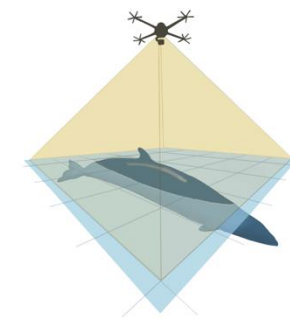




Oregon State University  
Marine Mammal  
Institute



CODEX  
CENTER OF DRONE EXCELLENCE

# CollatriX v2 Manual

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# Table of Contents (click to go to page)

- Getting started

- [Download files](#)...p.3
- [Launching CollatriX](#)...p.4
- [Function overview](#)...p.5

- [Wrangle LiDAR function](#)...p.6-7

- LiDAR for videos

- [Intro](#)...p.8
- [Pull LiDAR function](#)...p.9
  - [GPS Time Input](#)...p.10-12
  - [Video input](#)...p.13
  - [Lidar input and output](#)...p.14
- [Merge LiDAR function](#)...p.15
  - [Image list input](#)...p.16
  - [Lidar input and output](#)...p.17

- LiDAR for images

- [Intro](#)...p.18
- Pull/Merge LiDAR function
  - [GPS Time input](#)...p.19-21
  - [Image input](#)...p.22-23
  - [Lidar input and output](#)...p.24

- Collating function

- [Intro to function](#)...p.25
- [Function inputs](#)...p.26-30
- [Run function](#)...p.31

- Body Condition function

- [Intro to function](#)...p.32
- Function inputs...p.33
  - [Input file](#)...p.33
  - [Body Volume](#)...p.34-35
  - [Body Area Index](#)...p.36
  - [Output file](#)...p.37
- [Run function](#)...p.38

- Other

- [Close app](#)...p.39
- [Crash reporting](#)...p.40
- [Install exiftool on mac](#)...p.41

*If you ever want to come back to this page, just click on this icon (its in the bottom right corner of every slide!)*

[TOC](#)

# To start: download files

- Download CollatriX v2
  - <https://github.com/MMI-CODEX/CollatriX/releases>
  - To download just click on the file you want under “Assets”
    - If you have a windows download the .exe version
    - If you have a mac download the .dmg version
      - This version is compatible with either Intel or M1/M2 chips
      - You’ll also need exiftool installed on your mac. If you already have it installed, great! If not, download the zipfile on github for an easy download (more details on [this slide](#)).
    - If you get a security warning...
      - Windows: click on open anyway
      - Mac: go to settings > privacy & security > allow the app to open anyway
- We strongly encourage following along with our video tutorials
  - [https://media.oregonstate.edu/playlist/dedicated/1\\_hm9cgwh4/](https://media.oregonstate.edu/playlist/dedicated/1_hm9cgwh4/)

# Launching CollatriX

- Launch CollatriX by opening the application (once opened it will look like Fig 1).
  - To launch, just double click on the file you downloaded
- Note, that the program may take longer to launch its first time opening. To open, just double click on the file.

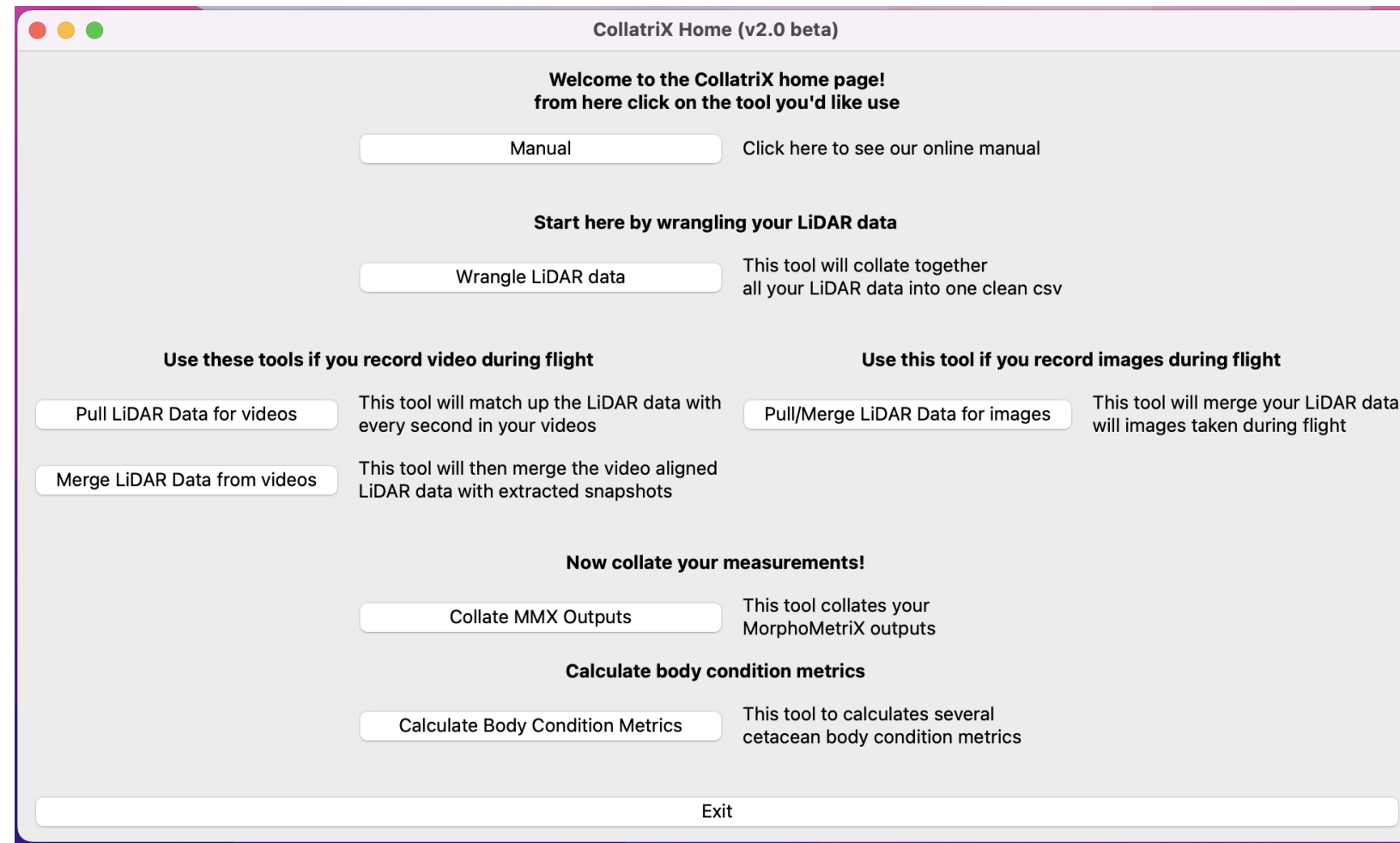


Figure 1. Opening CollatriX

# Function overview

- CollatriX now has all functions available from a homepage (Fig 1).
- To run one of the tools, just click on the button

Key

- Blue fill = **new** collatrix function
- Yellow fill = existed in old collatrix

