AI methods to derive skin temperature from GIIRS

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Earth's skin temperature (Tskin), or the combination of land and sea surface temperatures (LST and SST), is an essential climate variable that can be measured by remote sensors on board different satellites. The Geostationary Interferometric Infrared Sounder (GIIRS) on board FengYun-4 series satellites is the world's first geostationary hyperspectral infrared sounder. Its main goal is the provision of temperature and humidity profiles for improving weather forecasts. No official skin temperature product exists to date from GIIRS, and scientific literature uses surface skin temperature from ERA5 hourly data.

In this study, we focus on the FY-4B, the second satellite in the FY-4 series, which was launched in June 2021. The observation domain of FY-4B/GIIRS is mostly over eastern Asia, with a focus on China. We present a fast method for retrieving land and sea surface temperatures from GIIRS based on convolutional artificial neural networks from a set of spectral channels selected from GIIRS that are sensitive to Tskin. The neural networks are trained with skin temperatures from the Infrared Atmospheric Sounding Interferometer (IASI).

We discuss the challenges in the retrieval of Tskin from GIIRS and validate our product with IASI and ERA5. We also discuss the spatio-temporal variability of the Tskin product over China. Finally, we show the adaptability of the methods developed here to derive Tskin from the upcoming Infrared Sounder (IRS) over Europe and Africa.