

Answers - GLaSS Training material, Lesson #5

Part 1

Analyze results: what's the trend of CHM during the year? It can be noticed some kind of seasonality or values are quite constant?

Data extracted from EO products of year 2005 show two different trend for the two regions: in 'Coastal' regions more algal blooms occurred during the year, from early Spring to late Autumn while in 'Pelagic' region the highest values were recorded from late Spring to early Autumn, as shown in Figure 1.

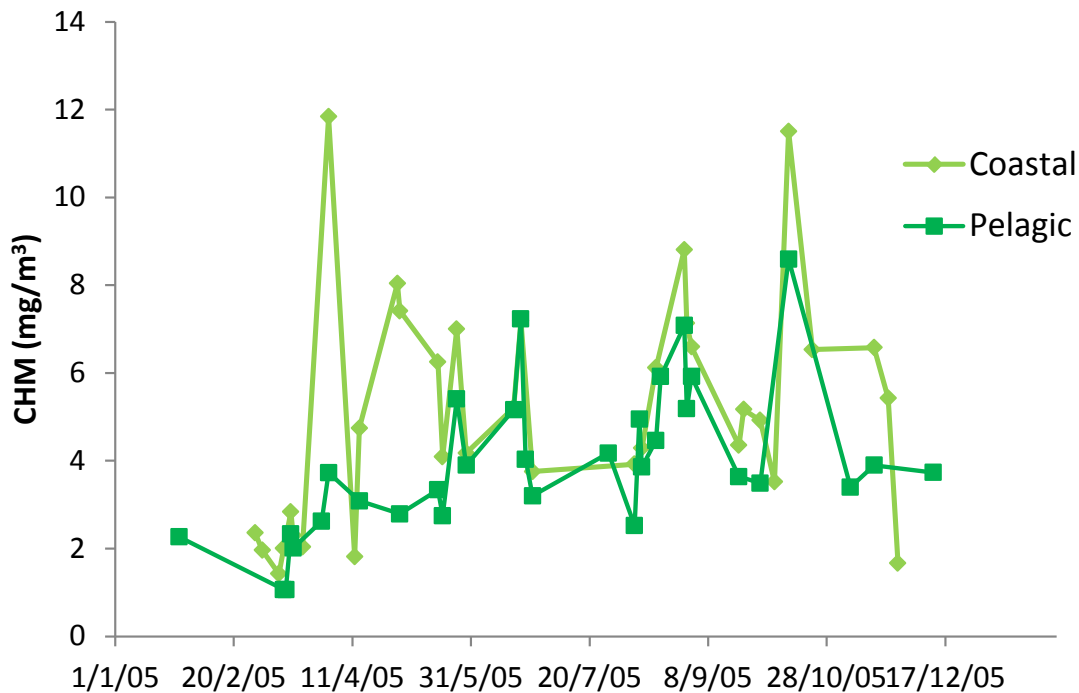


Figure 1. CHM time series for year 2005 extracted from Lake Constance regions.

Can you recognize some CHM peak in the series? When CHM reaches its maximum in 2005? Is CHM similar in both regions? Where and when is it higher?

CHM reached its maximum value on April 1st in 'Coastal' region and on October 12nd 2005 in both regions. During the year, peaks were recorded in both stations but with different magnitude: mainly in 'Coastal' station values are higher.

Considering CHM mean plus its standard deviation, how many times did CHM exceed this threshold in 2005?

CHM mean and standard deviation were respectively 5.09 (3.96) mg/m³ and 2.64 (1.72) mg/m³ in region 'Coastal' ('Pelagic'), giving a threshold value of 7.73 (5.68) mg/m³. This value was exceeded on 1/4/2005, 30/4/2005, 29/8/2005, 12/10/2005 in 'Coastal' region and on 21/6/2005, 19/8/2005, 29/8/2005, 1/9/2005, 12/10/2005 in 'Pelagic' one.

Part 2

What's CHM average value in both regions on 1st April 2005?

In Figure 2 statistics for both regions, computed considering only valid pixels, are shown.

