Weekly Report – January 12, 2024

Cooperative Institute for Satellite Earth System Studies (CISESS)

NOAA/NESDIS/STAR

Submitted by: Debra Baker & Kate Cooney
Email: drb@umd.edu
Phone: 301-405-5397

Date of Submission: 12 January 2024

FUTURE OUTLOOK

Summary Items

Date and Name of Meeting/Event/Significant Publications *Details Below **

- 01/16 & 17 Coastal Adaptation Guidelines Webinar, Emily Smail N

**** N: New, U: Updated, P: In previous weekly report***

Detailed Article

Newly Submitted

Next Week: GEO Blue Planet Webinar on Coastal National Adaptation Guidelines
CISESS Scientist & GEO Blue Planet Executive Director Emily Smail (STAR/SOCD) will be one of the speakers at a webinar entitled "Coastal National Adaptation Guidelines: Moving from Theory to Practice." The group of speakers has recently completed an analysis of existing National Adaptation Plans in coastal countries, combined with regional workshops, to improve the understanding of coastal adaptation priorities and will soon be issuing a detailed report. The webinar will be offered twice for its international audience: January 16th at 15:00 UTC and January 17th at 02:00 UTC, with separate links to register for either seminar.

PUBLICATIONS

International Team Documents Record Ocean Temperatures in 2023

Citation: Cheng, Lijing; John Abraham, Kevin E. Trenberth, Tim Boyer, Michael E. Mann, Jiang Zhu, Fan Wang, Fujiang Yu, Ricardo Locarnini, John Fasullo, Fei Zheng, Yuanlong Li, Bin Zhang, Liying Wan, Xingrong Chen, Dakui Wang, Licheng Feng, Xiangzhou Song, Yulong Liu, Franco Reseghetti, Simona Simoncelli, Viktor Gouretski, Gengxin Chen, **Alexey Mishonov**, Jim Reagan, Karina Von Schuckmann, Yuying Pan, Zhetao Tan, Yujing Zhu, Wangxu Wei, Guancheng Li, Qiuping Ren, Lijuan Cao and Yayang Lu, 2024: New Record Ocean Temperatures and Related Climate Indicators in 2023. *Adv. Atmos. Sci.*, in press, https://doi.org/10.1007/s00376-024-3378-5. Summary: CISESS Scientist Alexey Mishonov (NCEI) along with other scientists from the United States, China, New Zealand and Italy have a new article published online on January 11th in the journal *Advances in Atmospheric Science*. They document the record highs in the global ocean set in 2023:

- Highest annual sea surface temperatures (SST) ever recorded by modern instruments;
- Record annual average heat content in the upper 2,000 m of the ocean;
- Highest annual density stratification in the ocean; and
- Record annual spatial inhomogeneity of ocean temperatures.

This warming was influenced by the development of a strong El Niño during 2023, which also caused anomalies in salinity patterns. They characterize the SST increase in the second half of 2023 over 2022 values of more than 0.3°C as "astounding."

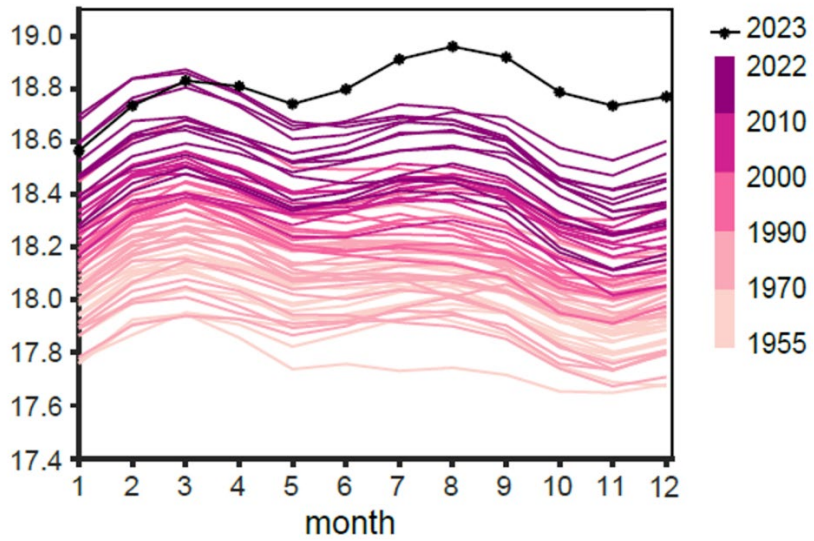

Figure: The within-year variation of SST, with 2023 values shown in black.

