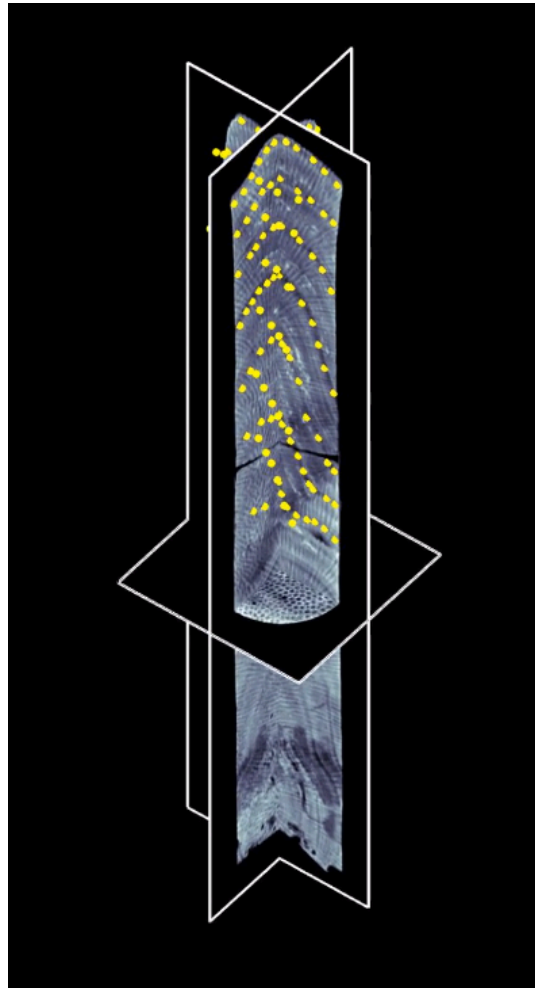


# CoralCT User Guide



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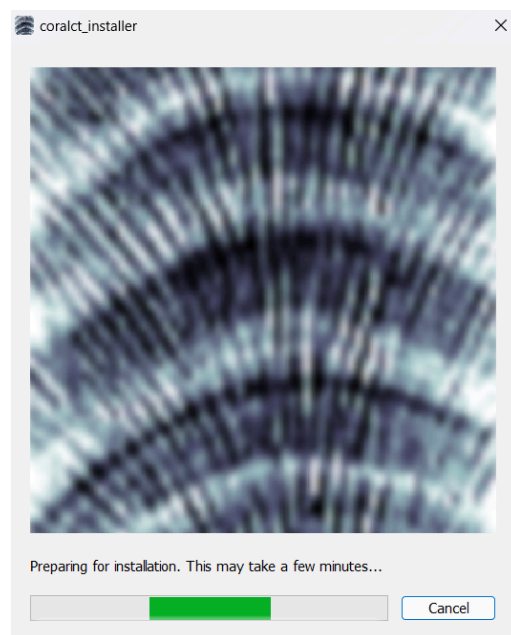
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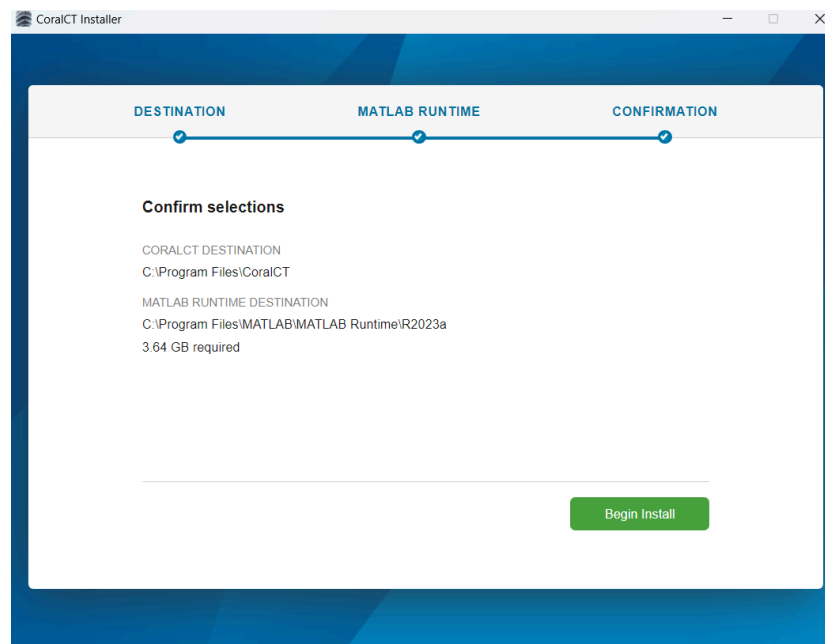
# Downloading CoralCT

## Instructions for Mac

- Go to the official CoralCT website (<http://www.coralct.com/>)
- Scroll down until you see the Mac and Windows options
- Download the MATLAB Runtime 2023a by clicking the bolded 'download'
- Allow the program to make changes to your computer
- Choose a destination for this program in your applications
- Once downloaded, go back to the official CoralCT website
- Download the CoralCT program, move the download into applications
- Allow the program to make changes to your computer if prompted



- When asked to pick the destination, choose the same destination as the MATLAB program

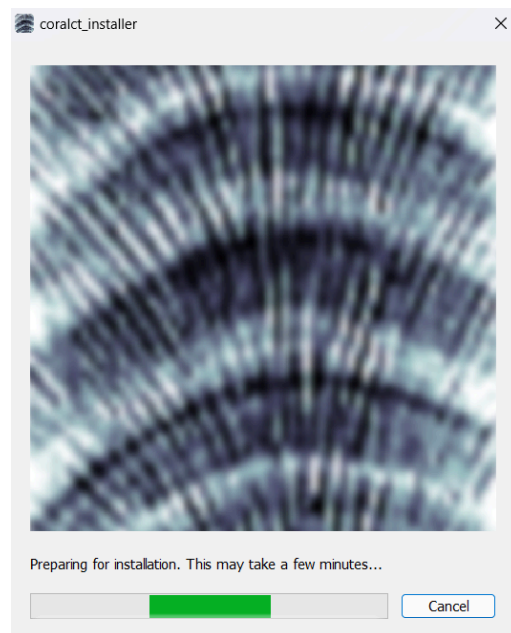


- Allow the program to install, this may take a few minutes

## Instructions for Windows

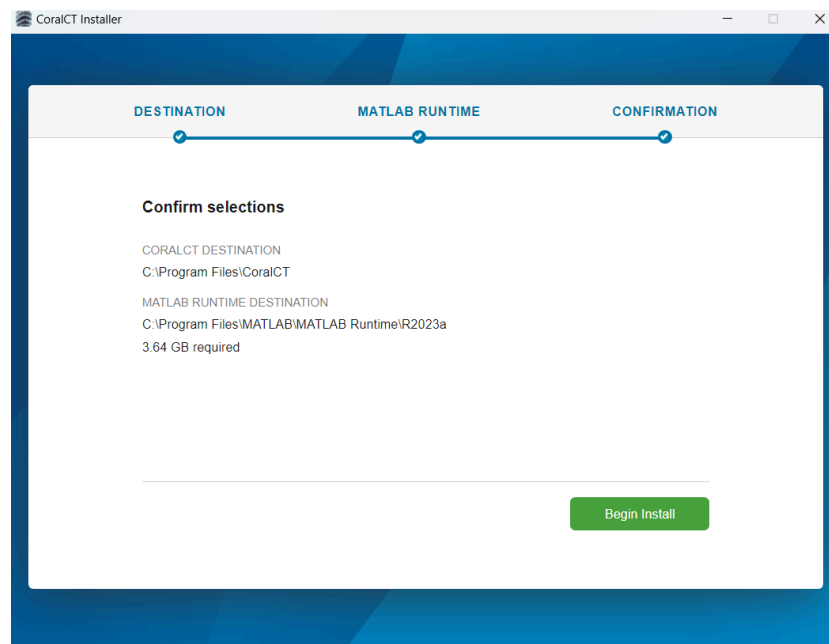
- Go to the official CoralCT website (<http://www.coralct.com/>)
- Scroll down until you see the Mac and Windows options
- Download the CoralCT program by clicking the bolded 'Download CoralCT'
- Once clicked, you can check the status of the download by clicking the small arrow in the circle on the upper right hand corner of the browser window
- The program should be titled "coralct\_installer.exe"
- Once the program is marked as done, click on the box with a diagonal arrow to open the program

- A blue Microsoft window by pop up saying, “Microsoft Defender SmartScreen prevented an unrecognized app from starting. Running this app might put your PC at risk”.
  - To counter this, click ‘more info’. A new option will appear at the bottom right hand corner of the window saying ‘Run anyway’.  
Click this button
- The computer will ask if you want to allow this app to make changes to your device, click yes.
- A new window will appear from coralct\_installer that says “Preparing for installation. This may take a few minutes...” allow it to run



- The next pop up should contain the version of CoralCT, Thomas DeCarlo, and tdecarlo@hpu.edu. Click the blue ‘next’ button.
- You’ll be able to select a destination folder, this is where all the data is stored including: CT scan of the core you are working on, CT scan data you choose to save with the checkbox on the main screen, and downloaded growth rate datasets

- You can add a shortcut to desktop if wanted
- Click the 'next' button once the appropriate folder is selected
- On the MATLAB RUNTIME screen do not click anything but the 'next' button
- The license agreement will appear as the next screen.
  - Read through the license agreement, then click the circle on the left of the word 'Yes'
  - The 'Next' button should appear, click to move on to the last section
- The last window asks you to confirm the folder destinations, click the green "Begin Install" button at the bottom right of the window



- Allow the program to install, this may take a few minutes
- Once downloaded, hit the blue 'Close' button on the bottom right of the window

# Opening CoralCT

## Creating an Account

- When opening the program, the first window to appear every time asks you to choose a local working directory
- Click the green button and your file explorer should open
- Create a folder to store the corals you are working on, click 'select folder'
- In the top right corner, click the button that says 'Create username'
- Fill in the prompts: Username, Email, Password, Confirm Password
- Once filled in, hit the button on the right that says, 'Register'
- An email should be sent with a code, enter that code into where it says 'Verification code:' (this may take a few seconds to appear)
- Allow the number to sit in the box, after a few seconds, the window should reset to the original format
- Enter in the username and password you created (they may have automatically been entered) and hit 'Login'

## Process After First App Use

- The 'Choose local working directory' screen should appear when you first load the program
- A feature of this screen is saving the selection for next time. This is not recommended on shared devices
- It is recommended to only have one local directory folder
- Enter in the username and password created earlier and click the 'Login' button



