

Integrating Remote Sensing into a Water Quality Monitoring Program

Compare OLI Level-2 Chlorophyll-a Concentration with In Situ Measurements in Selected Wisconsin Lakes



Objectives

- Learn to prepare in situ data in SeaBASS format to analyze in SeaDAS
- Learn to compare Ocean Color data from remote sensing with in situ data using SeaDAS

Outline

- Download in situ data from Lake Mendota and Lake Waubesa in Wisconsin for September 1, 2015
- Prepare a plain text file based on the in situ data in SeaBASS format using a template
- In SeaDAS open the OLI Level-2 image that was processed in Homework 2
- Import the in situ data in SeaDAS
- Compare in situ Chlorophyll data with the OLI-derived data and find a regression relationship between the two
- Homework 3 will have questions based on this exercise

Prepare In Situ Data in SeaBAS Format

https://seabass.gsfc.nasa.gov/wiki/Data_Submission#Data%20Format

1. Download and open the file **WQ_Insitu2015.xlsx**
2. Download the file **WQ_Insitu2014.txt** and open the file
 - This is a sample file that was demonstrated earlier today and can be used as a template to create another file in the SeaBASS format
3. Prepare a new text file: **WQ_Insitu2015.txt** on your computer using data from **WQ_Insitu2015.xlsx** and **WQ_Insitu2014.txt** as a template
4. Make the header and data sections as in the sample file
5. Include lake code name, latitude, longitude, time of measurements, depth of the lake in meters, and chlorophyll-a amount in the data section. Write down the units of chlorophyll-a.

SeaBASS File Format

```
/begin_header
/investigators=Amita Mehta
/affiliation=NASA
/contact=amita.v.mehta@nasa.gov
/experiment=WQ
/cruise=none
/data_type=Ch
/north_latitude=43.080110[DEG]
/south_latitude=42.559750[DEG]
/east_longitude=-88.931990[DEG]
/west_longitude=-88.466210[DEG]
/measurement_depth=NA
/missing=-9999
/below_detection_limit=-8888
/above_detection_limit=-7777
/delimiter=comma
/fields=station,lat,lon,time,depth,CHL,
/units=none,degrees,degrees,hh:mm:ss,m,mg/m^3
/end_header

RC1,43.080110,-88.93199,11:08:00,12.50,8.30
RC2,43.08863,-88.92916,11:32:00,13.72,7.71
RC3,43.07246,-88.9287,12:05:00,8.23,5.49
GN1,42.55975,-88.54052,14:50:00,42.06,2.10
GN2,42.5665,-88.5032,15:27:00,28.96,1.27
GN3,42.56896,-88.46621,16:04:00,21.95,0.0132
```

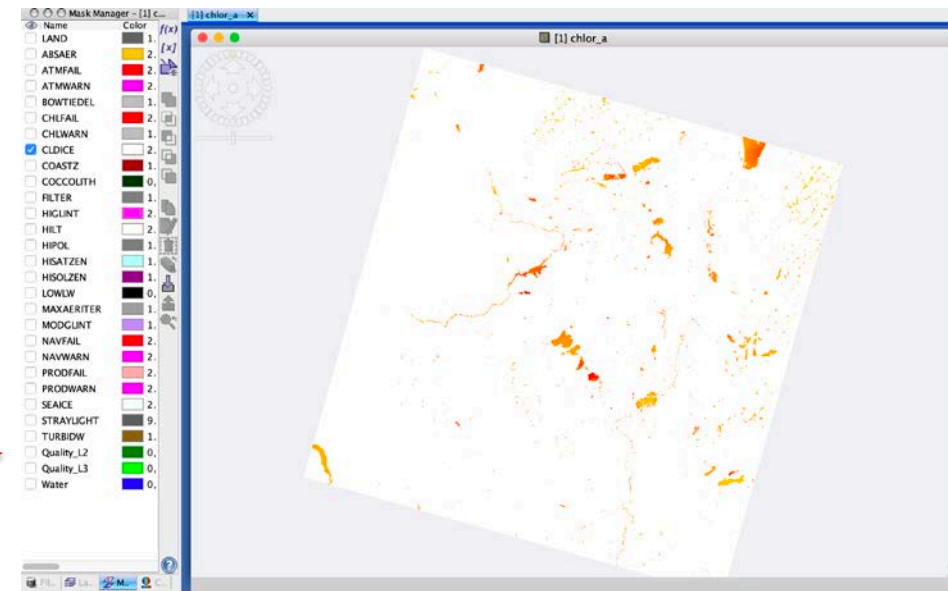
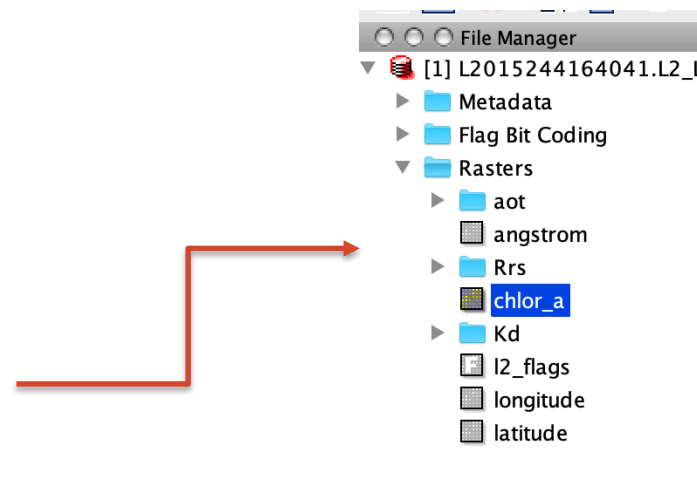
Header

