Zircon Helper Excel Add-in Guide

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Version:	2.0.2
Description:	This excel add-in is designed to aid with preparation of zircon geochronology data from LADR and Glitter for further analysis
Version Changes:	2.0.2 Changed UI to office Ribbon 2.0.1 Enhanced error protection and flexibility of LADR procedure 2.0 Adds functionality for preparation of LADR output csv files. Optimises sorter code and enhances flexibility. Adds this documentation

Contents

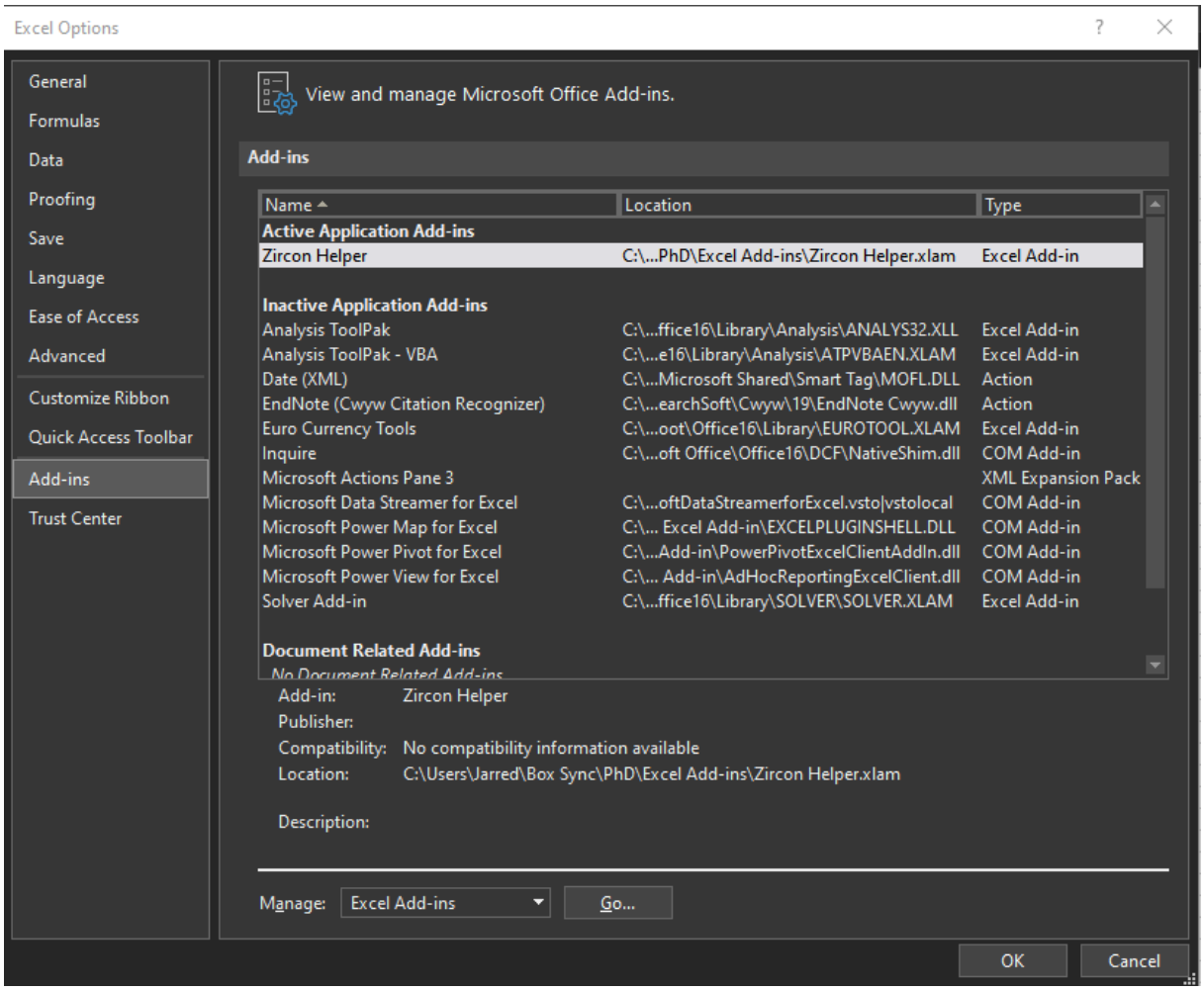
1 Installation of Add-in

Copy the “Zircon Helper VX-Y-Z.xlam” to a local folder of your choosing.

