

Numerical Weather Prediction in Portugal 2021:
Surface-Atmosphere Interaction

A Google Earth Engine application to retrieve high resolution Land Surface Temperature from Landsat imagery

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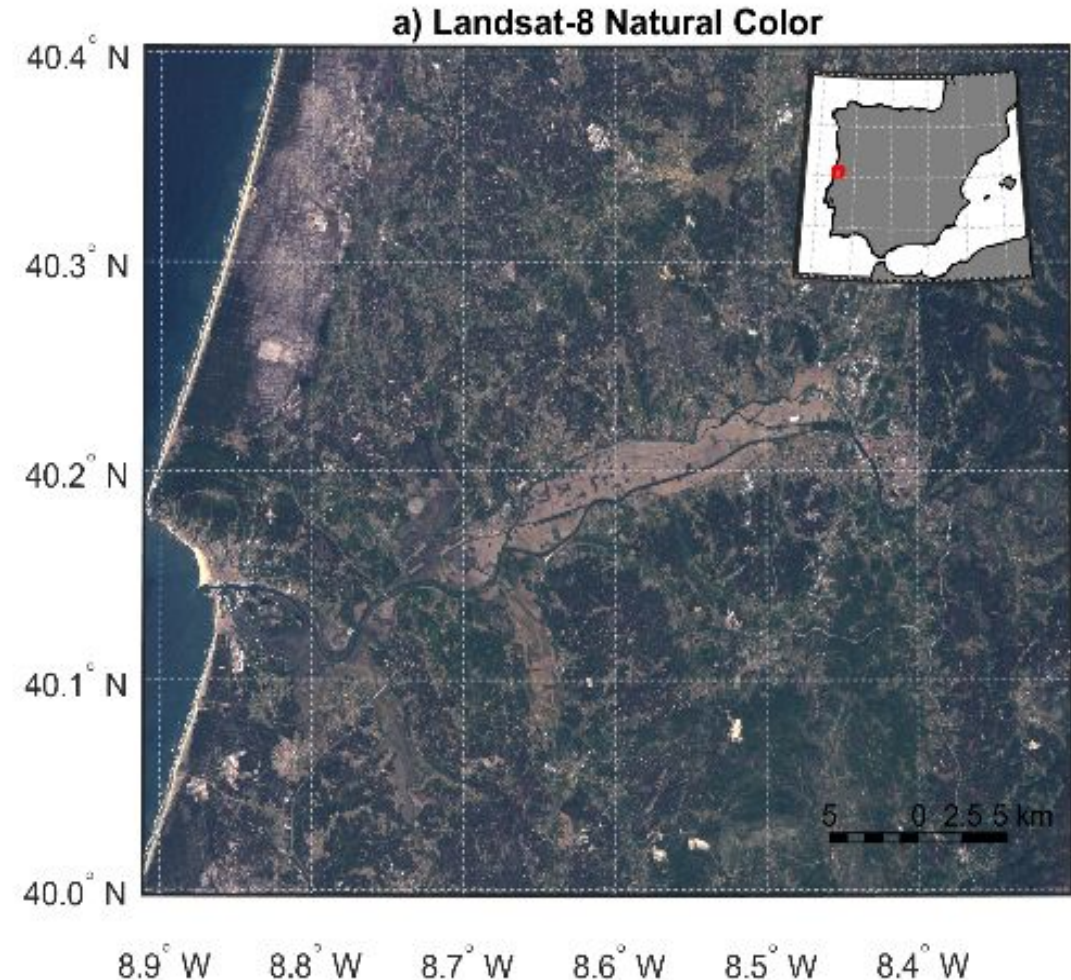
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Motivation

- Study the urban heat island effect over Coimbra, Portugal

Why use the GEE?

