

MASTERGIS

► **Days**

2023

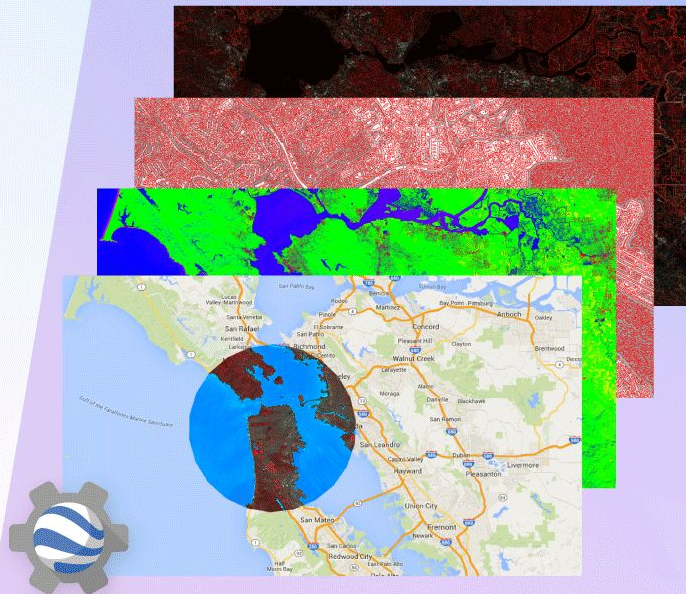
PROCESAMIENTO Y VISUALIZACIÓN DE DATOS GEOESPACIALES CON GOOGLE EARTH ENGINE



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- ▶ Doctorando en Física y Ciencias de la Tierra de la Universidad de Leipzig (Alemania).
- ▶ Investigador en el Centro de Percepción Remota para la Investigación del Sistema Terrestre (RSC4Earth) desde hace 3 años.
- ▶ Desarrollador Experto de Google (GDE) para Earth Engine desde hace 2 años. Creador de múltiples software de código abierto para el procesamiento de datos geoespaciales desde hace 3 años.



¿Les ha pasado que han descargado grandes volúmenes de datos geoespaciales en computadoras locales y no han contado con la capacidad de cómputo necesaria para llevar a cabo su geoprocesamiento?

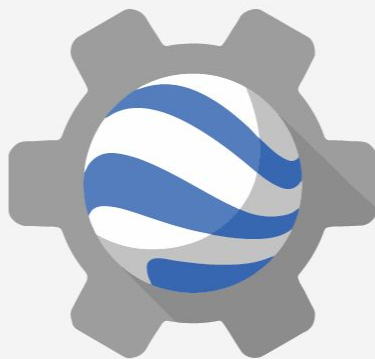


OBJETIVOS



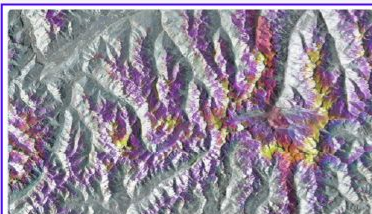
- ▶ Reconocer los conceptos fundamentales de datos geoespaciales dentro de GEE.
- ▶ Usar GEE para el procesamiento de datos geoespaciales.
- ▶ Visualizar y comunicar datos geoespaciales usando GEE.

PROCESAMIENTO Y VISUALIZACIÓN DE DATOS GEOESPACIALES CON



Google Earth Engine

► Catálogo de Google Earth Engine



Sentinel-1 SAR GRD: C-band Synthetic Aperture Radar

Data availability: 2014 – Present

The Sentinel-1 mission provides data from a dual-polarization C-band Synthetic Aperture Radar (SAR) instrument. SAR instruments are capable of acquiring meaningful data in all weather conditions (even clouds) during daytime and nighttime. Sentinel 1 data is used across many domains, including maritime activity, sea ice mapping, humanitarian aid, crisis response, and forest management.



Sentinel-2 MSI: Multispectral Instrument

Data availability: 2015 – Present

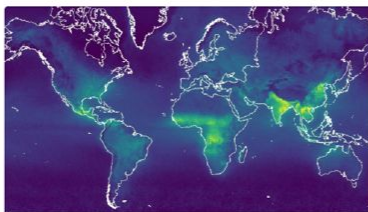
The Sentinel-2 mission collects high-resolution multispectral imagery useful for a broad range of applications, including monitoring of vegetation, soil and water cover, land cover change, as well as humanitarian and disaster risk.



