Historical Ocean Ensemble Reanalyses

With:

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SODA Efforts

SODA – UMD:

With Dave Behringer/NOAA: Implement LETKF
Develop a coupled ensemble filter

Improve Arctic – Fresh and Salt water fluxes – Sea Ice

SODA – TAMU:

Historical reanalysis: mid-1800s to present

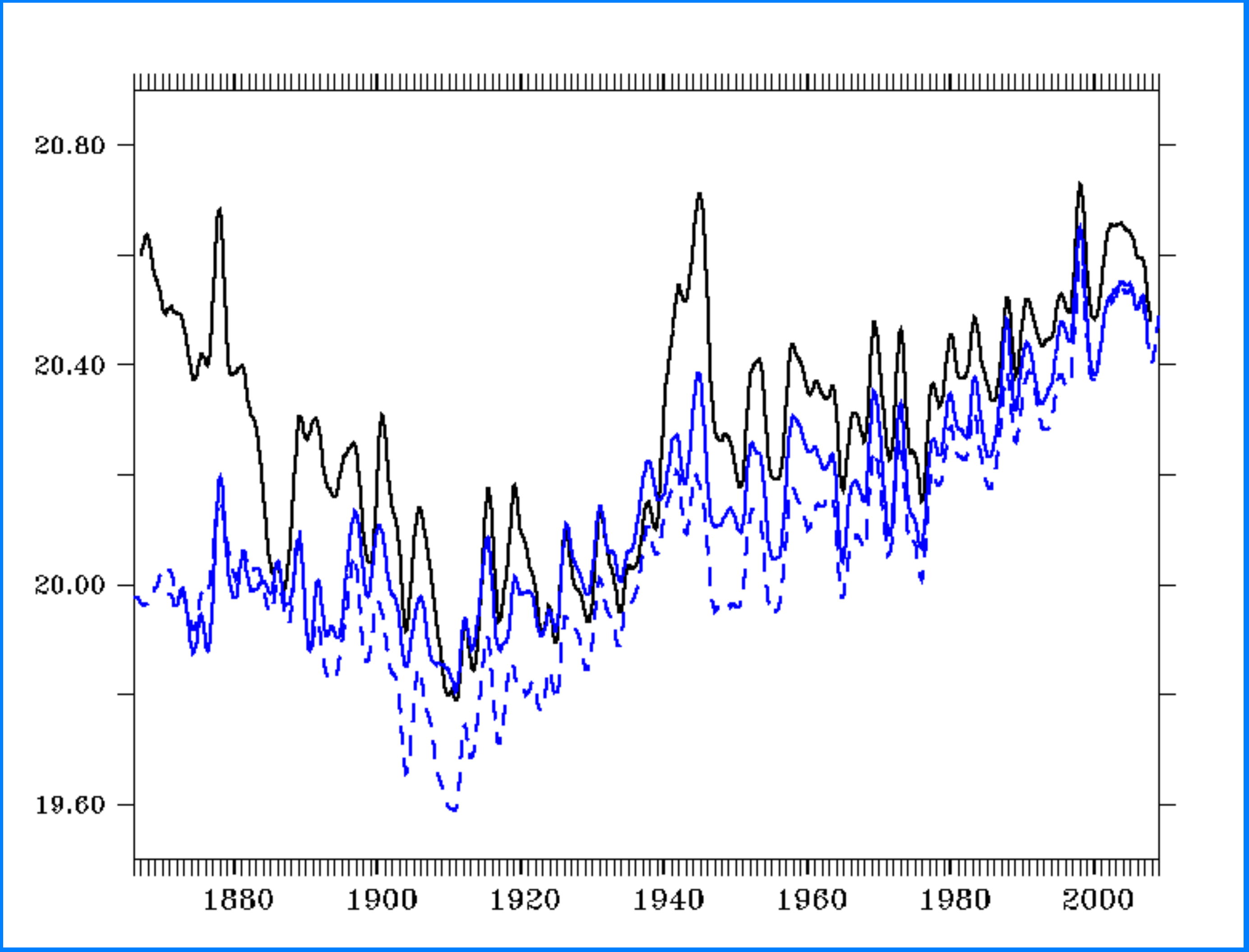
Develop OARCA – Ocean Atmosphere Reanalyses for Climate Applications

