Climatology of Severe Convective Environments from the 20th Century Reanalysis

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Introduction

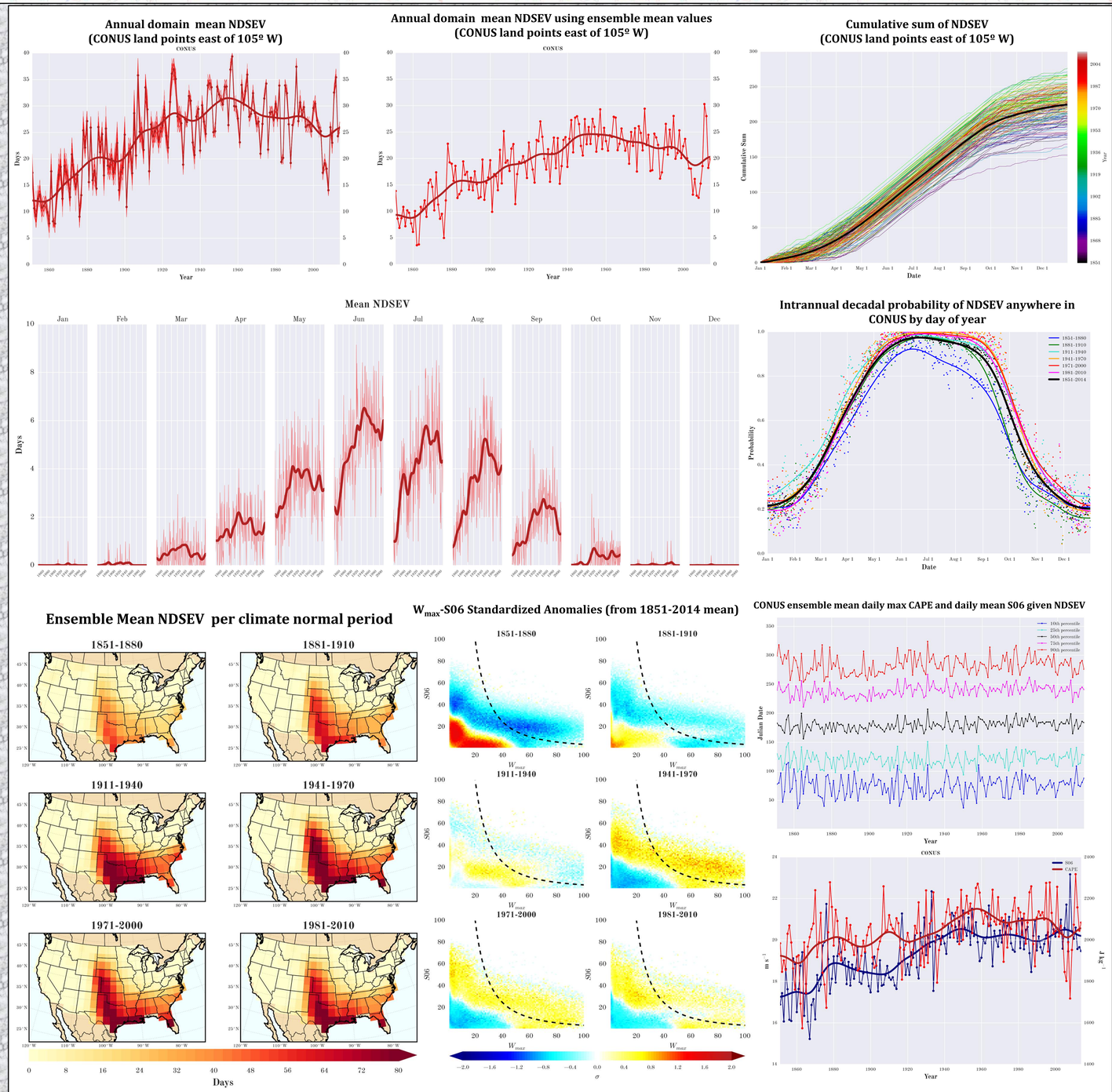
Due to record keeping, environmental proxies of severe convective storms are desirable for studies examining the impact of climate change on severe weather. In the past, such studies have been limited to the radiosonde era (~1949) due to past methodologies used in reanalysis data assimilation. The 20th Century Reanalysis project uses a longer-running historical record of surface pressure to create a global ensemble of **atmospheric conditions back to 1851**.

Here, we examine several aspects of the 20CR related to severe convective storm environments, mainly CAPE and deep-layer wind shear, since the product of these variables has been shown to statistically discriminate between environmental conditions favorable and not favorable for significant severe weather. *This work represents the first convective study using the* ***20CRV2c*** *dataset.*

Learn More About the 20th Century Reanalysis

Data & Methods

- Obtained surface based CAPE for all 56 ensemble members (available from NERSC portal) and 0-6 km deep-layer shear (S06) computed from the ensemble mean wind fields from 20CR (version V2c) data, available from ESRL's PSD portal for the time period 1851 - 2014.
- NDSEV = A day with CAPE * S06 ≥ 20,000
- A known low pressure bia prior to 1865 appears to have affected the 20CR dataset, and thus, we have low confidence in the presented results during this period.



Discussion

We present the **longest historical reanalysis record** of severe convective storm environments.

Prior to 1950, an increasing trend of severe weather environments is shown. This is rather uncertain, however, due to the lack of comparison with other reanalysis datasets and limited surface pressure observations.

Variability amongst the 56 ensemble members is greatly reduced post 1950, when a greater density of surface observations were assimilated into the reanalysis.

Similar to pervious work, severe weather environments **have been relatively unchanged** (or even decreasing) since the radiosonde era.

This work will help put future projected changes in convective environments into a better historical perspective.

Future Work

- Examine at the global scale
- Create composite parameters (e.g., Supercell Composite)
- Examine variability relationship to potential teleconnections (e.g., ENSO, MJO, GWO)
- Update Brooks et al. 2003 global environments climatology
- Return intervals of extreme values

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