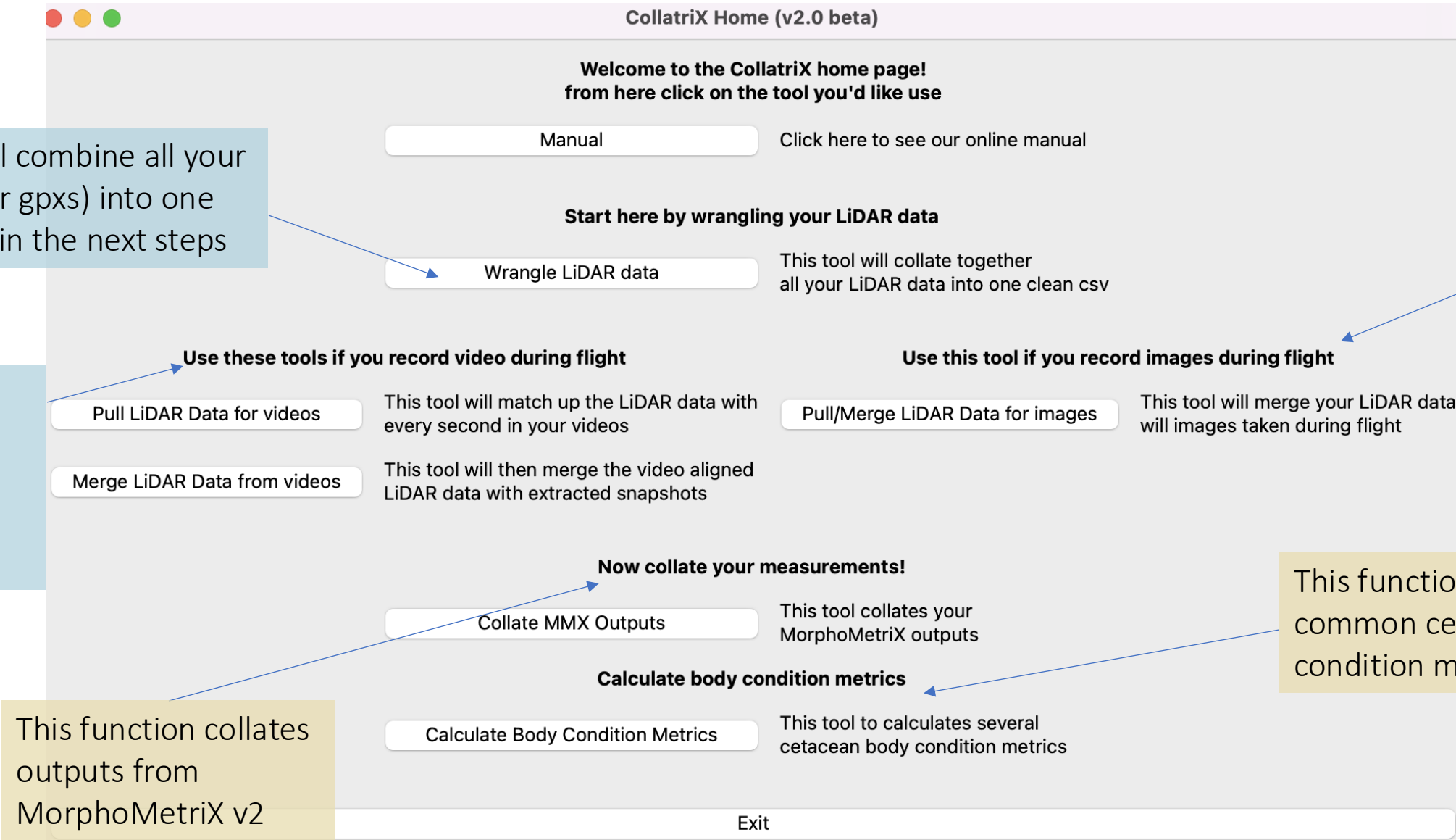


Figure 1. CollatriX home page

\*\*the output of the Merge LiDAR functions can be the start of your safety for the Collate function\*\*

# Wrangle LiDAR Data

- LiDAR data can come in different forms, so this tool collates all your lidar files into one clean output that will be used as an input for the subsequent lidar tools (both the video and image associated functions).
- This function can wrangle with csvs from a LightWare LiDAR (e.g. LidarBoX) or gpxs from a drone like the lemhex.

Click this button and navigate to the folder where all your lidar files are saved. The file path you select will be displayed in the box below.

Select your lidar type from the drop down, your choices are LightWare (csv) and Lemhex (gpx)

Select whether your lidar is mounted to the drone (fixed) or if it's gimbaled. If gimbaled, the tilt degree correction will *not be* applied

Type the file prefix you'd like in this text box. The output file will be named: "*prefix\_CleanedLidar.csv*"

Click this button and navigate to the folder where you want the output file to be saved. The file path you select will be displayed in the box below.

Click this button to run the tool. A message will display below the button when it's done running.

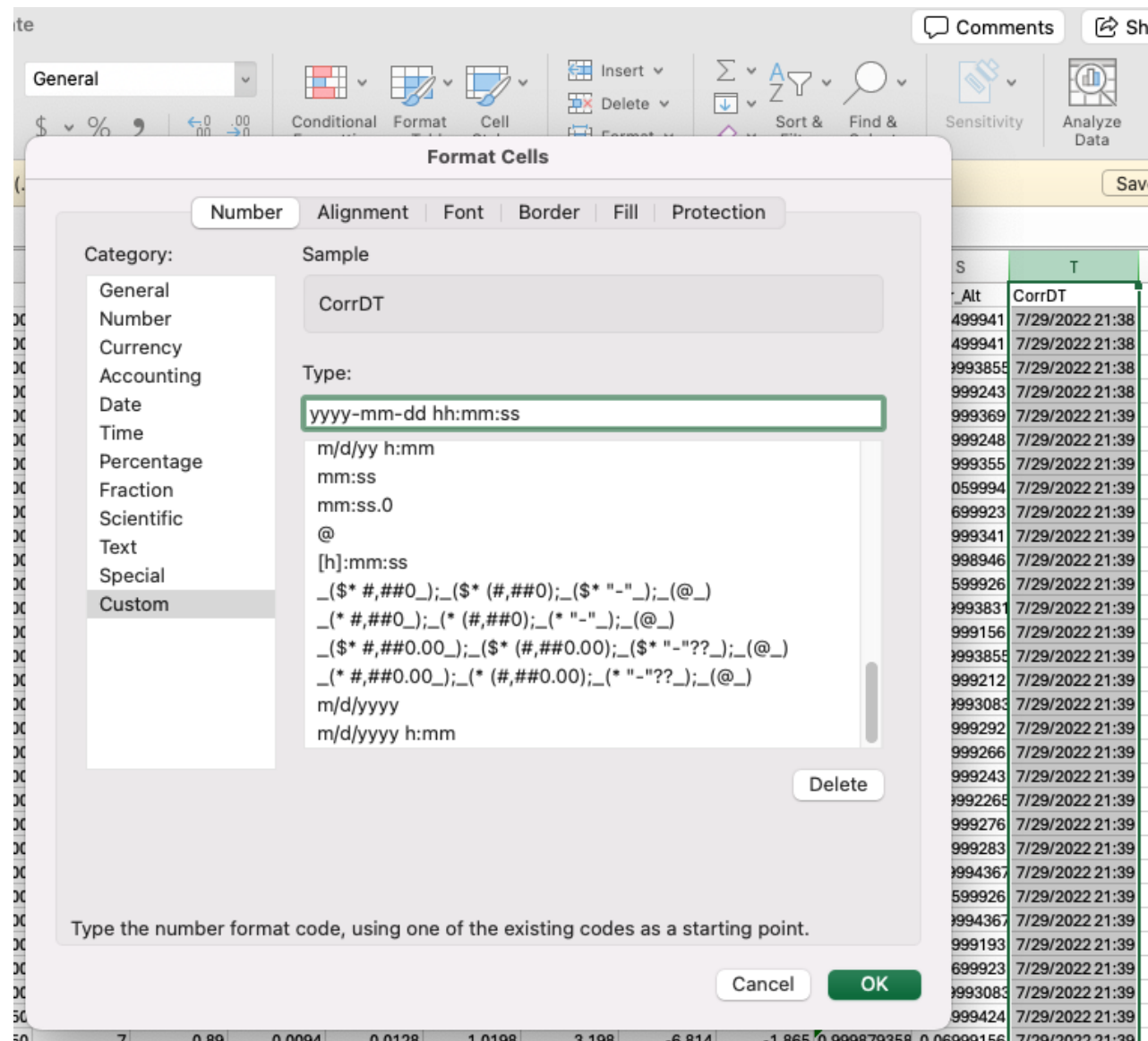
The screenshot shows a web-based interface for processing LiDAR data. At the top, it says "Welcome to the lidar wrangling tool!". Below this, there are several input fields and buttons:

- A button labeled "Lidar folder" with the text "Click to select folder containing lidar files" next to it. Below this button is a dashed rectangular box for the file path.
- A dropdown menu labeled "Select which lidar you used" with "LightWare (csv)" selected.
- A dropdown menu labeled "Lidar mount:" with "fixed" selected.
- A text input field labeled "Output prefix:".
- A button labeled "Output folder" with the text "Click to select folder where output should be saved" next to it. Below this button is a dashed rectangular box for the file path.
- A large button labeled "Run!" in red text.