- ▶ Easy to learn
- ▶ Doesn't require resources
- ▶ Analysis of large volumes of data
- ▶ Fully independent





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The LST algorithm

Statistical Mono-Window algorithm

$$LST = A_i \frac{Tb}{\varepsilon} + B_i \frac{1}{\varepsilon} + C_i$$

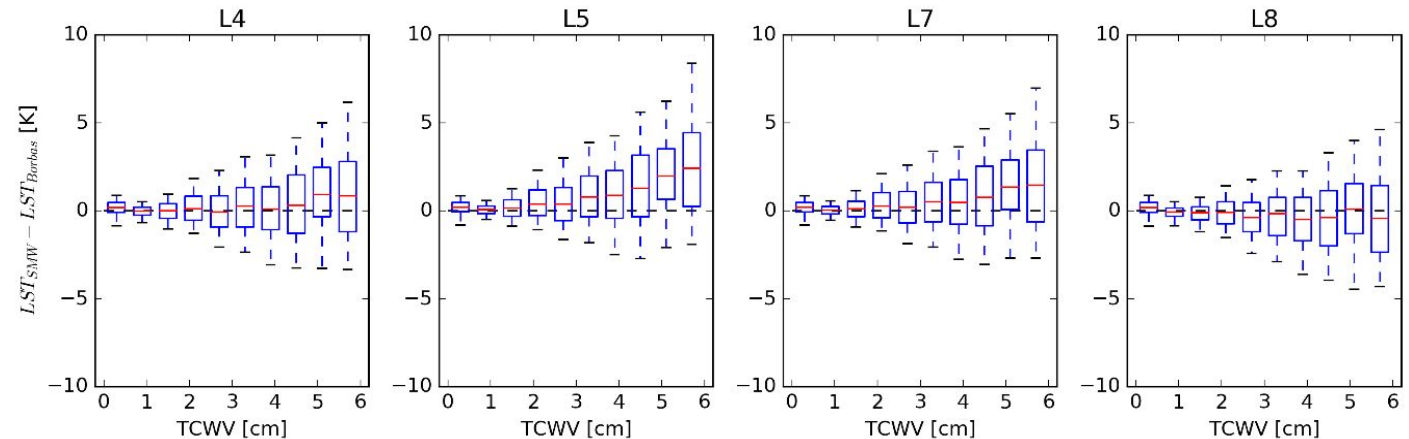
Tb = Brightness Temperature
 ε = Emissivity



Algorithm Calibration:

Radiative Transfer Model: RTTOV (v12)

Atmospheric profile data: Borbas et al. (2005)





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The code

Google Earth Engine

https://code.earthengine.google.com/?accept_repo=users/sofiaermida/landsat_smw_lst