## Features of Home Screen

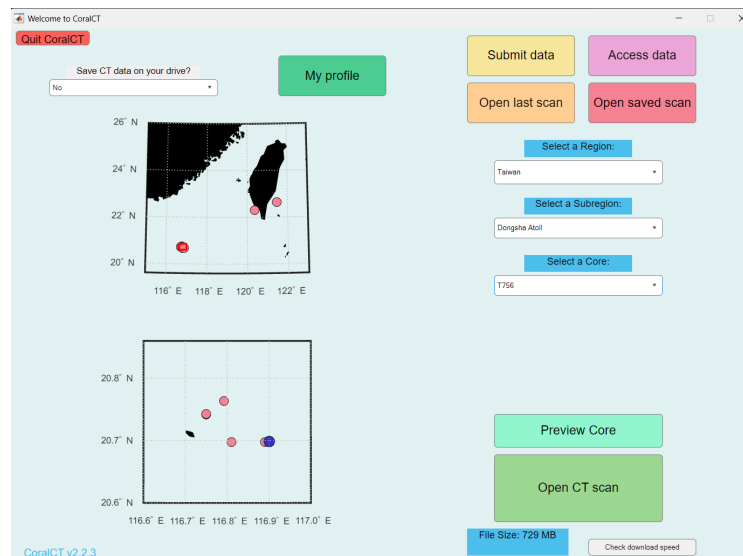
- **Remember me?** - When checked, this button will autofill your username and password each time you log into CoralCT
- **Forgot Password?** - Click to reset your password. Before clicking, have the username entered into the blue box. An email will be sent to the account associated, and will contain a temporary password to log in with.
- **Change Password** - Change your password. Before clicking, have the username entered into the blue box. It will ask for the old password, new password, and to confirm the new password. Click 'Apply'.
- **Leaderboards** - Two leaderboards are present, an overall leaderboard and a current year leaderboard. The cores processed are the entire coral core. The bands processed are the individual bands located on a coral core. Underneath the leaderboard, it tells the total number of cores in CoralCache
  - CoralCache is the term used to describe the server where all the CT scan data is stored
- **About** - Clicking this button allows you to view the information about CoralCT as a whole as well as the specific version being used
- **Check for Updates** - tells whether the program has a more recent version able to download. More about the process of updating at the end of these instructions

# Selecting a Core

## Features

### ○ World Map

- After a few seconds, a world map should appear on the screen
- Red dots represent all the locations cores have been collected.
- This world map will enhance as you go through the region, subregion, and individual core selection
- Once the subregion is selected the world map will change to a square regional map
- Once a specific core is selected, that core will change to blue instead of red



### ○ Buttons

#### ■ My Profile

- When clicked, two tables should appear

- The table on the left contains information about the account including: Username, Cores processed, Bands processed, Inter-user agreement score
- The table on the right shows the cores completed, the band number per core, and the confidence score per core (Only show after first core is complete)

#### ■ **Submit data**

- Clicking this button allows you to submit a Coral CT scan or a fieldwork video
- There should be five options on the right hand side of the screen: Choose zipped CT data file, Choose CT data folder, Choose CT Metadata file, Submit a fieldwork video for loading screens, and Convert or resize data.
- Before submitting a core, the files must be compressed into a zip file, as well as providing a .csv file containing metadata
  - Metadata includes: latitude, longitude, depth, region, and subregion

#### ■ **Access data**

- This button allows you to access core analysis done by other researchers
- There is more information on this later in the instruction manual

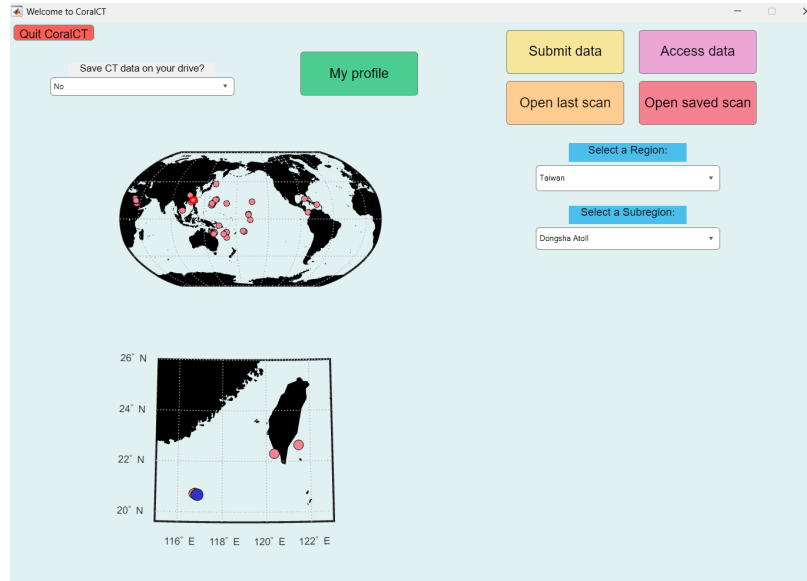
#### ■ **Open last scan**

- This button allows the user to open the last scan that the account worked on, without re-downloading from the sever
- When clicked, the open-core window appears with the video of core collection playing

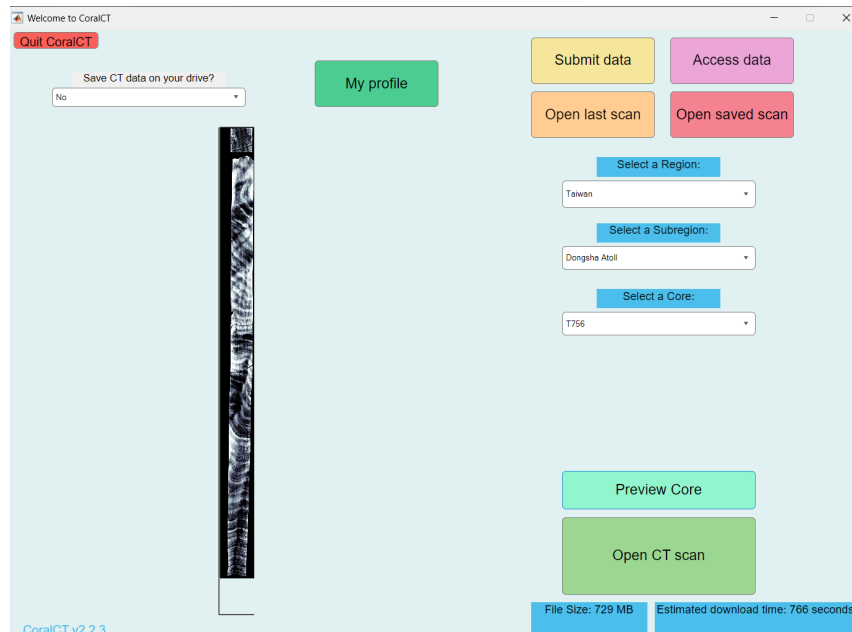
- This button only works when using the same working directory, so it will not work across different devices
- **Open saved scan**
  - When this button is clicked, the device's file explorer opens
  - Click on the working directory, my\_corals, and then select a folder with a core name that you previously worked on (this requires that you selected the "Save CT data on your drive" option when working on that core)

## Drop Down Menus

- **Save CT data on your drive**
  - Choosing this option saves the CT data for the next downloaded scan in your local working directory, in a folder named by the core name. The advantage of this is that the core can be reopened at any later time using the "Open saved scan" button without re-downloading the CT scan data from the server
- **Select a Region**
  - Clicking on this drop down menu will give you a wide range of regions to choose from
  - For this instruction guide we will go to Taiwan
  - Once Taiwan is clicked, a new map will appear, this may take a few seconds
  - The top world map shows the area selected with a red box, while the bottom regional map shows the subregions
  - For this instruction guide, we will go to the subregion Dongsha Atoll, click the drop down menu and select Dongsha Atoll



- Two new maps will appear, the top subregion map shows the subregion selected with a red box, while the bottom map shows the individual cores
- For this instruction guide we will select T769, click the drop down menu and scroll until this appears and click
- Three new buttons will appear at the bottom right corner
  - The first button is **‘Check download speed’**
    - Once clicked, it should say ‘checking connection speed...’, this will take a few minutes
    - A blue box will appear with the estimated download time in seconds
    - The blue box to the left of this tells the file size of the coral core



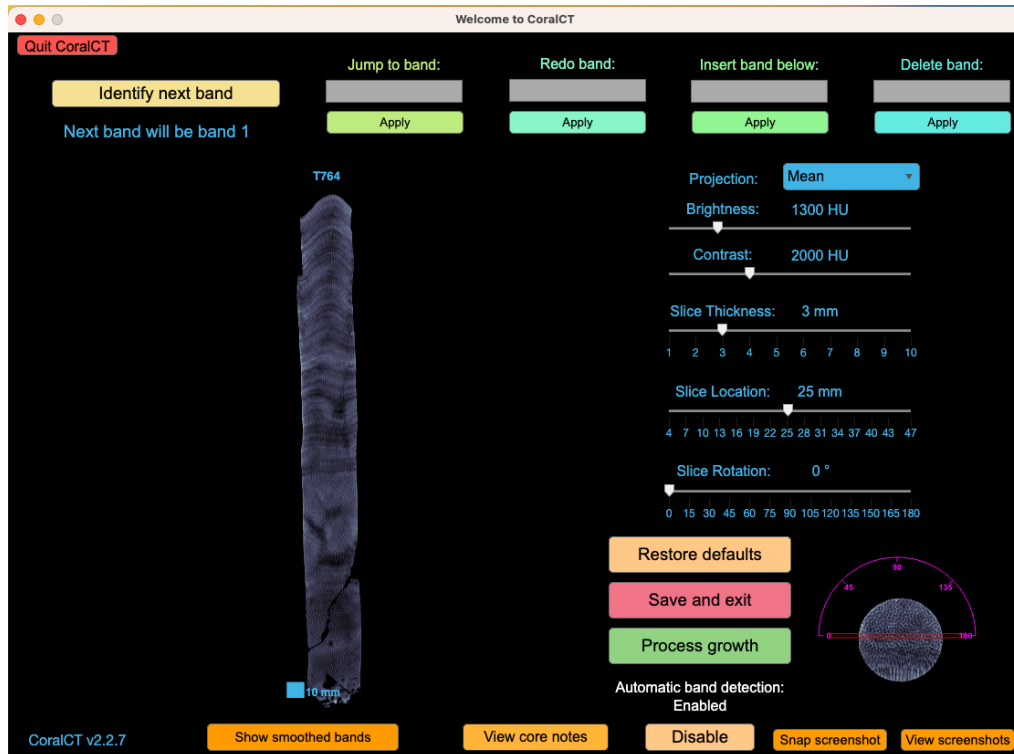
- The next button is the **'Preview Core'**
  - When clicked, the maps on the left will be replaced with a visual of the core selected in its entirety
- The last button is **'Open CT scan'**
  - This button will redirect you to a loading screen with a video of core collection taking place
  - Loading the core will take a little while depending on the file size

