Fulcrum: Integrated Graphical User Interface in SCALE

Capability Overview

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Presentation Outline

- Mission Statement

- Component Overview

- Input Editor

- Data Plotting

- Geometry Visualization

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Fulcrum Mission Statement

Provide a cross-platform graphical user interface (GUI) designed to facilitate problem creation, modification, navigation, validation, and visualization, as well as output and data file interaction as needed by new and experienced users.
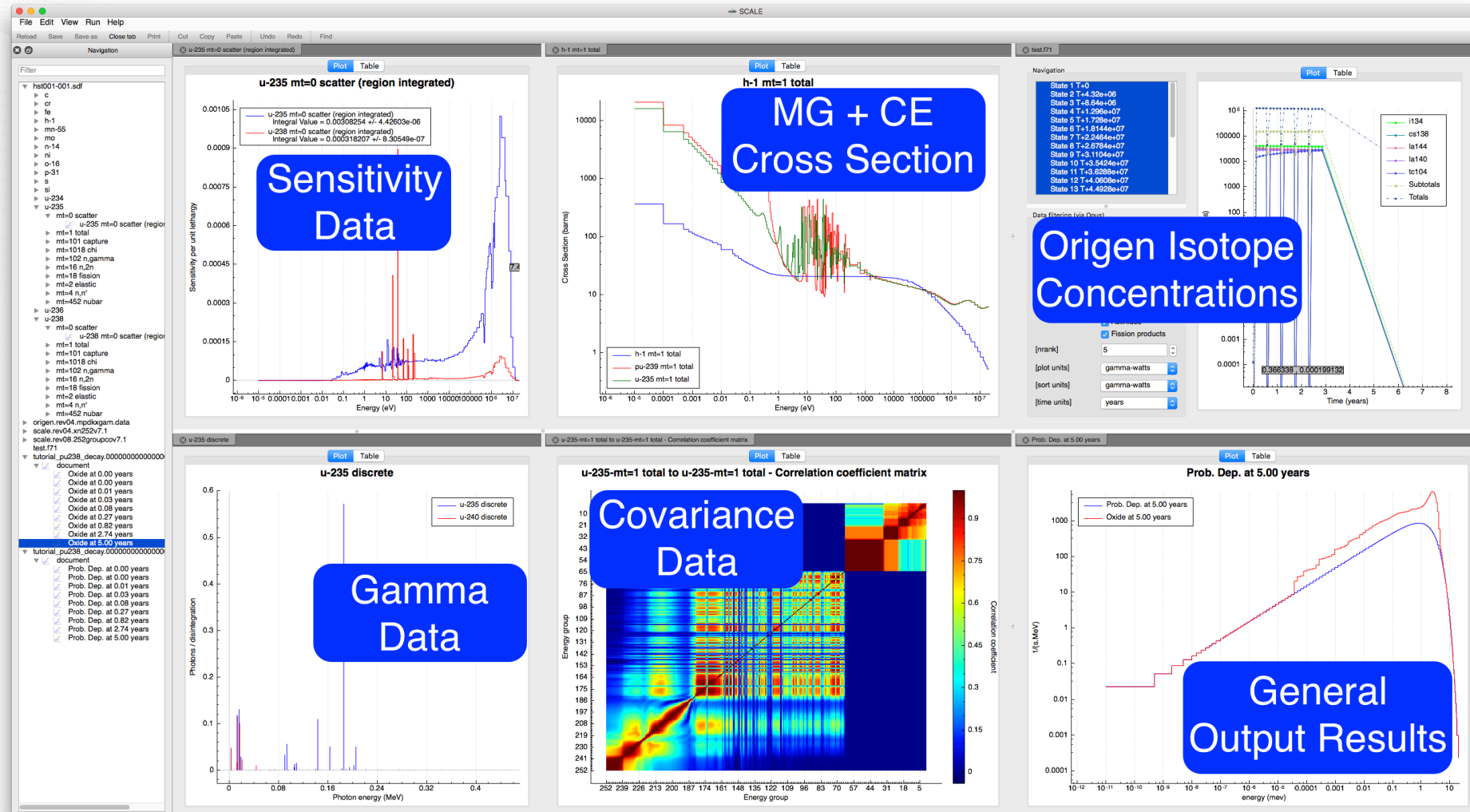
Fulcrum Component Overview