60S-60N Zonal Averaged SST

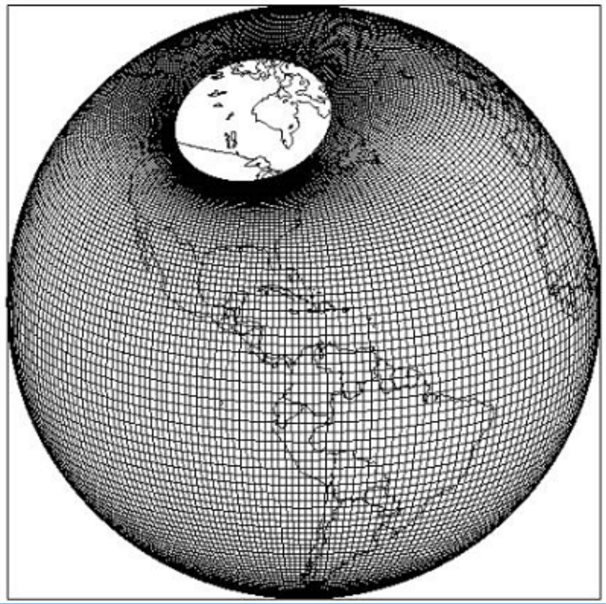
SODA 2.2.4 (black) 20CRv2 Ensemble Mean Forcing

HadISST (blue)

ERSST (dashed)



SODA 2.2.6



- **8 Ensemble Members**
- **Winds**
  - 20CRv2 ensemble member daily stress 1871 – 2008
- **Heat and Salt fluxes**
  - Bulk formulae using 20CRv2 daily variables
- **SODA Data Assimilation**
  - Only ICOADS 2.5 SST data (no hydrography)

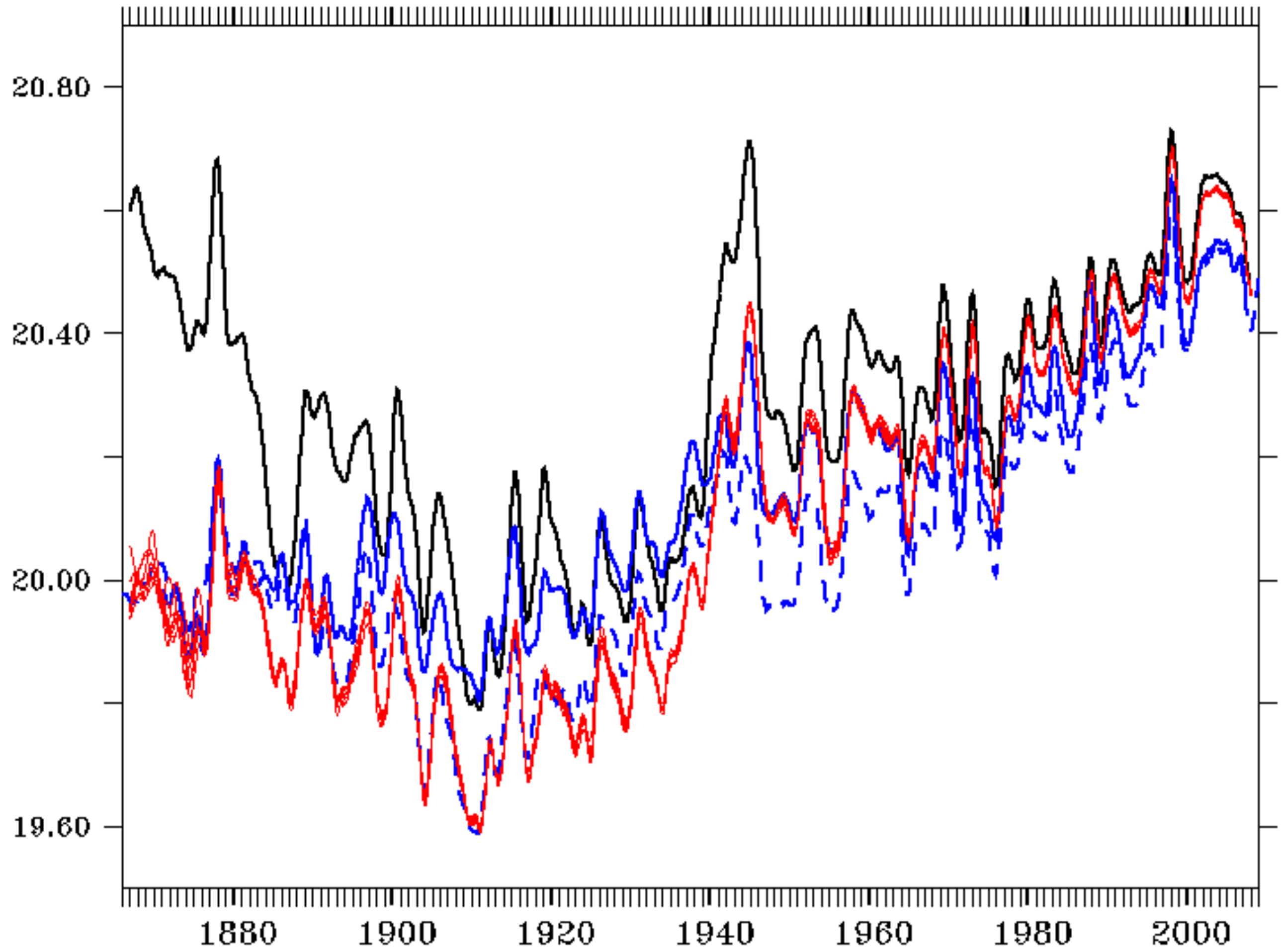
60S-60N Zonal Averaged SST

SODA 2.2.4 (black)