The default add-in location for Microsoft Office is %appdata%/Microsoft/AddIns although you can access the add-in from any local location.

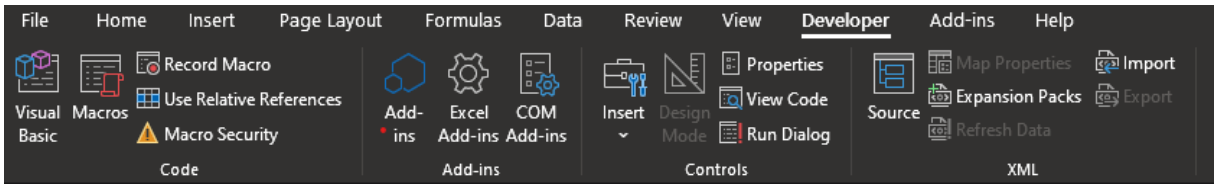
Due to the way Excel 2016 and above handle add-in security the downloaded version of the add-in may not load correctly/at all. The easiest work around to this it to place the add-in into a trusted folder. Copy this into the address bar of windows explorer: %AppData%\Microsoft\Excel\XLSTART

- Open Excel
- Then either
    - File > Options > Add-ins > Manage > Excel Add-ins > Go >Browse

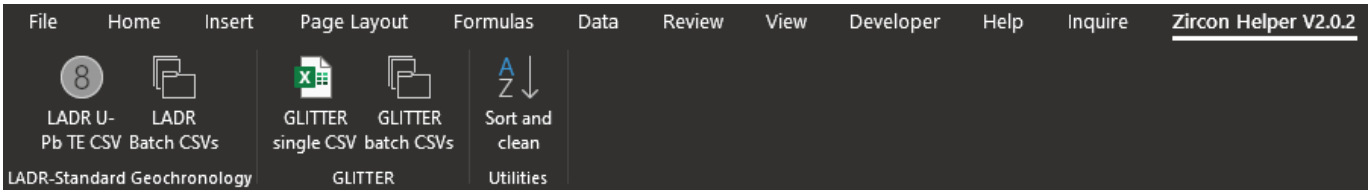


Or if you have the *Developer* Tab enabled on the ribbon

- Developer > Excel Add-ins > Browse



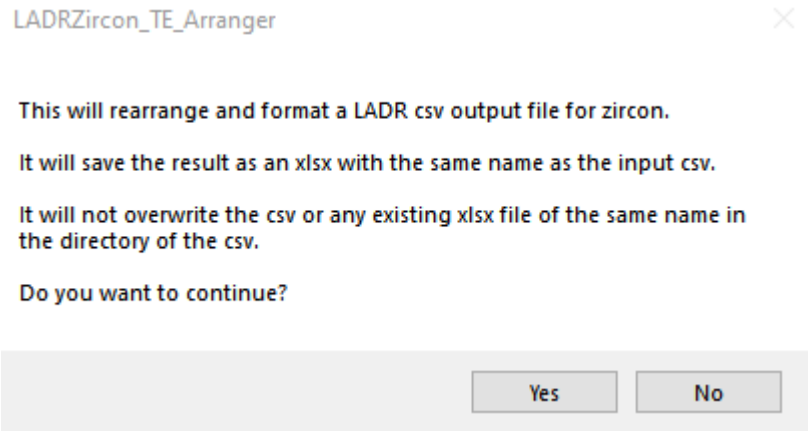
- Then navigate to the folder containing “Zircon Helper VX-Y-Z.xlam” and select it
- Enable the Add-in by ticking the checkbox and pressing the OK button
- The add-in should show in the ribbon as the last tab with the name and version



