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Towards a Combined Surface Temperature Dataset for the Arctic from the Along-Track Scanning Radiometers (ATSRs)

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Surface Temperature (ST) changes in the Polar Regions are predicted to be more rapid than either global averages or responses in lower latitudes. Observations increasingly confirm these findings in the Arctic. It is, therefore, particularly important to monitor Arctic climate change.

Satellites are particularly relevant to observations of Polar latitudes as they are well-served by low-Earth orbiting satellites. Whilst clouds often cause problems for satellite observations of the surface, in situ observations are much sparser. The ATSRs are accurate infra-red satellite radiometers, designed explicitly for climate standard observations and particularly suited to ST observations. ATSR radiance observations have been used to retrieve sea and land ST for a series of three instruments over a period greater than twenty years. This series will be extended with the launch of SLSTR on Sentinel 3, which has the same key design features necessary for providing climate quality ST datasets.

We have combined land, ocean and sea-ice ST retrievals from ATSR-2 and AATSR to produce a new ST dataset for the Arctic; the ATSR Arctic combined Surface Temperature (AAST) dataset. The method of cloud-clearing, use of auxiliary data for ice classification and the ST retrievals used for each surface-type will be described. We will establish the accuracy of sea-ice and land-ice retrievals with recent results from validation against in situ data. We will also discuss the results from the calculation and propagation of uncertainties in the AAST dataset. Time series of ST anomalies for each surface type will be presented. The time series for open ocean in the Arctic Polar Region shows a significant warming trend during the AATSR mission. Time series for land, land-ice and sea-ice show high variability as expected but also interesting patterns.

Overall, our purpose is to present the state-of-the-art for ATSR observations of ST change in the Arctic and hence indicate confidence we can have in temperature change across all three domains, and in combination.