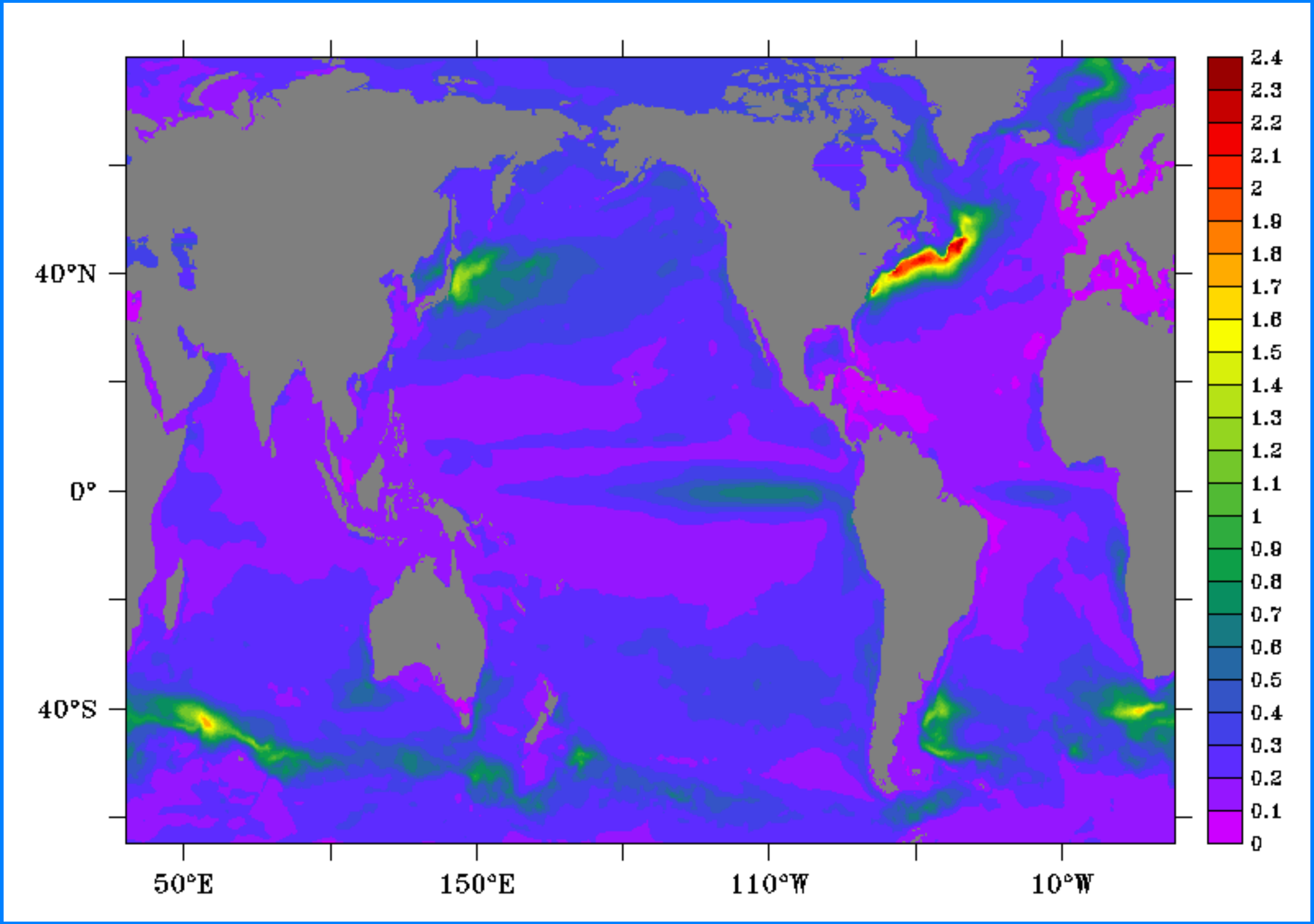
HadISST (blue)

ERSST (dashed)