Blue arrows point from the explanatory text on the left to the corresponding elements in the interface: from the first paragraph to the "Lidar folder" button, from the second paragraph to the "Select which lidar you used" dropdown, from the third paragraph to the "Lidar mount:" dropdown, from the fourth paragraph to the "Output prefix:" text box, from the fifth paragraph to the "Output folder" button, and from the sixth paragraph to the "Run!" button.

# Wrangle LiDAR Data – beware excel date formatting

- If you open the output csv in excel, the CorrDT formatting may change from YYYY-MM-DD HH:MM:SS (ex. 2024-02-06 11:40:00) to M/DD/YY H:MM (ex. 2/06/24 11:40) IF you save this sheet in excel, the date formatting will be messed up and the next tools will throw an error.
- If you do save it, just highlight the column and change the format to custom and enter the following:
  - yyyy-mm-dd hh:mm:ss

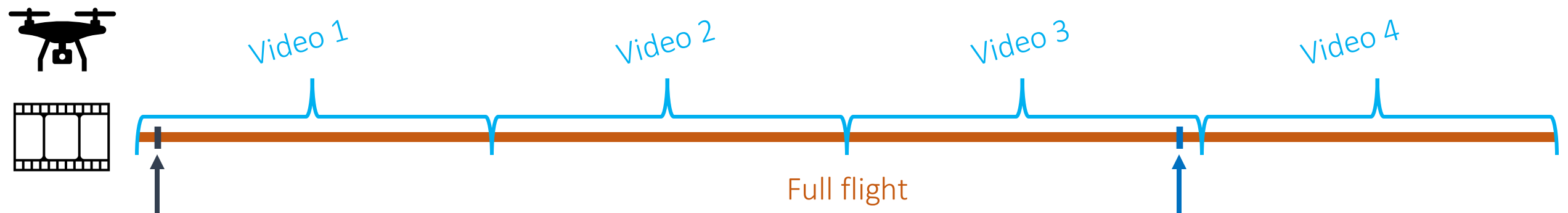
[illegible]



# LiDAR for videos

- If you record video during flight and then extract snapshots for measuring, these tools are for you. Because the LiDAR is using time from a satellite and the snapshot time is associated with the time in the video, a few steps are needed to align timestamps.
- The first tool (Pull LiDAR function) matches up the LiDAR timestamps with the video timestamps. This tool will output a datasheet where every second of every video is matched up with its corresponding LiDAR timestamp and value.
- The second tool (Merge LiDAR function) will then merge the snapshot timestamps with the values from the output of the first tool.
- **Note:** for any of these tools to work, you need to have recorded a GPS satellite time at the start of each flight.

During a *flight* of continuous recording, the footage is typically split into *several videos*



The GPS time image is taken at the beginning of the *flight*, but offset is applied to all *videos* from the flight

So, for a snapshot from minute 3:40 of video 3, the true image time is: the start time of video 3 (extracted from the video metadata) + 3:40 (time in video) + the offset correction (same for whole flight)



# Pull LiDAR Data for Videos

- This tool requires a lot of inputs. We'll walk through them in the next several slides but this is what the complete window looks like when you open it (Fig 3).
- What you'll need: A GPS time file, all your videos in one folder, and the Lidar file from the Wrangle Lidar tool.

GPS Time File

Click to upload GPS time file

☐

Check if the time in video of the image is in a column (named VideoTime)

Enter Example Image Name:

Enter Delimeter:

Select Time Components:

Hour:

Minute:

Second:

☐

Check if flight prefix is in a column (named FlightID)

Select Flight Prefix Parts:

☐

Check if video prefix is in a column (named VideoID)

Select Video Prefix Parts:

Video folder

Click to select folder containing raw drone videos

Default tag names should appear when video folder is selected, but if not click the 'Exif Tag Viewer' for help

Exif Tag Viewer

Select file name exif tag

Select duration exif tag

Select modify date exif tag

Enter Example Video Name:

Enter Delimeter:

Select Flight Prefix Parts:

Lidar file

Click to select cleaned lidar file (output from lidar wrangle tool)

Output prefix:

Output folder

Click to select folder where outputs should be saved

Run!

See [slide 13](#) for a breakdown of these inputs

See [next slide \(p. 9\)](#) for a breakdown of these inputs

See [slide 12](#) for a breakdown of these inputs

Figure 3.

# Pull LiDAR Data for Videos: GPS Time inputs part 1

- Camera clocks on drones are often inaccurate and/or have a lot of drift. So, to make sure that we can properly align our snapshot timestamps with the LiDAR timestamps (come from GPS satellite unit), we follow these steps:
  - We film a GPS clock at the start of the flight
  - We then extract snapshots of the GPS clock using VLC
    - VLC lets us embed the timestamp of the snapshot (time in video) in our image name. But you can have a column with this timestamp if need be.
  - We manually type the time on the clock in the image into a column in our GPS Time file.
- Let's break down an example GPS Time file
  - **Note** that your column headers must be **spelled and capitalized exactly as shown here**.
    - The contents of the following columns **must also be formatted as shown here**: VideoTime, GPS\_Time, and GPS\_Date

Here I have the timestamp embedded in the name (00\_00\_01), meaning this snapshot was taken in the first second of the video

But this column contains the same information, formatted HH:MM:SS.

This column is the time displayed on the clock that was filmed in the snapshot. **Formatted as HH:MM:SS.**

This column is the date displayed on the clock that was filmed in the snapshot **formatted as YYYYMMDD.**

These columns contain information linking the image to the flight and video it came from. If you have this information contained within the image name (as we do here) these columns are not necessary.

Image	VideoTime	GPS_Time	GPS_Date	FlightID	VideoID
220729_I2O_S0_U2_DJI0006_00_00_01_vlc00001.png	0:00:01	22:58:12	220729	220729_I2O_S0_U2	220729_I2O_S0_U2_DJI0006
220729_P4P_S0_U2_DJI0007_00_00_02_vlc00001.png	0:00:01	22:37:58	220729	220729_P4P_S0_U2	220729_P4P_S0_U2_DJI0007

# Pull LiDAR Data for Videos: GPS Time inputs part 2

Click this button and select the GPS time file you’ve set up (detailed on previous slide). The file path will appear in the box below the button.

The first image name from the Image column will automatically appear in the “Enter Example Image Name” box

The next steps are all needed if the information from the following columns is included in the image name: **VideoTime, FlightID, VideoID**

If you all three columns, click to check the boxes each column (in blue box here). Then you can proceed to the [video input section](#) of this tool.

If you have the information in the image name, don’t check the boxes, go to the next slide.

GPS Time File

Click to upload GPS time file

☐ Check if the time in video of the image is in a column (named VideoTime)

Enter Example Image Name:

Enter Delimeter:

Select Time Components:

Hour:

Minute:

Second:

☐ Check if flight prefix is in a column (named FlightID)

☐ Check if video prefix is in a column (named VideoID)

Select Flight Prefix Parts:

Select Video Prefix Parts:

Image	VideoTime	GPS_Time	GPS_Date	FlightID	VideoID
220729_I2O_S0_U2_DJI0006_00_00_01_vlc00001.png	0:00:01	22:58:12	220729	220729_I2O_S0_U2	220729_I2O_S0_U2_DJI0006
220729_P4P_S0_U2_DJI0007_00_00_02_vlc00001.png	0:00:01	22:37:58	220729	220729_P4P_S0_U2	220729_P4P_S0_U2_DJI0007

# Pull LiDAR Data for Videos: GPS time inputs part 3

We assume that you use the same delimiter throughout your image name (e.g. we use “\_”). Type your delimiter into the box.

Once you enter the delimiter, several inputs will populate.

Each of these drop downs contains each section of your prefix as an option. For each Time Component input, select which section of the prefix represents the Hour, Minute, and Second.

Here I'll select that this first 00 is the hour. The tool will then know that the 6th item in the prefix represents the hour.

Now you need to tell the tool which components of the prefix represent the Flight ID and the Video ID by checking each box that is part of the prefix. So for the Flight ID I'd check all **these boxes**, and for the Video ID I'd check all **these boxes**.

Now the tool will know that the first 4 objects in the prefix correspond to the flight ID and the first 5 objects correspond to the video ID.

Again, if you have columns in the GPS Time file that include this info, these steps are no necessary.

