Weekly Report – August 09, 2024

Cooperative Institute for Satellite Earth System Studies (CISESS)

NOAA/NESDIS/STAR

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TRAVEL AND MEETING REPORTS

Guangyang Fang and the Faulty GPS – Problem Solved!

The DC Lightning Mapping Array (DCLMA) is a nine-station VHF radio antenna network that detects and geolocates lightning in the DC region. The most recent antenna was added to the network in June 2024, located on the rooftop of a building on the Howard University campus in D.C. However, a GPS issue cropped up soon after the installation. On 2 August 2024, CISESS Scientist Guangyang Fang visited the site to troubleshoot the problem. The GPS antenna, which functioned well in the lab at the Earth System Science Interdisciplinary Center in College Park, could not pick up signals from satellites over D.C. After exhausting all troubleshooting options, it was determined that the problem was due to the GPS channels changing in D.C., rendering the old GPS board unable to capture them. The issue was successfully resolved by replacing the old GPS board with a new one. This site is now functioning well and collecting good lightning data.

(Guangyang Fang, CISESS, gfang@umd.edu; Funding: GOES-R AWG, GOES-R PGRR)

Jiang Presents at the 11th International Carbon Dioxide Conference in Brazil

The quadrennial International Carbon Dioxide Conference (ICDC11) took place in Manaus, Brazil from July 29 to August 2, 2024. As one of the foremost conferences dedicated to the global carbon cycle, ICDC11 facilitates crucial exchanges of knowledge and insights that drive advancements in understanding and addressing carbon-related challenges on a global scale. During the August 1 oral session on the theme "Measuring and modelling CO_2 in the ocean", CISESS Scientist Liqing Jiang presented on ocean acidification climatologies and atlases along the North American ocean margins, coastal areas that are among the most productive parts of the global ocean. Jiang reported that this was the first time an ocean carbon climatology was produced using the World Ocean Atlas technology, noting that this product will serve as a benchmark for future ocean chemistry changes in the North American coastal ocean. For more details, refer to the associated publication: https://doi.org/10.5194/essd-16-3383-2024.

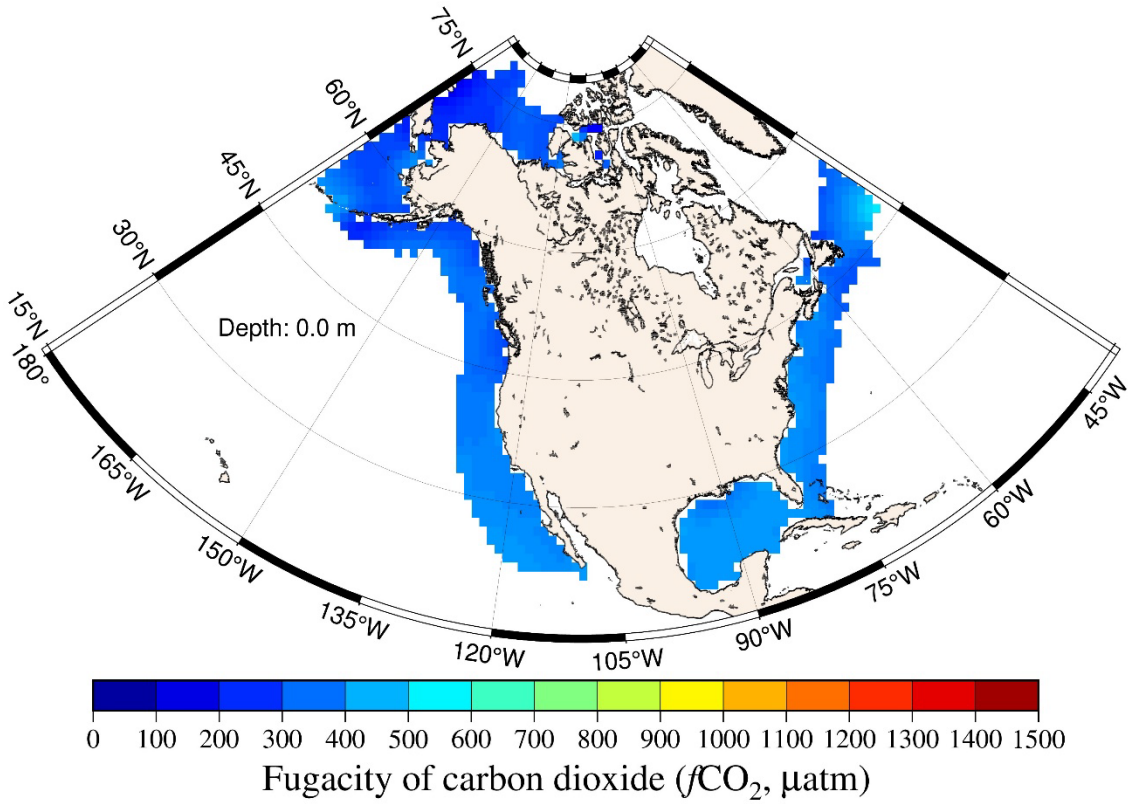

Figure. Map of the fugacity of CO_2 at the ocean surface. This variable is critical in quantifying the ocean-atmosphere exchange in CO_2.