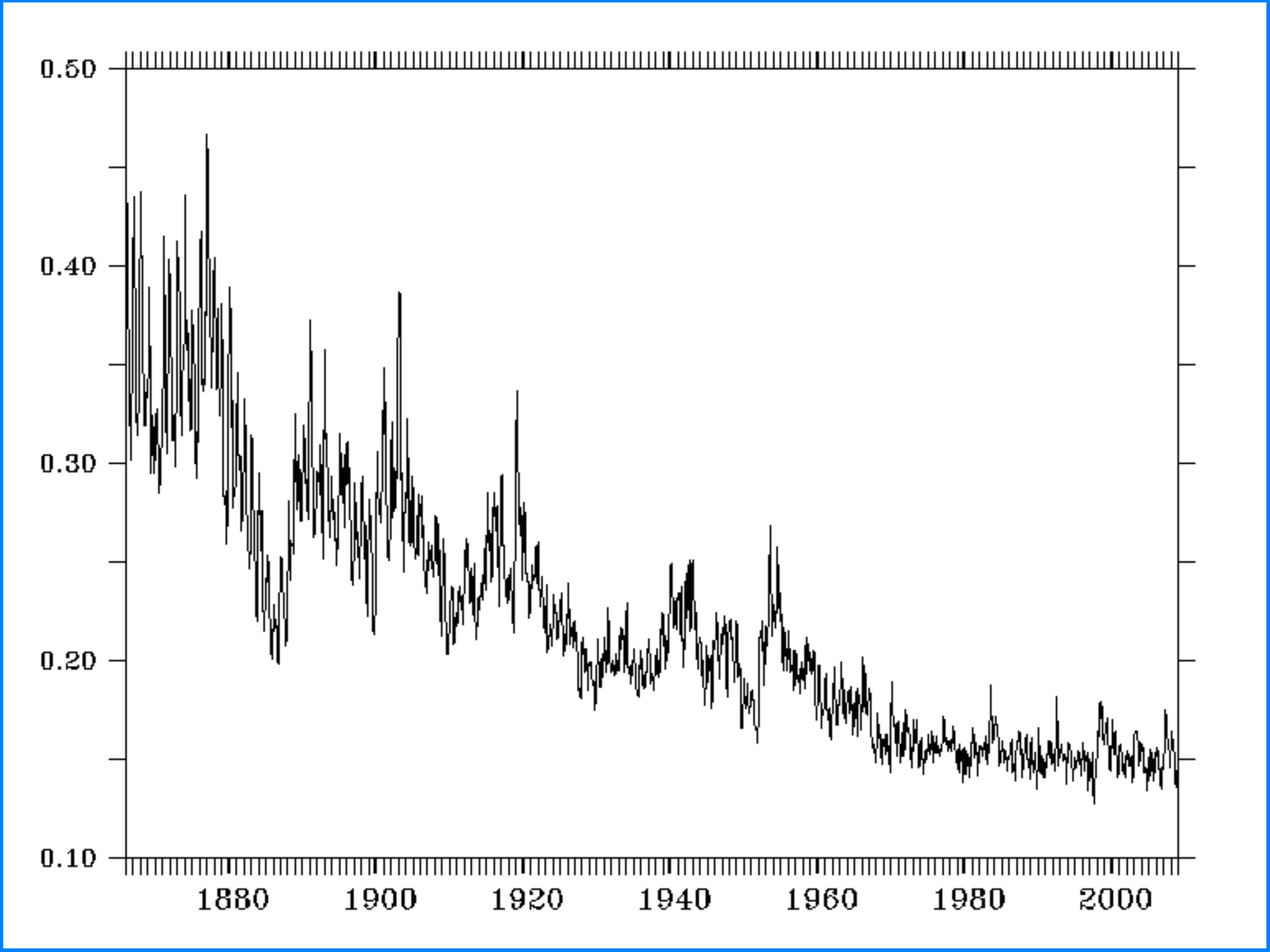
SODA 2.2.6 (red) Ensembles



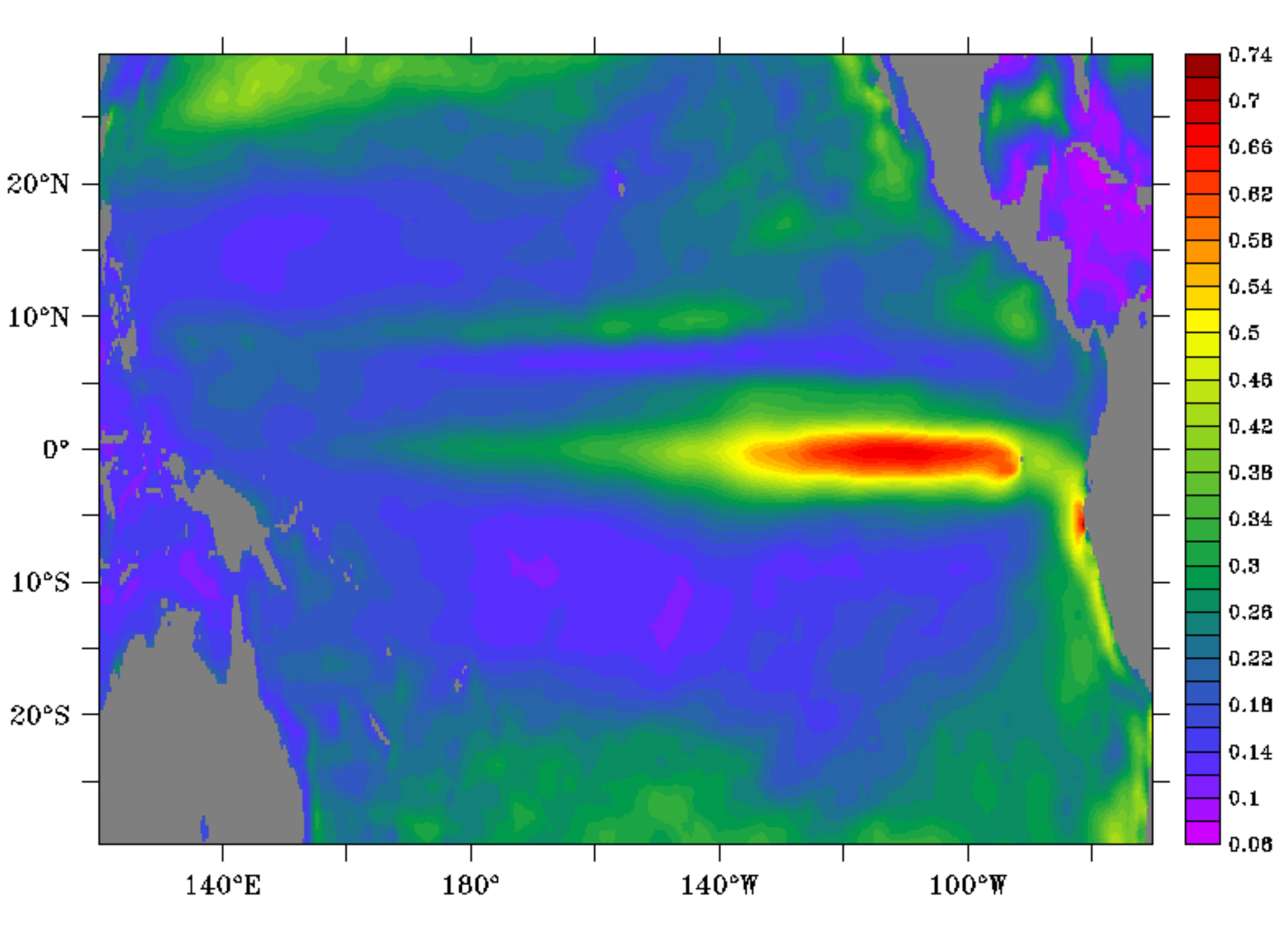