GPS Time File

Click to upload GPS time file

/Users/clarabird/Box Sync/OSU/CODEX/collatrix\_dev/cx\_testing/lidar video functions/GPS\_time.csv

☐

Check if the time in video of the image is in a column (named VideoTime)

Enter Example Image Name:

220729\_I2O\_S0\_U2\_DJI0006\_00\_00\_01\_vlc00001.png

Enter Delimeter:

\_

Select Time Components:

Hour:

None

Minute:

None

Second:

None

☐

Check if flight prefix is in a column (named FlightID)

☐

Check if video prefix is in a column (named VideoID)

Select Flight Prefix Parts:

Select Video Prefix Parts:

☐ 220729

☐ 220729

☐ I2O

☐ I2O

☐ S0

☐ S0

☐ U2

☐ U2

☐ DJI0006

☐ DJI0006

☐ 00

☐ 00

☐ 00

☐ 00

☐ 01

☐ 01

☐ vlc00001.png

☐ vlc00001.png

# Pull LiDAR Data for Videos: Videos

This tool uses video metadata to pull the start time of the video in local time. We use this to calculate when the snapshot was taken by adding the time in video timestamp of the snapshot to the start time of the video.

Click this button and navigate to the folder containing your original drone videos. The file path will appear in the box below the button.

Once a folder has been selected the exif tag inputs and example video name will populate.

The tool needs three metadata items to run: the file name, the duration time, and the file modify date. If your video has the same metadata tags (metadata labels) as the videos we used to develop CollatriX (DJI drone footage), then it will automatically populate the fields with the tags.

If not, you'll need to click the drop down and select the right tag name for each required tag.

If you need help knowing which information each tag contains, click on the Exif Tag Viewer button (in blue box) and a table will appear in a separate window that displays the metadata for the first video in the video folder you selected. You can use this to select the appropriate tag for each required tag information.

You also need to tell the tool your delimiter and which components of the prefix represent the Flight ID. So, type your delimiter into the box and check the boxes for Flight ID.

Video folder

Click to select folder containing raw drone videos

Default tag names should appear when video folder is selected, but if not click the 'Exif Tag Viewer' for help

Exif Tag Viewer

Select file name exif tag

Select duration exif tag

Select modify date exif tag

Enter Example Video Name:

Enter Delimiter:

Select Flight Prefix Parts:

Video folder

Click to select folder containing raw drone videos

/Volumes/IdelisaB/BAJA\_GN\_2023/UAS/230309

Default tag names should appear when video folder is selected, but if not click the 'Exif Tag Viewer' for help

Exif Tag Viewer

Select file name exif tag

Select duration exif tag

Select modify date exif tag

Enter Example Video Name:

Enter Delimiter:

Select Flight Prefix Parts:

230309

I2F

S1

U1

DJI0001.MOV

select tag

SourceFile

ExifToolVersion

Warning

FileName

Directory

FileSize

FileModifyDate

FileAccessDate

FileNodeChangeDate

FilePermissions

FileType

FileTypeExtension

MIMEType

MajorBrand

MinorVersion

CompatibleBrands

MediaDataSize

MediaDataOffset

MovieHeaderVersion

CreateDate

ModifyDate

TimeScale

Duration

PreferredRate

PreferredVolume

PreviewTime

PreviewDuration

PosterTime

SelectionTime

SelectionDuration

CurrentTime

NextTrackID

GPSCoordinates-err

SpeedX-err

SpeedY-err

SpeedZ-err

Pitch-err

Yaw-err

Roll-err

CameraPitch-err

CameraYaw-err

CameraRoll-err

Comment

Category

Model

UserData\_mux-fr

ExifTag Viewer

	tag	value
1	SourceFile	/Volumes/IdelisaB/BAJA_GN_2023/...
2	ExifTool:ExifToolVersion	12.76
3	ExifTool:Warning	[minor] The ExtractEmbedded option ...
4	File:FileName	230309_I2F_S1_U1_DJI0001.MOV
5	File:Directory	/Volumes/IdelisaB/BAJA_GN_2023/...
6	File:FileSize	4092935294
7	File:FileModifyDate	2023:06:20 10:55:01-07:00
8	File:FileAccessDate	2024:02:01 14:37:54-08:00
9	File:FileNodeChangeDate	2023:06:20 10:55:01-07:00
10	File:FilePermissions	100700
11	File:FileType	MOV
12	File:FileTypeExtension	MOV
13	File:MIMEType	video/quicktime
14	QuickTime:MajorBrand	qt
15	QuickTime:MinorVersion	2011.7.0
16	QuickTime:CompatibleBrands	['qt ']
17	QuickTime:MediaDataSize	4092847487
18	QuickTime:MediaDataOffset	44
19	QuickTime:MovieHeaderVersion	0



# Pull LiDAR Data for Videos: Lidar and Output

Click this button to navigate to and select the output file from the lidar wrangle tool. Remember its named *“prefix\_CleanedLidar.csv”*

The file path will appear in the box below.

Type the file prefix you’d like in this text box. The output file will be named: *“prefix\_VideoLidar.csv”*

Click this button and navigate to the folder where you want the output file to be saved. The file path you select will be displayed in the box below.

Click this button to run the tool. A message will display below the button when it’s done running.

The interface consists of a light gray panel with the following elements:

- A button labeled "Lidar file" with the instruction "Click to select cleaned lidar file (output from lidar wrangle tool)" to its right. Below it is a dashed rectangular box for the file path.
- A text input field labeled "Output prefix:".
- A button labeled "Output folder" with the instruction "Click to select folder where outputs should be saved" to its right. Below it is a dashed rectangular box for the folder path.
- A large button at the bottom labeled "Run!" in red text.

Four red arrows originate from the text instructions on the left and point to the "Lidar file" button, the "Output prefix:" text box, the "Output folder" button, and the "Run!" button respectively.

# Merge LiDAR Data for Videos

- This tool does a merge based on time of your image data and the video lidar data we just made in the last tool
  - It will output a csv with a laser altimeter altitude value for each image in a list you provide.
- What you'll need: An image list file and the Lidar file from the Pull LiDAR Data for video tool.

Merge LiDAR data from videos with images

Welcome to the lidar image match up tool!

Image List File

Click to upload image list file

Enter Example Image Name:

☐ Check if the time in video of the image is in a column (named VideoTime)

Select Time Components:

Hour:

Minute:

Second:

Enter Delimiter:

☐ Check if video prefix is in a column (named VideoID)

Select Video Prefix Parts:

LiDAR File

Click to select folder containing lidar file

☐ Check if you want to find a lidar value within a window

Window size (in seconds)

Output prefix:

Output folder

Click to select folder where outputs should be saved

Run!

15

[TOC](#)



# Merge LiDAR Data for Videos: Image List File

Click this button to navigate to and select your image list file. It should be formatted like the table shown below.

Once a file is selected the file path will be shown in the box below the button and the example image name will be populated.

Each of these drop downs contains each section of your prefix as an option. For each Time Component input, **select which section of the prefix represents the Hour, Minute, and Second.**

If you have a VideoTime column in your image list, don't select time components from the drop downs, just **check the box.**

Type your delimiter in here, the prefix list will automatically populate. **Check the boxes** for the components that make up the Video ID

Unless! You have that information as a column. **In that case, just check the box** for the video prefix being a column.

**Note:** Any other columns you have in the image list file will be included in the output, so if you have other metadata included, it won't be lost.

Here I have the timestamp embedded in the name (00\_00\_01), meaning this snapshot was taken in the first second of the video

But this column contains the same information, **formatted HH:MM:SS.**

These columns contain information linking the image to the video it came from. If you have this information contained within the image name (as we do here) this column is not necessary.

Image	VideoTime	VideoID
220729_I2O_S0_U2_DJI0006_00_01_21_vlc00001.png	0:01:21	220729_I2O_S0_U2_DJI0006
220729_I2O_S0_U2_DJI0006_00_02_01_vlc00001.png	0:02:01	220729_I2O_S0_U2_DJI0006

# Merge LiDAR Data for Videos: Lidar and Output

Click this button to navigate to and select the output file from pull lidar for video tool. Remember its named “*prefix\_VideoLidar.csv*”

The file path will appear in the box below.

Sometimes there’s a missing lidar value at the exact second of a photo (due to an error), but there’s an available value within a few seconds. If you’d like to pull the nearest lidar value within a few seconds, **check the box** and **enter the number of seconds** you’d like to look for a lidar value before and after the image time (i.e., if the image was taken at 00:02:45, and the window size is 10, the code will look for the nearest lidar value within 00:02:35-00:02:55)

Type the file prefix you’d like in this text box. The output file will be named: “*prefix\_LidarMerge.csv*”

Click this button and navigate to the folder where you want the output file to be saved. The file path you select will be displayed in the box below.

