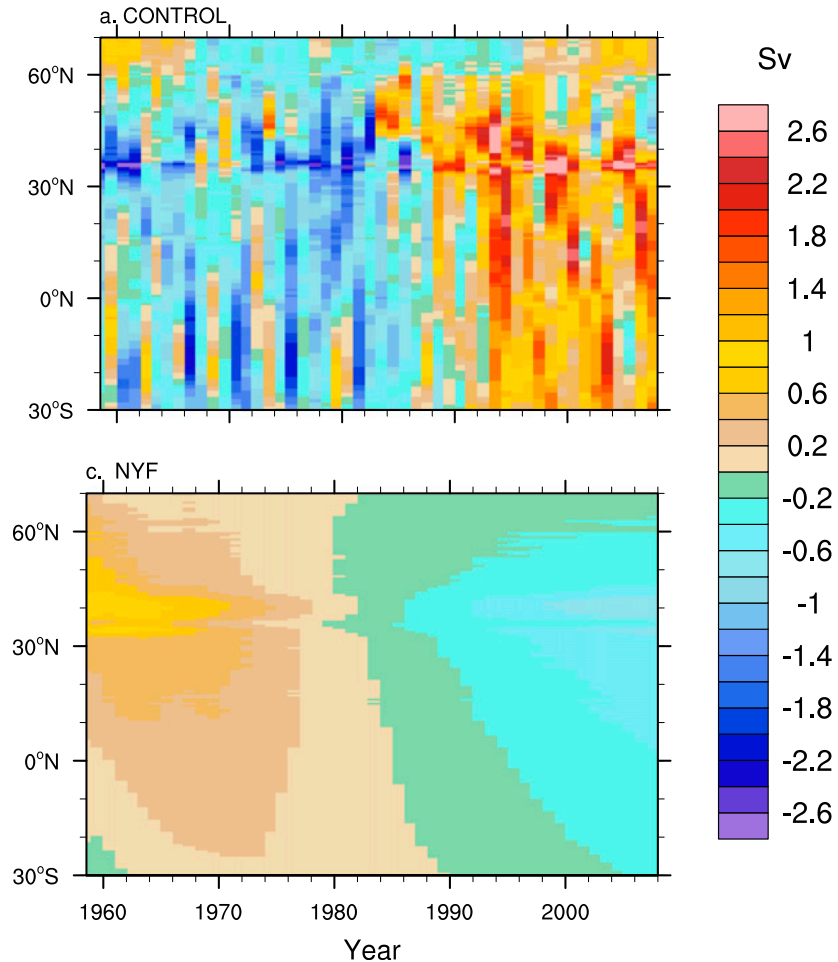
What is NYF?

Large and Yeager (2004) describes the construction of a single year of forcing suitable for ocean/sea-ice modelling that would serve to eliminate forced interannual variability. The desired attributes were:

1. Forcing infrastructure can remain unaltered
2. The seasonal cycle of forcing is to be retained
3. There should be realistic propagation of high-frequency forcing (weather) over the oceans
4. The climatological fluxes obtained from coupling NYF to observed SST should be as close as possible to the “observed” climatological fluxes
5. There should be a smooth transition from end-of-year to beginning-of-year to avoid initiating spurious transients when the forcing is repeated
6. NYF should not be overly weighted to any individual year (and the anomalous atmospheric state in that year)

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- LY04 note that “repeating the forcing of any single year doesn’t satisfy (4) and (6) above, even if there is some blending to satisfy (5).”
 - Therefore, a spectral averaging technique was used to generate NYF

- While NYF is extremely useful, there are several drawbacks:
 - It does **not**, in practice, produce the same equilibrium ocean/ice state as IAF



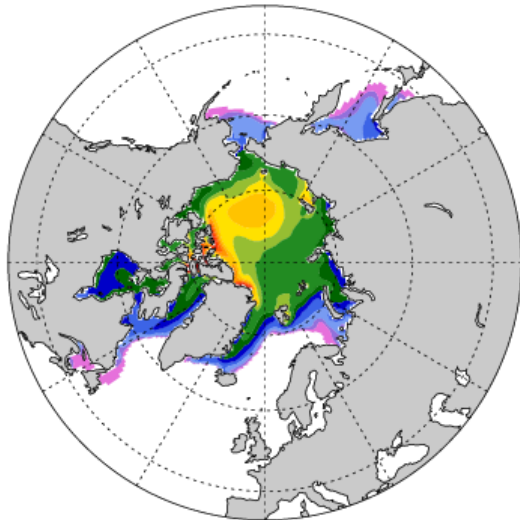
Yeager and Danabasoglu, 2014: The Origins of Late-Twentieth-Century Variations in the Large-Scale North Atlantic Circulation, *J. Climate*, 27, 3222-3247.