Fulcrum Plot Data

- Supports Most Major SCALE Data Formats
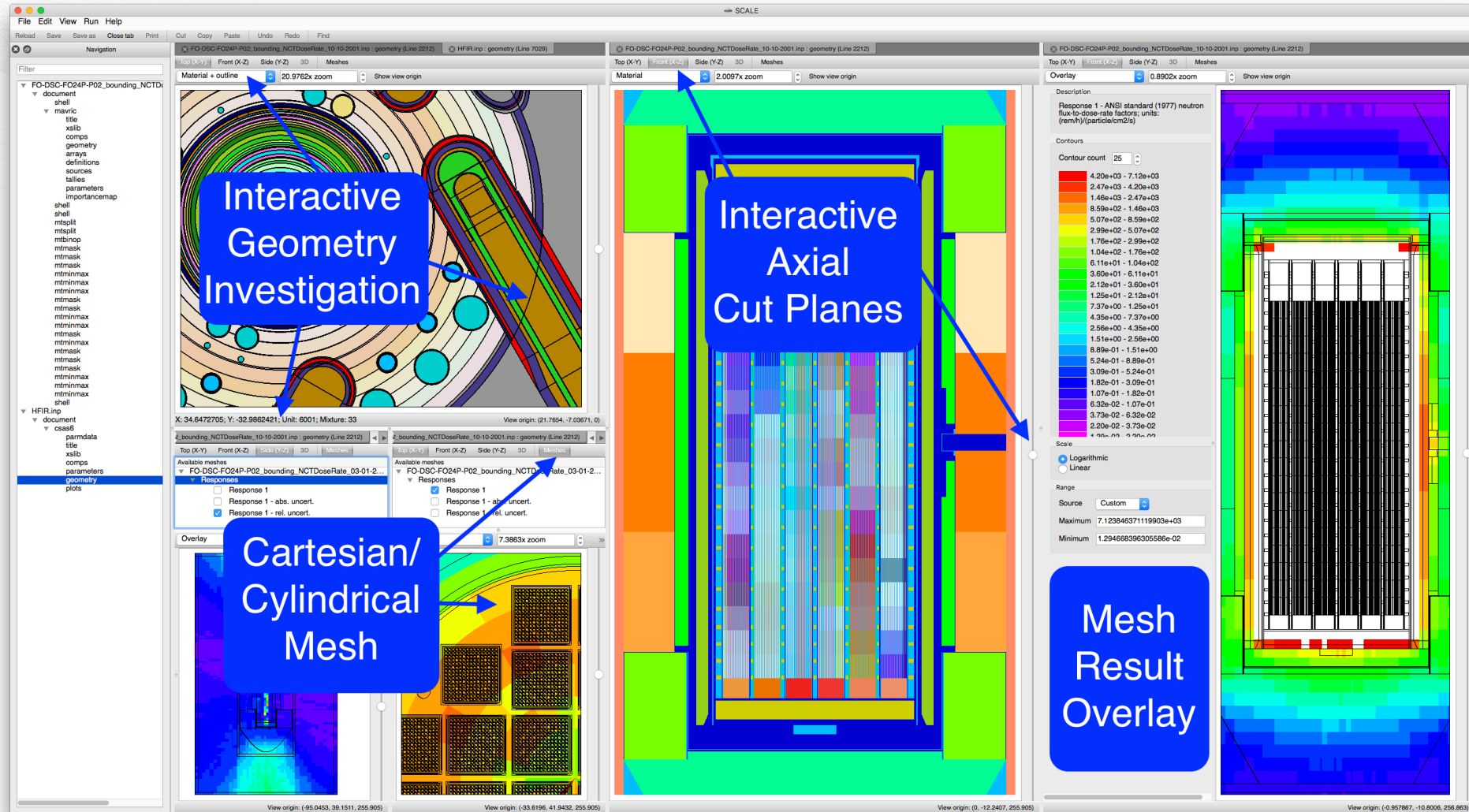- Export to Image (supports scalar vector graphics)