Click this button to run the tool. A message will display below the button when it’s done running.

LiDAR File Click to select folder containing lidar file

☐ Check if you want to find a lidar value within a window

Window size (in seconds)

Output prefix:

Output folder Click to select folder where outputs should be saved

**Run!**

# Pull/Merge LiDAR Data for Images

- This tool requires a lot of inputs. We'll walk through them in the next several slides but this is what the complete window looks like when you open it.
- What you'll need: A folder of GPS snapshots, a GPS time file, all your images in one folder, an image list (optional), and the Lidar file from the Wrangle Lidar tool.

**Welcome to the lidar image matchup tool!**

**GPS Image folder** Click to select folder containing GPS time images

**GPS Time File** Click to upload GPS time file

☐ Check if flight prefix is in a column (named FlightID)

Enter Example Image Name:

Enter Delimiter:

Select Flight Prefix Parts:

**Image folder** Click to select folder containing images

Default tag names should appear when image folder is selected, but if not click the 'Exif Tag Viewer' for help

**Exif Tag Viewer**

Select file name exif tag

Select create date exif tag

☐ Check if you have a csv with an image list

**Image List** Click to select image list file

☐ Check if flight prefix is in a column (named FlightID)

Enter Example Image Name:

Enter Delimiter:

Select Flight Prefix Parts:

**Lidar file** Click to select

☐ Check if you want to find a lidar value

Window size (in seconds)

Output prefix:

**Output folder** Click to select

**Run**

See next slide (17) for breakdown of these inputs

See slide 20 for breakdown of these inputs

See slide 21 for breakdown of these inputs

# Pull/Merge LiDAR Data for Images: GPS Time inputs part 1

- Camera clocks on drones are often inaccurate and/or have a lot of drift. So, to make sure that we can properly align our snapshot timestamps with the LiDAR timestamps (come from GPS satellite unit), we follow these steps:
  - We take a picture of GPS clock at the start of the flight with the drone
  - We manually type the time on the clock in the image into a column in our GPS Time file.
- Let's break down an example GPS Time file
  - **Note** that your column headers must be **spelled and capitalized exactly as shown here**.
    - The contents of the following columns **must also be formatted as shown here**: GPS\_Time, and GPS\_Date

Image name

This column is the time displayed on the clock that was filmed in the snapshot.  
**Formatted as HH:MM:SS.**

This column is the date displayed on the clock that was filmed in the snapshot  
**formatted as YYYYMMDD.**

These columns contain information linking the image to the flight the image came from. If you have this information contained within the image name (as we do here) this column is not necessary.

Image	GPS_Time	GPS_Date	FlightID
220729_I2O_S0_U2_DJI0001.png	22:58:12	220729	220729_I2O_S0_U2
220729_P4P_S0_U2_DJI0002.png	22:37:58	220729	220729_P4P_S0_U2

# Pull/Merge LiDAR Data for Images: GPS Time inputs part 2

Click this button and select the folder containing all your GPS time images (images of the clock). The selected file path will appear in the box below.

Click this button and select the GPS time file you've set up (detailed on previous slide). The file path will appear in the box below the button. The first image in the list will appear in the Example Image name. The selected file path will appear in the box below.

If you have a FlightID column, check the box. You won't need to select flight prefix parts.

If you have the information in the image name, don't check the boxes, go to the next slide.

GPS Image folder

Click to select folder containing GPS time images

GPS Time File

Click to upload GPS time file

☐

Check if flight prefix is in a column (named FlightID)

Enter Example Image Name:

Enter Delimiter:

Select Flight Prefix Parts:

Image	GPS_Time	GPS_Date	FlightID
220729_I2O_S0_U2_DJI0001.png	22:58:12	220729	220729_I2O_S0_U2
220729_P4P_S0_U2_DJI0002.png	22:37:58	220729	220729_P4P_S0_U2

# Pull/Merge LiDAR Data for Images: GPS time inputs part 3

We assume that you use the same delimiter throughout your image name (e.g. we use “\_”). Type your delimiter into the box.

Once you enter the delimiter, the list of prefix parts will appear.

Now you need to tell the tool which components of the prefix represent the Flight ID by checking each box that is part of the prefix. So for the Flight ID I’d check all **these boxes**

Now the tool will know that the first 4 objects in the prefix correspond to the flight ID.

Again, if you have columns in the GPS Time file that include this info, these steps are no necessary.

GPS Image folder Click to select folder containing GPS time images

/Users/clarabird/Box Sync/OSU/CODEX/CollatriX/collatrix\_dev/cx\_testing/lidar image function/GPS

GPS Time File Click to upload GPS time file

/Users/clarabird/Box Sync/OSU/CODEX/CollatriX/collatrix\_dev/cx\_testing/lidar image function/GPS\_time.csv

☐ Check if flight prefix is in a column (named FlightID)

Enter Example Image Name: 231018\_I2F\_S0\_U1\_DJI0001.JPG

Enter Delimeter: \_

Select Flight Prefix Parts:

- ☐ 231018
- ☐ I2F
- ☐ S0
- ☐ U1
- ☐ DJI0001.JPG



# Pull LiDAR Data for Images: Images part 1

This tool reads the image metadata to determine it's start time.

Click this button and navigate to the folder containing your images. The file path will appear in the box below the button.

Once a folder has been selected the exif tag inputs and example image name will populate

The tool needs two metadata items to run: the file name and the file create date. If your image has the same metadata tags (metadata labels) as the images we used to develop CollatriX (DJI drone images), then it will automatically populate the fields with the tags.

If not, you'll need to click the drop down and select the right tag name for each required tag.

If you need help knowing which information each tag contains, click on the Exif Tag Viewer button (in blue box) and a table will appear in a separate window that displays the metadata for the first image in the image folder you selected. You can use this to select the appropriate tag for each required tag information.

Image folder

Click to select

Image folder

Click to select folder containing images

Default tag names should appear when image folder is selected, but if not click the 'Exif Tag Viewer' for help

Default tag names should appear when image folder is selected, but if not click the 'Exif Tag Viewer' for help

Select file name exif tag

Select file name exif tag

Select create date exif tag

Select create date exif tag

☐ Check if you have a csv with an image list

Select create date exif tag

Image List

Click to select image list file

☐ Check if flight prefix is in a column (named FlightID)

Enter Example Image Name:

Enter Delimeter:

Select Flight Prefix Parts:

Exif Tag Viewer

Exif Tag Viewer

FileName

CreateDate

select tag

SourceFile

ExifToolVersion

Warning

✓ FileName

Directory

FileSize

FileModifyDate

FileAccessDate

FileInodeChangeDate

FilePermissions

FileType

FileTypeExtension

MIMEType

ExifByteOrder

ImageWidth

ImageHeight

EncodingProcess

BitsPerSample

ColorComponents

YCbCrSubSampling

ImageDescription

Make

Model

Orientation

XResolution

YResolution

ResolutionUnit

Software

ModifyDate

YCbCrPositioning

ExposureTime

FNumber

ExposureProgram

ISO

ExifVersion

DateTimeOriginal

CreateDate

ComponentsConfiguration

CompressedBitsPerPixel

ShutterSpeedValue

ApertureValue

ExposureCompensation

MaxApertureValue

SubjectDistance

Example Exif Tag Viewer

	tag	value
1	SourceFile	/Users/clarabird/Box ...
2	ExifTool:ExifToolVers...	12.76
3	ExifTool:Warning	[minor] Possibly ...
4	File:FileName	231018_I2F_S0_U1_DJL...
5	File:Directory	/Users/clarabird/Box ...
6	File:FileSize	6490672
7	File:FileModifyDate	2023:10:18 ...
8	File:FileAccessDate	2024:01:30 ...
9	File:FileInodeChang...	2023:10:18 ...
10	File:FilePermissions	100777
11	File:FileType	JPEG

Example drop down



# Pull/Merge LiDAR Data for Images: Images part 2

You don't have to provide a list of images as a spreadsheet, but if you already have some linked metadata and want to add the laser altitude to it, you can upload an image list by **checking the box** for image list and **clicking the Image List button** to select your file.

