

General Protocol for Processing CT Image

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1. Drag the Stem Image into ImageJ

2. Create 04_OuterRing_Mask.tif

- Please follow: **Protocol for Tree Ring Marking via ImageJ.**

3. Pre-Process Image by ImageJ

- Use the target Image opened in the ImageJ,
- Navigate to **Plugins / Macros / Run...**
- Select the Macro file: "**Tree-Ring_Pre-Processing Steps.ijm**"
- The relevant data inputs for R Scripts will be generated & saved in the folder.
ps.

Specific parameters can be edited by:

Navigate to: **Plugins / Macros / Edit... /**

select Macro file: "**Tree-Ring_Pre-Processing Steps.ijm**"

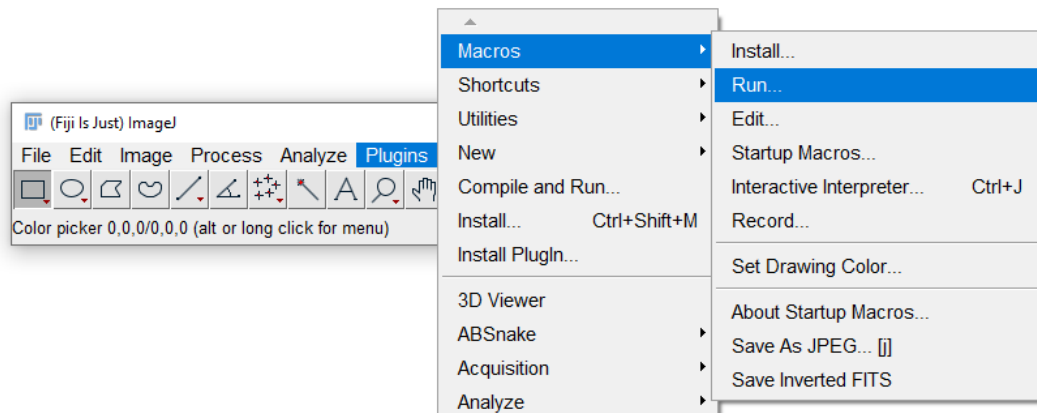


Fig.01 Navigation to run Macro files.

4. Delineate Tree Ring Structures by R

- Run R scripts for delineating tree ring structures & generate "**ring_auto.csv**"
- R-Script file: "**Detection Code.R**"
- Please note that:
 - (1) This step takes some time;
 - (2) Adjust the R-script according to the personal work directory.
 - (3) The work directory should be the same as the folder with targeted stem image & all processing scripts/ Macros.

5. Import Tree Rings into ImageJ

- Open ImageJ with the targeted stem image (if closed).

- Run Macro to input tree ring structures as ROI files into ROI Manager.
- Navigate to: **Plugins / Macros / Run...**
- Select the Macro file: "**R_2_ImageJ.ijm**".

6. Post-Process Tree Rings Manually by ImageJ

- Select each tree ring structure from the ROI Manager and check their structures accordingly. For any wrong delineation, use "Selectin Brush Tool" to adjust the R-detected results:
- **Select the ROI with mistakes / use "Selectin Brush Tool" for adjustments / ROI Manager / Update**
- Save the Updated ROI objects by:
- **ROI Manager / Select all ROIs of tree rings / More >> / Save...**

7. Import Revised Tree Rings into R (Optional)

- In case the updated tree-ring structure data is needed to be back into R, Navigate to: **Plugins / Macros / Run...**
- Select the Macro file: "**ExtractROICoordinate.ijm**"
- **Save** the pop-up table as "**Results.csv**"
- In R-Script "**Detection Code.R**", **Section [2]-(5)**,
- There are supportive lines to translate the csv file from ImageJ to R.
- Remember to also import the targeted Image into R as "**im**" as **matrix format** and source relevant function script "**Functions_Data Conversion.R**".