# Working on a Core

## Features

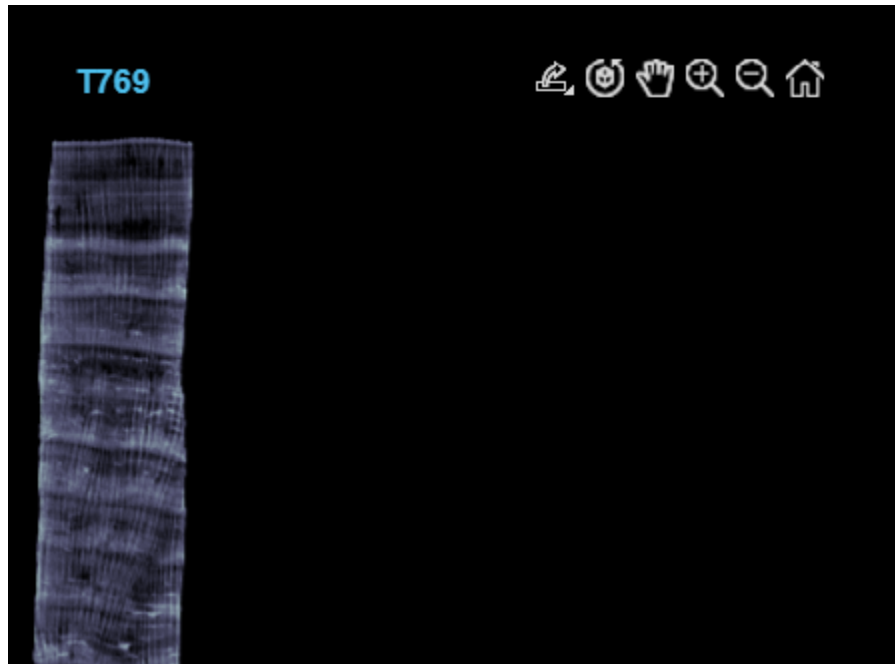
- **Base Screen**

- Once the core has loaded, the core should look like this



- On the left, the core is pictured in its entirety, above in blue is the core name and below is the size reference (10 mm)
- The top left corner in blue should read 'Next band will be band 1', this tells what band you're inputting when you hit the button above 'Identify next band'.
- The top line has different applications to effect bands, information discussed later in the section

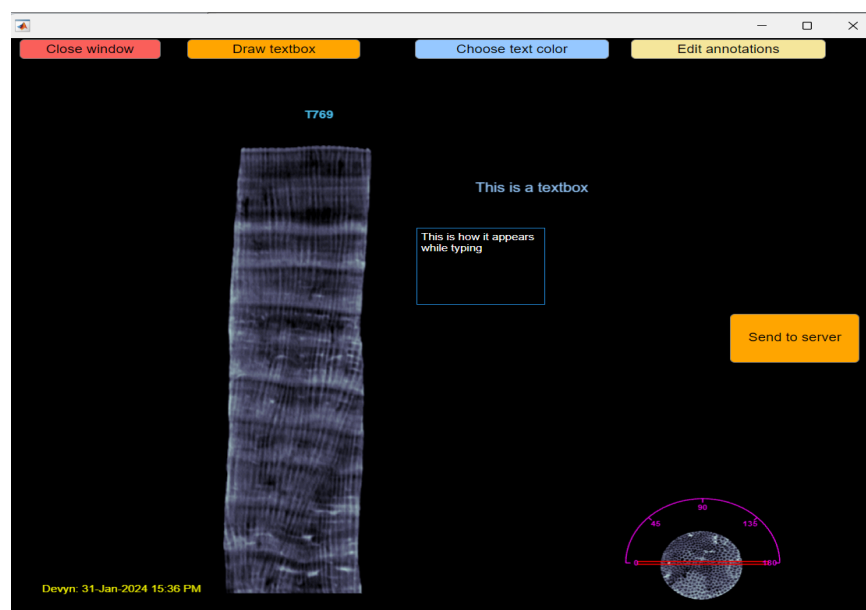
- Moving the mouse around the core causes more tools to light up:



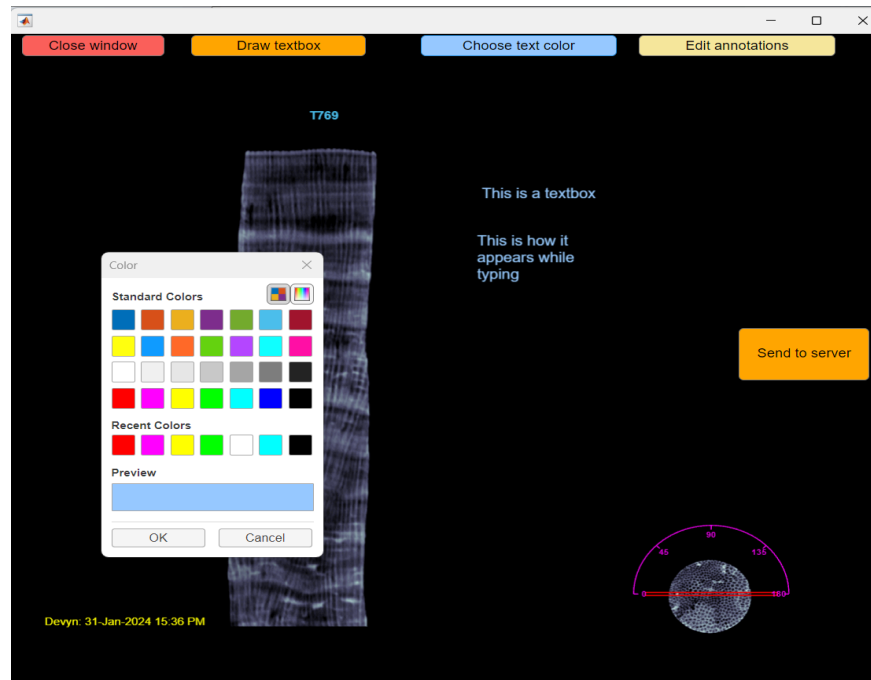
- From right to left these tools are: A drop down (Save as, Copy as image, Copy as a vector graphic), Rotate 3D, Pan, Zoom in, Zoom out, and Restore View
- The slide bars on the right side of the screen are ways to modify the core image, more information later in the section
- The image in the bottom right corner shows the core band from a dorsal (top) view
- **Buttons**
  - **Identify the next band** - this button changes the band being worked on. This will go in sequential order, this must be pressed first before beginning a band
  - **Restore defaults** - this button will move all the slide bars back to their default position (back to the base screen)



- **Save and exit** - this button saves the progress made on the band and will redirect back to the world map screen. This button saves your work on the server, so it is always important to press this button before exiting CoralCT.
- **Process growth** - This is the last button to be pressed once the core is fully complete. This button also saves your work (band identifications) to the server. More information on the details needed after processing a core come later in the guide
- **Snap screenshot** - Clicking this button will take a screenshot of the core as it appears. A popup will appear with the image of the core, the dorsal view, and your username, date and time.
  - Send to server - this button will send the screenshot to the server, this allows it to be viewed by other researchers
  - Close window - This button will close the screenshot window. Pressing this before 'Send to server' will not save the screenshot.
  - Draw textbox - This allows the user to make text notes next to the core to be included in the screenshot

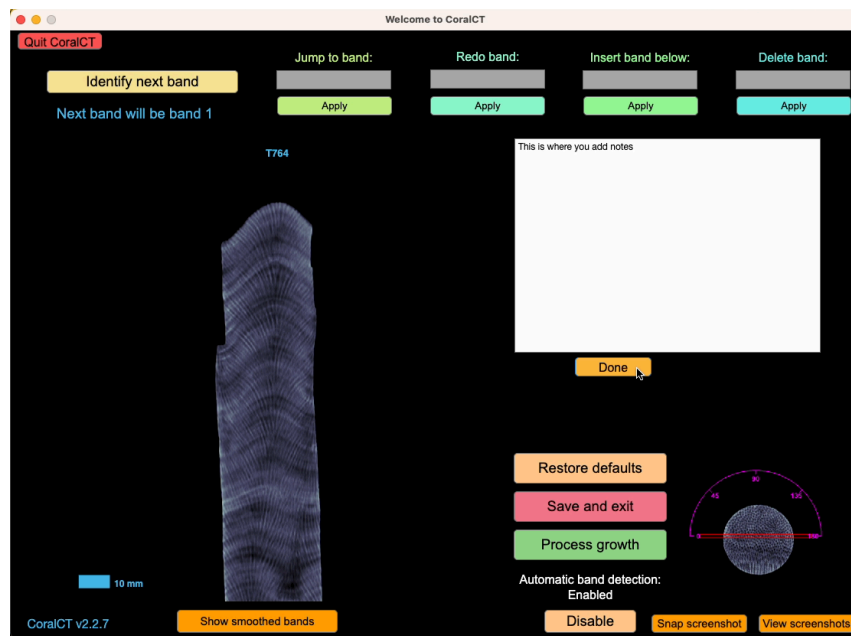


- Choose text color - This button allows you to change the color of the text being imputed. Choose your color before drawing a textbox



- Edit annotations - allows you to modify the words in the textbox. When finished, a tab will open to the right of the window, click 'Done editing'
- **View Screenshots**
    - After clicking, it may take a few seconds to pop up
    - This allows you to view screenshots taken by other researchers
    - When finished click 'Close window' in the top left corner
  - **Automatic Band Detection**
    - Having this button enabled allows the program to estimate the band

- By clicking in the middle of a band, the system will estimate the rest of the points
  - This system may not be perfect, so it's best to double check any bands made to see if they need adjustments
  - For most bands, it is best to manually enter bands
- **View core notes**
- Using this tab, the user is able to input notes about the core while doing the analysis
  - Click 'Edit notes' in order to type notes.