If you have a FlightID column (like in GPS time), **check the box** and don't select flight prefix parts

If you don't have a FlightID column, you'll need to select prefix parts.

After entering your delimiter in the text box, the prefix parts list will populate.

Now you need to tell the tool which components of the prefix represent the Flight ID by checking each box that is part of the prefix. So for the Flight ID I'd check all **these boxes**

Now the tool will know that the first 4 objects in the prefix correspond to the flight ID.

Again, if you have columns in the Image List that include this info, these steps are no necessary.

The screenshot shows the following interface elements:

- Image folder** button: Click to select folder containing images. Below it is a text box containing the path: `/Users/clarabird/Box Sync/OSU/CODEX/CollatriX/collatrix_dev/cx_testing/lidar image function/images`.
- Exif Tag Viewer** button.
- Select file name exif tag**: Dropdown menu with `FileName` selected.
- Select create date exif tag**: Dropdown menu with `CreateDate` selected.
- ☒ **Check if you have a csv with an image list**
- Image List** button: Click to select image list file. Below it is an empty text box.
- ☐ **Check if flight prefix is in a column (named FlightID)**
- Enter Example Image Name:** Text box containing `231018_I2F_S0_U1_DJI0003.JPG`.
- Enter Delimiter:** Text box containing `_`.
- Select Flight Prefix Parts:** A list of checkboxes:
  - ☒ 231018
  - ☒ I2F
  - ☒ S0
  - ☒ U1
  - ☐ DJI0003.JPG

# Pull/Merge LiDAR Data for Videos: Lidar and Output

Click this button to navigate to and select the output file from pull lidar for wrangle tool. Remember its named “*prefix\_LidarCleaned.csv*”

The file path will appear in the box below.

Sometimes there’s a missing lidar value at the exact second of a photo (due to an error), but there’s an available value within a few seconds. If you’d like to pull the nearest lidar value within a few seconds, **check the box** and **enter the number of seconds** you’d like to look for a lidar value before and after the image time (i.e., if the image was taken at 00:02:45, and the window size is 10, the code will look for the nearest lidar value within 00:02:35-00:02:55)

Type the file prefix you’d like in this text box. The output file will be named: “*prefix\_ImageLidar.csv*”

Click this button and navigate to the folder where you want the output file to be saved. The file path you select will be displayed in the box below.

Click this button to run the tool. A message will display below the button when it’s done running.

The screenshot shows a web-based tool interface for pulling and merging LiDAR data. It features several input fields and buttons. Red arrows from the surrounding text point to the following elements:

- Lidar file** button: Points to the text "Click to select folder containing lidar files".
- Check if you want to find a lidar value within a window** checkbox: Points to the checkbox itself.
- Window size (in seconds)** text input: Points to the input field.
- Output prefix:** text input: Points to the input field.
- Output folder** button: Points to the text "Click to select folder where outputs should be saved".
- Run!** button: Points to the button itself.

The interface includes a dashed box for the output file path, a checkbox for finding lidar values within a window, a text input for the window size, a text input for the output prefix, and a button for selecting the output folder.

# Collate MMX Outputs Function

- Here we have all the same inputs as the original function, just combined into one window!
- Details in the next few slides

**Collate MorphoMetriX Outputs**

**Welcome to the collating tool!**  
this tool will collate your morphometrix outputs into on clean csv

☐ Use folder names for AID? Check if you want the Animal ID to be assigned based on the name of the folder

☐ Use safety? Check if you want to use a safety

Safety File Click to upload safety file

Enter the prefix you'd like for output files

MMX folder Click to select folder containing MorphoMetriX outputs

Output folder Click to select folder where outputs should be saved

Both in one file Select which outputs you'd like

Collate Data! (click to run)

# Collate MMX Outputs: Use AID?

- Use folder names for AID?
  - MorphoMetriX output csvs can be saved in any file structure. The function will search through all folders within the folder provided and pull all csvs. If you have saved the outputs within folders named using Animal IDs, you can choose to have the Animal ID be pulled from the folder name. If the box is unchecked, the Animal ID will be the 'Image ID' manually entered through MorphoMetriX.
- An example of a file structure where the folders are named using the Animal ID is:
- Whale1
  - > image\_name1.jpg
  - > image\_name1.csv
- Whale2
  - > image\_name2.jpg
  - > image\_name2.csv

The screenshot shows a web application titled "Collate MorphoMetriX Outputs". It has a light gray background and a white border. At the top, there's a header with the title and a subtitle: "Welcome to the collating tool! this tool will collate your morphometrix outputs into on clean csv". Below this, there are several input fields and checkboxes. A red box highlights the checkbox "Use folder names for AID?". Other checkboxes include "Use safety?". There are three file selection buttons: "Safety File", "MMX folder", and "Output folder". A text input field is labeled "Enter the prefix you'd like for output files". A dropdown menu is labeled "Both in one file". At the bottom, there's a large button labeled "Collate Data! (click to run)".

Collate MorphoMetriX Outputs

Welcome to the collating tool!  
this tool will collate your morphometrix outputs into on clean csv

☐ Use folder names for AID? Check if you want the Animal ID to be assigned based on the name of the folder

☐ Use safety? Check if you want to use a safety

Safety File Click to upload safety file

Enter the prefix you'd like for output files

MMX folder Click to select folder containing MorphoMetriX outputs

Output folder Click to select folder where outputs should be saved

Both in one file Select which outputs you'd like

Collate Data! (click to run)

# Collate MMX Outputs: Safety

Use safety?

- Because it's easy to accidentally enter the wrong altitude, focal length, or pixel dimension in MorphoMetriX, this function can recalculate the measurements using the correct values. **Checking the box** for this input will have the function recalculate, using values that you will need to provide through an additional csv. If you check the box, the “Safety File” button will become active, and **you can click on that button to select your safety file.**

How to format this csv (note: header spelling and capitalization matters most)

- Required columns (spelled and capitalized just as written here): Image, Altitude, Focal\_Length, Pixel\_Dimension
- Make sure that the image names are identical to the name of the images measured (be mindful of capitalization, *especially of the file extensions*, .JPG and .jpg would not be considered matching).

Image	Altitude	Focal_Length	Pixel_Dimension
whale1.JPG	55.0	35	0.0039
whale2.JPG	40.0	35	0.0039

Collate MorphoMetriX Outputs

Welcome to the collating tool!

this tool will collate your morphometrix outputs into on clean csv

☐ Use folder names for AID?

Check if you want the Animal ID to be assigned based on the name of the folder

☒ Use safety?

Check if you want to use a safety

Safety File

Click to upload safety file

Enter the prefix you'd like for output files

MMX folder

Click to select folder containing MorphoMetriX outputs

Output folder

Click to select folder where outputs should be saved

Both in one file

Select which outputs you'd like

Collate Data! (click to run)

# Collate MMX Outputs: Prefix

- Prefix
  - Type in the prefix you would like added to the output files

**Collate MorphoMetriX Outputs**

**Welcome to the collating tool!**  
this tool will collate your morphometrix outputs into on clean csv

☐ Use folder names for AID? Check if you want the Animal ID to be assigned based on the name of the folder

☒ Use safety? Check if you want to use a safety

Safety File Click to upload safety file

Enter the prefix you'd like for output files

MMX folder Click to select folder containing MorphoMetriX outputs

Output folder Click to select folder where outputs should be saved

Both in one file Select which outputs you'd like

Collate Data! (click to run)



# Collate MMX Outputs: File paths

- Select file paths
- MMX folder
  - Click on this button to select the folder where the morphometrix outputs you want to collate are located.
  - Note – if there are non-mmx outputs in the folder that's ok, collatrix will ignore them
- Output folder
  - Click on this button to select the folder where you want the outputs to be saved

**Collate MorphoMetriX Outputs**

Welcome to the collating tool!  
this tool will collate your morphometrix outputs into on clean csv

☐ Use folder names for AID? Check if you want the Animal ID to be assigned based on the name of the folder

☒ Use safety? Check if you want to use a safety

Safety File Click to upload safety file

Enter the prefix you'd like for output files

MMX folder Click to select folder containing MorphoMetriX outputs

Output folder Click to select folder where outputs should be saved

Both in one file Select which outputs you'd like

Collate Data! (click to run)