Fulcrum General Output Result Plots
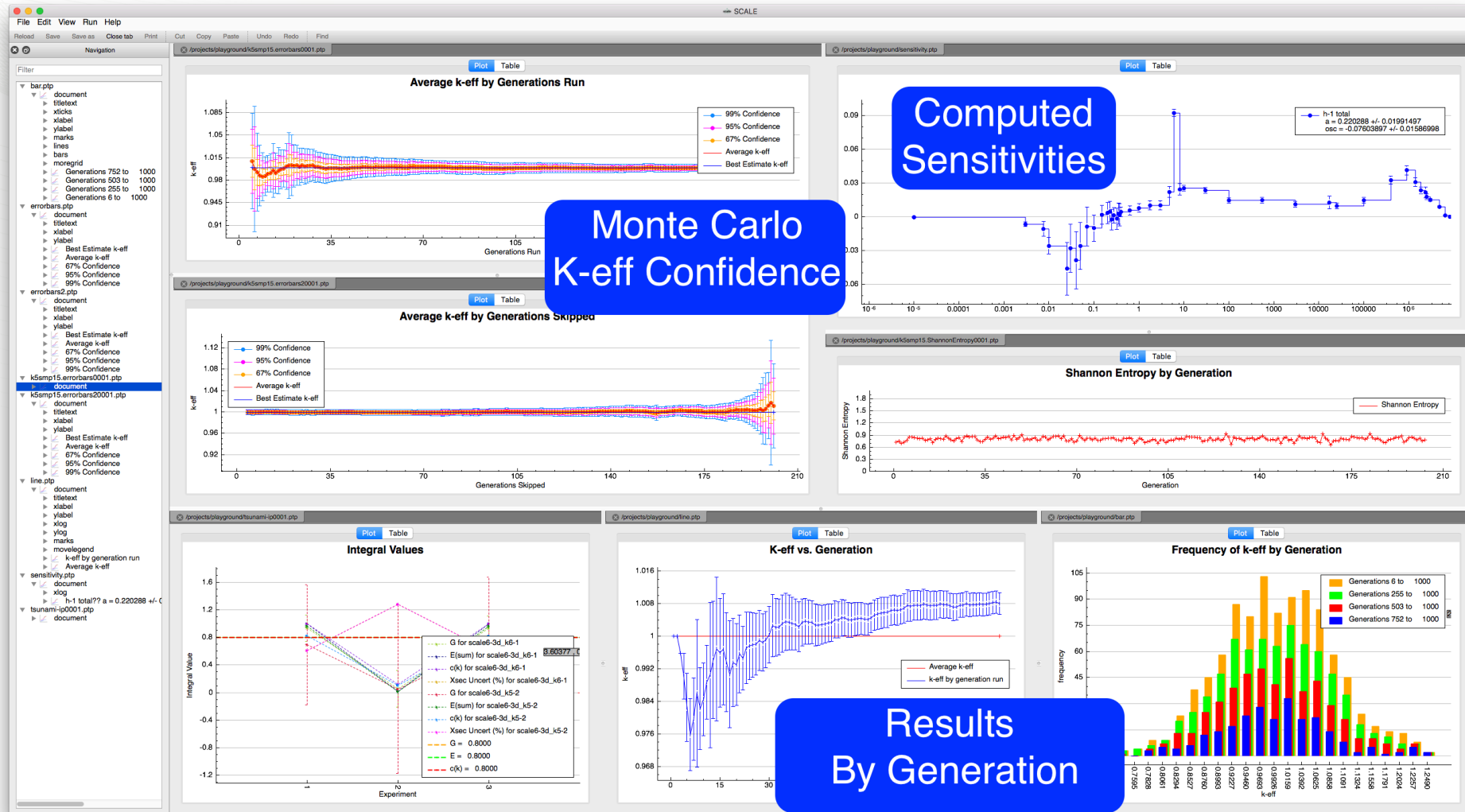
Fulcrum Geometry Visualization

- Interactive Geometry Visualization
- Support for Most Mesh Data*

*Currently Support: 3dmap, Mesh Importance Map, Mesh Source Map, and Denovo Flux File

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Component Summary

- Input editor facilitates problem creation, modification, navigation, validation, execution and output file viewing in a consistent, platform independent manner.

- Data plotting facilitates a fast, interactive means of interrogating input and output data.

  – Supports most SCALE data formats.

- Geometry viewer facilitates a fast, interactive means of interrogating SCALE Geometry.

- Fulcrum provides a modular workspace with splitting and drag-and-drop configurable layout.

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Fulcrum Input Editor Components

Input Autocompletion : Static Text

- Static text autocompetion also facilitates abbreviated input to include the component's description allowing users to discover and/or more quickly recall the necessary input components for their analysis.

- Cursor context allows the autocompletion popup to show what is legal and has not already been specified.

