

Mapping and Monitoring MODIS Chlorophyll Concentration and Temperature in Lake Titicaca

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Objective

- Learn how to search, access, analyze, visualize, and download MODIS Chlorophyll Level-3 data using the Giovanni web tool

Create Annual Average Chlorophyll Concentration Map in Lake Titicaca

1. Go to Giovanni: <http://giovanni.gsfc.nasa.gov/giovanni>
2. On the Giovanni page you will see the following options:

Select Plot:
selection of analysis options

Select Date Range:
select time period

The screenshot shows the GIOVANNI web interface with the following sections:

- Select Plot:** Includes a dropdown menu for "Maps: Time Averaged Map" and other options like "Comparisons", "Vertical", "Time Series", and "Miscellaneous".
- Select Date Range (UTC):** Features input fields for "YYYY-MM-DD" and "HH:mm" with a "Valid Range: 1948-01-01 to 2017-10-20" indicator.
- Select Region (Bounding Box or Shape):** Includes a text input field and a "Format: West, South, East, North" label.
- Select Variables:** Contains two expandable sections: "Disciplines" (with options like Aerosols, Atmospheric Chemistry, etc.) and "Measurements" (with options like Aerosol Index, etc.).
- Search and Action:** A "Keyword" search field with "Search" and "Clear" buttons, and a "Plot Data" button at the bottom right.

Select Region:
select geographic region by lat/lon, map, or shapefile

Keyword: search by data parameter or keyword

Plot Data: starts action to make your desired plot



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3. Enter the following options:

– **Keyword:** Enter **Chlorophyll** and click **Search**

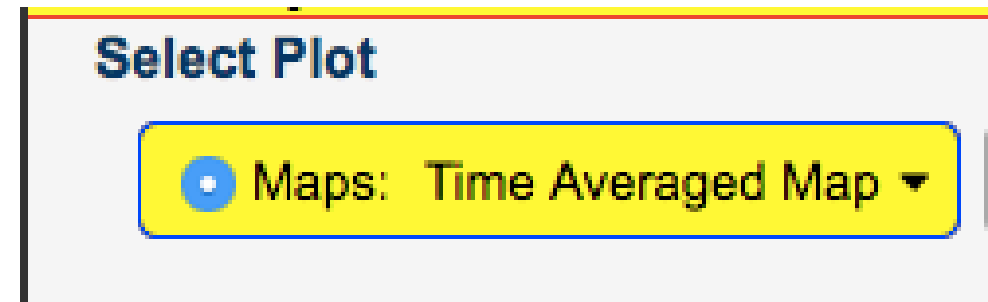
- You will get the following list, select Chlorophyll a Concentration: (MODISA_L3m_CHL_v2018)



Variable	Units	Source	Temp.Res.	Spat.Res.	Begin Date	End Date
<input type="checkbox"/> Total chlorophyll (NOBM_DAY vR2017)	mg m-3	NOBM Model	Daily	0.67 x 1.25 °	1998-01-01	2015-12-31
<input type="checkbox"/> Chlorophyll a Concentration (OCTS_L3m_CHL v2014)	mg m-3	OCTS	Monthly	9 km	1996-11-01	1997-06-30
<input type="checkbox"/> Total chlorophyll (NOBM_MON vR2017)	mg m-3	NOBM Model	Monthly	0.67 x 1.25 °	1998-01-01	2015-12-31
<input type="checkbox"/> Normalized fluorescence line height (MODISA_L3m_FLH v2018)	mW cm ⁻² um ⁻¹ sr ⁻¹	MODIS-Aqua	Monthly	4 km	2002-07-04	2018-05-31
<input checked="" type="checkbox"/> Chlorophyll a concentration (MODISA_L3m_CHL v2018)	mg m-3	MODIS-Aqua	Monthly	4 km	2002-07-04	2018-05-31

– Under **Select Plot**

- For **Maps**, Select **Time Averaged Map**
- This allows you to compute the average for a given year in each grid cell and plot the results to a map





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- Under **Select Data Range**
 - Under **YYYY-MM**, select the range **2017-01** to **2017-12** (for January to December)

Select Date Range (UTC)