Ensemble SST Spread



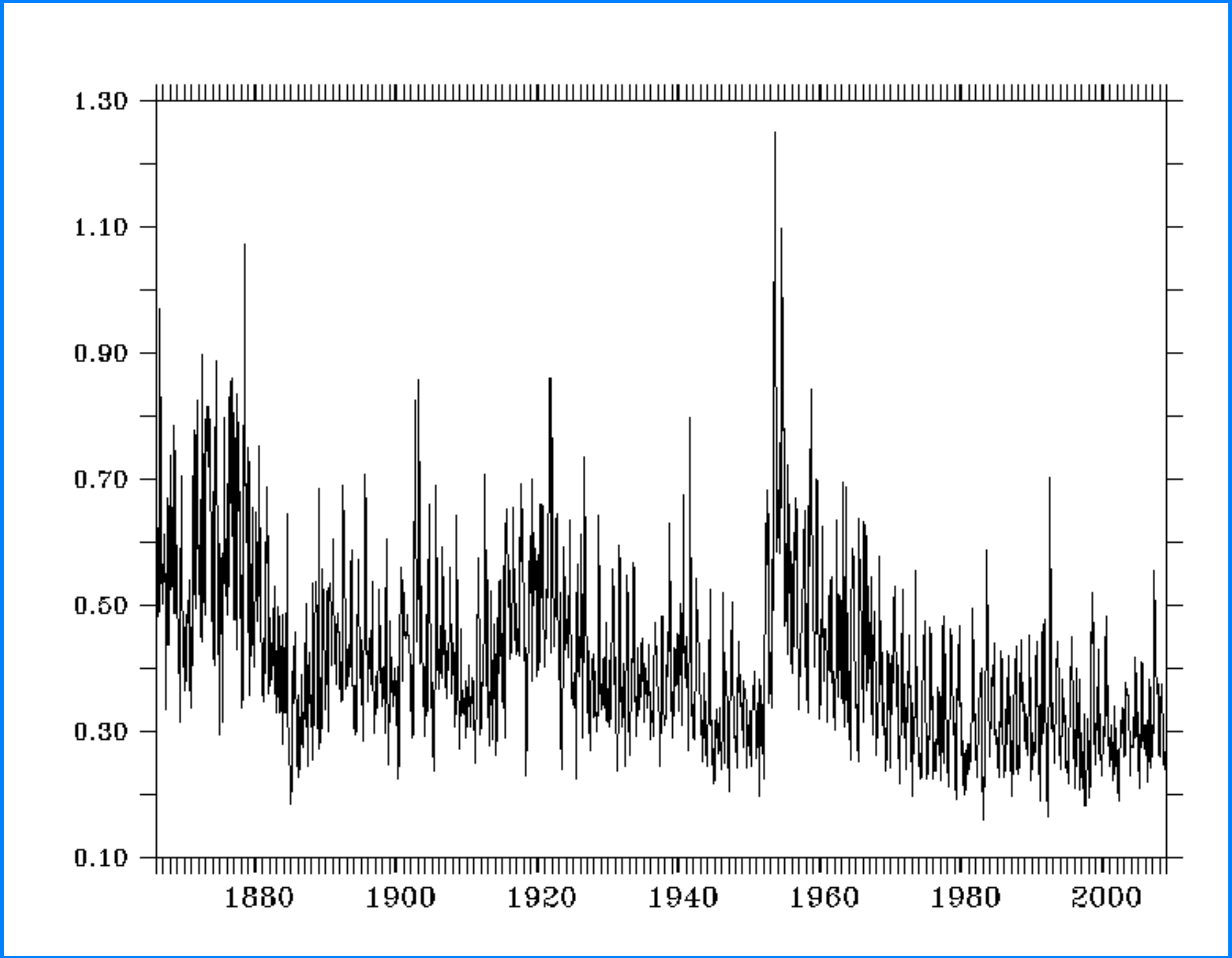
Ensemble SST Spread
60S-60N Zonal Average