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CORE NYF

Case g12b8.103
ANN Mean Years 0308-0312

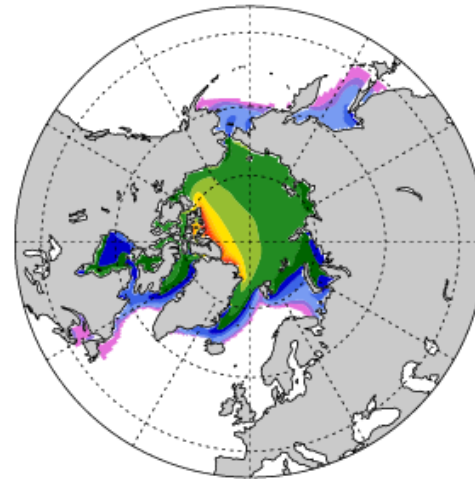
grid cell mean ice thickness m



JRA55

g14b6.JRA55.02 Yrs 0236 - 0260

grid cell mean ice thickness m



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 - Radiation and precipitation fields lack weather variance
 - Complicated; hard to generate

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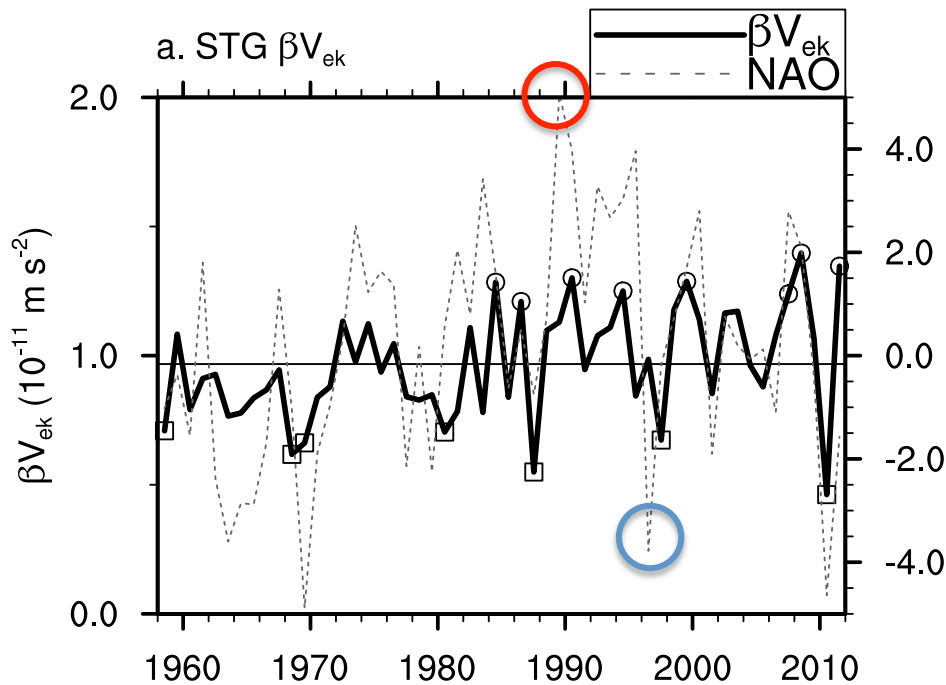
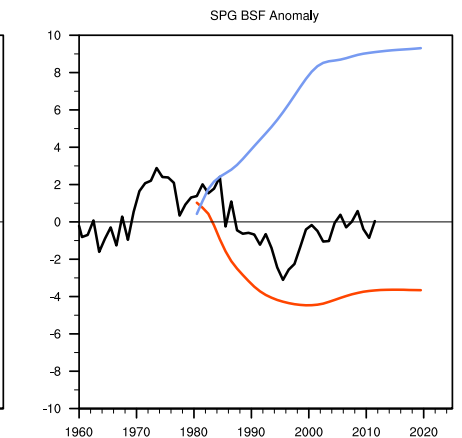
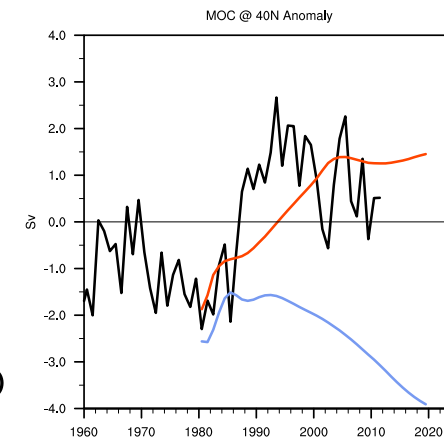
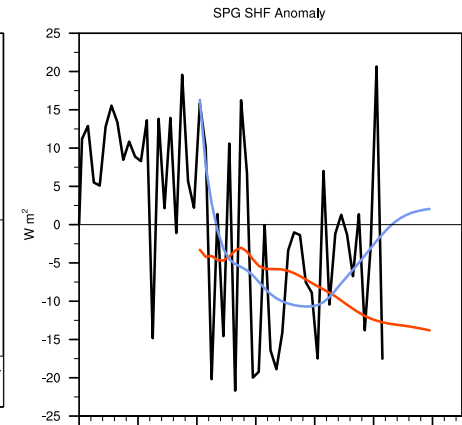
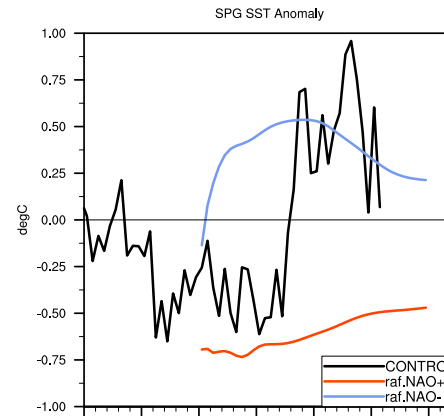
➔ We propose revisiting/revising requirements/expectations of NYF

