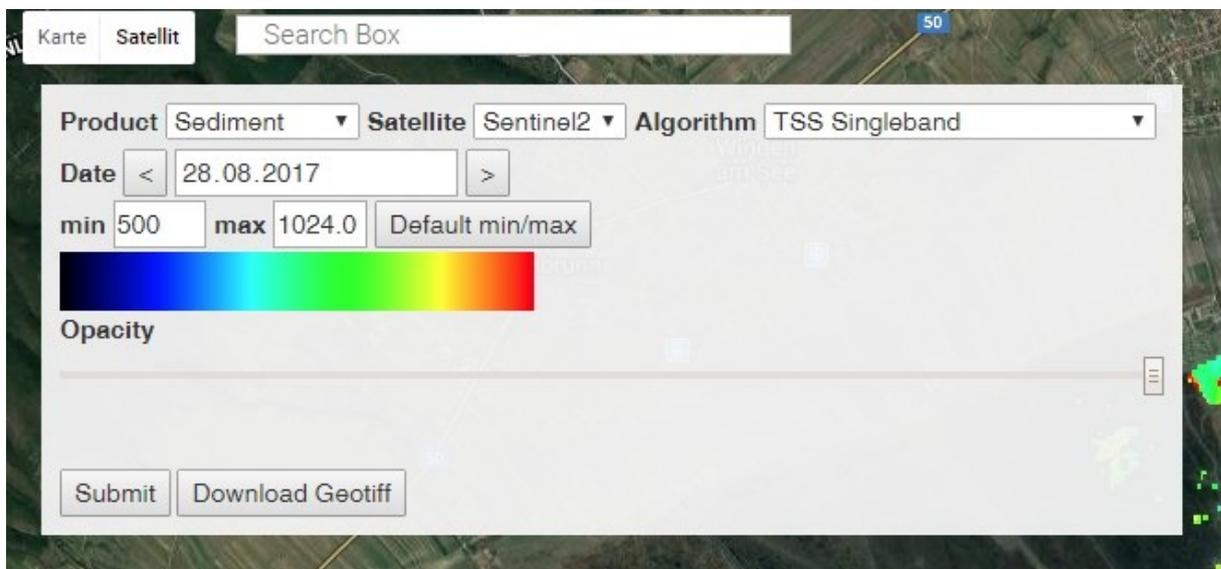


Global Lake Watch

Global Lake Watch is an interactive visualization of basic aquatic ecosystem parameters using satellite data. Earth observation satellites allow calculation of chlorophyll and suspended sediment concentration indices and brightness temperature using simple calculations. Several simple algorithms are available and have been tested for different environments, demonstrating that the index values are proportional to the target parameters in the typical case. No quantitative, global scale validation of these algorithms has been performed, therefore the maps shown here can only provide a qualitative understanding of the spatial and temporal patterns of these concentrations. The datasets allow an overview of aquatic ecosystem processes such as algae bloom dynamics, and physical processes such as sediment dynamics.

Navigation:

Navigation uses the same commands Google Maps does: zoom in and out with the mouse wheel or the + and - button in the bottom left corner, left-click and drag to pan. Type a region or location into the search box in the top field to move to find a location, switch between Google Maps streetmap or satellite background with the buttons on top left.



How to use

Select area of interest using the Google Maps search bar or by panning and zooming the map. Select product of interest (chlorophyll, sediment, temperature or satellite water marker) of interest from the left dropdown menu, satellite of interest from medium menu (Sentinel 2 and 3, Landsat 7 or 8, MODIS and algorithm and of interest from the right dropdown menu.