The paper has been well-reported in the media within a day of its release, including in Nature, The Guardian, and the Chinese Academy of Science News. *(Alexey Mishonov, CISESS, alexey.mishonov@noaa.gov, Funding: NCEI)*

Global Water Vapor Trend Analysis from Satellite Radio Occultation Data

Citation: **Shao, Xi**; Shu-Peng Ho, **Xin Jing**, Xinjia Zhou, Yong Chen, **Tung-Chang Liu**, Bin Zhang, and **Jun Dong**, 2023: Characterizing the tropospheric water vapor spatial variation and trend using 2007–2018 COSMIC radio occultation and ECMWF reanalysis data, *Atmos. Chem. Phys*., **23**(22), 14187–14218, https://doi.org/10.5194/acp-23-14187-2023.

Summary: CISESS Scientists Xi Shao, Xin Jing, Tung-Chang Liu, Bin Zhang, and Jun Dong have an article in the journal *Atmospheric Chemistry and Physics* that analyzed radio occultation data on water vapor trends and compared it with the European Centre for Medium-Range Weather Forecasts (ECMWF) Reanalaysis Model 5 (ERA5). The radio occultation data is from the Formosa Satellite Mission 3–Constellation Observing System for Meteorology, Ionosphere, and Climate (FORMOSAT-3/COSMIC) and runs from 2007 to 2018. There is strong consistency between the two sources in water vapor changes per decade. The areas of disagreement (see figure below) are primarily in the tropics, often in the Intertropical Convergence Zone (ITCZ). These areas have deep clouds and strong convection, where the differences in how the two data sources characterize water vapor distribution may cause such trend differences.

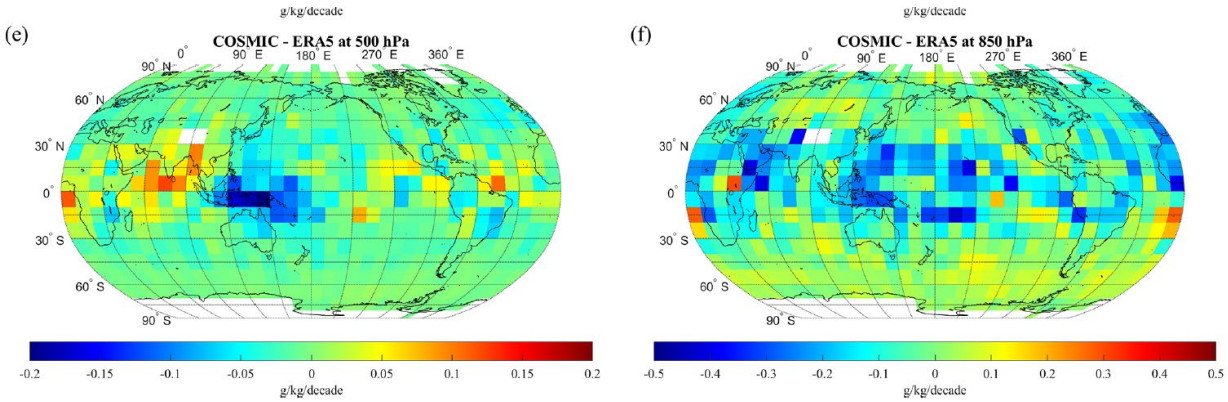

Figure: The difference in water vapor trends (g kg^{-1} decade^{-1}) from the COSMIC data and the ERA5 data are shown for 500 hPa (left) and 850 hPa (right).
(Xi Shao, CISESS, xshao@umd.edu; Funding: JSTAR, METOP-SG, COSMIC-2)