## NASA DEVELOP SUMMER 2017:

## Deriving Water Quality Parameters from Landsat 8 and Sentinel-2 Imagery Using ACOLITE Processing Software

This is a short guide to processing Landsat 8 and Sentinel-2 imagery to retrieve water quality variables provided within ACOLITE software. The steps are as follows:

<u>Step 1</u>: Run images through ACOLITE <u>Step 2</u>: Convert NetCDF files to GeoTIFFs <u>Step 3</u>: Geolocate

If you're working on a Mac computer, ACOLITE will not be compatible with your current XQuartz version. Download the older version, 2.7.9 here before you begin: <u>https://www.xquartz.org/releases/XQuartz-2.7.9.html</u>

Images can be bulk downloaded using USGS EarthExplorer Bulk Download Application (BDA). Once downloaded, they need to be unzipped before being passed to ACOLITE.

## Step 1: Run images through ACOLITE

1. All of your unzipped, downloaded Landsat path/rows or Sentinel-2 tiles should be located in the same directory. Each scene/tile is located within its own folder.

5		
LC08_L1TP_043033_20160213_20170224_01_T1	Today, 3:14 PM	 Folder
LC08_L1TP_043034_20160112_20170224_01_T1	Today, 3:15 PM	 Folder
LC08_L1TP_043034_20160213_20170224_01_T1	Today, 3:17 PM	 Folder
LC08_L1TP_044034_20160204_20170224_01_T1	Today, 3:18 PM	 Folder

2. Create a text file containing a list of the paths to each image.

**For a Mac**: Select all of the paths/tiles and copy them. Open up the application TextEdit. Select "Format"  $\rightarrow$  "Make Plain Text."

Select "Edit"  $\rightarrow$  "Paste and Match Style".

You should now have a list of all of the scenes/tiles located within your directory. In order to bulk process on ACOLITE, you need to supply the paths to all of these scenes. For example – in the image above, the four Landsat scenes are located within a folder named "Landsat" on my desktop. To supply the whole path within text edit, I can search for the first two letters "LC" and "replace all" with /Users/kcavanau/Desktop/Landsat/LC. Save the text file as dirslist.txt within the acolite\_mac folder. The resulting text file should look as follows:

	Untitled —	Edited ~				
Q~ LC			⊗	< >		Replace
/Users/kcavanau/Desktop/Landsat/LC			4	Replace	All	Done
/Users/kcavanau/Desktop/Landsat/LC /Users/kcavanau/Desktop/Landsat, /Users/kcavanau/Desktop/Landsat, /Users/kcavanau/Desktop/Landsat, /Users/kcavanau/Desktop/Landsat,	/LC08_L1TP /LC08_L1TP /LC08_L1TP /LC08_L1TP	_043033_2016 _043034_2016 _043034_2016 _044034_2016	4 50213_ 50112_ 50213_ 50204_	Replace 20170224_ 20170224_ 20170224_ 20170224_ 20170224_	AII 01_T1 01_T1 01_T1 01_T1 01_T1	Done

For a Windows: Select all of the paths/tiles and copy them. Hold Shift  $\rightarrow$  Right Click  $\rightarrow$  "Copy as Path." Paste the file names into Notepad, and delete the enclosing quotes. Save the text file as dirslist.txt within the acolite\_win folder. The resulting file should look the same as the one above.

3. Configure the ACOLITE settings file

**For a Mac**: Open up XQuartz. Change the directory to where your acolite\_mac folder is located (i.e. cd /users/kcavanau/applications/acolite\_mac). Next, to open ACOLITE, type the following into the XQuartz command window:

idl84/bin/idl -rt=acolite.sav

Click OK.

**For a Windows**: Double click the Application icon (acolite\_win.exe) within your acolite\_win folder.

Click OK.

	ACOLITE (version 20170113.0)			
	Input and output			
I	Select input			
Ĭ	Select output			
Region crop (decimal degrees)				
South North	West East			
I	I Clear			
RGB processing				
□ RGB - Top Of Atmosphere □ RGB - Rayleigh corrected				
	L2 processing			
Cenerate NetCDF file(s): 4) a single NetCDF 4 file with gzip compression				
□ Generate PNC file(s) □	JGenerate GeoTIFF file(s)			
Output parameters: I				
Save or restore settings: Save Restore				
Advanced settings About				
Run				
Exit				
	(c) 2014-2017 RBI			

For both platforms, the following screen should pop up:

Leave input, output, and region crop blank. Unclick all boxes. Leave "4) a single NetCDF 4 file with gzip compression" selected. For "Output parameters" (circled in red). Within this box, type the desired parameter you want to derive. All parameters are listed in the ACOLITE manual (<u>https://odnature.naturalsciences.be/downloads/remsem/acolite/ACOLITE\_processing\_options\_2</u> 0170113.0.pdf). To derive multiple parameters within one NetCDF, separate them with a comma and no space.

Click "Save," and save as the default name (acolite\_settings.cfg) within your acolite application folder (either acolite\_win or acolite\_mac). Exit ACOLITE.

4. Run ACOLITE

**For a Mac**: In XQuartz, make sure you change the directory to where your acolite\_mac folder is located (i.e. cd /users/kcavanau/applications/acolite\_mac). After checking that you saved the image list (dirslist.txt) and the settings file (acolite\_settings.cfg) to your acolite\_win folder, type the following command into XQuartz:

idl84/bin/idl -rt=acolite.sav -args settings=acolite\_settings.cfg image=dirlist.txt

Your scenes should run, and export into the path/row folder as NetCDF files.

**For a Windows**: Open a command prompt, and change the directory to where your acolite\_win folder is located (i.e. cd C:/users/kcavanau/desktop/acolite\_win). Type the following into the command line:

C:/users/kcavanau/desktop/acolite\_win/idl84/bin/bin.x86\_64/idlrt.exe -vm=acolite.sav -args settings-acolite\_settings.cfg image=dirslist.txt

Your scenes should run, and export into the path/row folder as NetCDF files.

Step 2: Convert NetCDF files to GeoTIFFs.

- 1. After ACOLITE finishes running on your paths/tiles, search for ".nc" within your main directory. A list of all of the NetCDF files produced by ACOLITE should appear.
- 2. Copy and paste them to a new directory, and convert the files to GeoTIFF format.
  - a. You may use gdal\_translate (<u>http://www.gdal.org/gdal\_translate.html</u>) to convert the files to GeoTIFFs or use ArcGIS to export and save as a GeoTIFF (such as the Make NetCDF Feature Layer tool).

Step 3: Geolocate the GeoTIFFS using the upper left and lower right hand coordinates.

• gdal\_translate may also be used to complete this task

Note: The images may become flipped upside down during Step 2 or 3. If this happens, you may use the Flip tool in ArcGIS.

Email <u>develop.geoinformatics@gmail.com</u> or post a question on the DESC if you have any troubleshooting questions. You may also call in during the Geoinformatics Open Doors.