Access Autocomplete via
* CTRL+SPACE Keys, or,
* Edit…>Autocomplete

Parameters with descriptions

Input Autocompletion : Configurable Text

- Allows user to configure values prior to inserting into input.
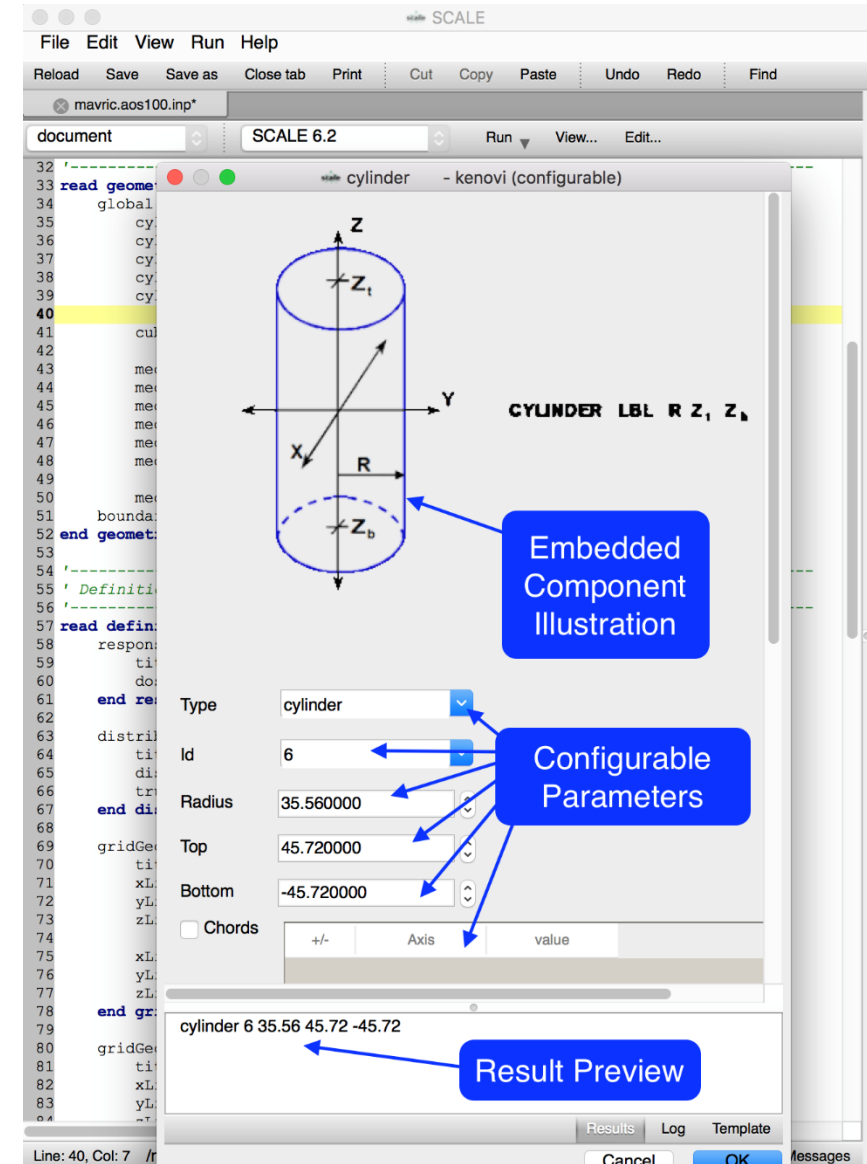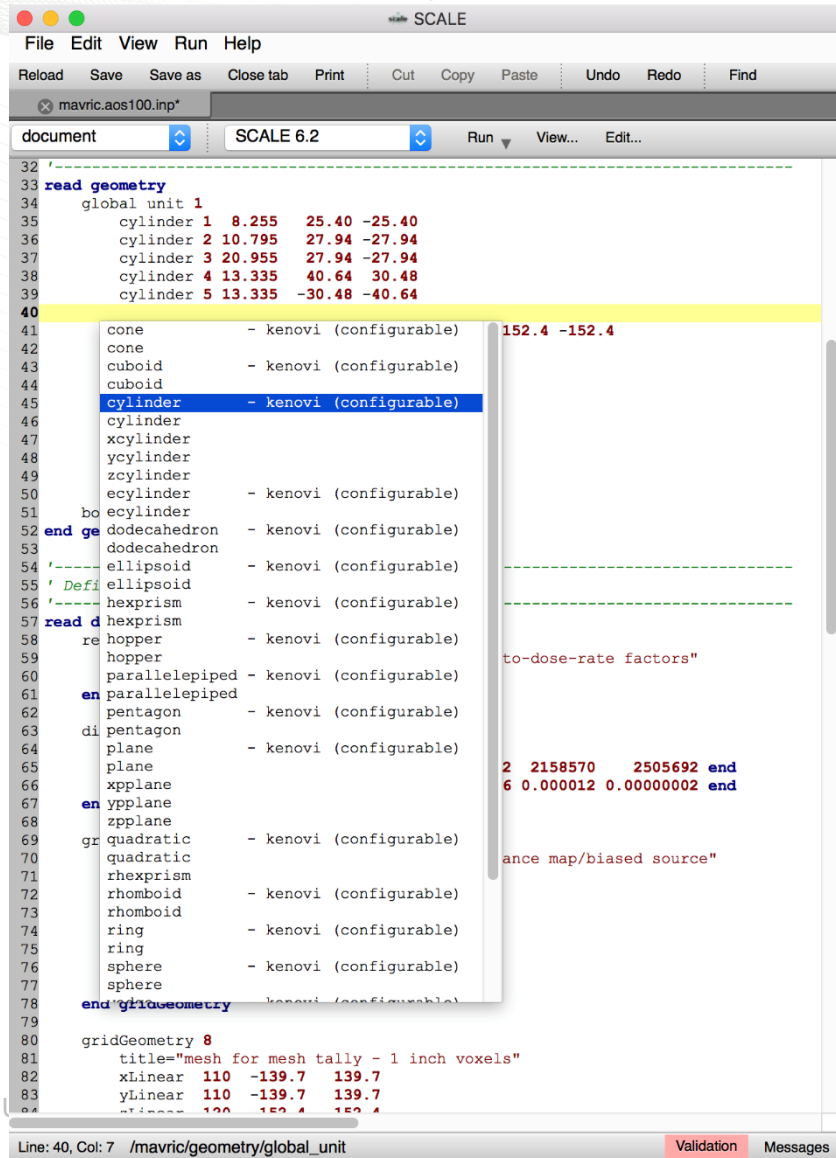
Input Autocompletion : Configurable Text

- Configurable autocompletion allows entire input creation.

- Results preview facilitates learning input syntax.

- Attributes can be labeled even when the actual input attribute may not have a label.

- Attributes can have a drop-down listing the available or common values to specify.

