A Preliminary Evaluation of SNPP VIIRS Land Surface Temperature Product with Landsat 8 Data

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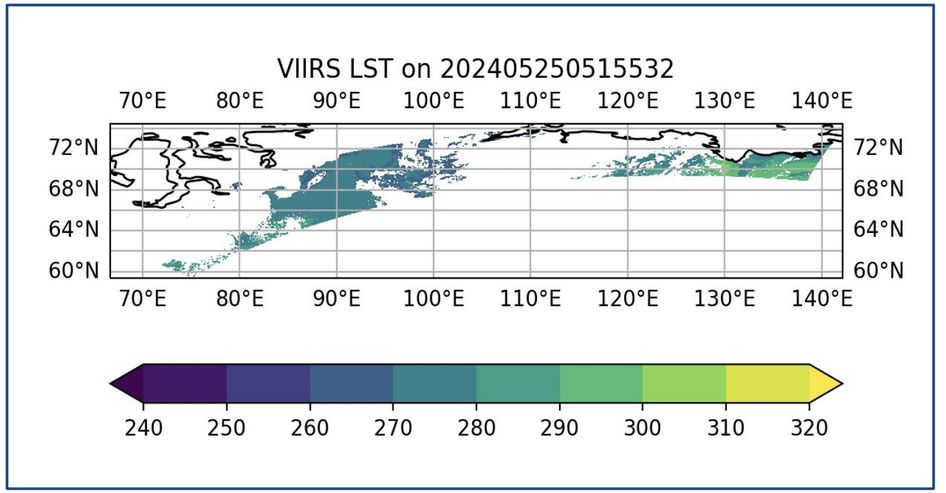
About Land Surface Temperature (LST):

- LST measures the Earth's surface temperature
- LST is a key parameter in controlling surface heat and water exchange with the atmosphere
- An LST product is routinely generated at NOAA from polar-orbiting operational environmental sensor VIIRS onboard SNPP for over a decade.
- The SNPP VIIRS LST has been extensively evaluated with ground observations [Liu, Y. et al., 2022, 2015]

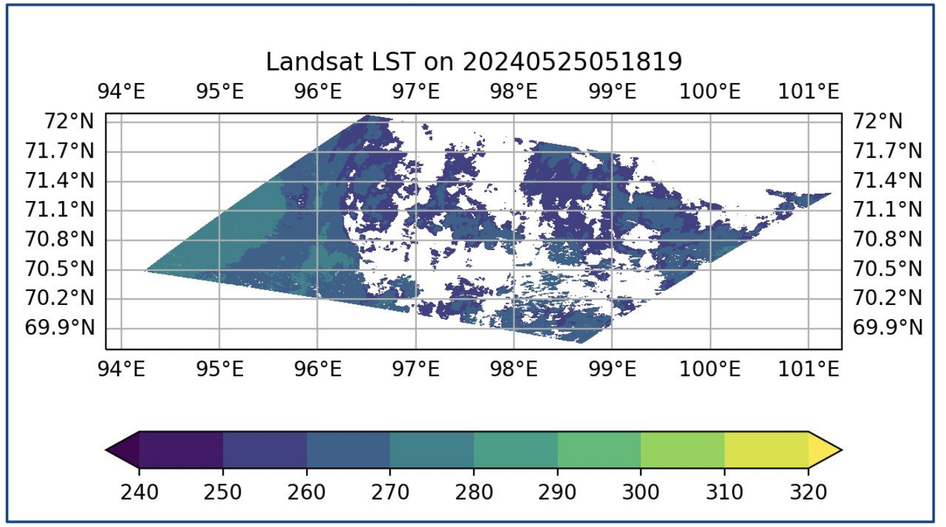
Question/research objective(s):

- Evaluate the VIIRS LST product by conducting a cross-comparison with independent satellite retrievals from the Landsat 8 Collection 2 Level 2 surface temperature product.