YYYY-MM HH:mm

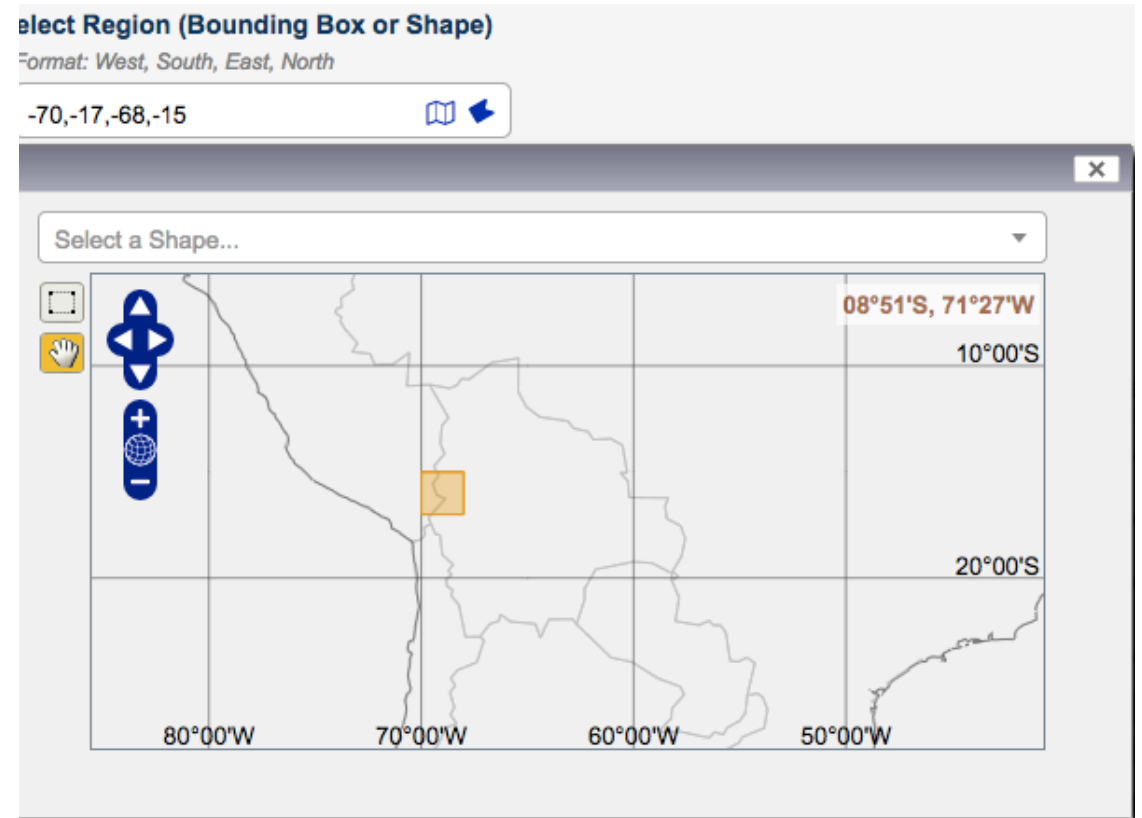
2017 -01 -01  00 : 00 to 2017 -12 -31  23 : 59

Valid Range: 2002-07-04 to 2018-05-31



Create Annual Average Chlorophyll Concentration Map in Lake Titicaca

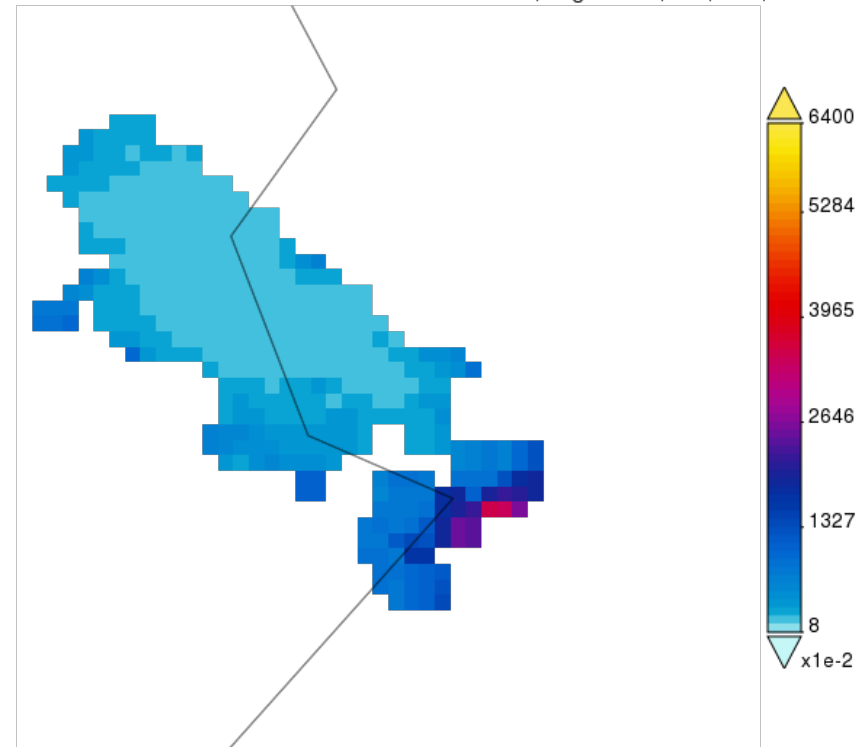
- Under **Select Region (Bounding Box or Shape)**
 - Enter the following west longitudes and south latitudes values [-70,-17,-68,-15]
 - Click or  to see the box on the map
 - Use the + button to zoom and arrows to pan the map



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4. Click **Plot Data** on the bottom right of the page. This will begin to process the data for our defined spatial and temporal variables
5. The resulting annual average map for 2017 will be displayed. This may take a few minutes.

Time Averaged Map of Chlorophyll a concentration monthly 4 km [MODIS-Aqua MODISA_L3m_CHL v2018] mg m-3 over 2017-01-01 00:25:01Z - 2018-01-01 02Z, Region 70W, 17S, 68W, 15S



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6. Click **Download** on the left side of the image. You can select to download the images as GeoTIFF raster, KMZ Google Earth product, or a PNG image file. The data can also be downloaded as a NetCDF (.nc) file for analysis with GIS.
7. Click **Back to Data Selection** at the bottom right
8. Under **Select Date Range (UTC)** change the **year of your choice** (from the range 2003 – 2016)
9. Click on **Plot Data** to get the map
10. You can also pick multiple years to make multi-year average

Questions Based on the Map

1. What is the unit of chlorophyll? What is the range of chlorophyll values in the maps?
2. Which area has maximum chlorophyll concentration in the lake?
3. Which year had larger chlorophyll concentration?