NOAA/GFDL: Seasonal-to-Decadal Variability and Predictability Division (SD)

Motivation and Objectives

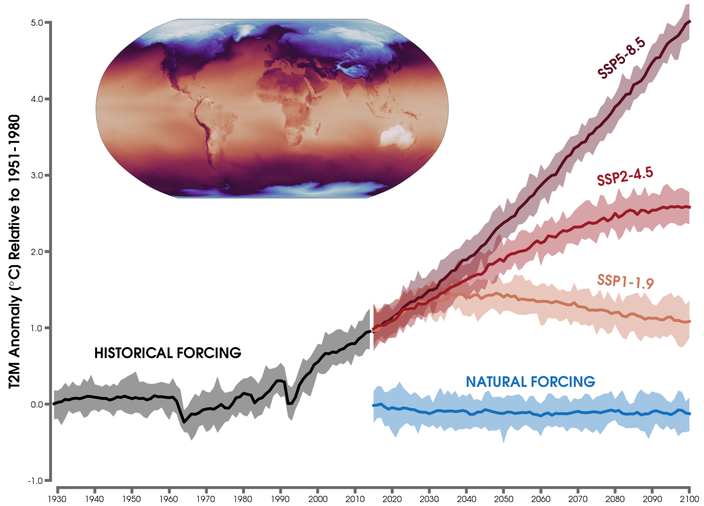
Our goal is to improve our understanding of climate variability, predictability, and change on time scales ranging from seasonal to multidecadal. This includes internal variability of the coupled climate system and the response to changing radiative forcing. We are also actively developing a next-generation experimental seasonal-to-decadal prediction system (SPEAR: Seamless System for Prediction and EArth System Research).

Key Research Areas

- Improve scientific understanding of the mechanisms and characteristics of seasonal-to-decadal climate due to internal variability and climate change
- Explore seasonal-to-decadal predictability and develop state-of-the-art modeling systems
- Provide probabilistic assessment of the evolution of the climate system over the next several decades

Model Products

- LOAR (200 km)
- FLOR (50 km)
- HiFLOR (25 km)
- SPEAR_LO (100 km)
- SPEAR_MED (50 km)
- SPEAR_HI (25 km)
- SPEAR_HI_25 (25 km*)
- SPEAR_ODA
- SPEAR_Flux-Adjusted



Delworth, Thomas L., et al. "SPEAR: The next generation GFDL modeling system for seasonal to multidecadal prediction and projection." ***Journal of Advances in Modeling Earth Systems*** **12.3 (2020): e2019MS001895. https://doi.org/10.1029/2019MS001895**

Relevance to NOAA/OAR

- Sustaining a healthy environment and economy
- Confronting challenges from our changing climate
- Protecting against extreme weather events and environmental hazards

Our Team (2024)

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Selected Recent Research

Delworth, Thomas L., William F Cooke, Vaishali Naik, David J Paynter, and Liping Zhang, August 2022: **A weakened AMOC may prolong greenhouse gas–induced Mediterranean drying even with significant and rapid climate change mitigation**. *Proceedings of the National Academy of Sciences*.

Jia, Liwei, Thomas L Delworth, Sarah B Kapnick, Xiaosong Yang, Nathaniel C Johnson, William F Cooke, Feiyu Lu, Matthew J Harrison, Anthony Rosati, Fanrong Zeng, Colleen McHugh, Andrew T Wittenberg, Liping Zhang, Hiroyuki Murakami, and Kai-Chih Tseng, July 2022: **Skillful seasonal prediction of North American summertime heat extremes**. *Journal of Climate*.

Joh, Youngji, Thomas L Delworth, Andrew T Wittenberg, William F Cooke, Anthony Rosati, and Liping Zhang, August 2022: **Stronger decadal variability of the Kuroshio Extension under simulated future climate change**. *npj Climate and Atmospheric Science*.

Johnson, Nathaniel C., Andrew T Wittenberg, Anthony Rosati, Thomas L Delworth, and William F Cooke, August 2022: **Future changes in boreal winter ENSO teleconnections in a large ensemble of high-resolution climate simulations**. *Frontiers in Climate*.

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Labe, Zachary M., Nathaniel C Johnson, and Thomas L Delworth, February 2024: **Changes in United States summer temperatures revealed by explainable neural networks**. *Earth's Future*.

Yang, Xiaosong, Thomas L Delworth, Liwei Jia, Nathaniel C Johnson, Feiyu Lu, and Colleen McHugh, June 2024: **Skillful seasonal prediction of wind energy resources in the contiguous United States**. *Communications Earth and Environment*.

Zhang, Liping, Thomas L Delworth, William F Cooke, Hugues Goosse, Mitchell Bushuk, Yushi Morioka, and Xiaosong Yang, February 2021: **The dependence of internal multidecadal variability in the Southern Ocean on the ocean background mean state**. *Journal of Climate*.