

EGU21-14373

<https://doi.org/10.5194/egusphere-egu21-14373>

EGU General Assembly 2021

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Global long-term land surface temperature for NOAA AVHRR: extension from 1981-2000 to 1981-2020

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As an important indicator of land-atmosphere energy interaction, land surface temperature (LST) plays an important role in the research of climate change, hydrology, and various land surface processes. Compared with traditional ground-based observation, satellite remote sensing provides the possibility to retrieve LST more efficiently over a global scale. Since the lack of global LST before, Ma et al., (2020) released a global 0.05×0.05 long-term (1981-2000) LST based on NOAA-7/9/11/14 AVHRR. The dataset includes three layers: (1) instantaneous LST, a product generated based on an ensemble of several split-window algorithms with a random forest (RF-SWA); (2) orbital-drift-corrected (ODC) LST, a drift-corrected version of RF-SWA LST at 14:30 solar time; and (3) monthly averages of ODC LST. To meet the requirement of the long-term application, e.g. climate change, the period of the LST is extended from 1981-2000 to 1981-2020 in this study. The LST from 2001 to 2020 are retrieved from NOAA-16/18/19 AVHRR with the same algorithm for NOAA-7/8/11/14 AVHRR. The train and test results based on the simulation data from SeaBor and TIGR atmospheric profiles show that the accuracy of the RF-SWA method for the three sensors is consistent with the previous four sensors, i.e. the mean bias error and standard deviation less than 0.10 K and 1.10 K, respectively, under the assumption that the maximum emissivity and water vapor content uncertainties are 0.04 and 1.0 g/cm^2 , respectively. The preliminary validation against *in-situ* LST also shows a similar accuracy, indicating that the accuracy of LST from 1981 to 2020 are consistent with each other. In the generation code, the new LST has been improved in terms of land surface emissivity estimation, identification of cloud pixel, and the ODC method in order to generate a more reliable LST dataset. Up to now, the new version LST product (1981-2020) is under generating and will be released soon in support of the scientific research community.