- When done making notes, click the 'Hide notes' button at the bottom center of the screen
- These notes will be saved with the core, and eventually submitted to the server with the core

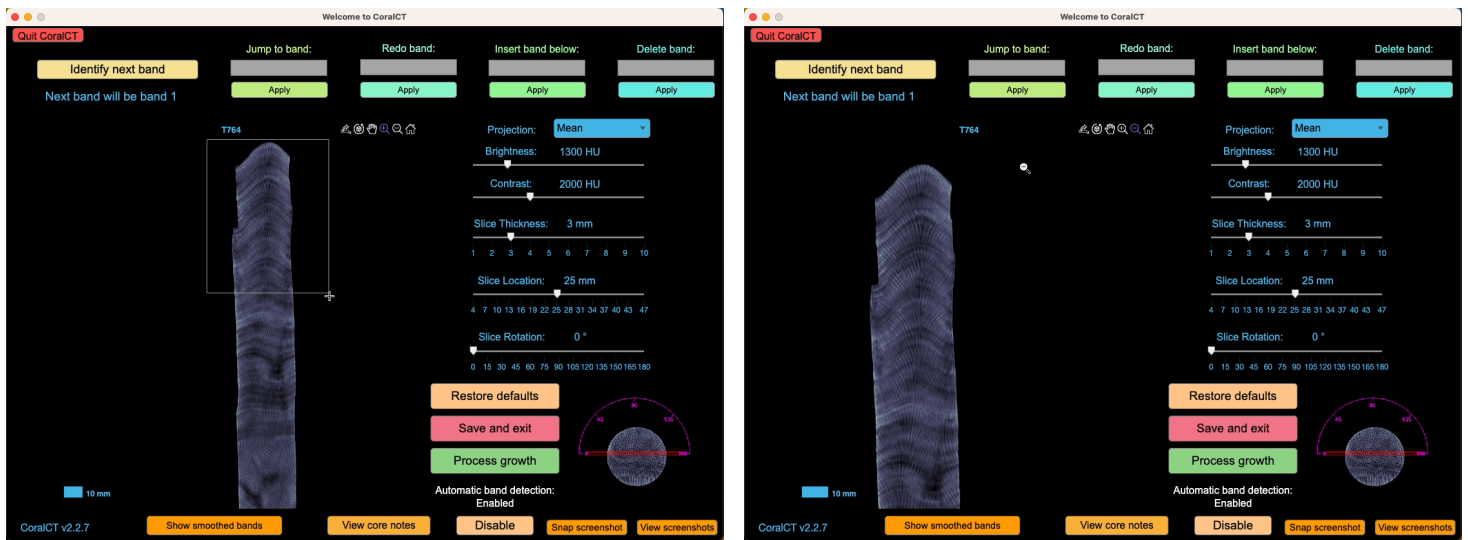
## ■ Show smoothed bands

- The default shows interpolated bands, directly connected points
- By clicking this button, the bands will smooth out to form one cohesive line

## Method

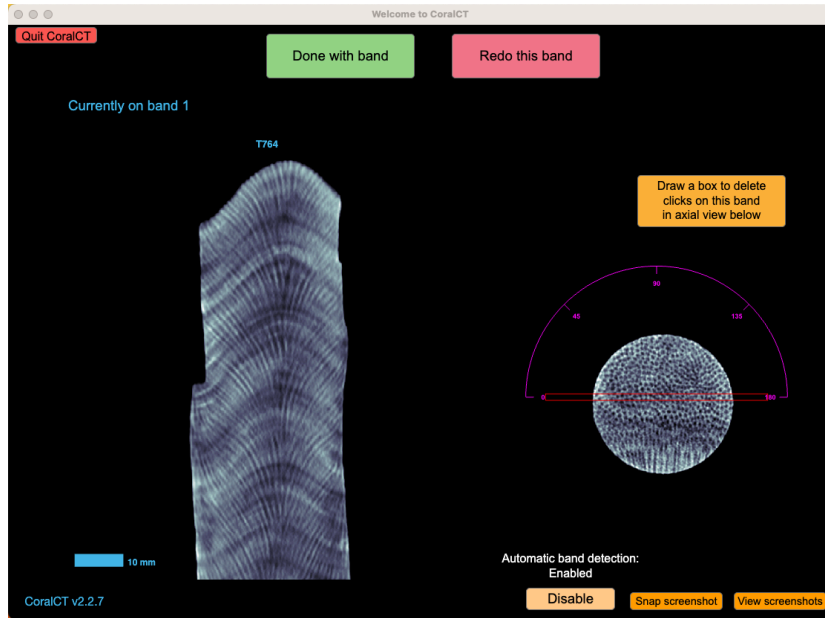
### ○ Making a Band

- In order to zoom in to the top of the core, click and drag a box with the zoom in button pressed

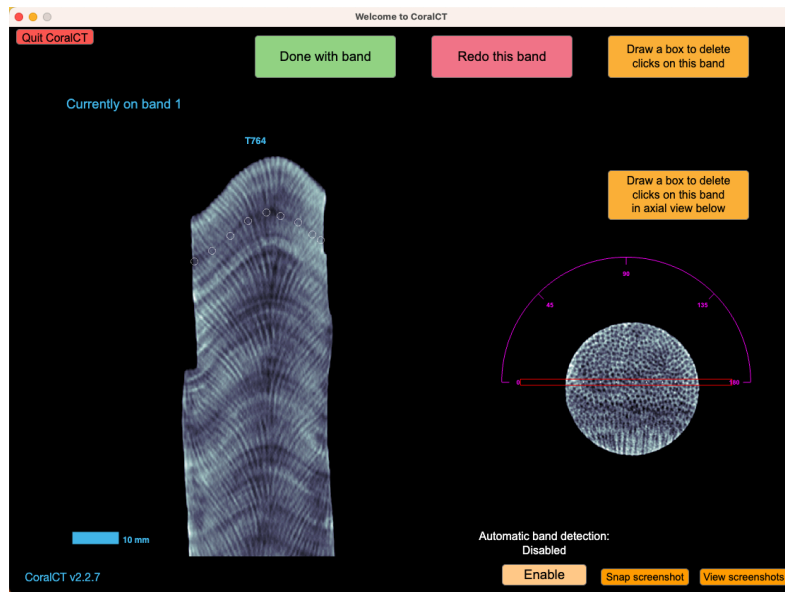


- Unclick the zoom in button and press the hand button
- In the top left corner, press the button that says “Identify next band”, it should say “Next band will be band 1”

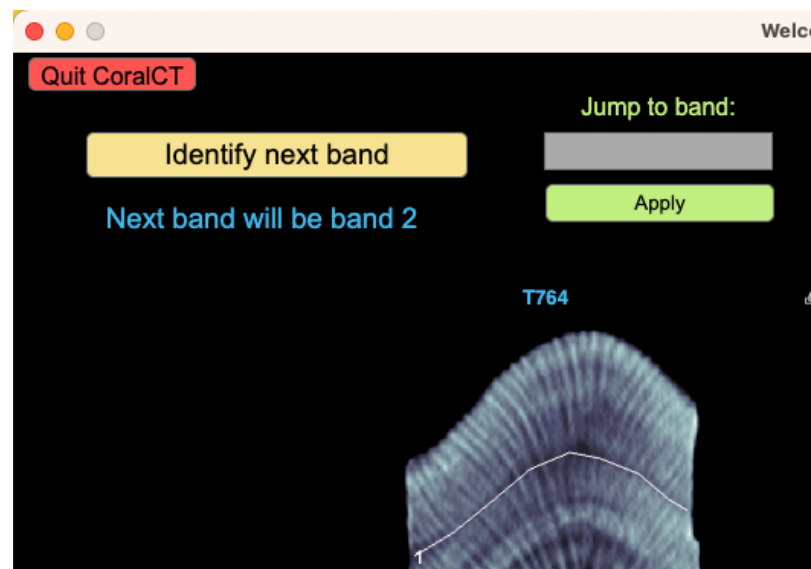
- Your mouse should now be in the shape of a circle, this will allow you to place the vectors for the line



- If not using automatic band detection, click disable on the bottom of the screen
- Going left to right, place vectors along the center of the dark portion of the bands

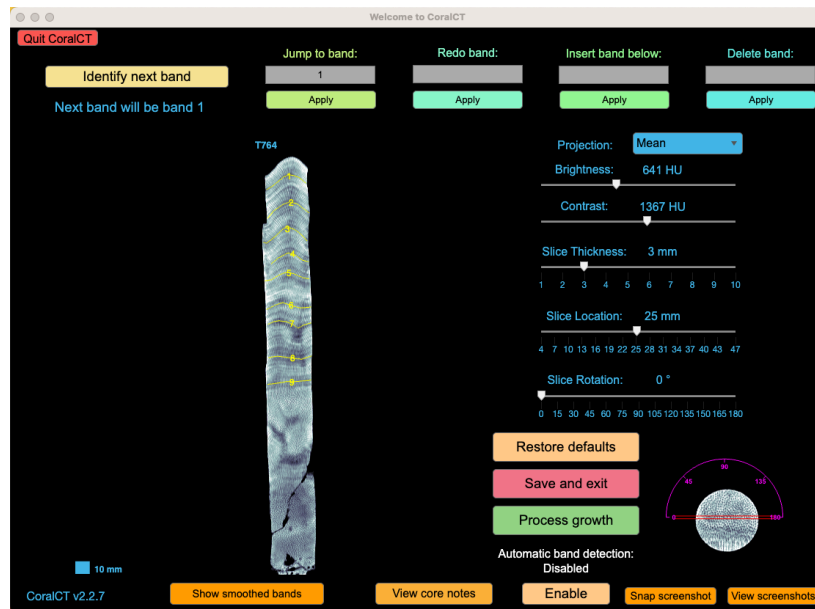


- If satisfied with the band, click ‘Done with band’, if not click ‘Redo this band’
  - Another button is on the right ‘Draw a box to delete clicks on this band in axial view below’
  - This can only be done once more rotations are complete
  - Will be discussed in next section
- If the core has a large dark section, it is up to the researcher to determine whether this is one or two bands. Altering the core image (next section) may help to reach a conclusion
- With the first band done, the system automatically will go to band 2 when hitting ‘Identify next band’



- To move the band down, click in the work space and move the mouse up or down

- This process continues until you have done the entire core

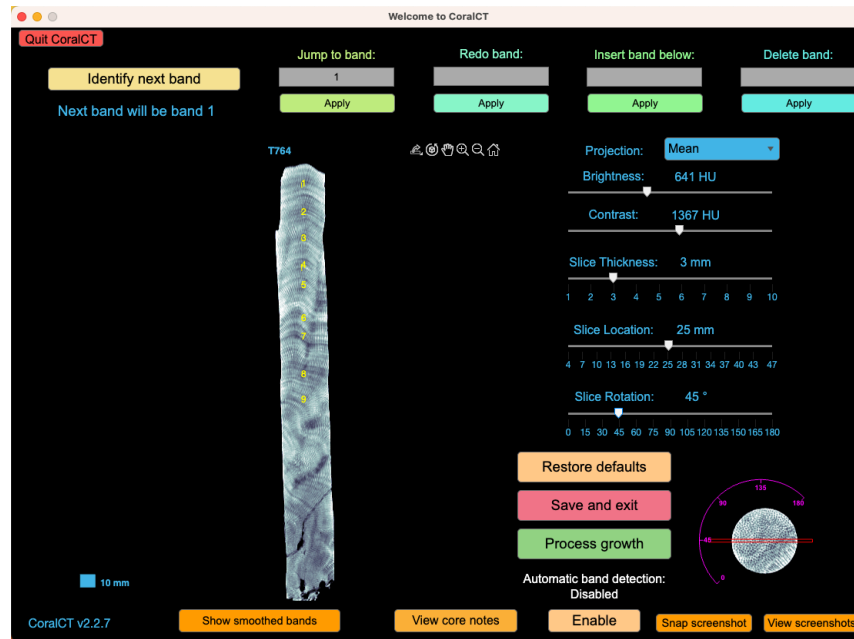


- It is okay if the bands become diagonal, have a slope, or do not go all the way to the right of the core.

