Spectral nudging: A tie-in with Theme I

- ***Spectral nudging*** developed under Theme I suppresses OGCM biases with respect to climatological mean and seasonal cycle while leaving variability on other bands unfettered

- In Theme I interesting variability = eddies

- In Theme II interesting variability is seasonal/interannual/ decadal…

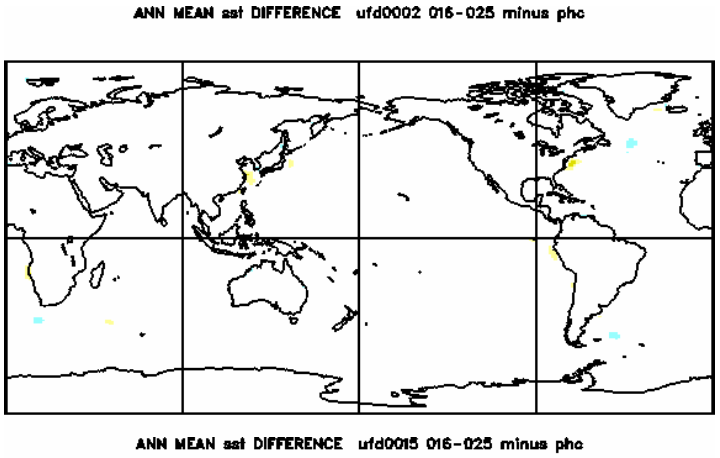
Spectral nudging in CCCma climate model

- Coded in CCCma OGCM by F. DuPont Jan-Feb 2009
- Debugging/testing by W. Merryfield & F. D.: Mar-Apr
- Implementation of standardized file management: May
- Multidecadal parameter sensitivity runs: May