GitHub

https://github.com/sofiaermida/Landsat_SMW_LST



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The GEE platform

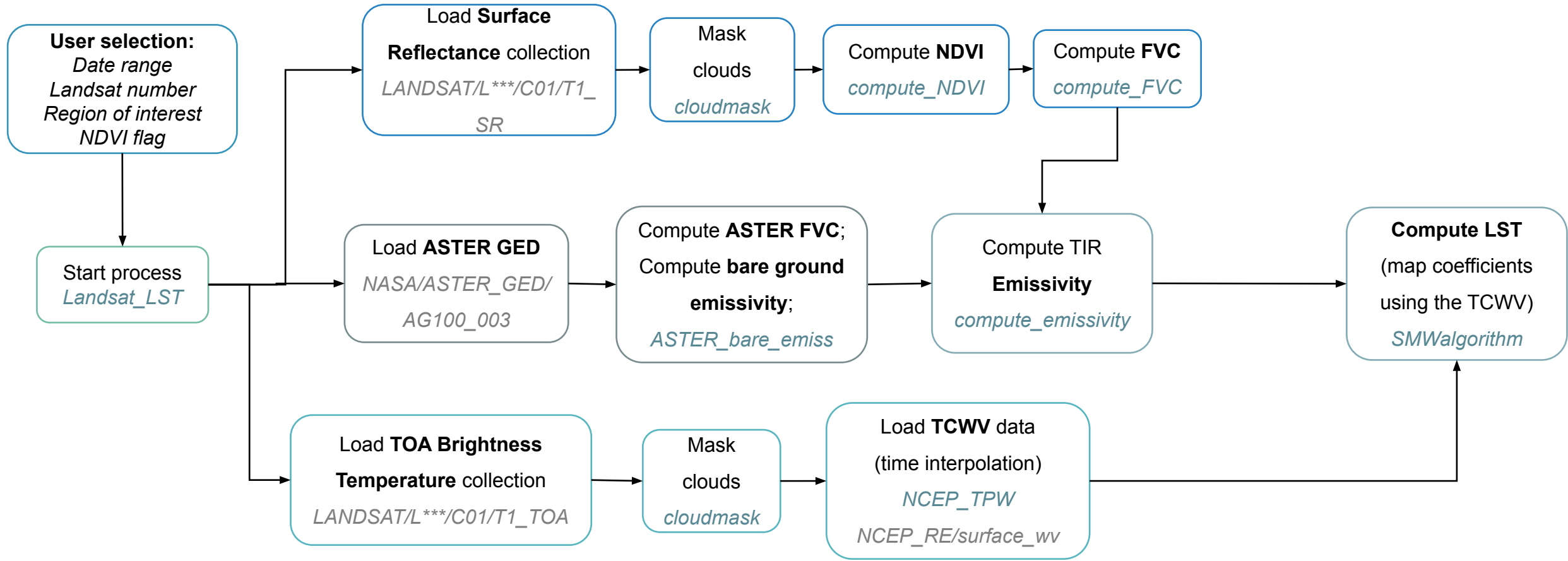


The screenshot displays the Google Earth Engine (GEE) web interface. At the top, the browser address bar shows the URL <https://code.earthengine.google.com>. The main header includes the Google Earth Engine logo and a search bar. Below the header, the 'Scripts' tab is selected, revealing a file explorer on the left. A red rectangular box highlights the 'modules' folder within the 'users/sofiaermida/landsat_smw_lst' project. The file tree lists several JavaScript files: ASTER_bare_emiss.js, Landsat_LST.js, NCEP_TPW.js, SMW_coefficients.js, SMWalgorithm.js, broadband_emiss.js, cloudmask.js, compute_FVC.js, compute_NDVI.js, compute_emissivity.js, example_1.js, and example_2.js. The central map area shows a satellite view of North America, with labels for various states and cities. The right sidebar contains the 'Inspector', 'Console', and 'Tasks' panels, with the 'Console' panel currently empty.