LST Example Images



VIIRS LST on May 25, 2024, at 05:15 UTC



Landsat LST on May 25, 2024, at 05:18 UTC

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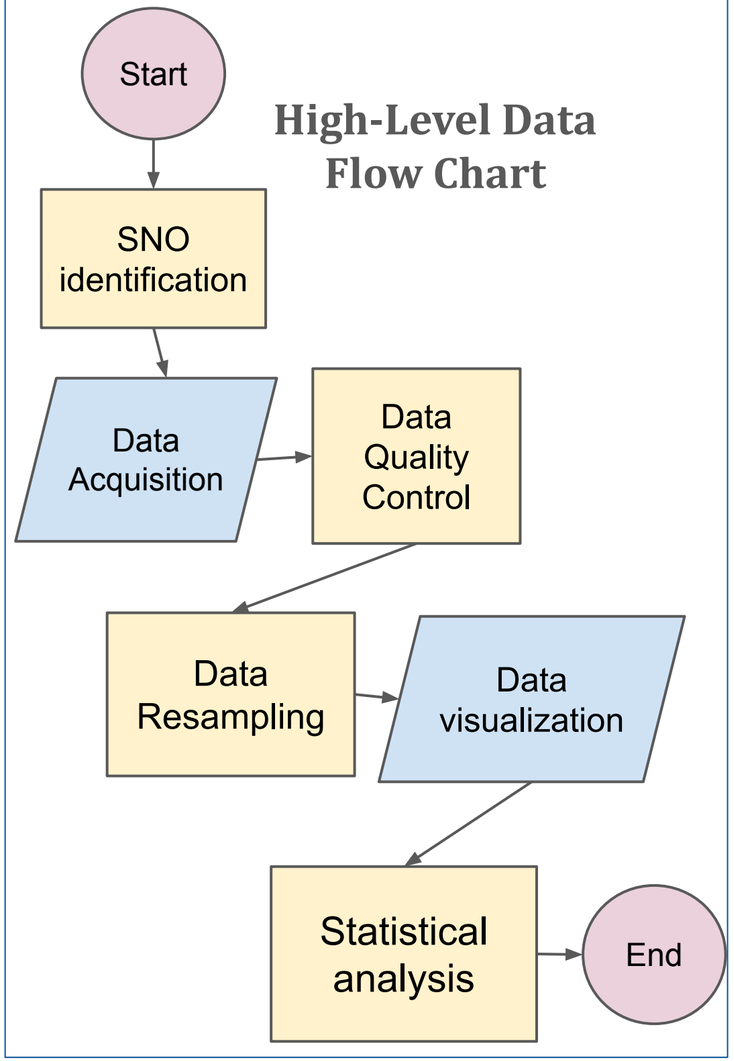
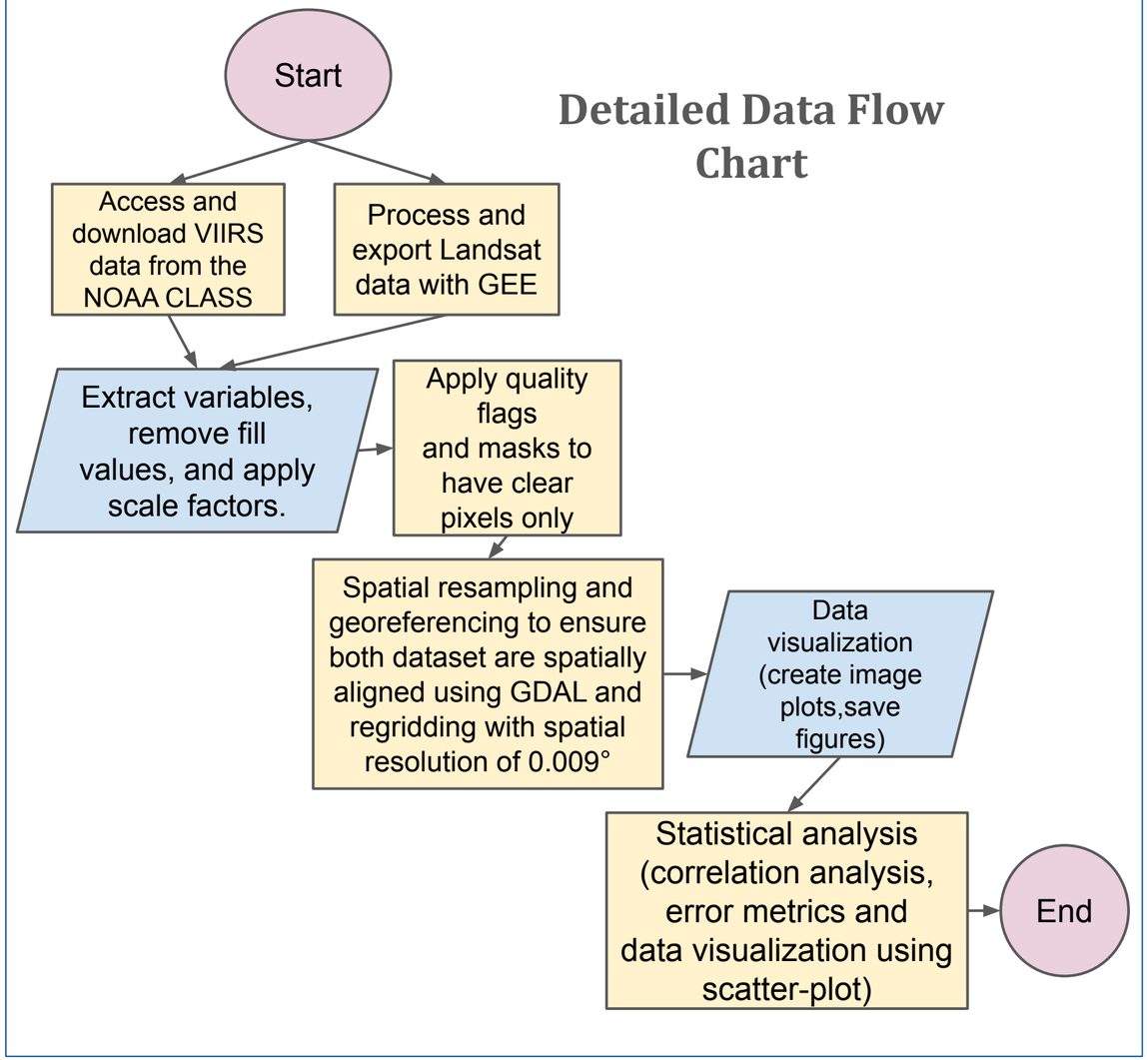
Cooperative Institute for Satellite Earth System Studies