Measurements



In Situ

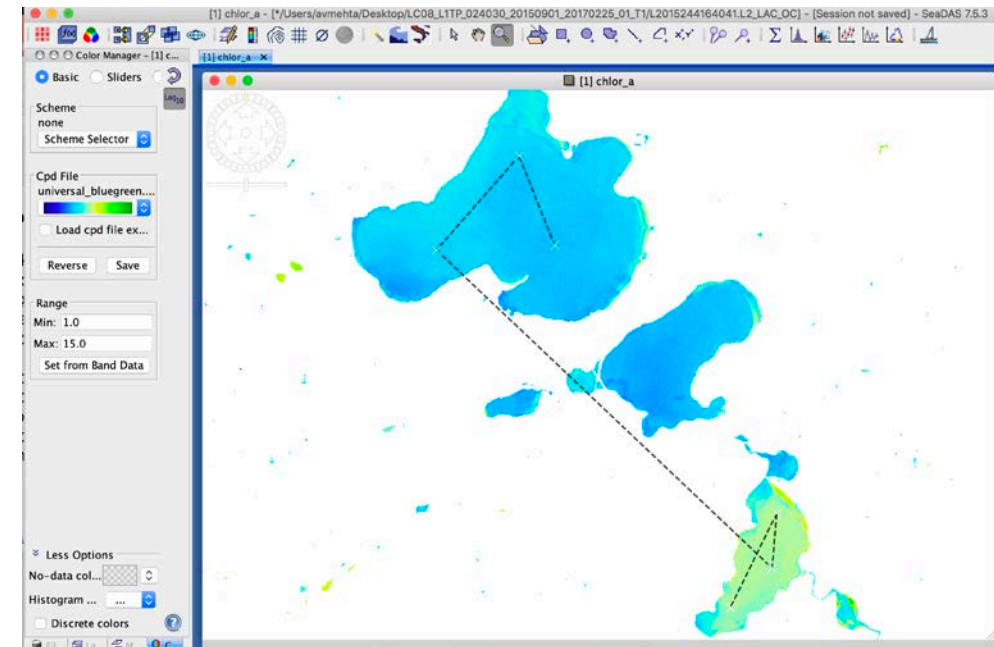
Open OLI Level-2 Data in SeaDAS

6. Open SeaDAS
7. Go to **File** (top bar) > **Open** and select the Level-2 file for 1 September 2015 that you created in Homework 2
8. Click on the **File Manager** > **Rasters** (on the left of the main SeaDAS window)
9. Select **Chlor_a**. You will get the Level-2 image in the SeaDAS window
10. At the bottom of the left panel, select **Mask Manager** and turn on the **CLDICE** mask
11. You will see the lakes in the image (you may change the colors by using the **Color Manager** on the bottom right)