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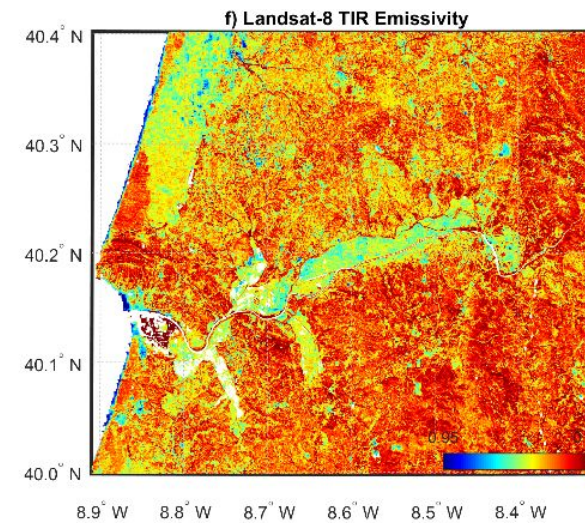
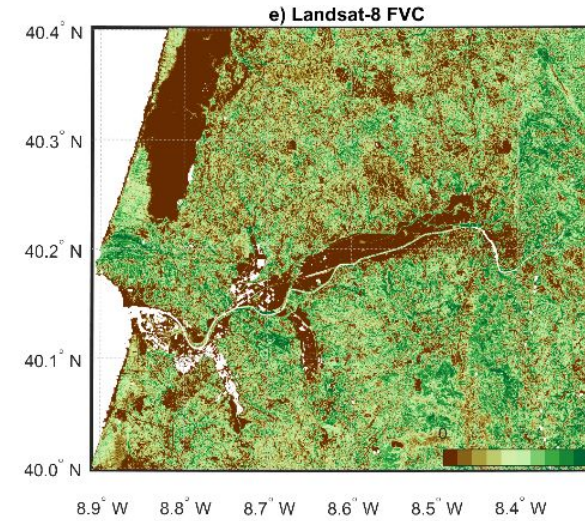
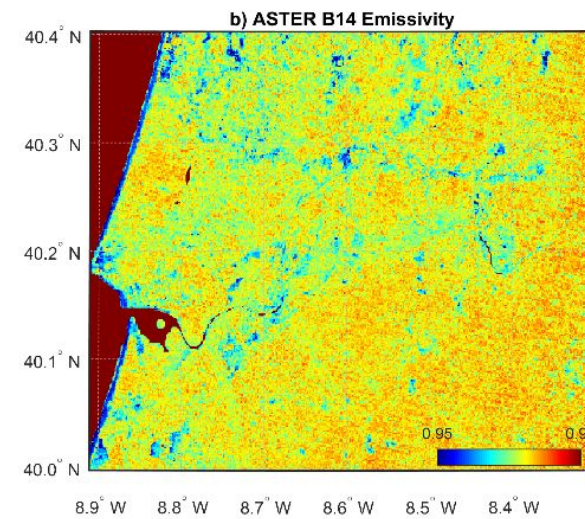
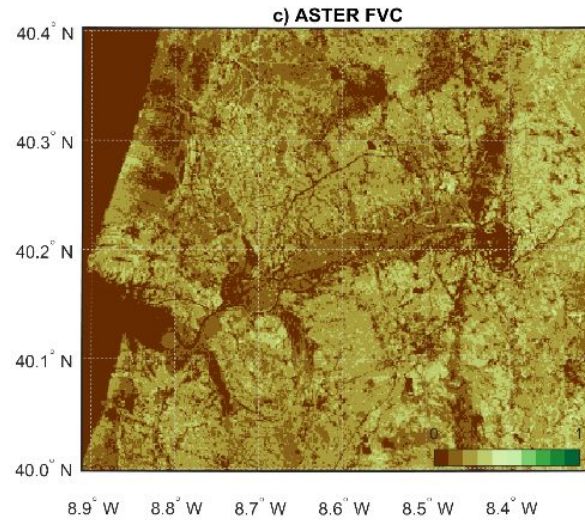
Code structure