Procedure:

High-Level Data Flow Chart



Detailed Data Flow Chart



Methodology:

- Identify Simultaneous Nadir Overpass (SNO) between SNPP VIIRS and Landsat 8 for April-May in 2024.
- Download VIIRS and Landsat LST data and quality-control to keep only clear-sky pixels.
- Resample VIIRS and Landsat 8 data to common regular grids with a resolution of 0.009° and match spatially.
- An example comparison was analyzed at 05:15 UTC for VIIRS and 05:18 UTC for Landsat 8 on May 25, 2024.

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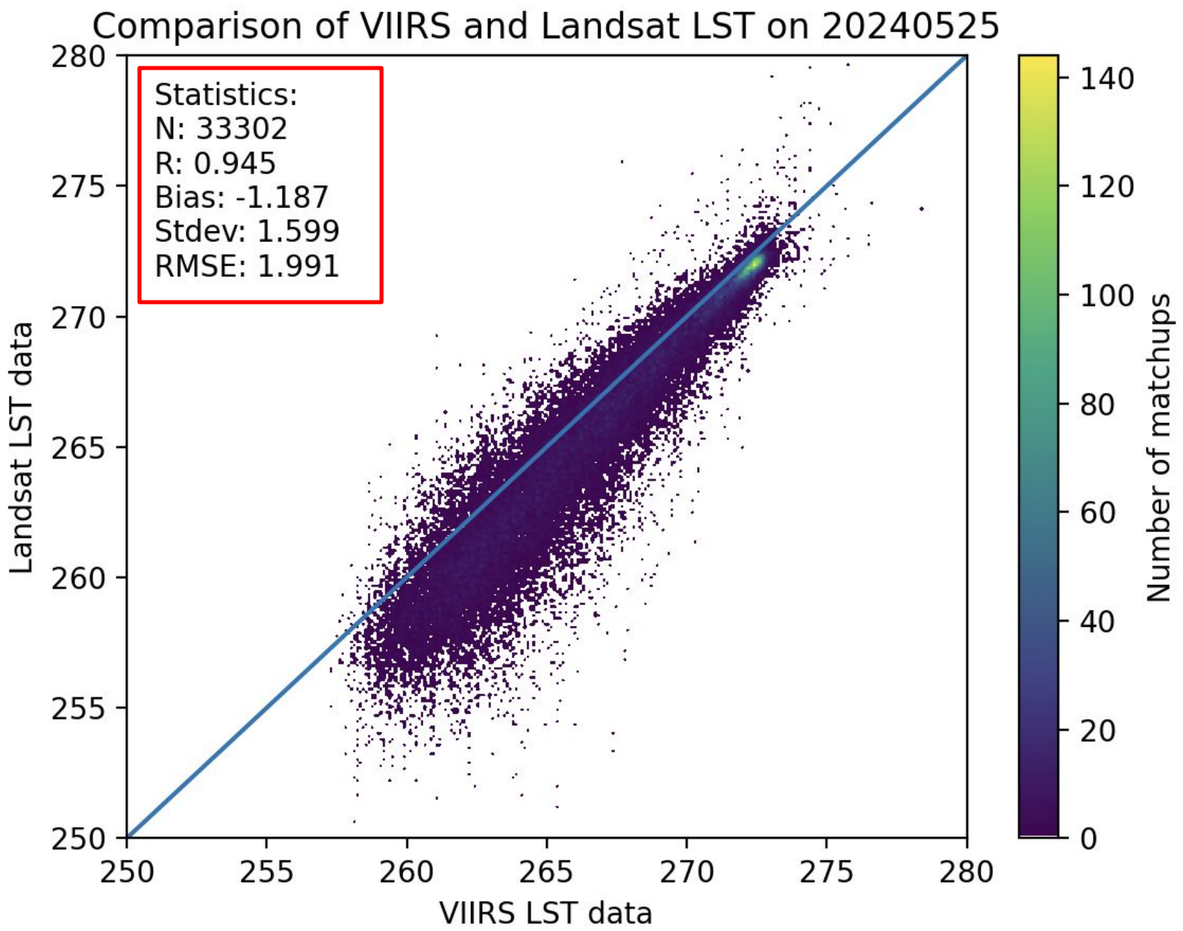

Results/next steps:

- The image plots illustrated similar spatial patterns.
- Statistical analysis indicated a reasonable agreement (as highlighted in the red box of the scatter-plot).
  - Agreement with bias of -1.2K and STD of 1.6K
- This comparison's results reflect the LST differences in high-latitude regions because the SNOs are primarily distributed in the high latitudes of the Northern and Southern Hemispheres, around 70 degrees.
- The study will continue to compare the LST from more VIIRS and Landsat 8 SNOs to analyze different scenarios (different seasons, day/night conditions, etc).