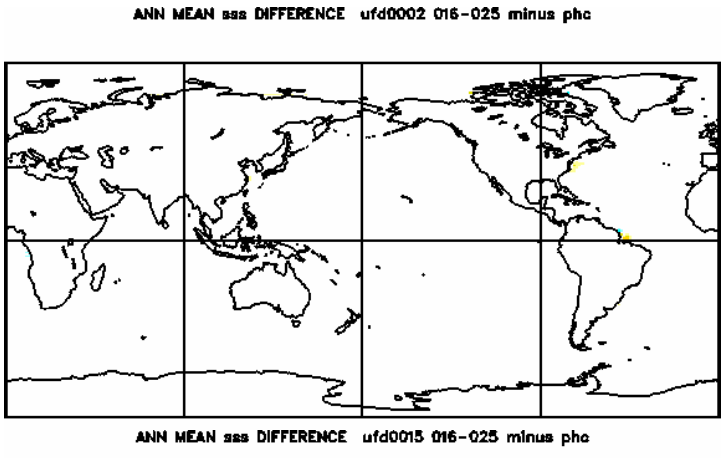
SST biases

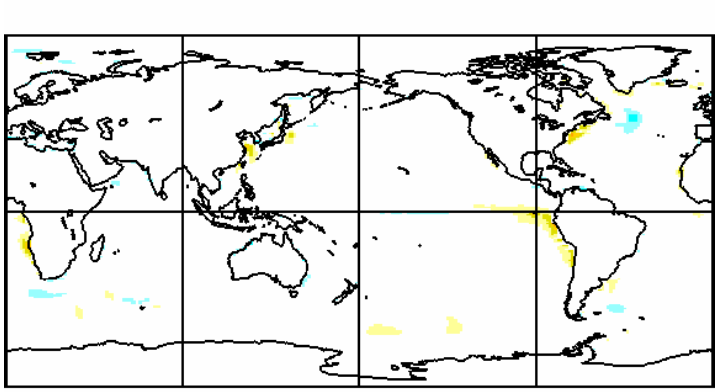
years 11-20 of run

SSS biases

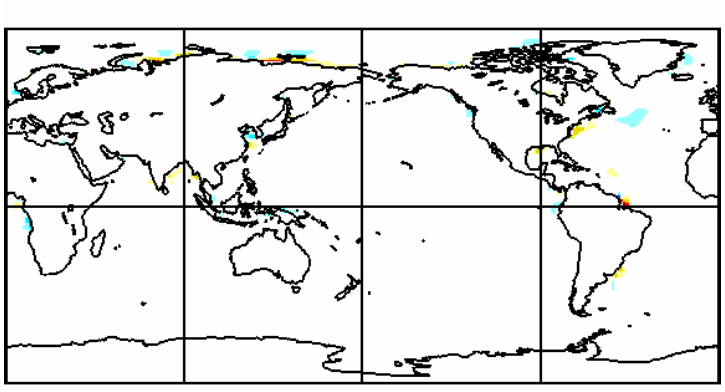


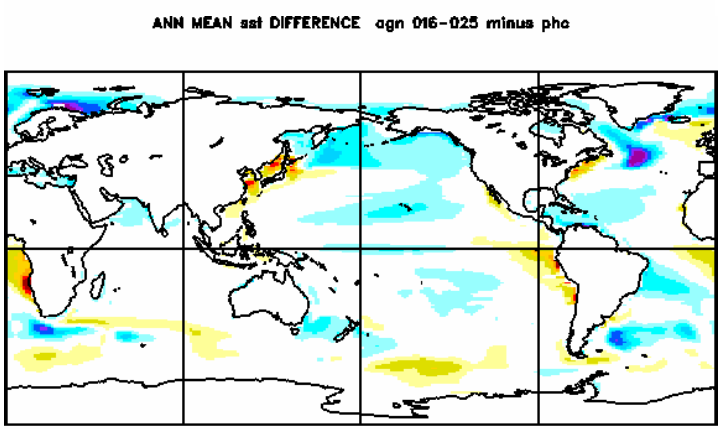