Sentinel-3 OLCI EFR: Ocean and Land Color Instrument

Data availability: 2016 – Present

The Sentinel-3 instrument provides systematic measurements of the planet's oceans, land, ice, and atmosphere, including the temperature, color and height of the sea surface as well as the thickness of sea ice.



Sentinel-5P TROPOMI: TROPospheric Monitoring Instrument

Data availability: 2018 – Present

The Sentinel-5 Precursor mission collects data useful for assessing air quality, including concentrations of: ozone, methane, formaldehyde, aerosol, carbon monoxide, nitrogen oxide, and sulphur dioxide.



Landsat 8 Surface Reflectance

2013 – Present



Landsat 7 Surface Reflectance

1999 – Present



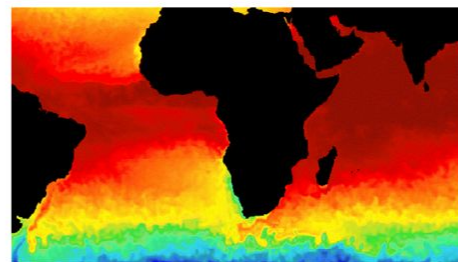
Landsat 5 Surface Reflectance

1984 – 2012



Landsat 4 Surface Reflectance

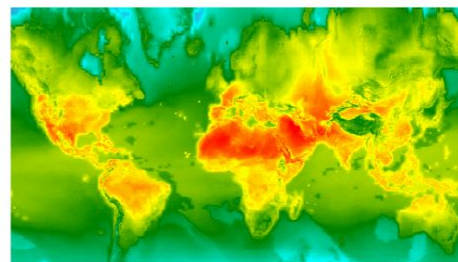
1982 – 1993



Surface Temperature

Thermal satellite sensors can provide surface temperature and emissivity information. The Earth Engine data catalog includes both land and sea surface temperature products derived from several spacecraft sensors, including MODIS, ASTER, and AVHRR, in addition to raw Landsat thermal data.

[Explore temperature data](#)



Climate





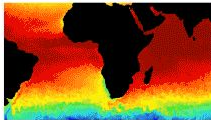
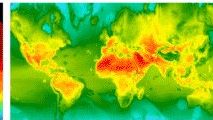
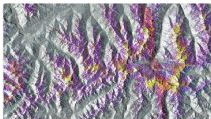


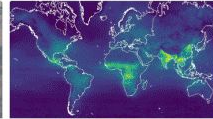
Climate models generate both long-term climate predictions and historical interpolations of surface variables. The Earth Engine catalog includes historical reanalysis data from NCEP/NCAR, gridded meteorological datasets like NLDAS-2, and GridMET, and climate model outputs like the University of Idaho MACAv2-METDATA and the NASA Earth Exchange's Downscaled Climate Projections.

[Explore climate data](#)







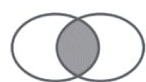


<https://developers.google.com/earth-engine/>

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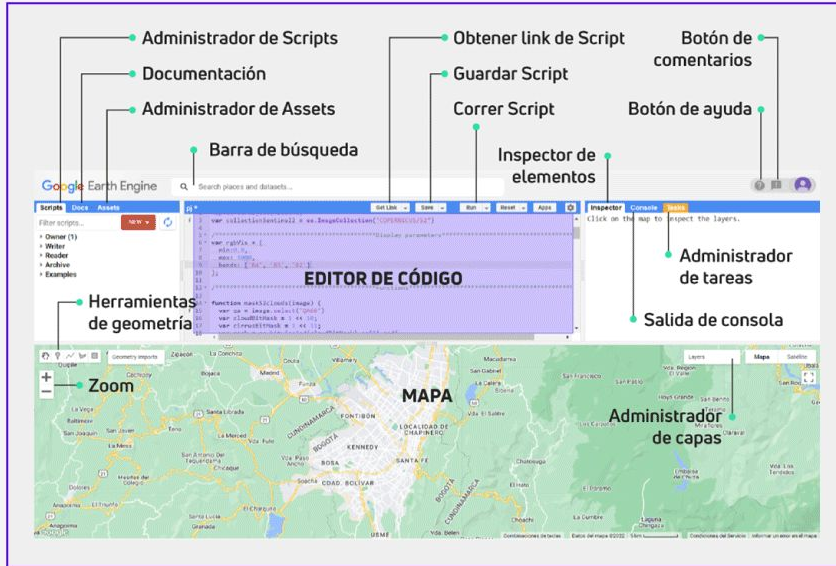
► Catálogo

