FUTURE OUTLOOK

Summary Items

Date and Name of Meeting/Event/Significant Publications

- August 2, 2023  Global Ocean Acidification Webinar – Virtual

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

Detailed Article

Previously Submitted

Global Ocean Acidification Webinar Series:
CISESS Scientist Li-Qing Jiang was invited to speak at a major international OA webinar series on August 2, 2023. The talk will be on “Global Ocean Acidification Indicators and the NOAA Strategy for Carbon Dioxide Removal Research.” The co-presenter Dr. Jessica Cross (NOAA), and the moderator is Dr. Richard Feely (NOAA).  (https://tinyurl.com/54zjut99)
(Liqing Jiang, CISESS, liqing.jiang@noaa.gov; Funding: NCEI& OCADS)
PUBLICATIONS

Refining the AMSR2 Soil Moisture Data Product using an Optimal Machine-Learning Model

Citation: Yin, Jifu; Xiwu Zhan, Michael Barlage, Jicheng Liu, Huan Meng and Ralph R. Ferraro, 2023b: Refinement of NOAA AMSR-2 soil moisture data product: 1. Inter-comparisons of the commonly-used machine learning models, IEEE Trans. Geosci. Remote Sens., 61, 4405410, https://dx.doi.org/10.1109/TGRS.2023.3280173. Summary: CISESS Scientists Jifu Yin and Jicheng Liu co-authored a study on the refinement of the AMSR2 soil moisture (SM) data product. This first paper of a two-part series intercompares six commonly used machine-learning models, including multiple linear regression (MLR), regression tree (RRT), random forest (RFT), gradient boosting (GBR), extreme gradient boosting (XGB), and artificial neural network (ANN) with the goal of selecting an optimal ML model. The evaluations were conducted using SM Active Passive (SMAP) observations and USDA Soil Climate Analysis Network (SCAN) in situ measurements as the reference data. Their results indicated that all six ML approaches can preserve the reference data information beyond the training time period. Relative to other models, the XGB method performed better with respect to the SMAP and SCAN reference data. The XGB machine-learning model will be implemented to refine AMSR2 datasets in the second paper.

Figure: With respect to the quality-controlled daily SCAN SM observations, root mean square errors (m3/m3) for (a) XGB, (b) ANN, (c) RRT, (d) MLR, (e) RFT, and (f) GBR over the July 2012–December 2021 period.

(Jifu Yin, CISESS, jifu.yin@noaa.gov; Funding: JSTAR GCOM, JPSS PGRR, STAR & IIJA)
Global Atmospheric Methane Zonal Distributions based on 20 years of Data from Satellite Hyperspectral Infrared Sounders  


Summary: CISESS Scientist Juying (AOSC Department) co-published a study that analyzed nearly 20 years of data from hyperspectral thermal infrared (TIR) sounders, in particular the Atmospheric Infrared Sounder (AIRS) and the Cross-track Infrared Sounder (CrIS). Their findings confirmed a significant increase in CH4 concentrations in the mid-upper troposphere (around 400 hPa) from 2003 to 2020. The rate of increase was derived using global satellite TIR measurements, which are consistent with in situ measurements, indicating a steady increase starting in 2007 and becoming stronger in 2014. The study also compared CH4 concentrations derived from the AIRS and CrIS against ground-based measurements from the NOAA Global Monitoring Laboratory (GML) and found phase shifts in the seasonal cycles in the middle to high latitudes of the northern hemisphere, which is attributed to the influence of stratospheric CH4 that varies at different latitudes.

![CH4 zonal distributions with time](image)

*Figure: CH4 zonal distributions with time (upper panel): AIRS raw (upper left), AIRS fitted (upper right), the corresponding rate of change from AIRS (lower left), and CrIS (lower right).*