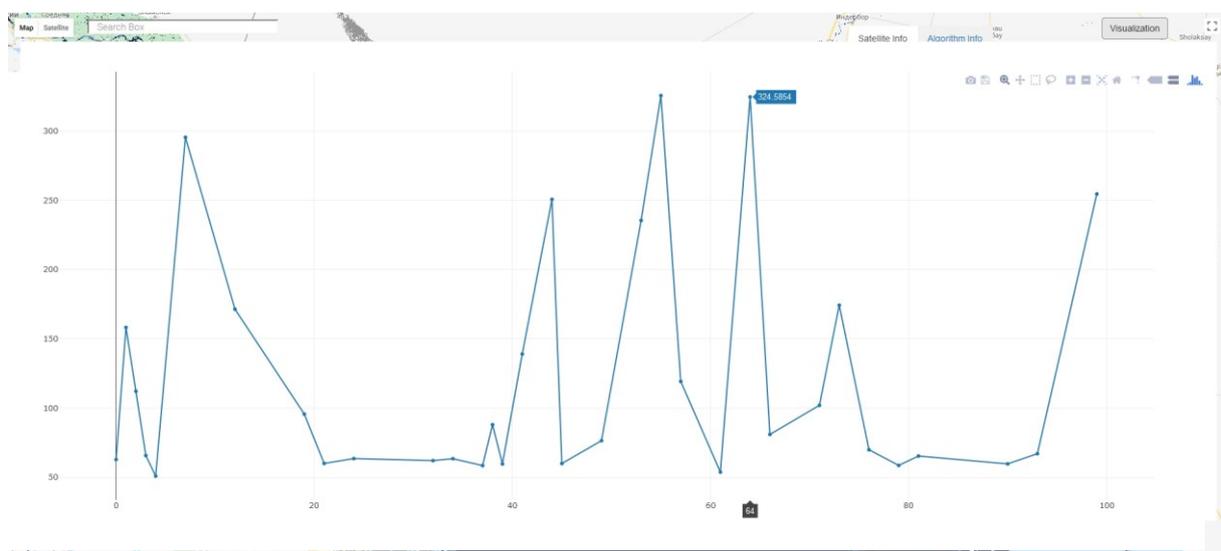
Select date from the calendar - this will query the satellite images closest to the chosen date. The default colour ramp is applied based on the range of index values encountered, but can be set manually to a specific range of interest to emphasize specific features. Cloud masking is applied based on the cloud data embedded in the satellite image products. If a pixel is cloudy it is displayed in grey - but extreme index values also suggest that the image might have clouds or cloud shadows. By selecting RGB, it is possible to visually check if the area of interest is affected by clouds or ice.

Chlorophyll concentration can only be quantified if the water is transparent, i.e. suspended sediment concentration is low. If you are interested in chlorophyll, check the suspended sediment map first to see where the chlorophyll maps are credible.

Summary:

1: Select date and location

- I want a true colour satellite image --> select RGB and go! Any satellite can be used
- I want a map of surface temperature --> select MODIS satellite sensor, first check RGB, if not cloudy at all, select Temperature
- I want a map of suspended sediment concentration --> select any satellite sensor, first check RGB for clouds, if OK, select Suspended sediment and choose algorithm
- I want a map of chlorophyll concentration --> select any satellite sensor, first check RGB for clouds, if OK, check suspended sediment, if OK, select Chlorophyll choose algorithm



Graph visualization

The pixel overlapping with the crosshairs in the centre of the map canvas will be queried. If you click on “visualization”, a line graph displaying the last 100 days’ values of the parameter, satellite and algorithm you selected for that particular pixel. If you hover the mouse over a point in the graph, the exact numeric values will be displayed.

What these variables mean

RGB true colour

Not all satellites have spectral bands that correspond closely to the colour vision of the human eye. Therefore, "true colour" images are composed from the spectral bands closest to the colours red, green and blue. RGB images can provide a general impression of aquatic processes such as vortexes, ship traffic, and ice conditions.

Total Suspended Sediment - TSS

The aquatic food chain is based on photosynthesis of microscopic algae (and, to a lesser extent, macrovegetation) in the water column and on the lake bottom. TSS is closely related to the transparency of the water and therefore gives an estimate of how much light is currently available for photosynthesis, how much energy can potentially be transferred through the food web to higher trophic levels (zooplankton, planktivorous fish, predators). Additionally, TSS concentrations show the movement of sediment with water currents and wave action, showing times and areas of sediment re(suspension) and deposition. TSS can therefore act as a natural tracer of water movement including currents, vortices, and inflowing sediment-rich or sediment-poor water. Satellite imagery detects the suspended sediment content of the surface layer of water bodies. However, in cases of transparent water sediment content of deeper layers of the water column can also contribute to the TSS signal, or for extremely high transparencies and bright sediments, reflection of the bottom can cause erroneously high TSS readings.

Chlorophyll

Chlorophyll is the pigment that allows plants and algae to harvest the energy of the sun to drive their metabolism. It is present in green algae, which in most cases dominate the surface layers of water bodies. Algae require light, oxygen and basic nutrients (nitrogen and phosphorous) for their growth. Therefore chlorophyll can be a tracer of nutrient loading, or show oxygen-rich upwelling currents. Low chlorophyll content is typically related to nutrient-poor, clear waters, while high chlorophyll contents are related to nutrient-rich, more turbid waters. Extremely high chlorophyll values can be related to blooms of algae which can produce toxins harmful also to humans.

Citation

Please cite this web site as:

Zlinszky, András, Peter Supan, and Zsófia Koma. "Near real-time qualitative monitoring of lake water chlorophyll globally using GoogleEarth Engine." *EGU General Assembly Conference Abstracts*. Vol. 19. 2017.