Ensemble SST Spread



Ensemble SST Spread 140w-90W 5S-5N



THE 1918/19 EL NIÑO

BY BENJAMIN S. GIESE, GILBERT P. COMPO, NIALL C. SLOWEY, PRASHANT D. SARDESHMUKH, JAMES A. CARTON, SULAGNA RAY, AND JEFFREY S. WHITAKER

An ocean model forced with winds from an atmospheric reanalysis of the first half of the twentieth century shows that the 1918/19 El Niño was much stronger than previously thought.

By any measure the year 1918 was tumultuous. Marked by the end of World War I, an influenza pandemic that killed over 25 million people (Johnson and Mueller 2002), a crippling drought in India (Parthasarathy et al. 1994), and revolutions in four countries, it was a period of tremendous social upheaval. It was also a year of intense global climate variability. The year 1918 began with record-setting cold temperatures in much of the United States: January 1918 still stands as the coldest January registered in Central Park in New York, New York. In summer, just as influenza started to take hold in the trenches of eastern Europe, India began to experience one of its worst droughts of the twentieth century (Parthasarathy et al. 1994). Late summer and fall were marked by an unusually weak Atlantic hurricane season (Donnel 1918), and in late fall North America was unusually warm.

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The abstract for this article can be found in this issue, following the table of contents.