Access Autocomplete via
* CTRL+SPACE Keys, or,
* Edit…>Autocomplete
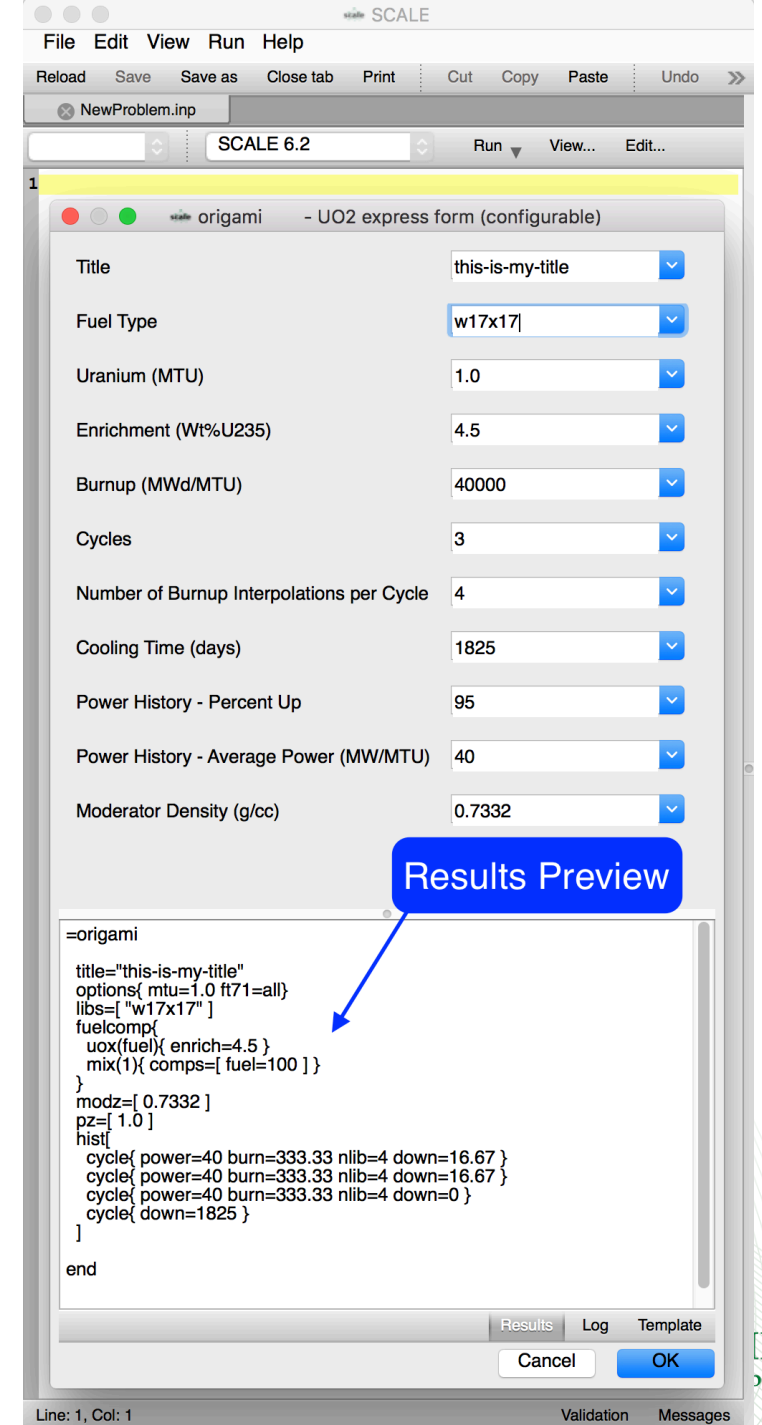
Input Validation : Value Errors

Value constraint errors can be hard to find. Input validation provides immediate feedback on the following.