 <p>Landsat 8 Surface Reflectance 2013 - Present</p>	 <p>Landsat 7 Surface Reflectance 1999 - Present</p>	 <p>Landsat 5 Surface Reflectance 1984 - 2012</p>	 <p>Landsat 4 Surface Reflectance 1982 - 1993</p>
 <p>Surface Temperature Reanalysis products combine global surface temperature and emissivity information. The Earth Engine info catalog includes both land and sea surface temperature products derived from several different sensors, including MODIS, AVHRR, and VIIRS, in addition to raw Landsat thermal data. Explore temperature data</p>		 <p>Climate Climate models provide both long-term climate predictions and historical reconstructions of surface variables. The Earth Engine catalog includes historical reanalysis data from NCEP/NCAR, global atmospheric reanalysis from ERA5, and GCMs, and climate model data from the National Institute of Space Research (INPE) and the NASA Earth Exchange Global Climate Prediction. Explore climate data</p>	
 <p>Sentinel-1 SAR GRD: C-band Synthetic Aperture Radar Data availability: 2014 - Present The Sentinel-1 SAR GRD products have been a fundamental part of Earth Engine's capacity to provide SAR imagery. SAR data can be used for a wide range of applications, including monitoring of land use, coastal zone management, and disaster response.</p>	 <p>Sentinel-2 MSI: MultiSpectral Instrument Data availability: 2015 - Present The Sentinel-2 MSI products provide high-resolution multispectral imagery useful for a wide range of applications, including monitoring of vegetation, soil, and water cover, land cover change, and air pollution and disaster risk.</p>		
 <p>Sentinel-3 OLCI: Ocean and Land Color Instrument Data availability: 2016 - Present The Sentinel-3 OLCI products provide synthetic measurements of the planet's oceans, land, ice, and atmosphere, including the temperature, color and height of the sea surface as well as the thickness of sea ice.</p>	 <p>Sentinel-5P TROPOMI: Tropospheric Monitoring Instrument Data availability: 2017 - Present The Sentinel-5P TROPOMI products provide data useful for assessing air quality, including concentrations of ozone, methane, formaldehyde, aerosol, carbon monoxide, nitrogen dioxide, and nitrogen dioxide.</p>		

► API: Objetos y Métodos

 <p>Image The fundamental raster data type in Earth Engine.</p>	 <p>ImageCollection A set of images.</p>	 <p>Geometry The fundamental vector data type in Earth Engine.</p>
 <p>Feature A geometry with attributes.</p>	 <p>FeatureCollection A set of features.</p>	 <p>Reducer An object used to compute statistics or perform aggregations.</p>
 <p>Join Combine datasets (Image or Feature collections) based on time, location, or an attribute property.</p>	 <p>Array An object for multi-dimensional analyses.</p>	 <p>Chart An object for charting properties and spatiotemporal reductions.</p>

<https://developers.google.com/earth-engine/>



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¿QUÉ HEMOS APRENDIDO HASTA AHORA?

- ▶ GEE cuenta con un extenso catálogo de datos geoespaciales.
- ▶ Datos geoespaciales son representados por diferentes objetos en GEE.
- ▶ Los objetos en GEE se pueden procesar vía su API de JavaScript o de Python.

RESUMEN/ESQUEMA DE LO QUE SE HARÁ EN LA PARTE PRÁCTICA

- ▶ Acceder a datos geoespaciales del catálogo de GEE usando la API de JavaScript (Code Editor).
- ▶ Procesar datos geoespaciales del catálogo de GEE en el Code Editor.
- ▶ Visualizar datos geoespaciales en el Code Editor.

CONCLUSIONES

- ▶ Se introdujeron los conceptos fundamentales de datos geoespaciales dentro de GEE.
- ▶ Se utilizó el Code Editor para el procesamiento de datos geoespaciales.
- ▶ Se visualizaron datos geoespaciales usando el Code Editor.

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- ▶ <https://earthengine.google.com/>
- ▶ <https://developers.google.com/earth-engine/>
- ▶ Cardille, J. A., Crowley, M. A., Saah, D., & Clinton, N. E. (Eds.). (2024). Cloud-Based Remote Sensing with Google Earth Engine. Springer International Publishing.
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¡GRACIAS!



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