# Collate MMX Outputs: Output format

- Select output format
  - CollatriX creates a dataframe of the measurements in pixels and one in meters, you can select how you want these outputted
  - The drop down includes 4 options
    - Both in one file: both meters and pixels in one csv with column headers indicates whether its meters or pixels
    - Both in separate files: one csv containing measurements in meters, one containing the pixel counts
    - Just meters: just one csv containing measurements in meters
    - Just pixels: just one csv containing measurements in pixels
  - All outputs will include the metadata inputted into morphometrix (Image ID, altitude, notes etc)
- CollatriX will also output a processing notes file with a record of what you inputted into this CollatriX window

The screenshot shows a web application window titled "Collate MorphoMetriX Outputs". The interface is light gray with white input fields and buttons. At the top, a welcome message reads: "Welcome to the collating tool! this tool will collate your morphometrix outputs into on clean csv". Below this, there are several configuration options:

- A checkbox labeled "Use folder names for AID?" with a help text: "Check if you want the Animal ID to be assigned based on the name of the folder".
- A checked checkbox labeled "Use safety?" with a help text: "Check if you want to use a safety". Below it is a "Safety File" input field and a "Click to upload safety file" button.
- A text input field for a prefix, with a label: "Enter the prefix you'd like for output files".
- An "MMX folder" input field with a "Click to select folder containing MorphoMetriX outputs" button.
- An "Output folder" input field with a "Click to select folder where outputs should be saved" button.
- A dropdown menu currently set to "Both in one file", with a label: "Select which outputs you'd like".
- A large "Collate Data! (click to run)" button at the bottom.

Red and blue boxes highlight the dropdown menu and the "Collate Data!" button, respectively.

# Collate MMX Outputs: Run it!

- Once you are all set with your inputs, you are ready to run!
- To run collatrix just click on Collate Data! (click to run)
- When done running, a message will appear underneath the run button.

**Collate MorphoMetriX Outputs**

**Welcome to the collating tool!**  
this tool will collate your morphometrix outputs into on clean csv

☐ Use folder names for AID? Check if you want the Animal ID to be assigned based on the name of the folder

☒ Use safety? Check if you want to use a safety

Safety File Click to upload safety file

Enter the prefix you'd like for output files

MMX folder Click to select folder containing MorphoMetriX outputs

Output folder Click to select folder where outputs should be saved

Both in one file Select which outputs you'd like

**Collate Data! (click to run)**

# Calculate Body Condition

- This function can calculate a variety of cetacean body condition metrics.

Calculate Body Condition Metrics

Welcome to the body condition metrix tool!

this tool can calculate common cetacean body condition metrics and add them to your output file

Collated Output File

Click to upload collated output

☐ Calculate Body Volume?

Check if you want to calculate Body Volume

Ellipse

Select Body Volume calculation method

Note: ellipse method always uses lower = 0, upper = 100, and interval = 5. If you choose 'Both', enter values for the circle method.

Length measurement name

Lower bound

Upper bound

Interval

☐ Calculate Body Area Index (BAI)?

Check if you want to calculate Body Area Index (BAI)

Parabola

Select BAI calculation method

Length measurement name

Lower bound

Upper bound

Interval

Enter prefix for output file

Output folder

Click to select folder where outputs should be saved

Calculated Body Condition! (click to run)

# Calculate Body Condition: input file

- CollatriX output csv
  - Select the csv containing the collated measurements outputted by the collate MMX outputs function
- The path to the file you selected will be displayed in the box below the button

The screenshot shows a web application titled "Calculate Body Condition Metrics". It features a welcome message and a description of the tool's purpose. The interface includes several input fields and buttons for configuring calculations. A red box highlights the "Collated Output File" input field and the "Click to upload collated output" button. Below this, there are two main sections for calculations: "Calculate Body Volume?" and "Calculate Body Area Index (BAI)?". Each section has a dropdown menu for the calculation method (Ellipse for Volume, Parabola for BAI) and a series of input fields for "Length measurement name", "Lower bound", "Upper bound", and "Interval". At the bottom, there are input fields for "Output folder" and "Enter prefix for output file", followed by a large button labeled "Calculated Body Condition! (click to run)".

Calculate Body Condition Metrics

Welcome to the body condition metrix tool!  
this tool can calculate common cetacean body condition metrics and add them to your output file

Collated Output File Click to upload collated output

☐ Calculate Body Volume? Check if you want to calculate Body Volume

Ellipse Select Body Volume calculation method

Note: ellipse method always uses lower = 0, upper = 100, and interval = 5. If you choose 'Both', enter values for the circle method.

Length measurement name

Lower bound

Upper bound

Interval

☐ Calculate Body Area Index (BAI)? Check if you want to calculate Body Area Index (BAI)

Parabola Select BAI calculation method

Length measurement name

Lower bound

Upper bound

Interval

Enter prefix for output file

Output folder Click to select folder where outputs should be saved

Calculated Body Condition! (click to run)

# Calculate Body Condition: body volume

- CollatriX also provides the option to calculate body volume using either the circular or elliptical methods
  - Circular frustums: Christiansen, F., Vivier, F., Charlton, C., Ward, R., Amerson, A., Burnell, S., & Bejder, L. Maternal body size and condition determine calf growth rates in southern right whales (2018). Maternal body size and condition determine calf growth rates in southern right whales. *Marine Ecology Progress Series*, 592, 267–281. <http://doi.org/10.3354/meps12522>
  - Elliptical: Christiansen F, Sironi M, Moore MJ, et al. Estimating body mass of free-living whales using aerial photogrammetry and 3D volumetrics. *Methods Ecol Evol.* 2019; 10: 2034–2044. <https://doi.org/10.1111/2041-210X.13298>
- From the drop down, you can select either or both
- Regardless you will have to provide
  - The name of your length measurement (i.e. if you named total length "TL" enter "TL")
- The elliptical method always uses 0-100 in 5% increments
  - You have to have measured in 5% increments
- But for the circular method enter:
  - The lower bound percentage (i.e. if you want to use widths between 20-80% of total length to calculate body volume, then 20 would be the lower bound)
  - The upper bound (using the above example, 80 would be the upper bound)
  - The interval that the widths were measured in (i.e 5 if you measured in 5% increments. **Note** this value cannot be less than the increments of width that you measured).
- Please remember to cite the paper that published the calculation method in addition to this software.

Calculate Body Condition Metrics

Welcome to the body condition metrix tool!  
this tool can calculate common cetacean body condition metrics and add them to your output file

Collated Output File Click to upload collated output

☐ Calculate Body Volume? Check if you want to calculate Body Volume

Ellipse Select Body Volume calculation method

Note: ellipse method always uses lower = 0, upper = 100, and interval = 5. If you choose 'Both', enter values for the circle method.

Length measurement name

Lower bound

Upper bound

Interval

☐ Calculate Body Area Index (BAI)? Check if you want to calculate Body Area Index (BAI)

Parabola Select BAI calculation method

Length measurement name

Lower bound

Upper bound

Interval

Enter prefix for output file

Output folder Click to select folder where outputs should be saved

Calculated Body Condition! (click to run)

# Calculate Body Condition: body volume ellipse notes

- The ellipse method works by assuming a ratio of whale body height to whale body width
  - Make sure you have thoroughly read this paper:  
*Christiansen F, Sironi M, Moore MJ, et al. Estimating body mass of free-living whales using aerial photogrammetry and 3D volumetrics. Methods Ecol Evol. 2019; 10: 2034–2044. <https://doi.org/10.1111/2041-210X.13298>*
- This means that you will have to manually add ratio columns for each width to your collated outputs before running the body condition tool.
  - You will need the following columns: [total length name]\_ratio5.00 through [total length name]\_ratio85.00
  - You can easily create the headers by copying the width headers ([total length name]\_w5.00) and replacing the w with “ratio”, then fill those columns with the appropriate ratios per image
  - An example of these added columns is available in the demo folder.