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Emissivity

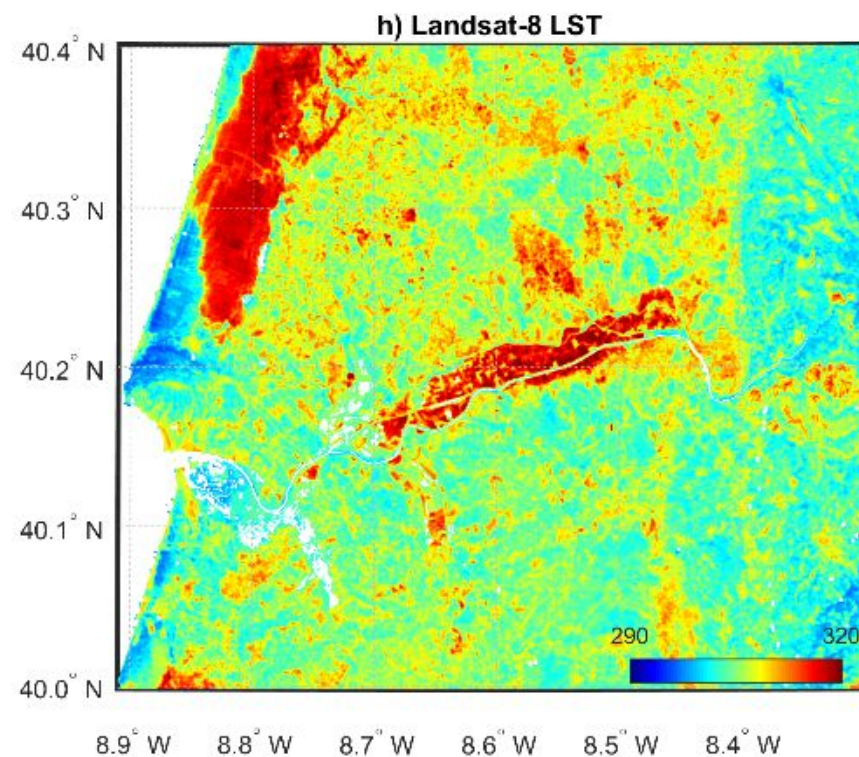
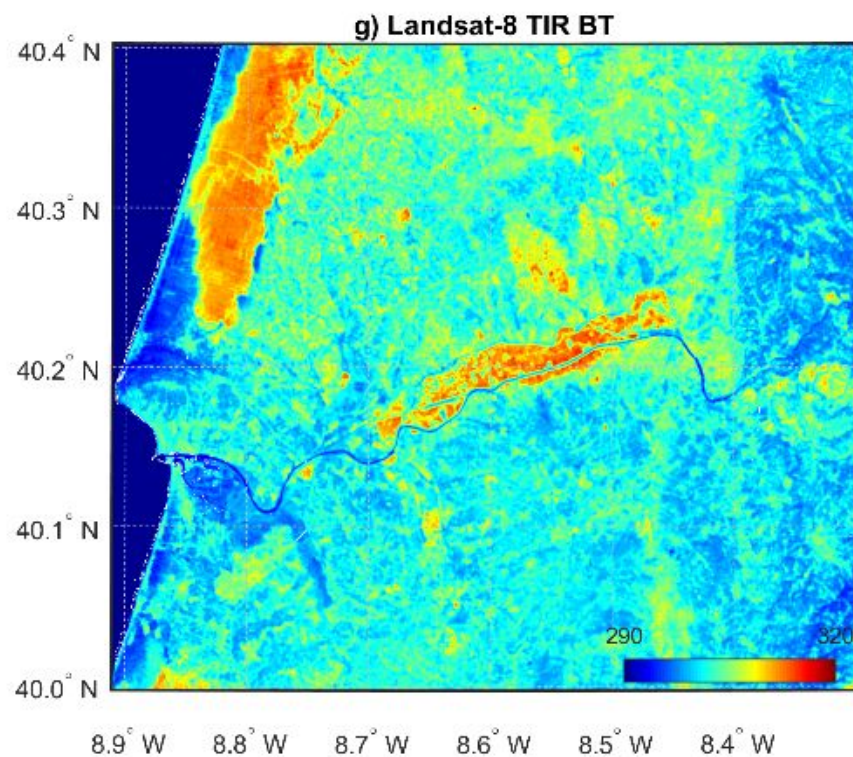