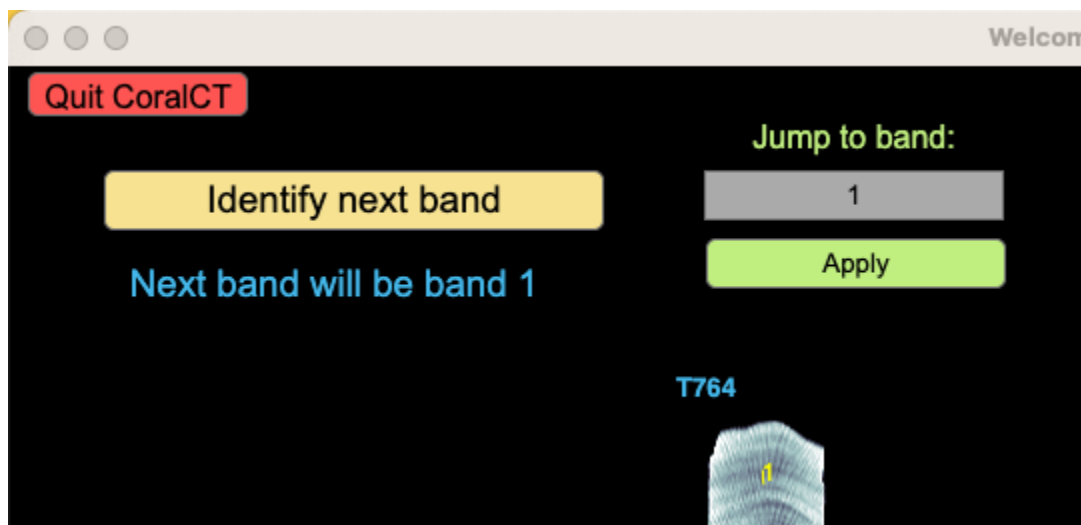
### ○ Rotating the Core

- Every core requires bands are done at at least four different rotations
- For this core we will do rotations at 0 degrees (default rotation), 45, 90, and 135 degrees.
- To rotate the core, we will use the slide bar at the bottom of the slide bars on the right. You can either slide the dial or click the gray bar

- Once rotated, you should see numbers on the core in yellow, this is your previous bands

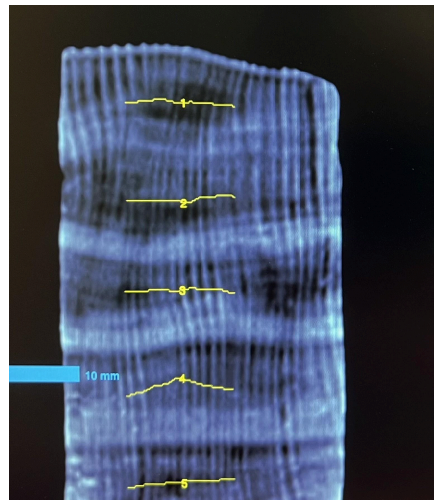


- At this point, do not click 'Identify next band', it will cause your band number to continue from where you left at the bottom of the core
- Go to the 'Jump to band:' at the top of the screen. Type 1 in the box and click 'Apply'
- This will start the band counting back at one and you're free to click 'Identify next band' again

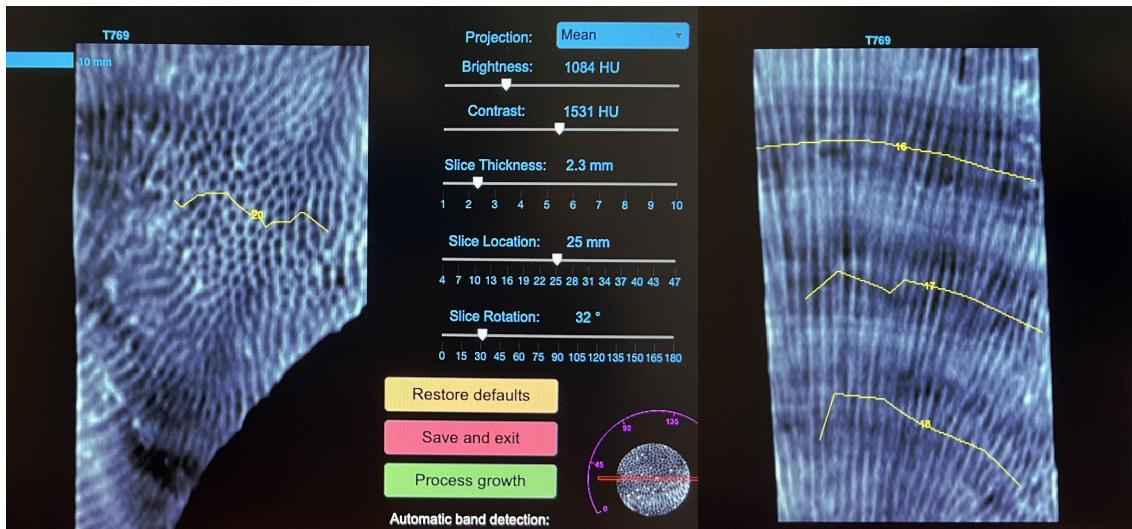




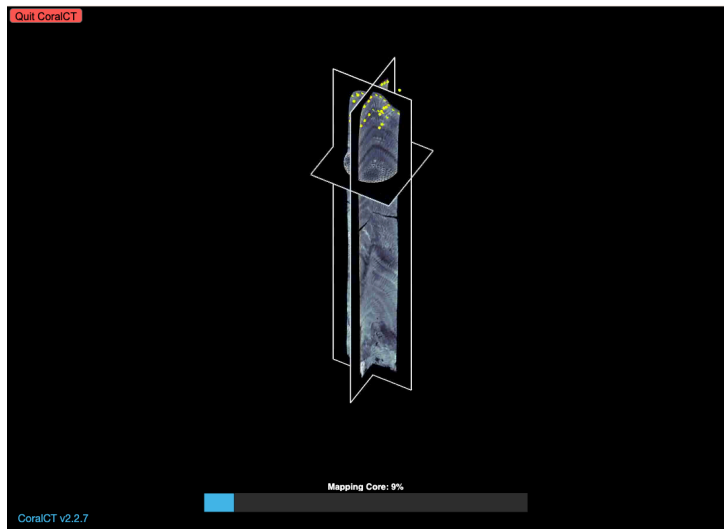
- There may be more bands at the bottom of the core only visible at certain rotations, it is okay if you do not end with the same number of bands every rotation.
- On rotations there's an option to hide interpolated bands (below the core), this will hide the previous bands done.
- These previous bands become more visible the more rotations completed, eventually becoming partial lines
  - This can help you place bands if it is hard to distinguish at certain rotations



- Once four rotations are complete, rotate the core to 180 degrees, if there are incomplete bands (ex: bands 17 and 18 on image), complete those bands
  - Sometimes jumping to rotations not done and checking the bands is a good idea, there could be missing or incomplete bands (ex: band 20)



- After all rotations are complete, click process growth, more instructions on how to finish in the **Process Growth** section
- Once notes, confidence interval, and age are determined, click ‘Send outputs to CoralCache server’
- You will see an animation of the bands you created being mapped onto a 3D image of the core selection



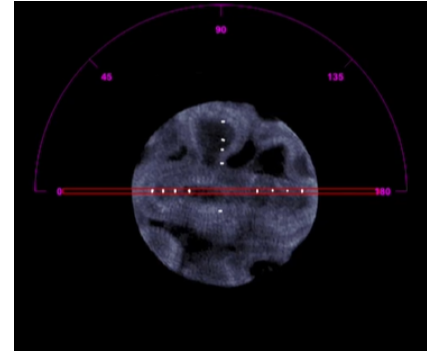
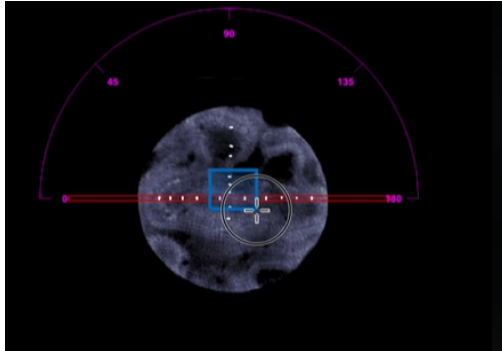
- Once mapping is complete, you will be redirected back to the world map screen

## Using Tools

### ○ **Modify Bands**

#### ■ **Draw a box to delete clicks on this band in axial view below**

- Click and drag the mouse on the axial view after clicking the button



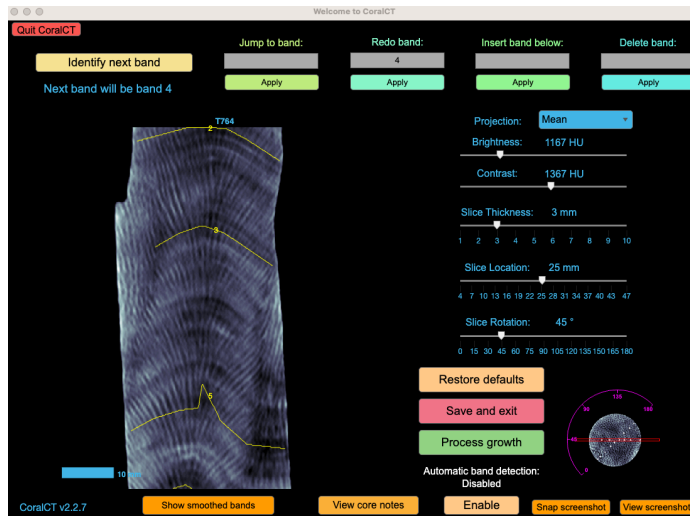
- When released the points inside the box should disappear
- Click 'Done with band'