ufd0002 conventionally nudged





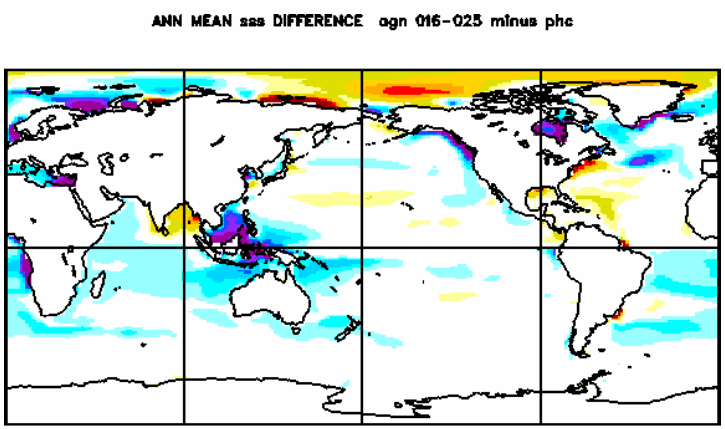
ufd0015 spectrally nudged





°C

agn freely running

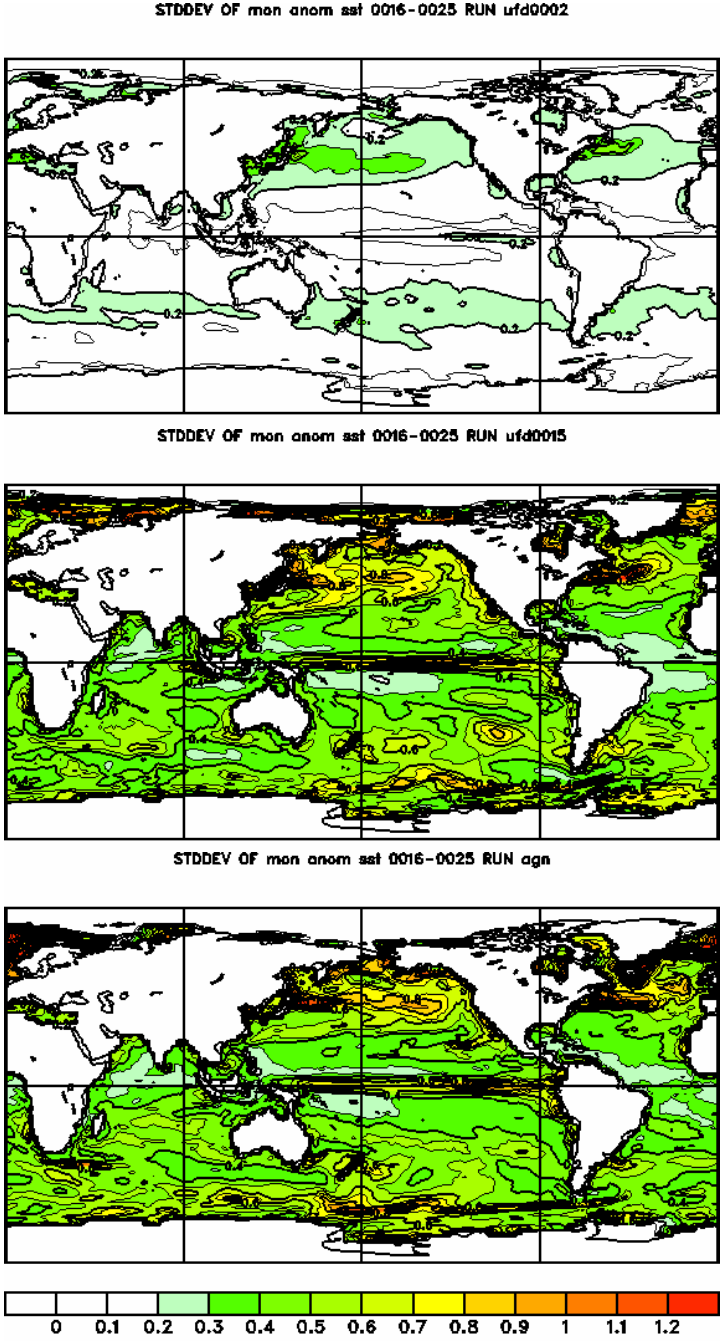


psu

mon SSTA standard dev

years 11-20 of run

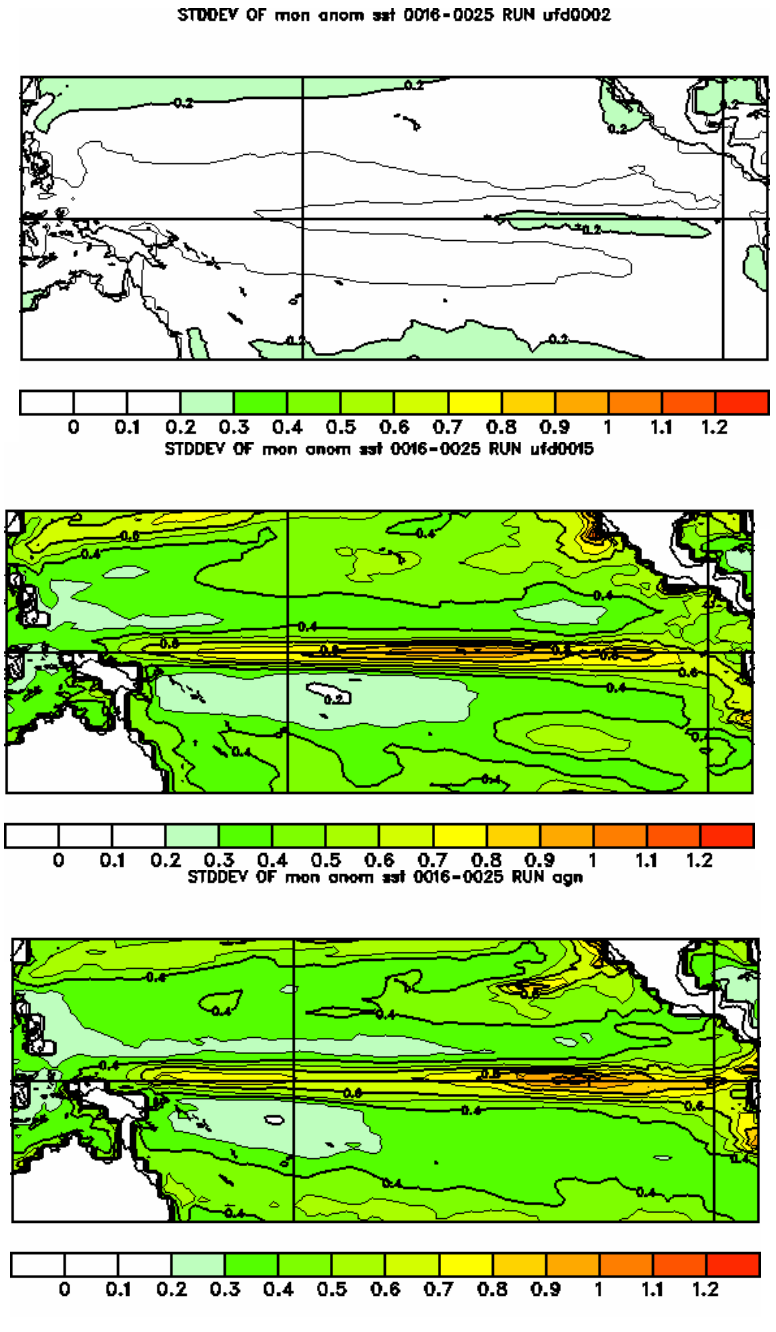