- ## Simple value ranges
  - E.g., $0.0 < x <= 100$

- ## More complex
  - Expected value sums
  - Expected value function (increasing, decreasing, etc.)
  - Component relationship
    - E.g., X > Y
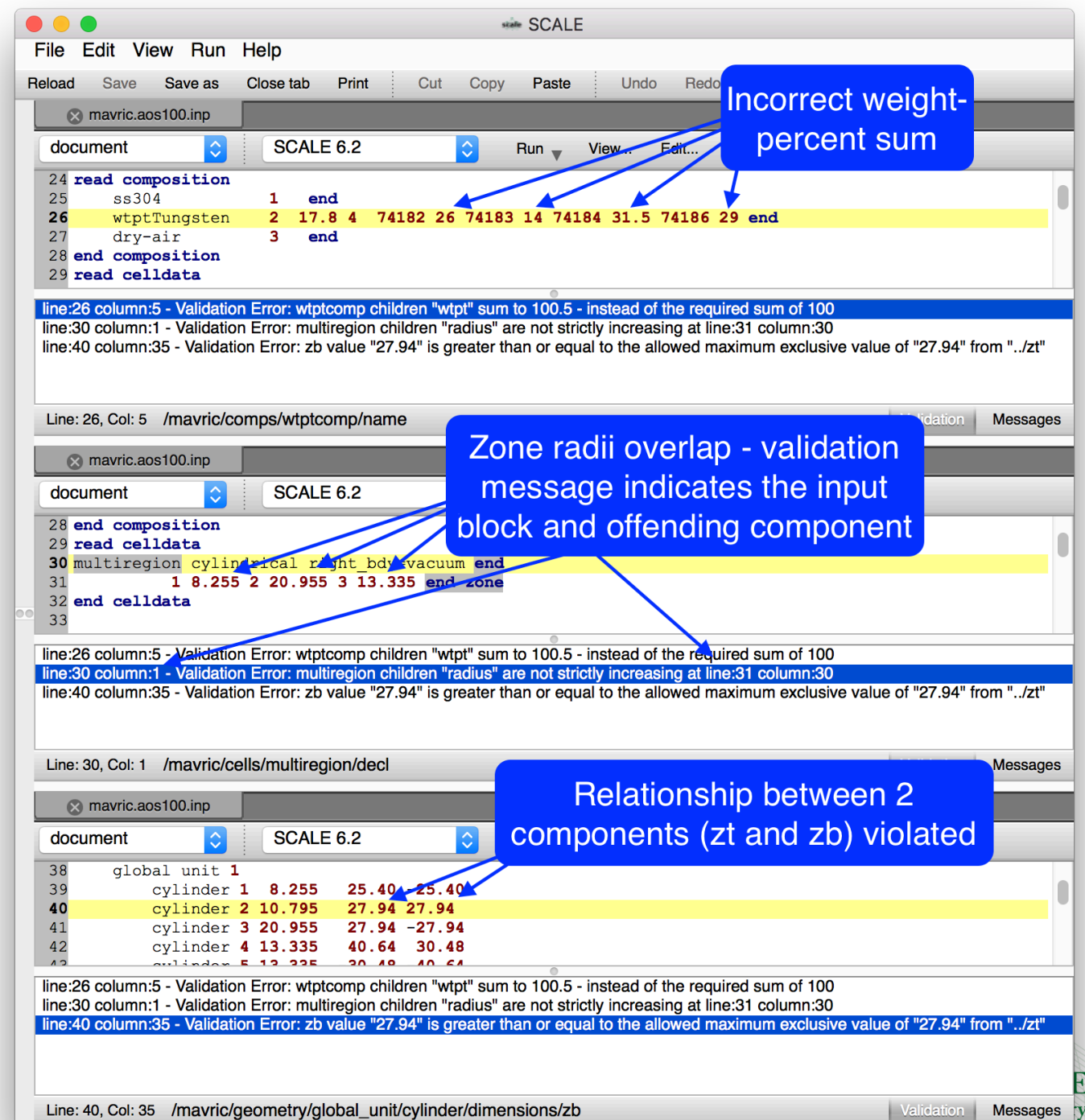
Input Execution : Customized Configurations

- Add new

- Clone existing

- Remove existing

- Modify existing

- Show executable help

- Provide additional arguments

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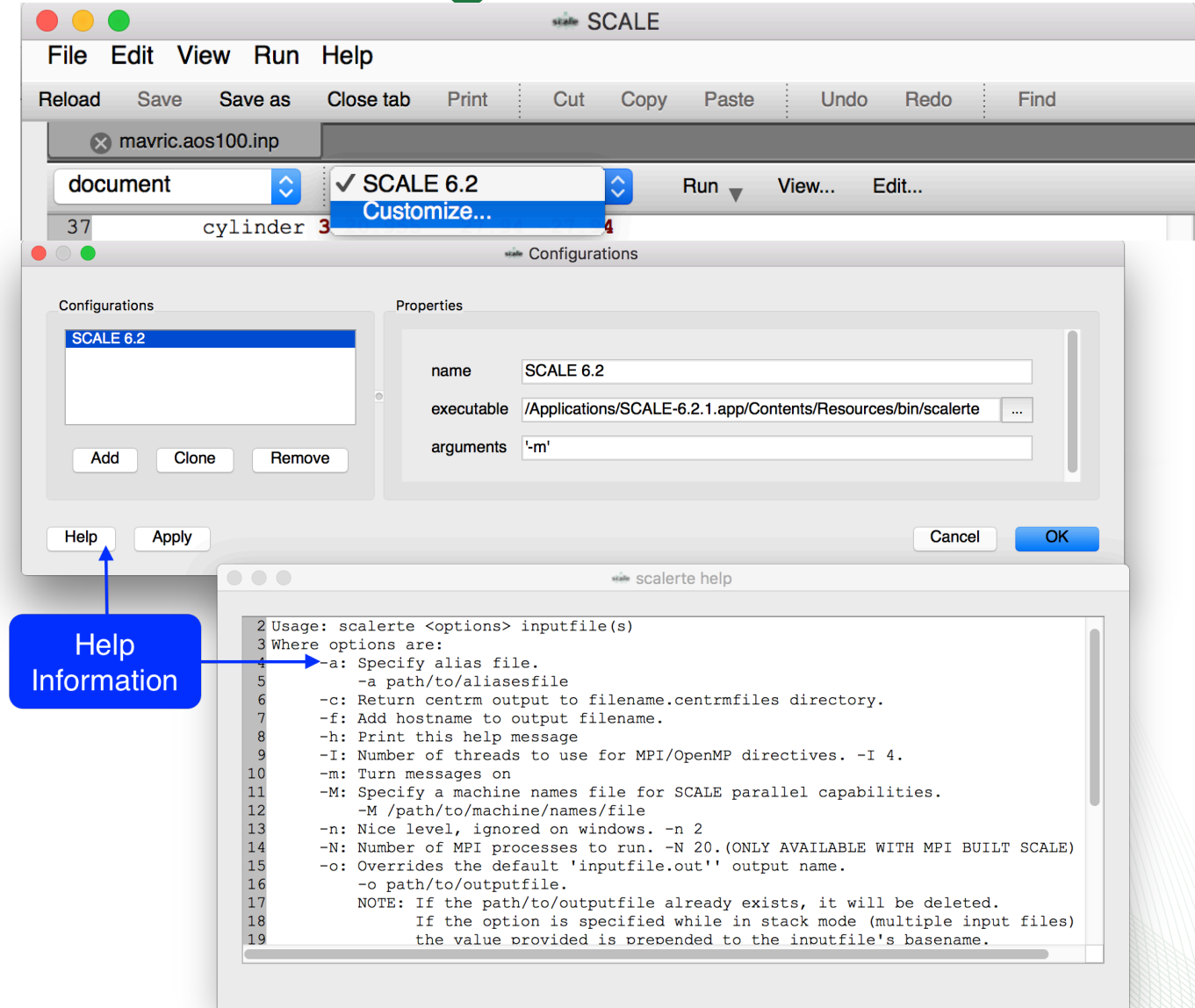
Miscellaneous Features