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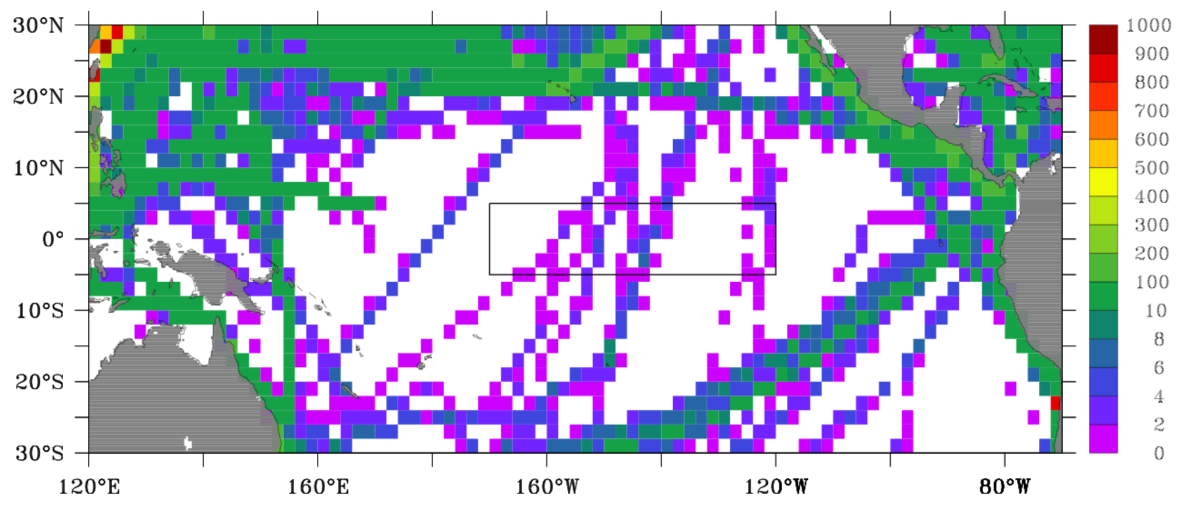
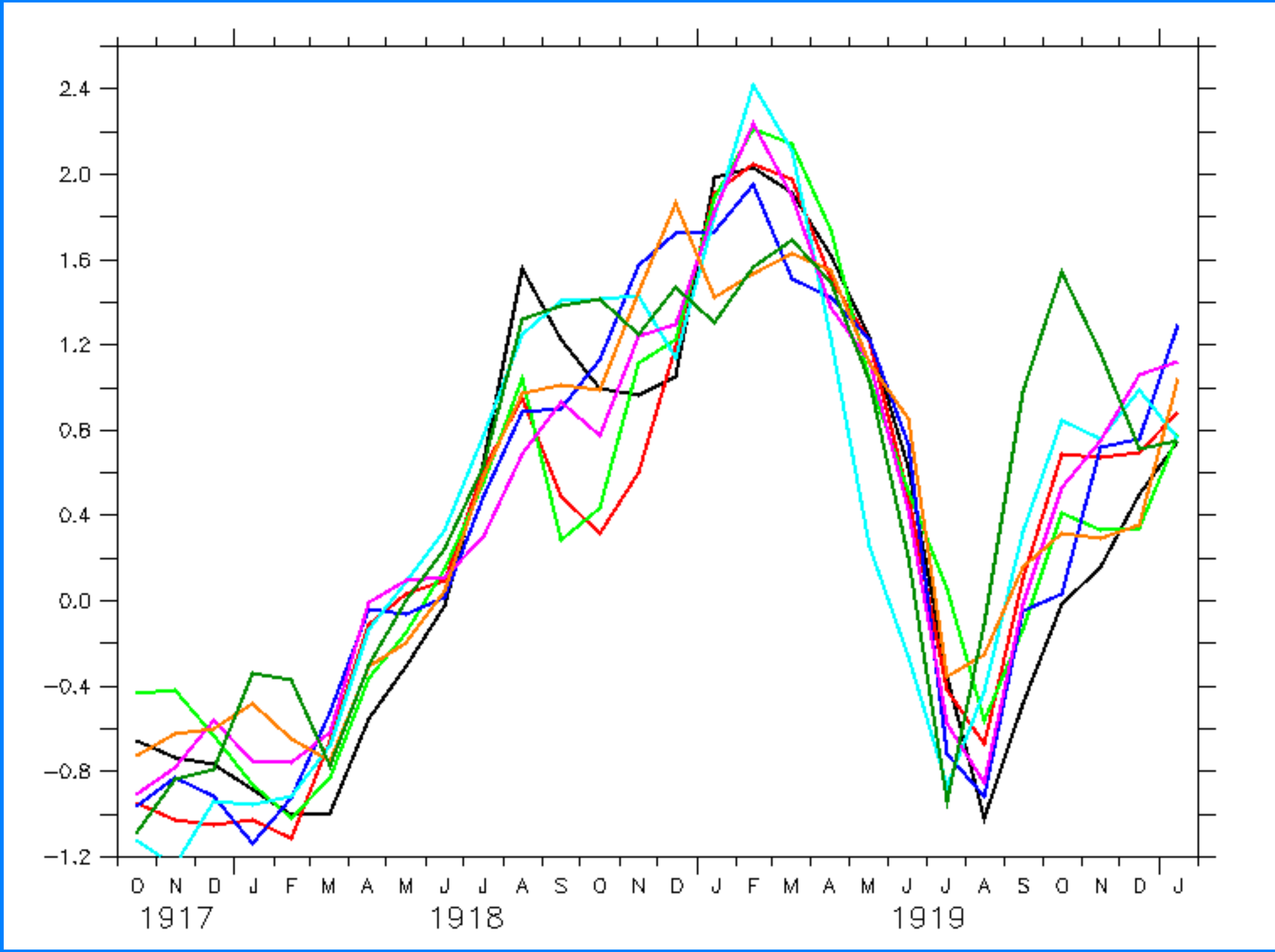
Climate patterns such as a weak Atlantic hurricane season, failure of the Indian monsoon, and weak all-Australia rainfall are widely recognized as El Niño teleconnections (Gray 1984; Torrence and Webster 1999; Power et al. 2006). However, Quinn et al. (1987) describe the El Niño of 1918 as “weak to moderate” and Kaplan et al. (1998) show modest temperature anomalies of about only 3°C in December 1918 with the largest anomalies adjacent to the coast of South America. It is difficult to reconcile the strong global teleconnections with a tepid El Niño; however, there is some evidence that ocean temperatures in the east Pacific may not have captured the intensity of the 1918/19 El Niño. Quinn et al. draw a distinction between El Niño, which they take to mean the oceanic changes that occur near the coast of South America, and El Niño–Southern Oscillation (ENSO), which they take to mean basin-scale ocean–atmosphere changes. Interestingly, in an earlier paper, Quinn et al. (1978) rank the 1918/19 ENSO, which includes indicators such as the Southern Oscillation index (SOI) and precipitation anomalies throughout the Pacific basin, as strong. In this paper, we consider El Niño and ENSO to refer to the same coupled phenomenon.