#### ■ **Jump to band**

- This button sets the next band to be identified, type the band number than 'Apply'
- This must be set to 1 when doing a new rotation
- If you only need to add a few bands at a certain rotation (ex: 180), use this button to jump to the exact band you need

## ■ Redo band

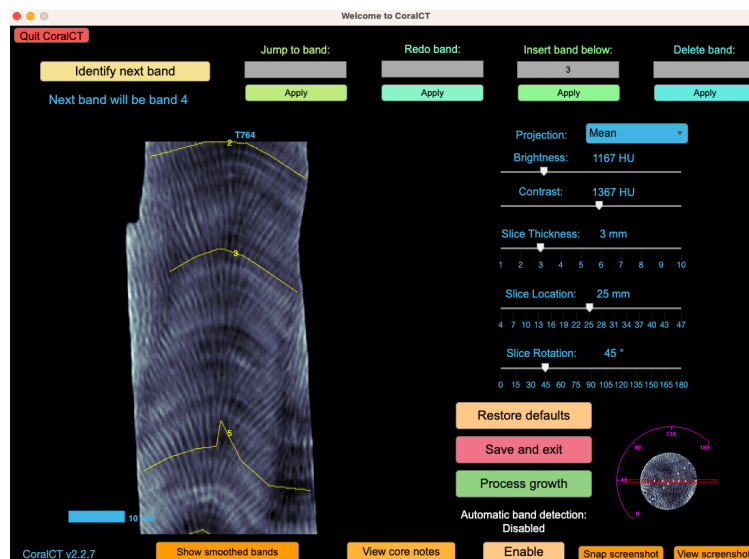
- This button will erase the band entered into the box



- This will leave a space for this band, and it will be the next band to be identified
- Be aware that this will redo the band from all rotations, if an error occurs on only one rotation, click the red “Redo this band” button when entering the band vectors

## ■ Insert band below

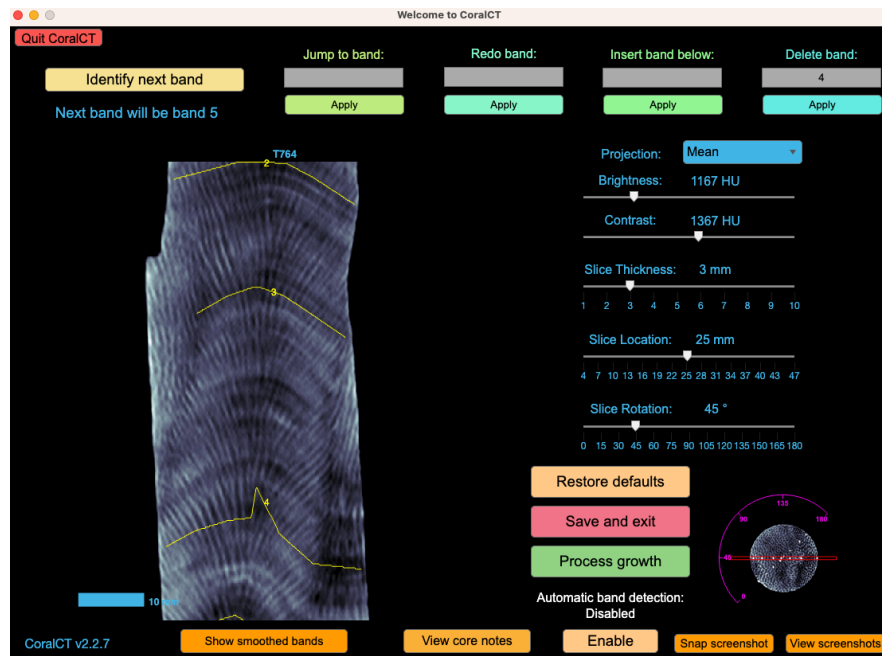
- This button will insert an empty space for a band below the number entered and shift the bands after up a number



- This is helpful if a band is accidentally deleted, or if a band only becomes apparent at a different rotation
- This will reset the ‘Identify next band’ to the number after what was entered in the box.

■ **Delete band**

- This is different from ‘Redo Band’ in that the rest of the bands shift down a number.



- This should only be used when a band is mistakenly placed and other band numbers need to be corrected.

○ **Modify Core Image**

■ **Brightness**

- This slide bar will adjust the brightness of the core. This can help make the white areas brighter than the dark to distinguish.

## ■ Contrast

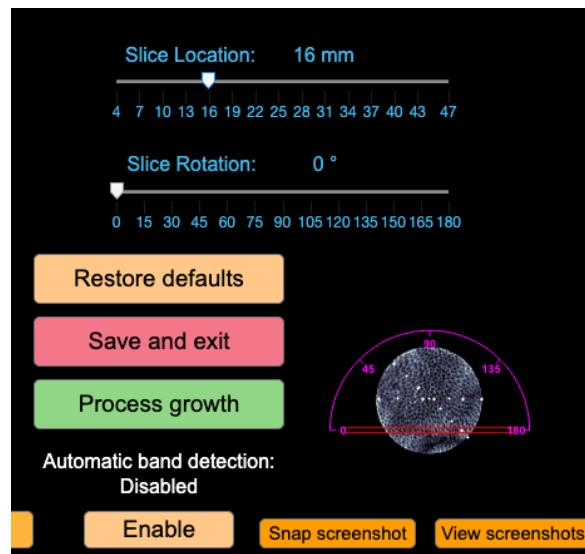
- This will increase or decrease the difference between the dark and white bands on the coral.

## ■ Slice Thickness

- This changes how thin or thick the vertical lines of the core are.

## ■ Slice Location

- This changes what spot of the core is altered, this change is best seen when looking at the axial view in the bottom right corner.

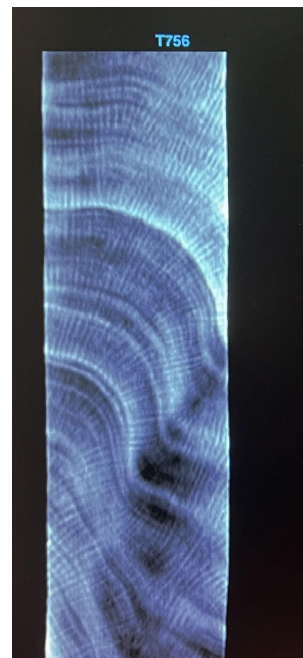
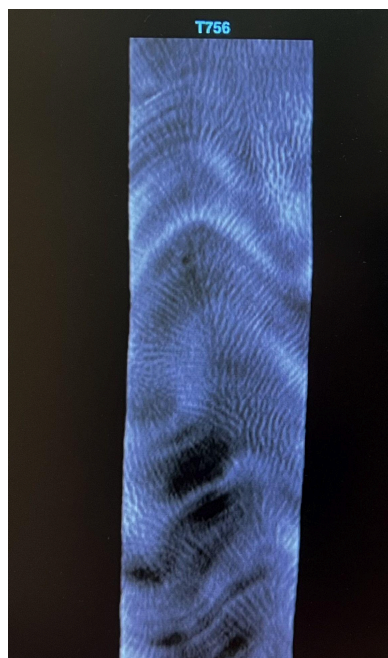


- ***Harder Core Help***

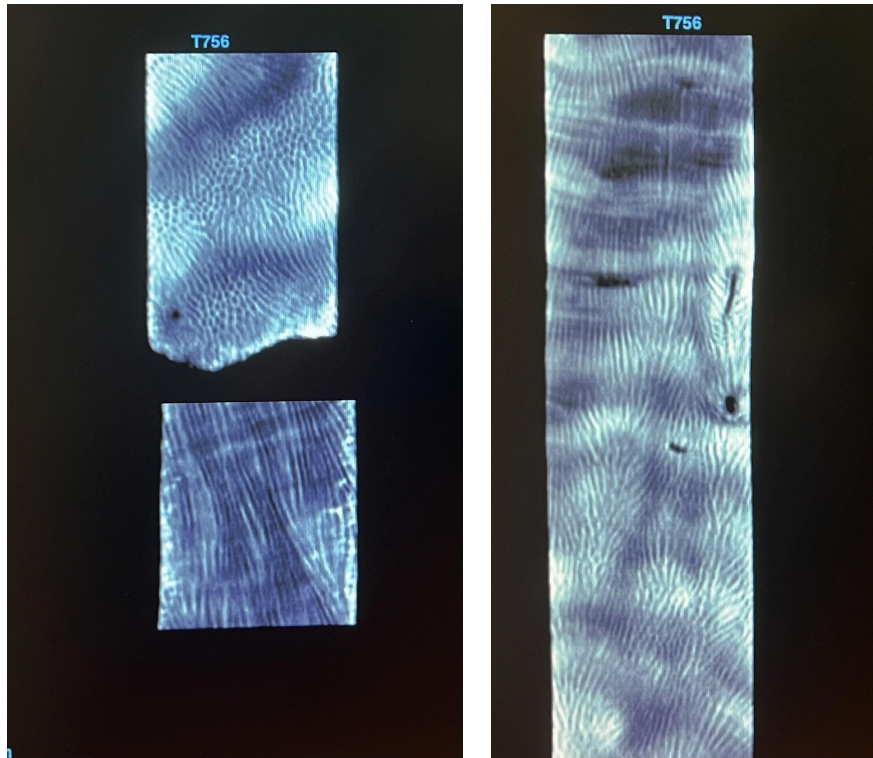
- If there is a section in a core where there is a break and the bands go vertical, do not analyze that section