17 May 2018



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Land Surface Temperature

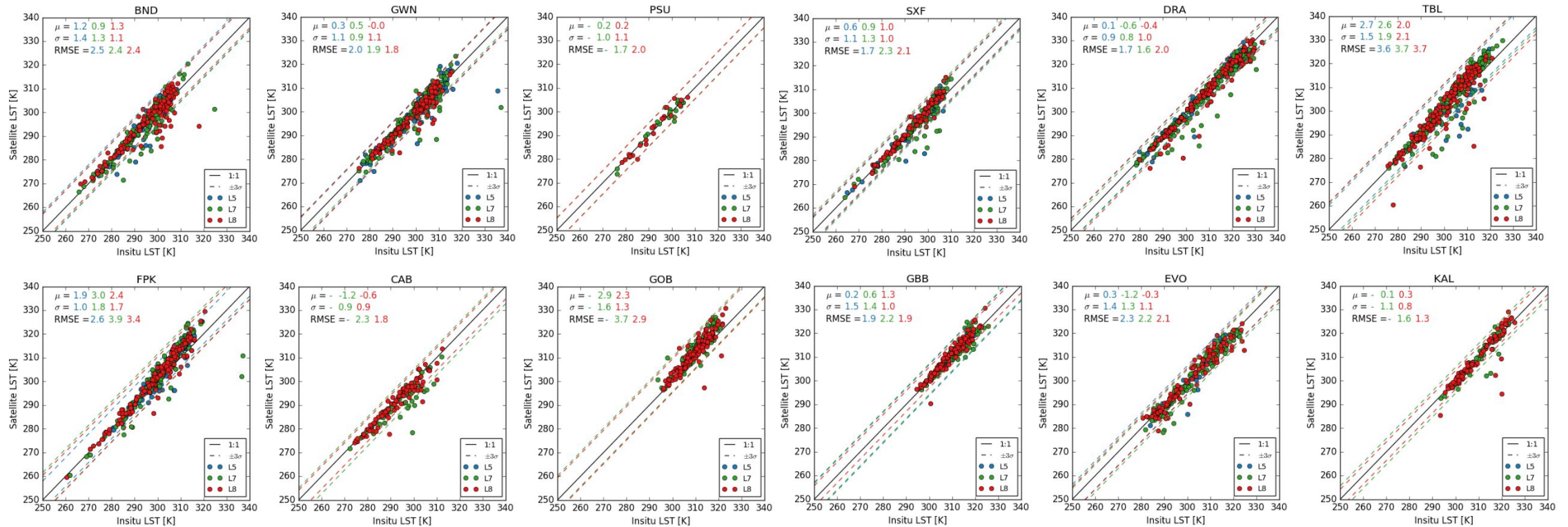


17 May 2018



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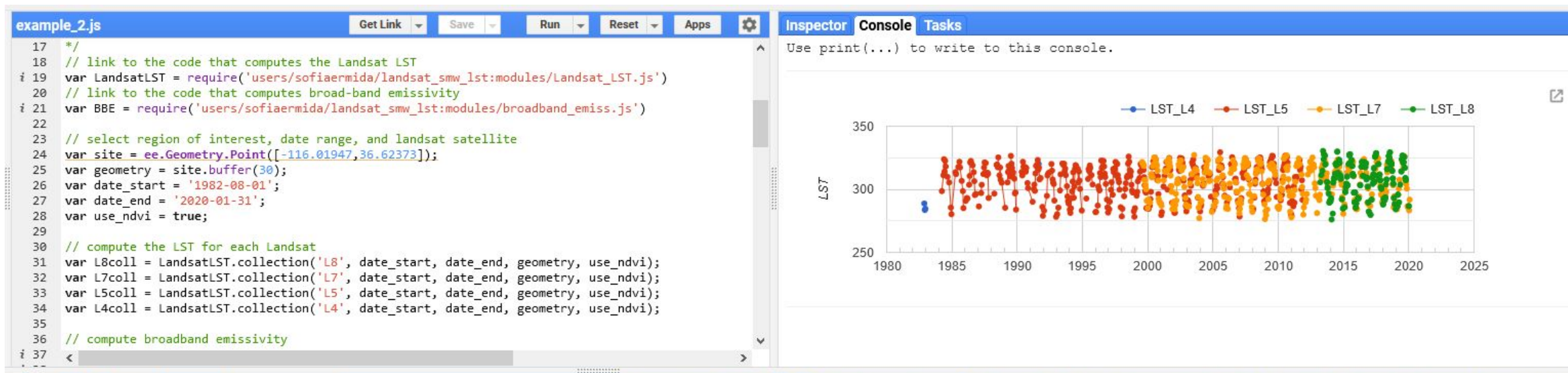
Quality assessment