- Column select/edit
  - via ALT+left click+mouse drag key and mouse combo
- Go to definition – allows quick navigation to input components definition via a right click popup context menu.
  - E.g., anywhere an identifier is used to reference another input component.
- Math evaluator
  - Ability to evaluate selected text as a math expression – replaces selection with expression's result.
- Comment toggle
  - Ability to comment/uncomment selected lines
- Indent/unindent
  - Ability to indent/unindent selected lines
- Auto saves – automatic backup to *inputname.fulcrum.autosave*.
  - File exists only while there are unsaved document changes

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Miscellaneous : Go To Definition

The 'Go To Definition' feature (available via right clicking an input component) is intended to facilitate the user in quickly navigating to the component being referenced. New users can discover input component relationships. Experienced users can have their navigation accelerated, especially in larger inputs.

- Referenced mixture identifier – goes to the mixture's definition.

- Referenced Geometry unit identifiers (holes) – goes to the unit definition.
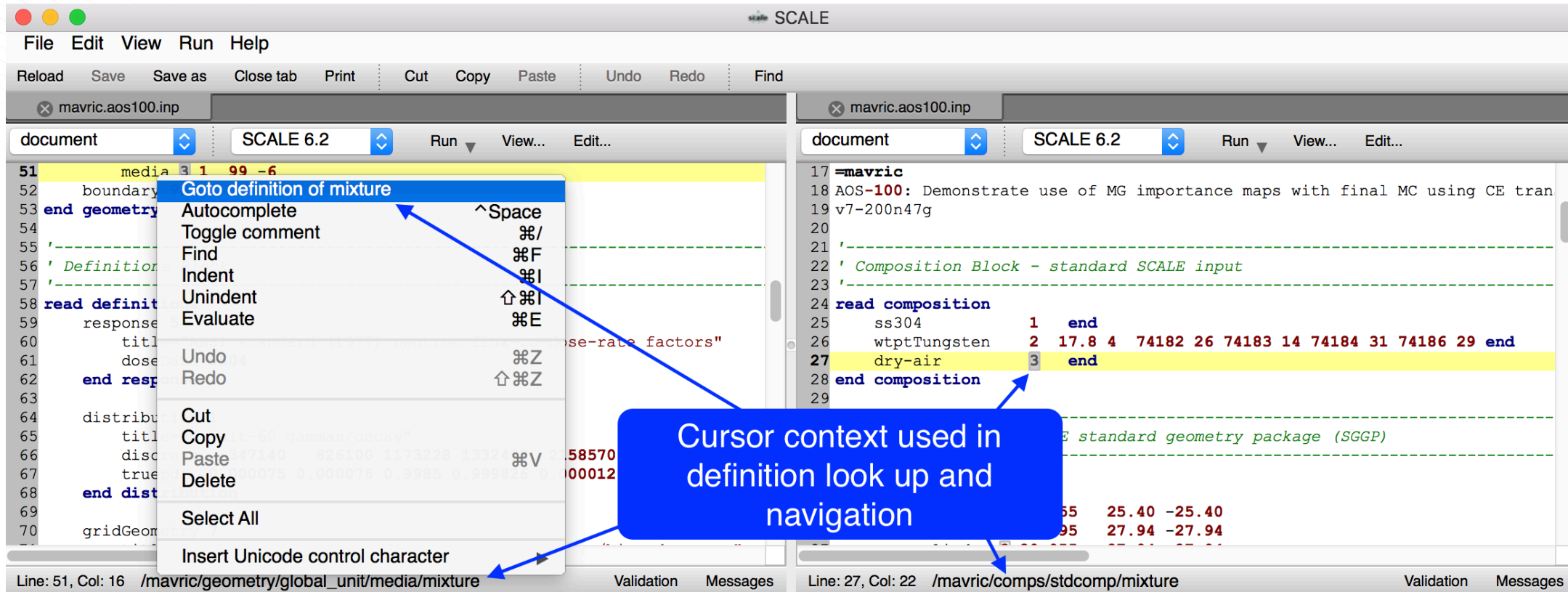
General Plot Overview