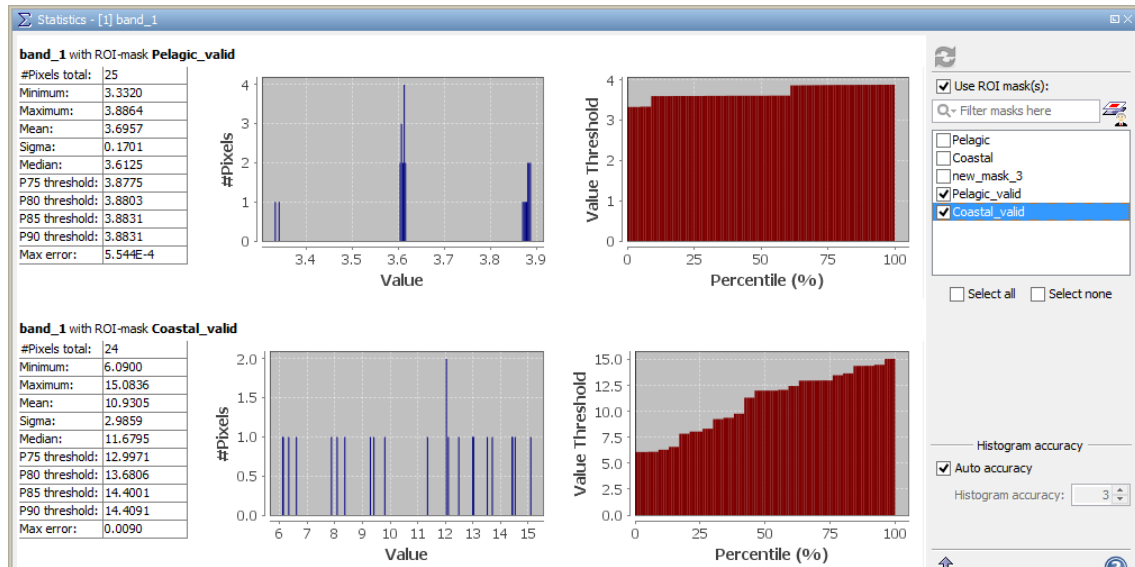



Figure 2. Statistics for valid pixels only on 1st April 2005.

Consider the sum of CHM mean and standard deviation calculated on both region in 2005: how much of the lake surface is interested by the phytoplankton bloom on 1st April 2005?

Mean+standard deviation calculated considering both regions on whole year 2005 was $4.45+2.27=6.72 \text{ mg/m}^3$.

- Open  and define a mask typing in $f(x)$ 'band_1>6.72' to find all pixels in lake surface with CHM value higher than the threshold and rename it as 'Bloom'.
- Compute statistics Σ using 'Bloom' mask: 1474 pixels resulted to be over the threshold and thus, considering a pixel area of 300x300 m, the area interested by the bloom was 132.7 km^2 .

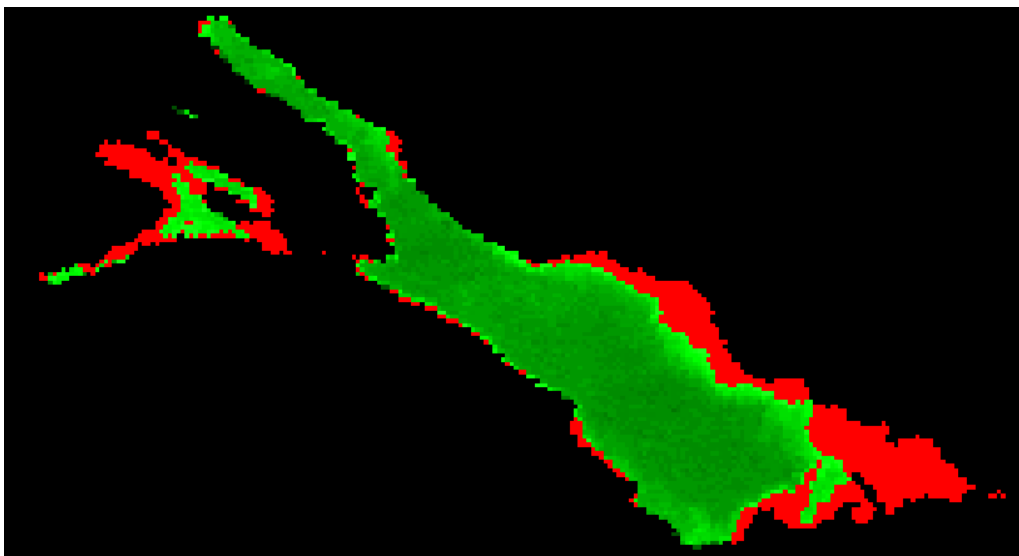


Figure 3. CHM map on 1st April 2005. Red indicates pixels with $\text{CHM} > 6.72 \text{ mg/m}^3$.

How much of the surface affected on 30th April 2005?

On 30th April 2005 in 815 pixels CHM exceeded the threshold defined, thus the area affected was about 73.4 km².

Part 3

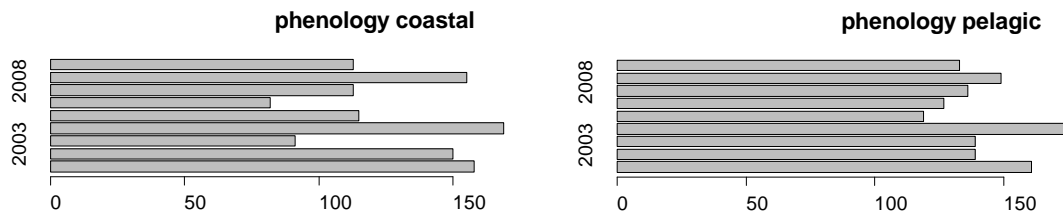


Figure 4. Start date for phenology in regions 'Coastal' and 'Pelagic'. On x axis, days of the year are shown.

In what region phenology started later in 2008?

As shown in Figure 4, phenology in 2008 started later in 'Pelagic' region

In 'Pelagic' region, when phenology started earlier?

In 2007 phenology started earlier than in the other years.