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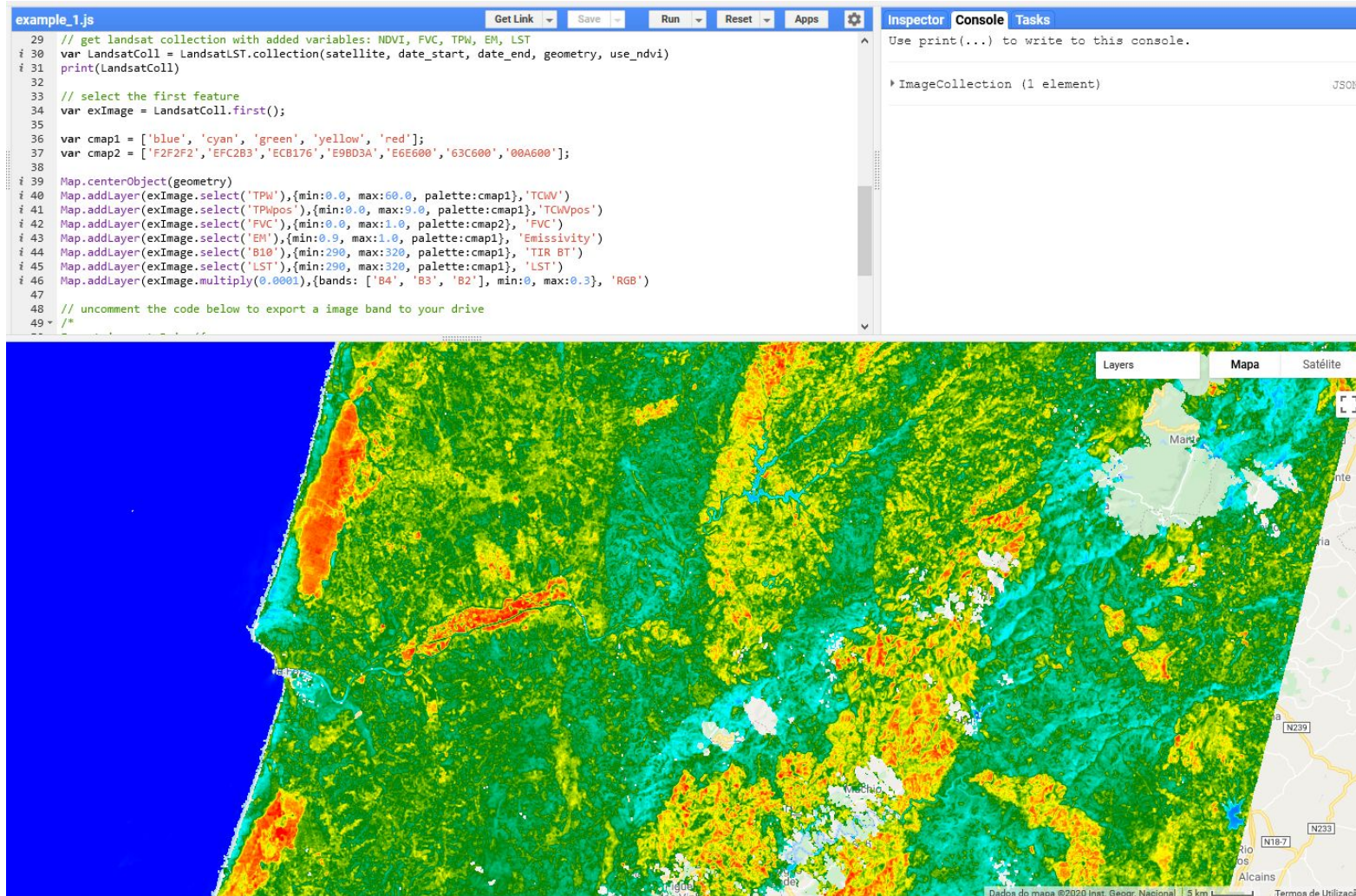
Applications: time-series





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Applications: Image analysis



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Thank you

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Ermida, S.L., Soares, P., Mantas, V., Göttsche, F.-M., Trigo, I.F., 2020. **Google Earth Engine open-source code for Land Surface Temperature estimation from the Landsat series**. *Remote Sensing*, 12 (9), 1471; <https://doi.org/10.3390/rs12091471>