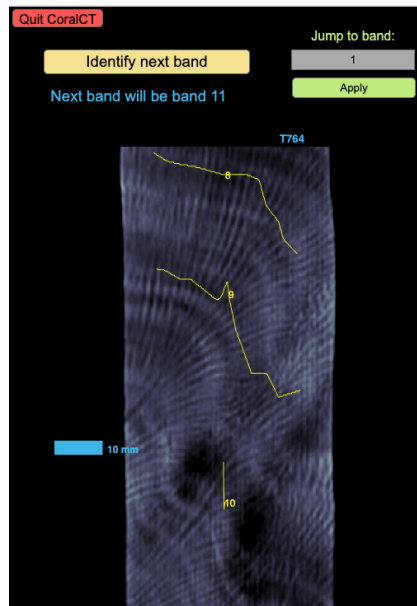
- If it is hard to make out bands, utilize the core image modifications like brightness and contrast
- If the default rotation has confusing band placement or you are unsure, attempt a different rotation, there may be clearer band placement



- There may be splits or blemishes in the core, place bands around them as if the split is not there

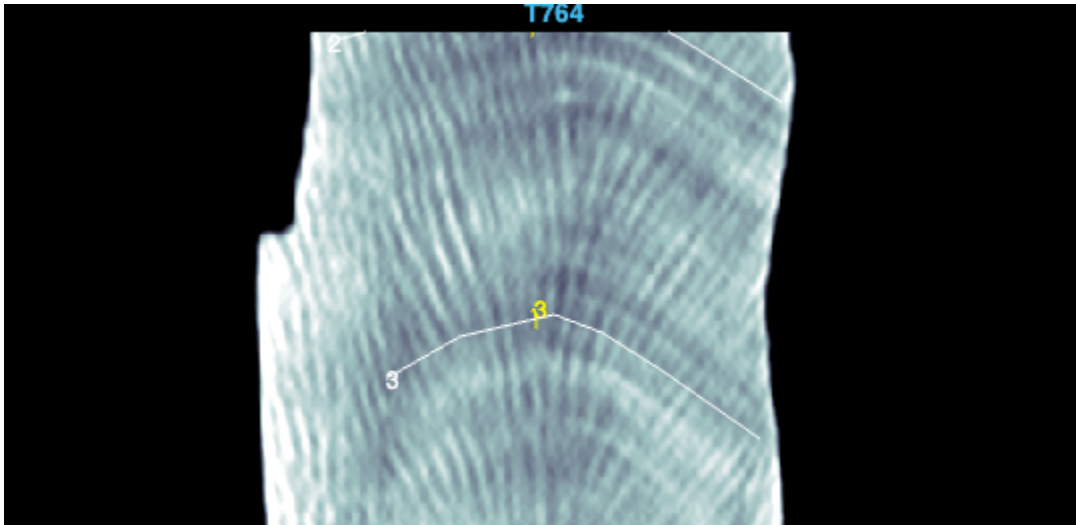


- Bands may have odd angles, when in doubt just follow the same line





- Certain bands may be not visible for part of the band, only mark what you are confident in



# Processing a Core

## Determining Age

- Depending on how close to the top the first band is, it is generally the calendar year the core was collected or the year before

## Confidence Interval

- This is a dial that measures how confident the user is with the placement of their bands
- The rating goes from one to ten, with one being the lowest rating

## Comment Box

- This allows the user to make any final comments about the core analysis
- This box can be used for explaining the decision for the confidence interval, or explaining the age chosen

Quit CoralCT

Rate your confidence in identifying bands:  
(1 = no confidence / 10 = highest)

Go back

Please enter any notes to save with the output file

Core T764 was collected in June 2013.  
Please estimate the calendar year of your first band:

Core was very small and damaged, hard to analyze

2012

Send outputs to CoralCache server

■ Delete your previous output files

CoralCT v2.2.7

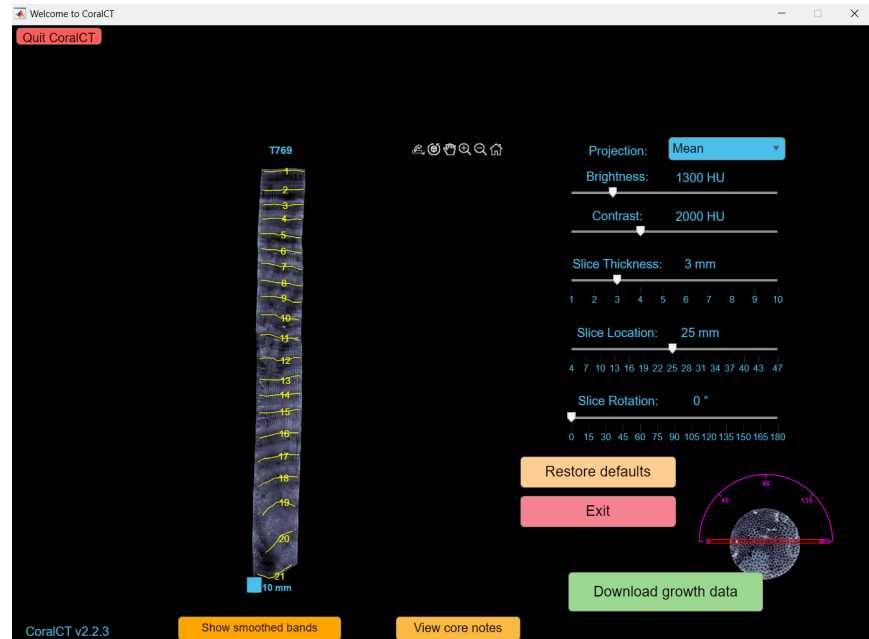
# Access Data

## Downloading

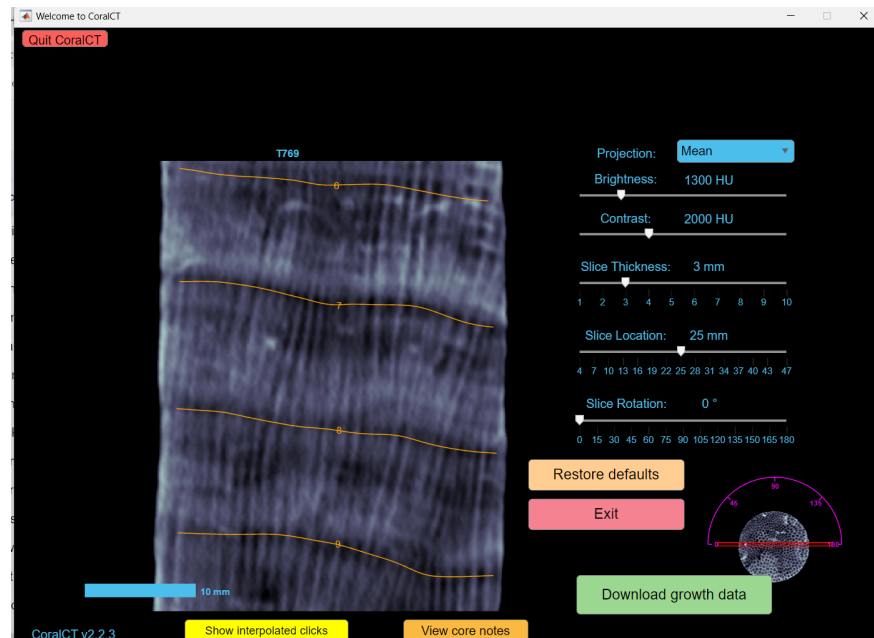
- Click which region and subregion you would like to download
- The last drop down menu is to select what core to download, the first option should be 'download all'
- For this instruction guide, we will download T769
- Once clicked a new drop down will appear which asks you to pick which band map
- This shows you all the researchers who completed the band analysis and the data completed, the first option should be 'download all'
- For this guide we will download TomDeCarlo\_17-July-23
- Three new buttons should appear
  - **Preview Core**
    - By clicking this button, a scan of the core will appear where the maps were previously
  - **View these bands in 3-D**
    - By clicking this button, you are rerouted to the loading screen, you should see the video of a core collection appear
    - This will take a few minutes depending on the file size
    - This shows you the scan of the core, with the band markings done by the researcher
    - You can change the image of the core by adjusting the factors on the right (eg: Brightness)
    - By clicking 'View core notes' you can read the notes made by the researcher while analyzing the core

- The last button on the bottom gives the option to view the core with smoothed bands (the default is the option interpolated clicks)

### *DEFAULT*



### *SMOOTH*



## ■ Download Growth Data

- Once clicked a box should appear stating the data is being downloaded from the server
- To access this data you need to start in work working directory folder
- Select the folder my\_corals, then datasets, the region (in this case Taiwan), then the core number (in this case T769)
- If you only downloaded one version of the core, one excel file should be present in this folder, if you downloaded multiple versions, there will be more excel files present
- When opening the excel file, all of the different details of the core are downloaded and labeled (eg: Density)