mon SSTA standard dev



ufd0002 conventionally nudged

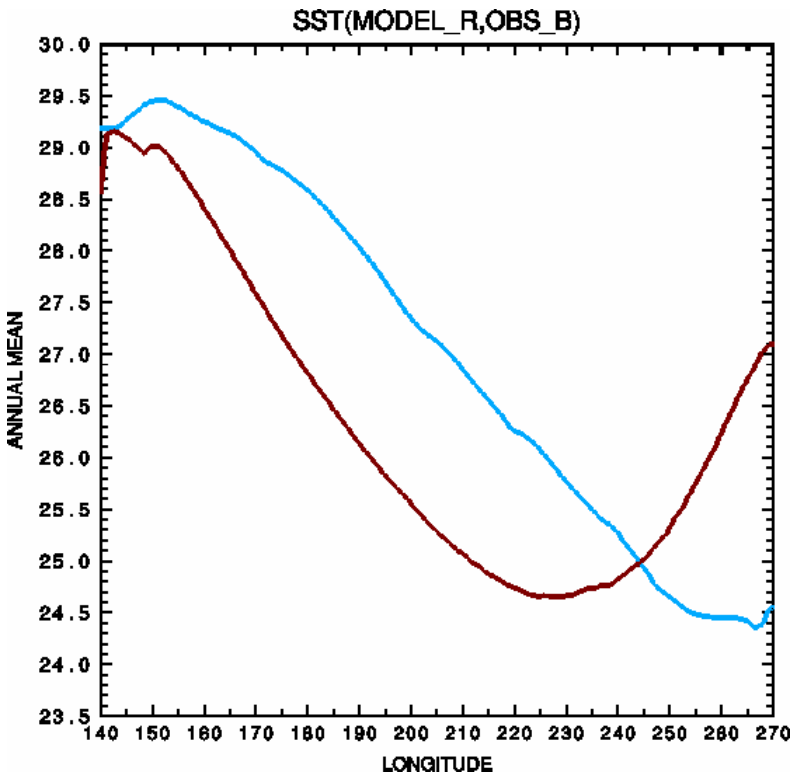
ufd0015 spectrally nudged

agn freely running

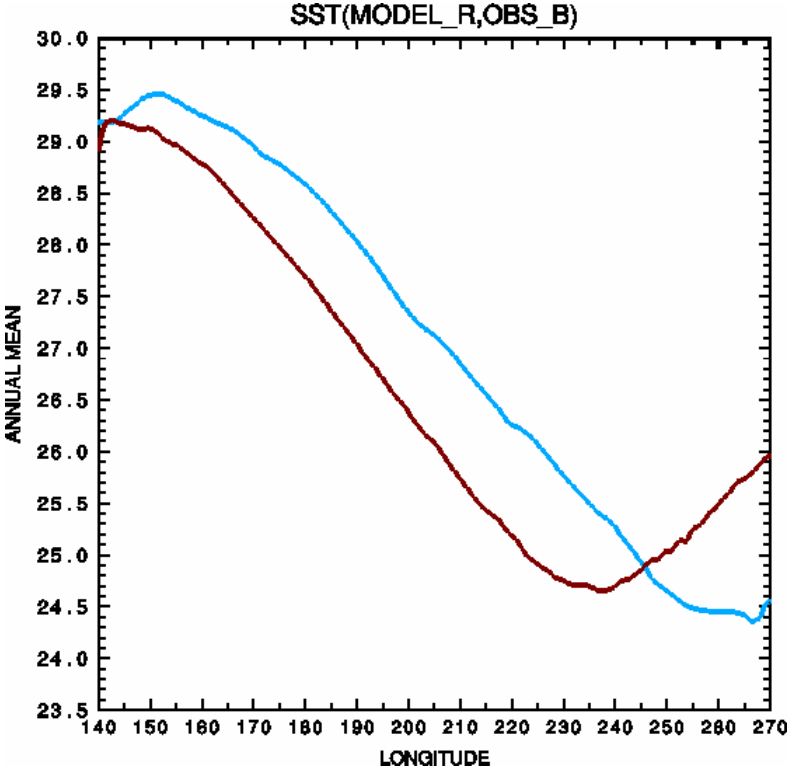


Equatorial Pacific SST biases

