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Eleven Years of Earth's Skin Temperature from IASI

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While long-term temperature time series mostly rely on weather stations, only satellite data are able to provide systematic global temperature data, from pole to pole on a regular basis, over both land and sea. Satellites measure the "skin" temperature derived from upwelling radiation at the Earth's land surface. The evolution of skin temperature is not yet fully exploited as its measurement is fairly recent.

One of the IASI-Flux and Temperature ERC project tasks aims at providing new climate benchmarks by using skin temperature observations from the calibrated radiances measured twice a day at any location by the IASI thermal infrared instrument on the suite of Metop satellites (2006-2025). The uniqueness of this project is that the IASI-data record will be completely independent from third party information, with no other data from observations or models used, and can therefore serve as an independent reference to e.g. reanalysis, or other climate data records.

In this presentation, we first describe our iterative method based on entropy reduction combined with artificial neural networks to derive an independent record of IASI temperature, we next compare and validate our novel method with different datasets (e.g. EUMETSAT, ECMWF reanalysis, SEVIRI satellite products and ground measurements). We then show our results of global skin temperature over land and sea and in different regions in the world over the period [2008- present]. The observed trends are analyzed at seasonal and regional scales in order to disentangle natural (weather/dynamical) variability and human-induced climate forcing. Finally, we show how expanding cities are hotspots for skin temperature reflecting the usefulness of skin temperature as a tracer for human-induced land use and climate change.