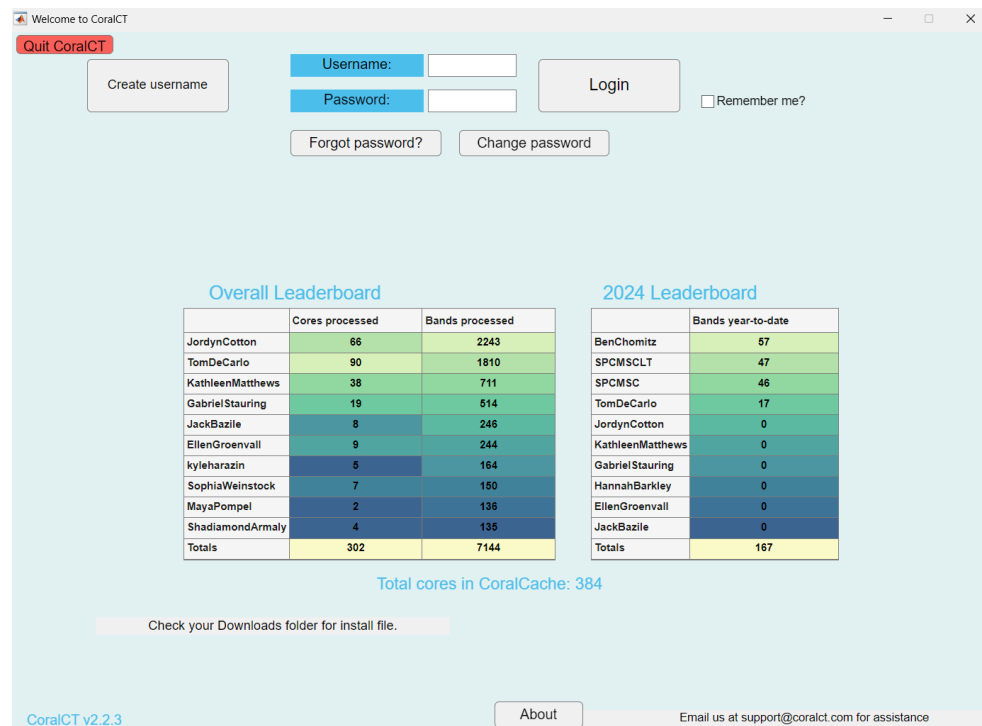
band	Estimated Hounsfield Density (g Extension	Extension	Calcificat	Calcification	sigma (g cm <sup>-2</sup> y <sup>-1</sup> )
1	2012 827.9706	1.075	1.2312	0.062979	1.3235 0.067701
2	2011 833.4811	1.0787	1.2402	0.059872	1.124 0.064683
3	2010 838.949	1.0824	1.037	0.047655	1.1007 0.051538
4	2009 808.388	1.1291	1.112	0.043444	1.2555 0.051138
5	2008 806.4986	1.1278	1.0346	0.039258	1.1657 0.024205
6	2007 819.955	1.1369	1.0502	0.038895	1.1394 0.044322
7	2006 890.406	1.1776	1.1828	0.026291	1.3629 0.026653
8	2005 897.6124	1.018	1.1464	0.06389	1.3319 0.07462
9	2004 864.3287	1.18	1.2997	0.063863	1.5077 0.075024
10	2003 895.3773	1.1203	1.4235	0.071086	1.3648 0.060311
11	2002 897.9635	1.0946	1.0162	0.1128	1.7207 0.123247
12	2001 877.9247	1.0396	1.3055	0.073455	1.4474 0.083652
13	2000 861.5447	1.0974	1.126	0.05045	1.2357 0.060353
14	1999 861.619	1.0976	1.179	0.050054	1.2941 0.05494
15	1998 813.3046	1.1324	1.6077	0.16716	1.8206 0.18929
16	1997 837.2337	1.1489	1.6219	0.21668	1.8628 0.24771
17	1996 842.1731	1.0545	1.7474	0.44115	1.8951 0.47844
18	1995 842.578	1.0848	1.8811	0.48628	2.0406 0.52751
19	1994 804.7029	1.0593	2.1937	0.67484	2.3238 0.715
20	1993 754.9971	1.0238	2.1453	0.59137	2.2008 0.65666
21	1992 714.768	0.99877	NaN	NaN	NaN

- Using this excel, many types of analysis's are able to be done

# Updating CoralCT

## Mac

- On the home screen of CoralCT, the bottom left hand corner has a button saying ‘Check for Updates’
- Click the button, it may take a few minutes to check for updates
- If there is a new update, it will say the version number and have a button to install, this may also take a few minutes
- Once it has scanned, you should see a message like this:



The screenshot shows the CoralCT application window titled "Welcome to CoralCT". At the top left, there is a red "Quit CoralCT" button. Below it is a "Create username" button. To the right, there is a login form with "Username:" and "Password:" labels, input fields, and a "Login" button. A "Remember me?" checkbox is located to the right of the login button. Below the login form are "Forgot password?" and "Change password" buttons.

Below the login form, there are two leaderboards:

### Overall Leaderboard

	Cores processed	Bands processed
JordynCotton	66	2243
TomDeCarlo	90	1810
KathleenMatthews	38	711
GabrielStauring	19	514
JackBazile	8	246
EllenGroenvall	9	244
kyleharazin	5	164
SophiaWeinstock	7	150
MayaPompel	2	136
ShadiamondArmaly	4	135
Totals	302	7144

### 2024 Leaderboard

	Bands year-to-date
BenChomitz	57
SPCMSCLT	47
SPCMSC	46
TomDeCarlo	17
JordynCotton	0
KathleenMatthews	0
GabrielStauring	0
HannahBarkley	0
EllenGroenvall	0
JackBazile	0
Totals	167

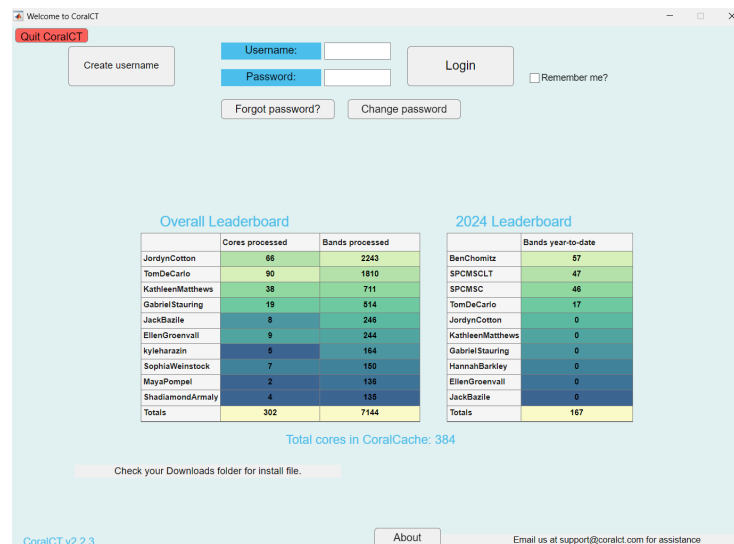
Below the leaderboards, there is a blue text message: "Total cores in CoralCache: 384".

At the bottom of the window, there is a message: "Check your Downloads folder for install file." and an "About" button. The version number "CoralCT v2.2.3" is displayed in the bottom left corner, and the email address "Email us at support@coralct.com for assistance" is in the bottom right corner.

- In the Finder, a .dmg file should appear. Download the program
- Drag the CoralCT program icon in applications

## Windows

- On the home screen of CoralCT, the bottom left hand corner has a button saying ‘Check for Updates’
- Click the button, it may take a few minutes to check for updates
- If there is a new update, it will say the version number and have a button to install, this may also take a few minutes
- Once it has scanned, you should see a message like this:



Welcome to CoralCT

Quit CoralCT

Create username

Username:

Password:

Login  Remember me?

Forgot password? Change password

### Overall Leaderboard

	Cores processed	Bands processed
JordynCotton	66	2243
TomDeCarlo	90	1810
KathleenMathews	38	711
GabrielStauring	19	514
JackBazile	8	248
EllenGroenvall	9	244
kyleharazin	5	164
SophiaWeinstock	7	160
MayaPompe	2	138
ShadiamondArmal	4	138
Totals	302	7144

### 2024 Leaderboard

	Bands year-to-date
BenChomitz	57
SPCMSCLT	47
SPCMSC	46
TomDeCarlo	17
JordynCotton	0
KathleenMathews	0
GabrielStauring	0
HannahBarkley	0
EllenGroenvall	0
JackBazile	0
Totals	167

Total cores in CoralCache: 384

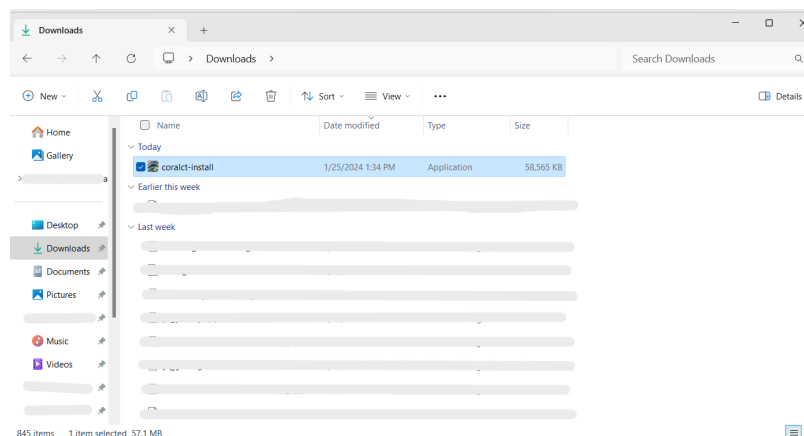
Check your Downloads folder for install file.

CoralCT v2.2.3

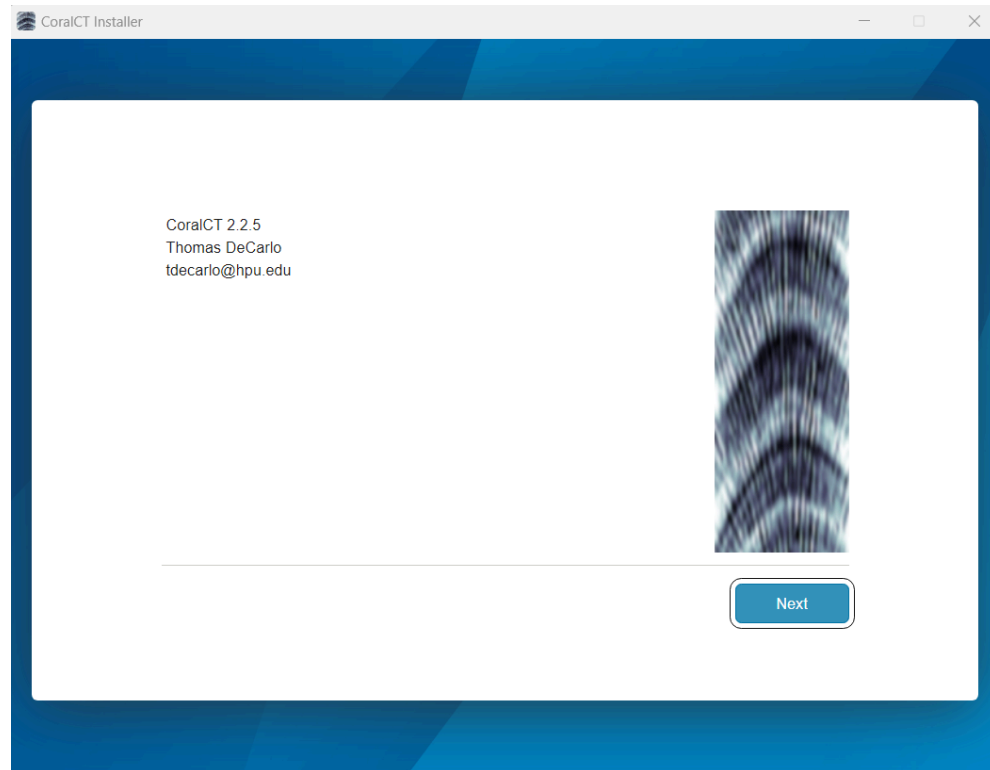
About

Email us at support@coralct.com for assistance

- In the file explorer, go to your downloads folder, there should be a download called ‘coralct-install’



- Double click the file, and the message asking to make changes to the device will pop up, click yes
- After a few seconds this screen will appear



- Hit 'next' , these will be the same prompts as the initial installation
- Hit 'begin install'
- Reopen the program once installation is complete