agn
freely
running



ufd0015
spectrally
nudged

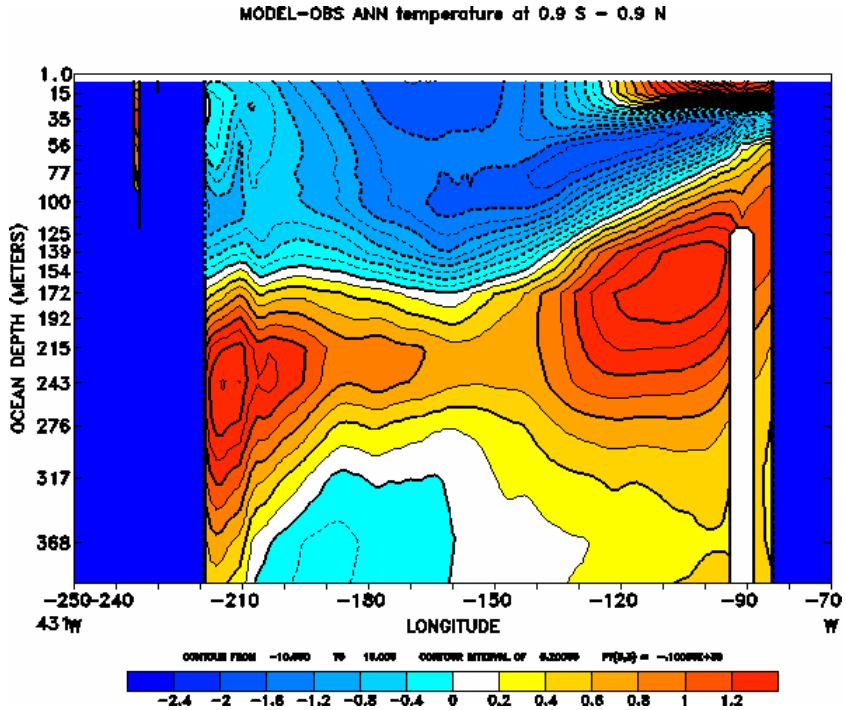


τ_{sp}=100d (spectral nudging time constant)

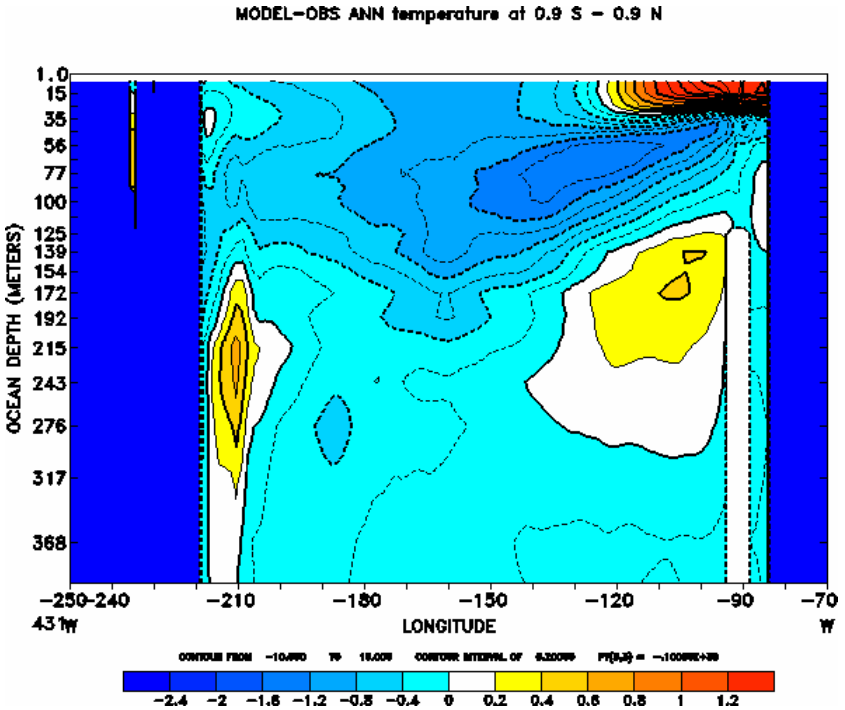
κ =(5 y)$^{-1}$ (bandwidth parameter)