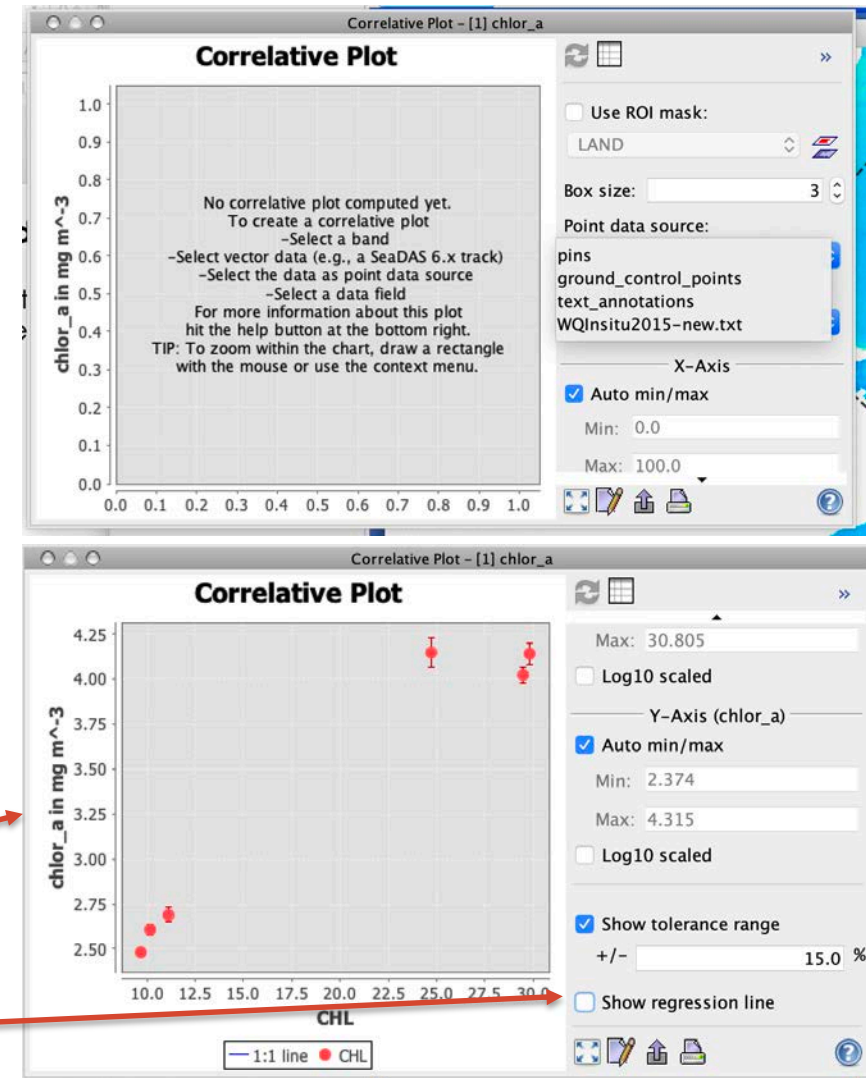
Import In Situ Chlorophyll Data Into SeaDAS

12. Click on the **Import field measurements (in situ) data (SeaBASS format)** button  on the top right of the options bar
13. Select and import the **WQ_Insitu2015.txt** file you created
14. You will see the in situ data points on the image. Zoom in to that area by using the zoom tool 
15. Move the cursor on the lakes where the in situ data is, using the latitude-longitude in the in situ file to identify the lakes



Compare Landsat OLI and In Situ Chlorophyll Data

16. Click on the **Display Corrective Plots for a Selected Band** button  on the top right of the options bar
17. You will get a window, **Correlative Plot**, with options on the right
18. For **Box Size**, select 3 pixels
19. For **Point Data Source**, select the **WQ_Insitu2015.txt** file you created
20. For **Data Field** select **CHL**
21. Keep the min and max values from the data for the x and y axis
22. You will get the **Correlative Plot**
23. Select **Show regression line**



Compare Landsat OLI and In Situ Chlorophyll Data

24. You will get a regression line on the plot. Write down the coefficients and correlation coefficient (R^2)
25. Change the **Box Size** to 1, 5, 7 and write down how the line, the regression line, and the R^2 values change

Questions & Discussion

1. What are the units of OLI and in situ Chlorophyll? Are they the same? Is the comparison valid?
2. Which data source (in situ or OLI) has larger range of Chlorophyll?
3. Which lake has better agreement between in situ and OLI Chlorophyll?
4. Why are the differences between in situ and OLI Chlorophyll values not surprising?
5. What are the R^2 values for the Box Size of 1, 3, 5, 7? Are the values significantly different?