(Liqing Jiang, CISESS, liqing.jiang@noaa.gov; Funding: NCEI)

PUBLICATIONS

Evaluating Earth's Energy Imbalance and Ocean Heat Uptake
Citation: Hakuba, Maria Z., Sébastien Fourest, Tim Boyer, Benoit Meyssignac, **James A. Carton**, Gaël Forget, Lijing Cheng, Donata Giglio, Gregory C. Johnson, Seiji Kato, Rachel E. Killick, Nicolas Kolodziejczyk, Mikael Kuusela, Felix Landerer, William Llovel, Ricardo Locarnini, Norman Loeb, John M. Lyman, **Alexey Mishonov**, Peter Pilewskie, James Reagan, Andrea Storto, Thea Sukianto, and Karina von Schuckmann, 2024: Trends and variability in Earth's energy imbalance and ocean heat uptake since 2005. Surv. Geophys., in press, https://doi.org/10.1007/s10712-024-09849-5.
Summary: Information about the accumulation of heat by the Earth system is obtained by quantifying and assessing the change in Earth's radiative energy imbalance (EEI) at the top of the atmosphere, representing the cumulative effect of radiative forcings and feedbacks. The

absolute magnitude of EEI can be quantified through a heat inventory analysis, noting that about 90% of Earth's heat surplus is stored in the ocean. Accurate ocean heat uptake (OHU) estimates are thus needed to assess the EEI magnitude and uncertainty. The Global Energy and Water Exchanges Project EEI Assessment Working Group was formed to investigate EEI magnitude, variability, and trends. As part of this effort, CISESS Scientists James Carton and Alexey Mishonov and their colleagues compared 21 ocean heat content (OHC) time series from reanalysis, in-situ, and satellite observations, reported in the journal *Surveys in Geophysics*. They found a significant spread in OHU and variable skill in tracking radiometric EEI variability. A number of recommendations are presented on ways to improve estimates of EEI, OHU, and OHC and their uncertainties.

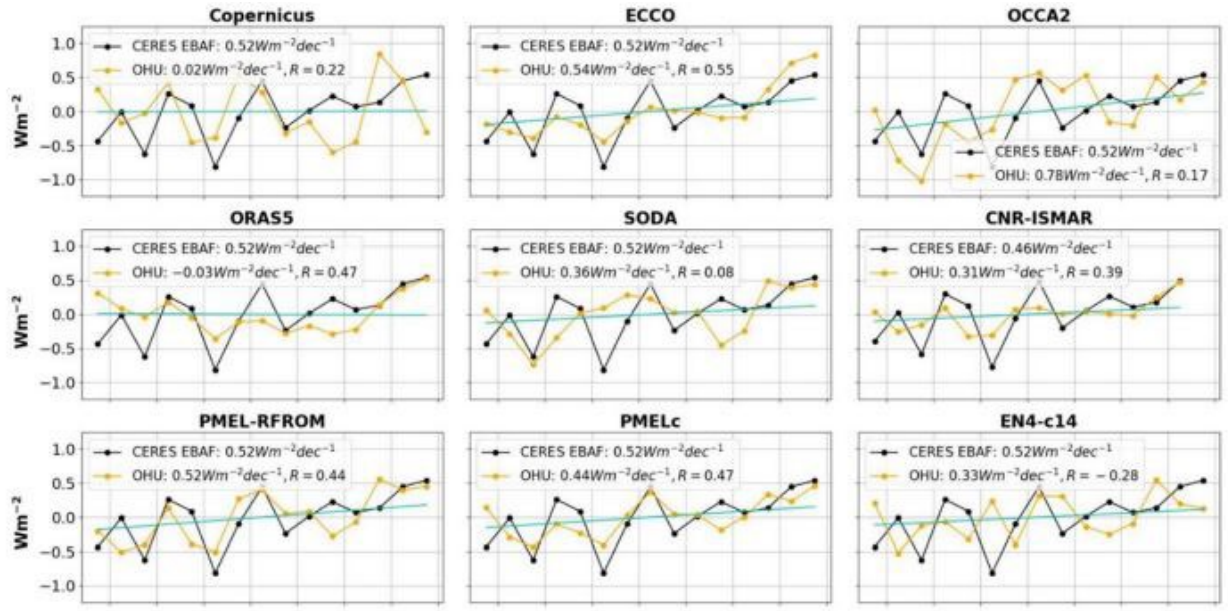

Figure. Annual OHU anomaly time series derived from 9 OHC products compared to CERES net radiative flux (black line) for the period 2005-2019. Green lines indicate the trend line through the OHU data, with trend values given in W m^{-2} per decade. Trends vary among the different products.

(James Carton, CISESS, carton@umd.edu; Funding: Jason, JPSS PGRR; Alexey MIshonov, CISESS, alexey.mishonov@noaa.gov; Funding: NCEI)

(Maureen Cribb, CISESS, mcribb@umd.edu, Funding: CISESS Task I)