Equatorial Pacific thermocline T biases

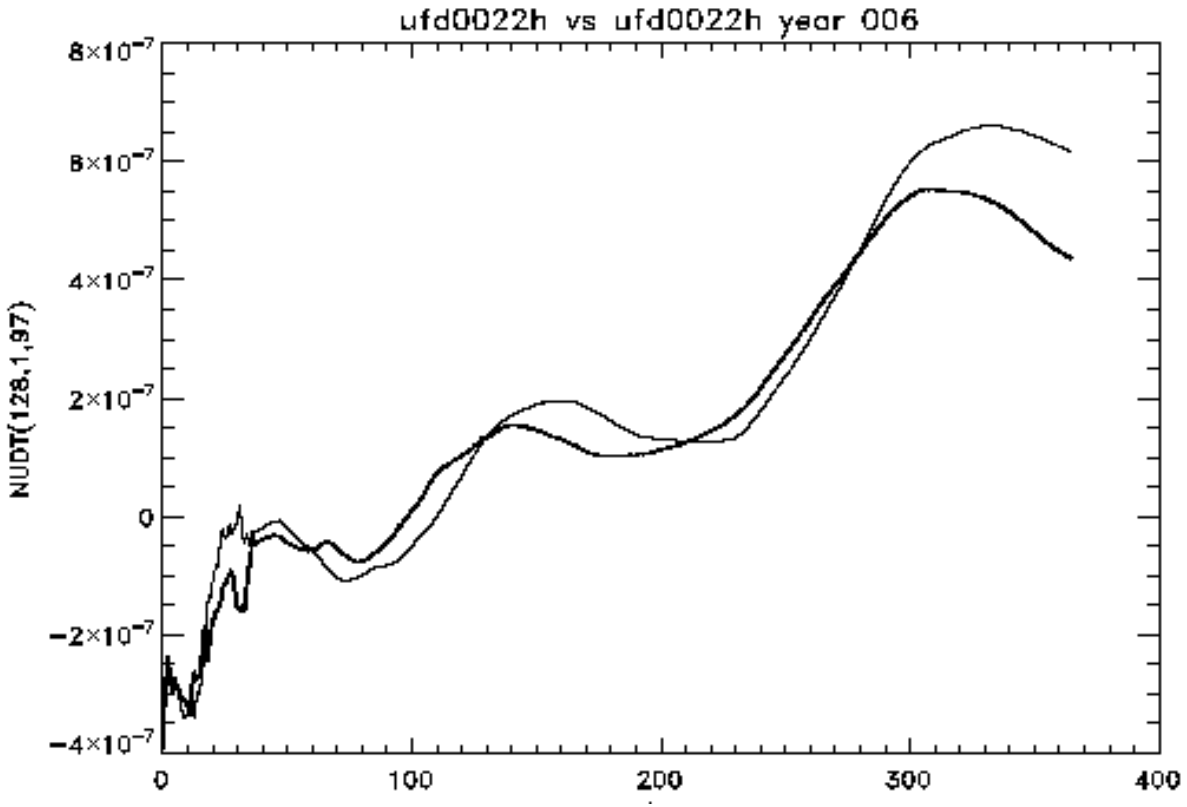
agn
freely
running



ufd0015
spectrally
nudged



Temperature nudging term near 0N, 180W for two “identical” runs



→ divergence begins early (8th time step at this location)

Current status

- Numerous parameter sensitivity tests running, e.g.
  - τ_{sp}=100d $\rightarrow$ 50d
  - decadal variability, trends admitted when κ =(5 y)$^{-1}\rightarrow$(20 y)$^{-1}\rightarrow$(40 y)$^{-1}$?
- "Dial back" surface enhancement of nudging from x4 to x2 or x1 when also directly nudging SST for forecast initialization
- Attempt seasonal forecasts when reproducibility problem fixed