➔ A well-chosen repeat annual forcing (RAF) data set may serve for all key intents and purposes:

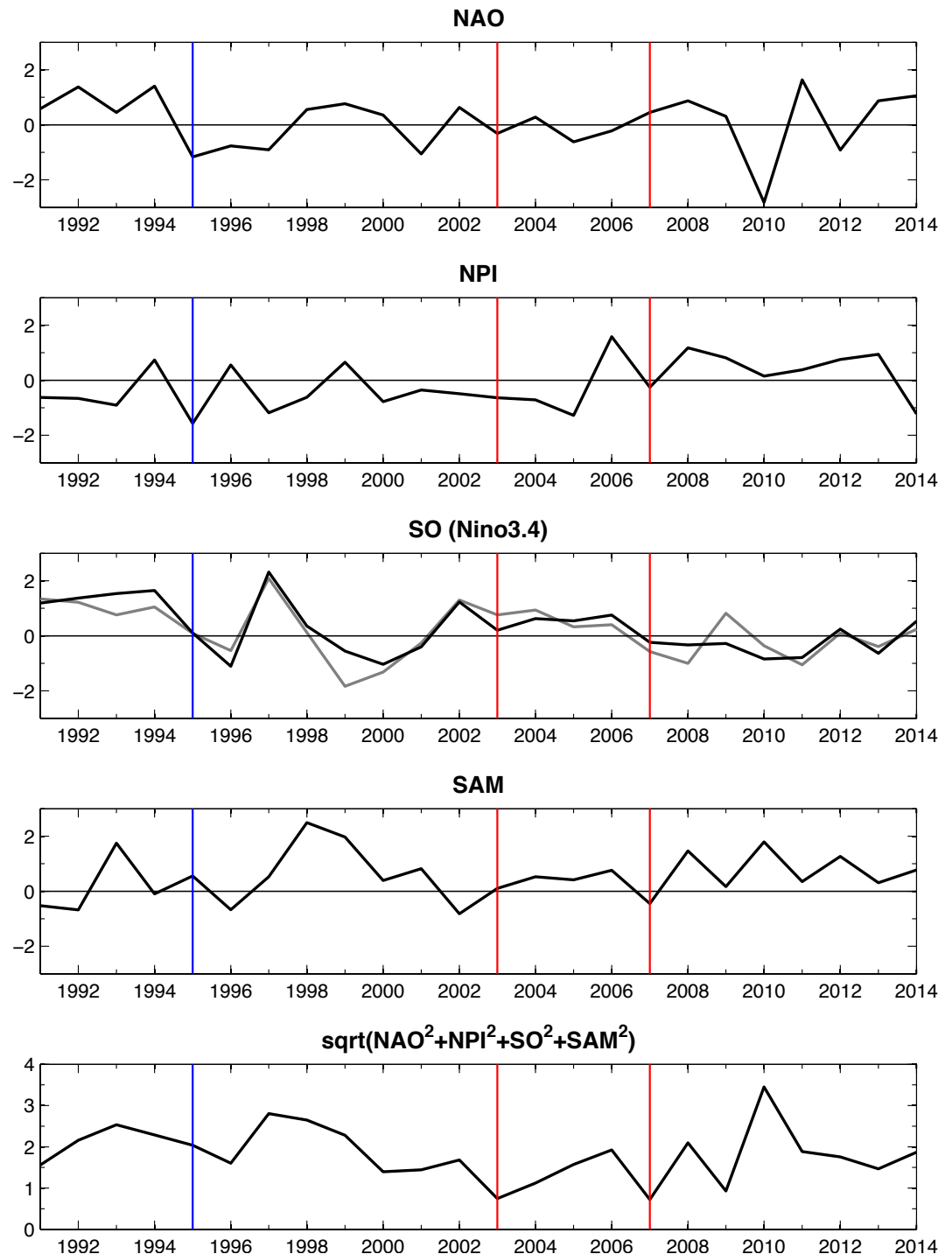
- Elimination of forced interannual variability
- Quasi-climatological (non-anomalous) atmospheric state
- Well-defined single-year forcing data for coordinated experiments