ICOADS Num. Obs. 1918-1919



Nino 3.4 SST Anomaly - 8 Ensembles

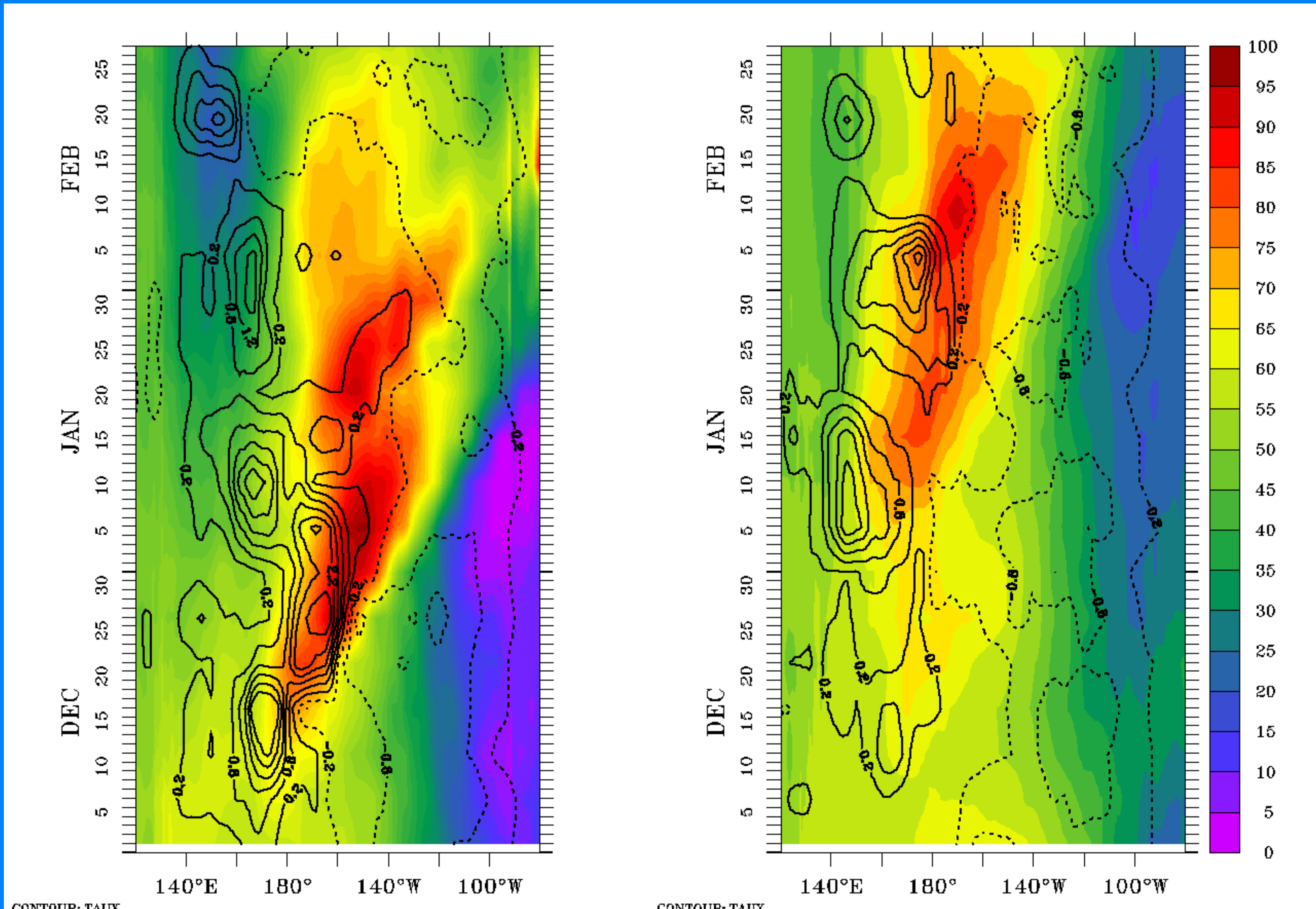


Shading: SSH   Contours: Zonal wind stress

Ens 7 - Strong ENSO   Ens 5 - Weaker ENSO

1919

1918



Conclusions

- We conduct an 8-member ensemble ocean reanalysis for the period from 1871-2008
- Significant differences in ENSO in the different Ensemble members.
- These differences should drive significant differences in the atmosphere.
- OARCA – Ocean Atmosphere Reanalysis for Climate Applications (1800s to present)