A new perspective on improving satellite data through data merging for hydrology and climate change assessments

Seokhyeon Kim[1], Ashish Sharma[2] and Doosun Kang[1]

(1) *Department of Civil Engineering, Kyung Hee University, 1732 Deogyeong-daero, Giheung-gu, Yongin-si 17104, Republic of Korea*
(2) *School of Civil and Environmental Engineering, University of New South Wales, Sydney, NSW 2052, Australia*

Merging multiple datasets is a simple and effective way to improve data performance, seeing wide application for satellite data and broad utilization in various hydrological and climate change studies. While most merged satellite data products are based on variations of weighted averages first proposed in the 1960s in the context of economic forecasting, we argue that this simplistic approach does not produce optimal results for satellite data. When the objective of merging datasets is to minimize prediction errors, then the merged outcome does not need to be confined to the weighted average of the parent data. To overcome the limitation, a more disciplined approach based on mathematical optimization to minimise prediction error, termed SNR optimization (SNR-opt), was proposed in a recent study (Kim et al., 2022). The key parameter for SNR-est is the signal-to-noise ratio (SNR) of the parent satellite datasets, not obtainable in general because the ground truth corresponding to the satellite data is extremely limited in both space and time. To address the problem, an estimation method, SNR-est, is presented to estimate the SNR required for the data merging. Extensive experimental validation of three global scale satellite-derived soil moisture and surface temperature datasets shows that SNR-op considerably improves merge over the conventional weighted averaging method. In this presentation, along with the key contents of SNR-opt and SNR-est, the application results and applicability to other studies will be presented. (Acknowledgement: This work is financially supported by the Korea Ministry of Environment (MOE) as part of the program “Graduate School specialized in Climate Change”)

References

Kim, S., Sharma, A., Liu, Y. Y., & Young, S. I. (2022). Rethinking Satellite Data Merging: From Averaging to SNR Optimization. IEEE transactions on Geoscience and remote sensing, **60**, 4405215. doi:10.1109/TGRS.2021.3107028