RAF for Mechanism Testing

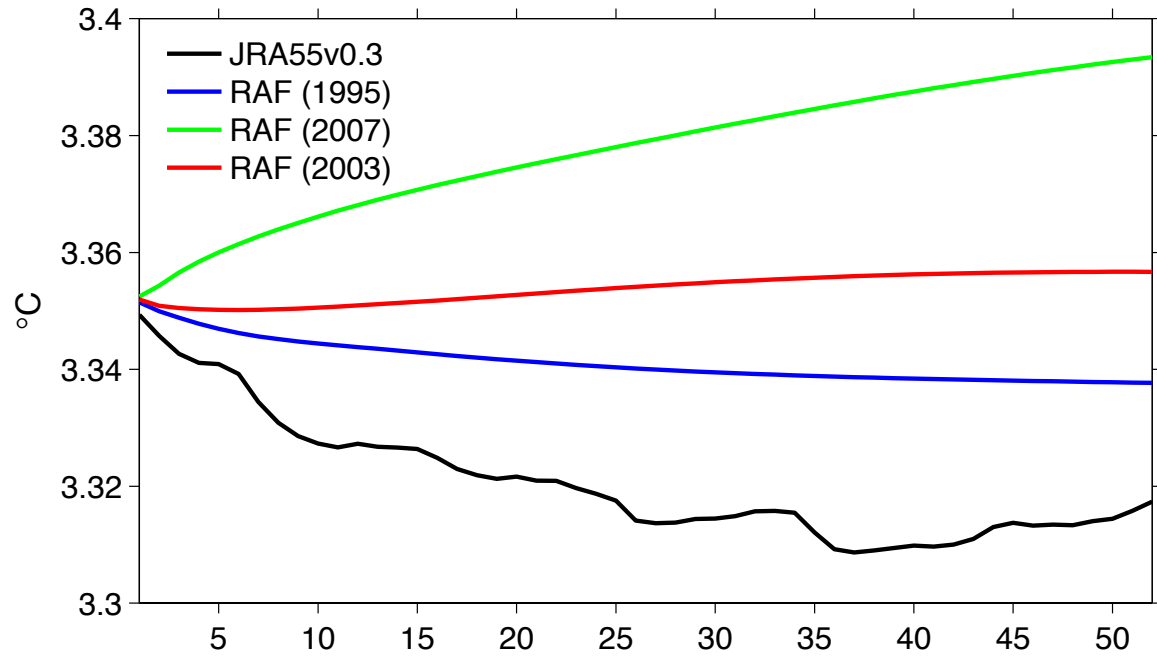
- Persistent NAO+ / NAO- forcing in coupled ocean/sea-ice configuration
- RAF ("Repeat Annual Forcing") NAO+:
 - January-June 1989
 - July-December 1988
- RAF NAO-:
 - January-June 1996
 - July-December 1995



RAF for model spinup



Temperature



Salinity

