The Nature Conservancy
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January 21, 2020

Neil A. Jacobs, Ph.D.
Assistant Secretary of Commerce for
Environmental Observation and Prediction
Performing the Duties of Under Secretary of Commerce
For Oceans and Atmosphere
National Oceanic and Atmospheric Administration
Herbert C. Hoover Building, Room 6811
14th Street & Constitution Avenue, NW
Washington, DC 20230

Dear Dr. Jacobs:

On behalf of the NOAA Science Advisory Board (SAB), I am pleased to transmit to you a report "Subseasonal-to-Seasonal-to-Decadal (S2S2D): A Pathway to Improved Prediction". The SAB approved this report at its December 16-17, 2019 in-person meeting. The report was written by the SAB's Climate Working Group (CWG). It was prepared as a result of the implementation of the Finite- Volume Cubed-Sphere dynamical core-Global Forecasting System (FV3-GFS) model, which combines the superior dynamics of global climate modeling with the day-to-day reliability and speed of operational numerical weather prediction. This convergence of climate and weather modeling also demonstrates the need for improved predictions on all timescales ranging from multiple decades, interannual, seasonal, and subseasonal, to days. The FV3-GFS upgrade can be the foundation for NOAA to dramatically improve forecasting abilities and for improved observation quality control, data assimilation, and model physics.

The report makes the following major recommendations:

Hybrid Statistical Models
Recommendation #1. Fund hybrid statistical-dynamic models (including contributions from machine learning, artificial intelligence, deep learning, etc.) to bridge the gap between the needs of stakeholders and limitations of the dynamic models at regional scales, especially for S2S2D predictions.

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Boundary Layer Processes

Recommendation #2. Fund boundary layer chemical dynamics research to help weather forecasting and calculations, as well as quantification of surface fluxes for air quality and climate needs.

Global Ocean Observations

Recommendation #3. Work towards realizing an expansion of observation networks into the tropics, deep, and polar oceans; obtain global oceanic biogeochemical observations through the implementation of deep Argo, BGC Argo and enhancements in Argo beyond the 2020 design.
Recommendation #4. Restore funding for ship time in support of sustained ocean observations and deployments.

Biogeochemical Observations - Oceanic

Recommendation #5. Fund a global biogeochemically-sensored autonomous profiling float array and train the personnel to deploy and calibrate them.

Biogeochemical Observations – Terrestrial

Recommendation #6. Invest in terrestrial biogeochemical research and modeling, especially collaborations with the United States Department of Agriculture (USDA); collaboration between Geophysical Fluid Dynamics Laboratory (GFDL) and Climate Prediction Center (CPC) would accelerate improvement of terrestrial biogeochemical processes in S2S2D predictions.

Improved Engagement and Communications on S2S2D Timescales

Recommendation #7. Train NOAA's workforce, academics, and commercial enterprises in the use of FV3-GFS and invest in educational outreach and resources.
Recommendation #8. Invest in the social sciences and human infrastructure for engaging sectors and communities in supporting decision-making and communicating earth system predictions.
Recommendation #9. Expand capacity to assess the return on science investment using multiple metrics such as economic impacts, diversity, and the number of people and locations served.

The SAB encourages NOAA to consider these recommendations as it designs its next-generation forecasting models. The SAB and CWG are happy to work with the agency to provide clarification on any language in the report. Please let me know if you have any questions, comments, or concerns about the process for this.

Sincerely,

Lynn Scarlett
Chair, NOAA Science Advisory Board
Chief External Affairs Officer, The Nature Conservancy

Attachment:
Final Report "Subseasonal-to-Seasonal-to-Decadal (S2S2D): A Pathway to Improved Prediction".

CC: Tim Gallaudet
        Kevin Wheeler
        Michael Weiss
        Craig McLean
        Adrian Mahoney
        Wayne Higgins
        Ben DeAngelo
        Neil Christersen
        Joellen Russell
        Cynthia Decker
        Emily Landeen
        Caren Madsen
        Courtney Edwards