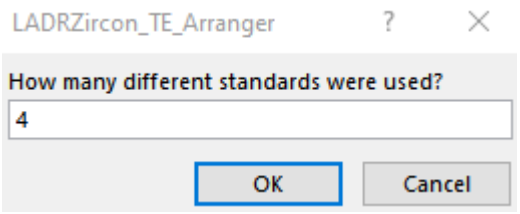
2 LADR Processor

The *LADR U-Pb TE CSV* option within *Geochronology Helper* is designed to be a dynamic and automated procedure that will prepare the CSV output from LADR for U–Pb geochronology and elemental data in a more user-friendly format that is suitable for easy interoperability with the IsoplotR (Vermeesch, 2018) GUI.

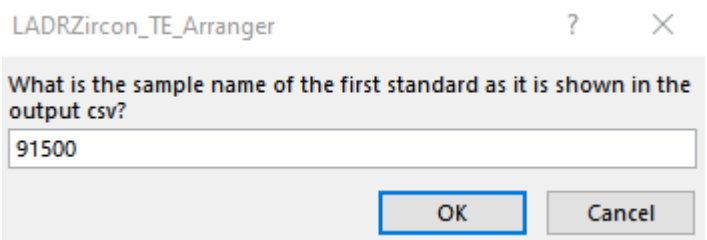
Upon initiation it first calls a confirm procedure. The user a prompt to confirm the execution of the main procedure. If the user selects “No” this will end the procedure, if “Yes” the procedure will execute.



Once the main procedure is the user will be presented a series of dialogs, the total number is dependent on the first input. The first dialog asks the user to enter the number of standards used, this needs to be entered as a value between 1 & 4. At this point in time the procedure can manage up to four standards. It can be modified to handle more quite easily. The default value is 4.



Up to four subsequent dialogs will prompt the user to enter the names of the standards used. These need to be entered as they appear in the LADR logbook file and functions within the procedure are not case sensitive. The default values for [1:4] are [91500, GJ, PLES, NIST610].



Beyond this point the procedure will run without redrawing or recalculating the screen until the last few steps where it freezes the top row and first two columns for each of

the new sheets that are created. This will cause the screen to quickly redraw a couple of times, however, unlike the rest of the procedure this cannot be run with Excel's application redrawing paused.

A message with time taken to complete is displayed upon completion of the procedure.

The procedure is optimised for performance and completes the following tasks:

- Creates new sheets
    - Geochronology Data – Unknowns
    - Geochronology Data – Standards
    - Elemental Data – Unknowns
    - Elemental Data – Standards
- Copies data from original csv sheets to the new sheets
- Dynamically determines variable for standards
- Dynamically determines ranges to copy
- Adds sequential numbers back to standards in the analysis column
    - These are removed in the logbook for data reduction in LADR
- Fixes sequential numbers for all analyses to format "000"
    - Corrects sorting for analyses
        - E.g. "unknown – 1" becomes "unknown – 001"
- Separates unknowns and standards
- Sorts sheets by *Analysis* column
- Rounds ages estimate and age estimate errors to 0 sf i.e. 600 Ma
- Writes additional and corrected headers to geochronology sheets
- Adds formulas to calculate concordance for [06/38-07/06] and [06/38-07/35]
- Adds formulas to calculate ρ[07/35][06/38] and ρ[06/38][07/06] based on (Schmitz & Schoene, 2007)

$$\rho_{ab} = \frac{\left(\frac{\sigma_a}{a}\right)^2 + \left(\frac{\sigma_b}{b}\right)^2 - \left(\frac{\sigma_c}{c}\right)^2}{2\left(\frac{\sigma_a}{a}\right)\left(\frac{\sigma_b}{b}\right)}$$

$$for\ \rho\left[\frac{07}{35}\right]\left[\frac{06}{38}\right], a\ \text{is}\ \left[\frac{07}{35}\right], b\ is\ \left[\frac{06}{38}\right], c\ is\ \left[\frac{07}{06}\right]$$

$$for\ \rho\left[\frac{06}{38}\right]\left[\frac{07}{06}\right], a\ is\ \left[\frac{06}{38}\right], b\ \ is\ \left[\frac{07}{06}\right], \text{c is}\ \left[\frac{07}{35}\right]$$