# Calculate Body Condition: Body Area Index (BAI)

- CollatriX also provides the option to calculate BAI from perpendicular width intervals along a total length measurement following Burnett et al. 2018. If you say "yes" to have BAI calculated, the following information will need to be provided:
- The method used to calculate BAI. Options: parabola, trapezoid, or both.
- The parabola method will calculate a parabola for the sides of the whale using the width measurements and surface is calculated as the area under this curve (Burnett et al. 2018). The trapezoid method calculates the surface area by summing the surface areas of the trapezoids created between each segment (Christiansen et al. 2016). You can also select both to have both methods used.
- The name of your length measurement (i.e. if you named total length "TL" enter "TL")
- The lower bound percentage (i.e. if you want to use widths between 20-80% of total length to calculate body volume, then 20 would be the lower bound)
- The upper bound (using the above example, 80 would be the upper bound)
- The interval that the widths were measured in (i.e 5 if you measured in 5% increments. **Note** this value cannot be less than the increments of width that you measured).
- *Burnett, Jonathan D., Leila Lemos, Dawn Barlow, Michael G. Wing, Todd Chandler, and Leigh G. Torres. 2018. "Estimating Morphometric Attributes of Baleen Whales with Photogrammetry from Small UASs: A Case Study with Blue and Gray Whales." Marine Mammal Science 35 (1): 108–39. <https://doi.org/10.1111/mms.12527>.*
- If you calculate BAI please cite Burnett et al. 2018 in addition to this software.

Calculate Body Condition Metrics

Welcome to the body condition metrix tool!  
this tool can calculate common cetacean body condition metrics and add them to your output file

Collated Output File

Click to upload collated output

☐ Calculate Body Volume?

Check if you want to calculate Body Volume

Ellipse

Select Body Volume calculation method

Note: ellipse method always uses lower = 0, upper = 100, and interval = 5. If you choose 'Both', enter values for the circle method.

Length measurement name

Lower bound

Upper bound

Interval

☐ Calculate Body Area Index (BAI)?

Check if you want to calculate Body Area Index (BAI)

Parabola

Select BAI calculation method

Length measurement name

Lower bound

Upper bound

Interval

Enter prefix for output file

Output folder

Click to select folder where outputs should be saved

Calculated Body Condition! (click to run)



# Calculate Body Condition: Output name and folder

- Lastly you need to enter a prefix that will be added to the output file name and the folder where you want it to be saved
- Prefix: The function will ask you what name you want for the output csv. The csv outputted by this function will be named inputname\_bodycondition.csv.
- Folder: Select the folder where you want the file to be saved to. The path you selected will appear in the box below the button.
- The output of this function will be the collatrix output with added columns.

Calculate Body Condition Metrics

Welcome to the body condition metrix tool!

this tool can calculate common cetacean body condition metrics and add them to your output file

Collated Output File

Click to upload collated output

☐ Calculate Body Volume?

Check if you want to calculate Body Volume

Ellipse

Select Body Volume calculation method

Note: ellipse method always uses lower = 0, upper = 100, and interval = 5. If you choose 'Both', enter values for the circle method.

Length measurement name

Lower bound

Upper bound

Interval

☐ Calculate Body Area Index (BAI)?

Check if you want to calculate Body Area Index (BAI)

Parabola

Select BAI calculation method

Length measurement name

Lower bound

Upper bound

Interval

Enter prefix for output file

Output folder

Click to select folder where outputs should be saved

Calculated Body Condition! (click to run)

# Calculate Body Condition: Run it!

- Once you are all set with your inputs, you are ready to run!
- To run collatrix just click on Calculate Body Condition! (click to run)
- When done running, a message will appear underneath the run button

Calculate Body Condition Metrics

Welcome to the body condition metrix tool!  
this tool can calculate common cetacean body condition metrics and add them to your output file

Collated Output File

Click to upload collated output

☐ Calculate Body Volume?

Check if you want to calculate Body Volume

Ellipse

Select Body Volume calculation method

Note: ellipse method always uses lower = 0, upper = 100, and interval = 5. If you choose 'Both', enter values for the circle method.

Length measurement name

Lower bound

Upper bound

Interval

☐ Calculate Body Area Index (BAI)?

Check if you want to calculate Body Area Index (BAI)

Parabola

Select BAI calculation method

Length measurement name

Lower bound

Upper bound

Interval

Enter prefix for output file

Output folder

Click to select folder where outputs should be saved

Calculated Body Condition! (click to run)

# Closing

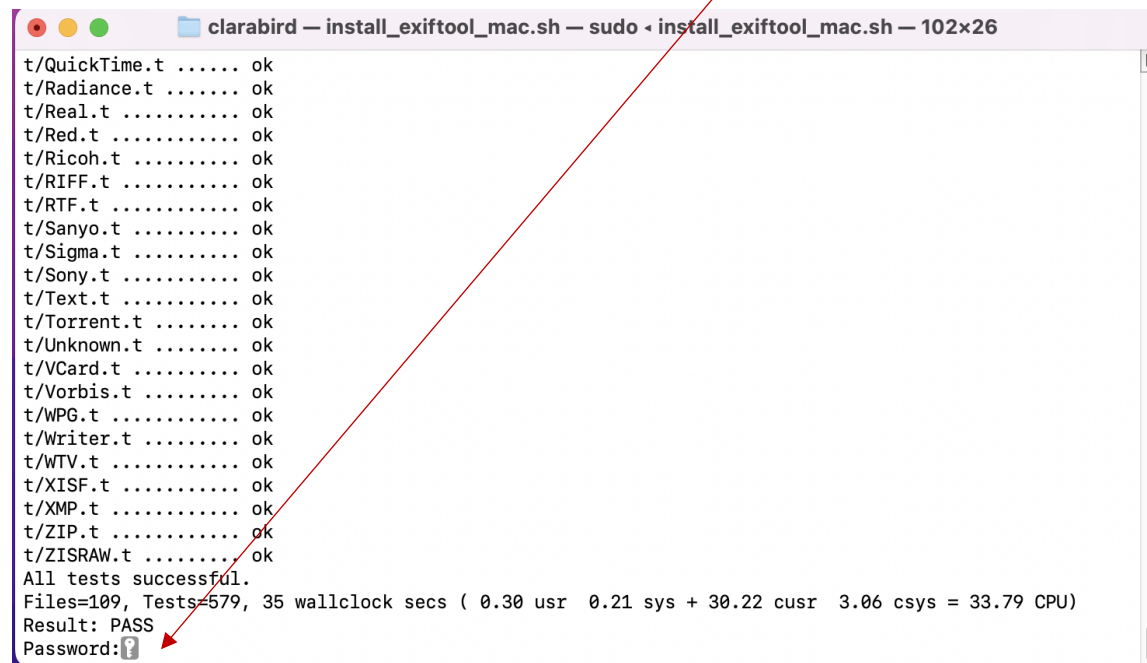
- To close, just close the windows.

# Crash Reporting

- If CollatriX crashes, a window should appear to save the crash report error code
- You can then open an “Issue” and upload the crash report on the CollatriX GitHub page <https://github.com/MMI-CODEX/CollatriX/issues>

# Installing exiftool on mac

- You can download exiftool from the website here: <https://exiftool.org/install.html>, follow the instructions for your machine.
- You can also download the “install\_exiftool\_mac” zip file linked to the collatrix release (link here).
  - Unzip the folder
  - Inside the folder, double click on the install\_exiftool\_mac.sh
  - A terminal window should open and start running
    - If it doesn't, right click on the .sh file and click on “Get Info”
    - Then change “Open with:” to Terminal
  - At one point it will stop and ask you to enter your password, do so
  - At the end it will ask you to hit Enter to exit. Do so, then you're done and can close the terminal window.



```
clarabird — install_exiftool_mac.sh — sudo • install_exiftool_mac.sh — 102x26
t/QuickTime.t ..... ok
t/Radiance.t ..... ok
t/Real.t ..... ok
t/Red.t ..... ok
t/Ricoh.t ..... ok
t/RIFF.t ..... ok
t/RTF.t ..... ok
t/Sanyo.t ..... ok
t/Sigma.t ..... ok
t/Sony.t ..... ok
t/Text.t ..... ok
t/Torrent.t ..... ok
t/Unknown.t ..... ok
t/VCard.t ..... ok
t/Vorbis.t ..... ok
t/WPG.t ..... ok
t/Writer.t ..... ok
t/WTV.t ..... ok
t/XISF.t ..... ok
t/XMP.t ..... ok
t/ZIP.t ..... ok
t/ZISRAW.t ..... ok
All tests successful.
Files=109, Tests=579, 35 wallclock secs ( 0.30 usr  0.21 sys + 30.22 cusr  3.06 csys = 33.79 CPU)
Result: PASS
Password: ?
```

