

Analyzing 30 Years of Annual Landsat Change: From Terabytes to Answers in Minutes

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Remote Sensing for Global Analysis: the Good & the Hurdles

- The use of satellite, airborne and unmanned aerial systems remote sensing is vital to monitor changes on the Earth's surface, and to answer science questions driven by these changes.
- Landsat data (30+ meters spatial resolution) is often used for regional and global scaling studies because it provides the longest continuous coverage of the Earth's surface
- Since the Landsat mission launched in 1972, over 7 million images have been acquired, amounting to petabytes of data.
- Processing, harmonizing, and analyzing the abundance of available data is cumbersome at best and impossible at worst due to limitations in storage space and computing power.

Our Study Areas



Above: Stordalen Mire in Abisko, northern Sweden, in the Arctic Circle;



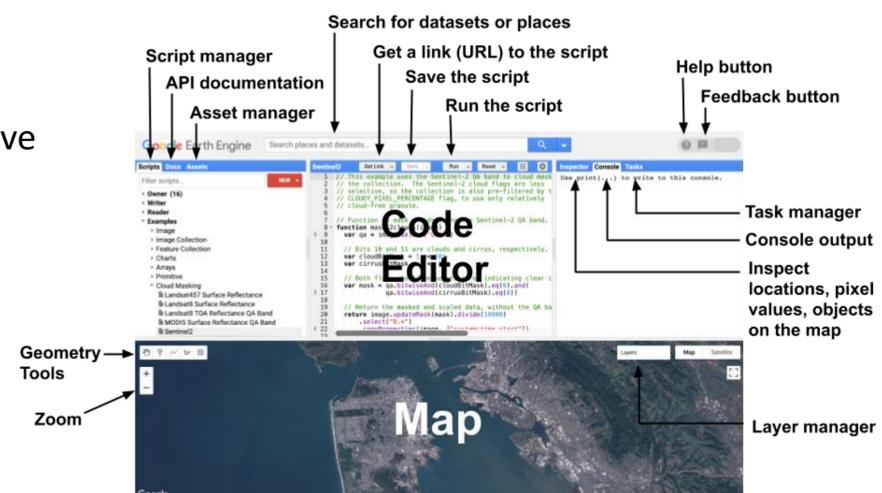
Right: Lake Sunapee, in Sunapee, New Hampshire

Solution: Using Cloud Infrastructure for Planetary-Scale Analysis



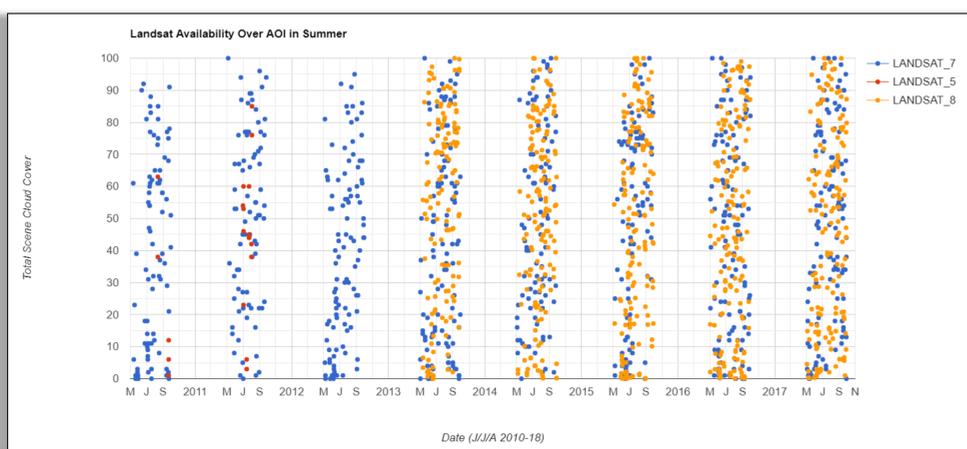
Google Earth Engine

- Google Earth Engine (GEE) is a cloud-based, GIS and remote-sensing platform capable of handling big data
- It enables analysis of geospatial data at the petabyte scale & leverages the massive computing ability of Google's cloud
- This type of computation environment is used to rapidly process and analyze enormous quantities of data for global-level processing
- Access is free for non-commercial purposes. At its simplest, users only need the Chrome web browser and an internet connection.
- Users can use their own data in addition to data available on Google's servers, and they have the option to make custom web-based applications to showcase their data products.

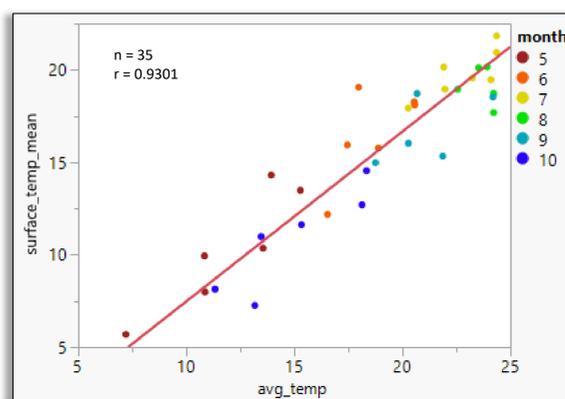


The interactive "playground" in an internet browser provides an IDE for coding, debugging, output, script management, documentation, feature creation, and more

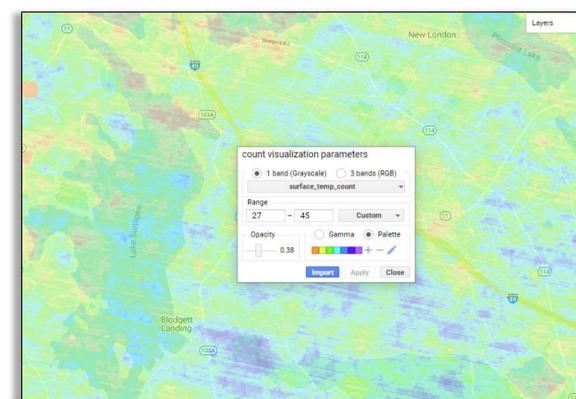
Results: Preprocessing and Analyzing Thousands of Landsat Scenes in < 5 minutes



> 1500 Landsat scenes over Stordalen Sweden plotted for date & cloud cover



Thermal band of Landsat 5, 7, & 8 preprocessed and compared with *insitu* data



Count of valid pixels over a region

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