- Formats *Geochronology* for easy interoperability with IsoplotR, U–Pb Concordia input format [07/35], [06/38], [07/06]
- Keeps original data in a separate sheet
- Freezes columns 1 & 2, row 1 of new sheets
- Makes headers bold
- Autofits columns based on header row
    - Autofits *Sample, Analysis* and *Comments* based on contents
- Saves as new workbook in original directory of CSV, will not overwrite original CSV or XLSX of same file name.

The only explicit error handling is when the file does not save due to a conflict with an already existing file of the same name.

Aside from this, errors should not occur unless variables are not set at the start of the procedure or the procedure is executed on a file that is not suitable. If they do, please note the error code and description, click on debug, and screenshot the code.

There is a batch processor available for multiple CSV files. Due to the nature of non-standardised file naming this will run on all CSV files in the host folder of the currently open and active workbook. It will call upon the single LADR processing procedure, requiring some input from the user for each file.

It is best to move all the files you want to process into a single folder. It will create a series of XLSX files with the same name as the csv on which it is executed.

Errors will occur if this runs on non-LADR geochronology output csv files as it will not be able to define the variables it uses, e.g. it will not set the variable *AgeEst4* by finding the cell containing “207/206 age”.

3 Individual Column Sorter and Text Clean

This is a very simple procedure that will sort each column the currently active sheet separately. It is safe for use with data with headers and will dynamically identify the ranges to sort and the range to clean of text.

It will work on non-contiguous ranges with respect to both columns and rows.

A confirmation procedure is called before the main procedure is executed to prevent accidentally running it. It is a good idea to save the workbook before executing this procedure of the add-in.

After confirmation from the user the primary procedure will execute running the sort. A further confirmation dialog will appear after the sort has executed asking if the user wants to remove text values from row two and below. The user can leave text in these rows by clicking no on the dialog box. It will remain sorted at the bottom of each row.

It is primarily desgined around preparation of data for KDE and MDS plotting within IsoplotR but is not limited to this.

4 GLITTER Functionality

The functionality of this is based upon Ben's Arranger for processing legacy GLITTER output CSV files. It has been updated to be slighlty more flexible, correctly calculte rho and execute faster but is not fully optimised for peformance. I am not planning to optimise this as we do not use GLITTER anymore.

There is a procedure to process an individual sheet that will run on the active workbook.

In addition, there is a batch processor that will operate on any CSV in the host folder of the currently active workbook. This will loop the individual procedure on each CSV saving them as new XLSX files. As with the LADR batch processor it is best to move all the files you want to process into a single folder. It will create a series of XLSX files with the same name as the CSV on which it is executed.

Like all other procedures a confirmation dialog will appear at the start of both of these functionalities to prevent accidental execution.

5 References

Microsoft, 2020, March 09. *Excel Visual Basic for Applications (VBA) reference*. Retrieved from Microsoft Docs: https://docs.microsoft.com/en-us/office/vba/api/overview/excel

Schmitz, M., & Schoene, B. (2007). Derivation of isotopes ratios, errors, and error correlations for U–Pb geochronology using 205Pb-235U-(233U)-spiked isotope dilution thermal ionization mass spectrometric data. *Geochemistry, Geophysics, Geosystems, 8:* https://doi.org/10.1029/2006GC001492

Vermeesch, P. (2018). IsoplotR: a free and open toolbox for geochronology. *Geoscience Frontiers, 9*(5), 1479-1493: https://doi.org/10.1016/j.gsf.2018.04.001