- Interactive and configurable plot rendering

- Plot data table displays graph data.
  - allows row and table copy to clipboard.
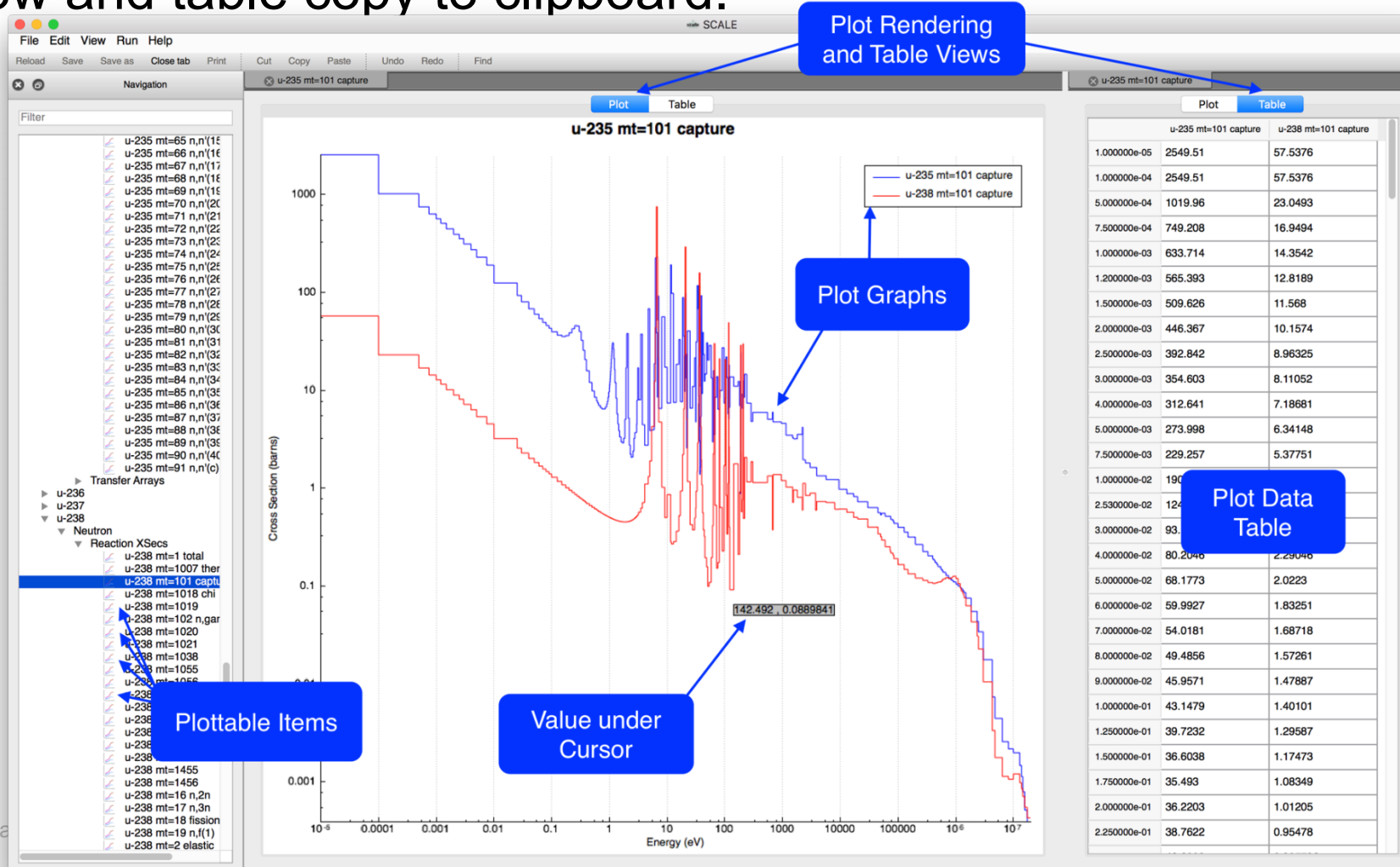
Plot Controls

Fulcrum plots consist of graph, bars, or color maps, which can be manipulated as follows.

- Select graph via left click in plot or legend.
  - Remove selection via context menu 'Remove selected'

- Zooming is performed via the mouse scroll action.
  - Zoom in by scrolling up.
  - Zoom out by scrolling down.

- Reset to original via context menu Fit graphs.

- Panning is performed via a click and drag.
  - Pan right by left clicking and dragging left.
  - Pan up by left clicking and dragging down.

- Save Plot as
  - **PDF (includes scalable vector graphics - SVG)**,
  - PNG and JPG image format
  - **Interactive Scale Plot Format (SPF)**

- Plot attributes (color, style, etc.) can be changed via context menu Plot options.

- Plot Legend can be drug to 9 cardinal positions via left-click and drag.

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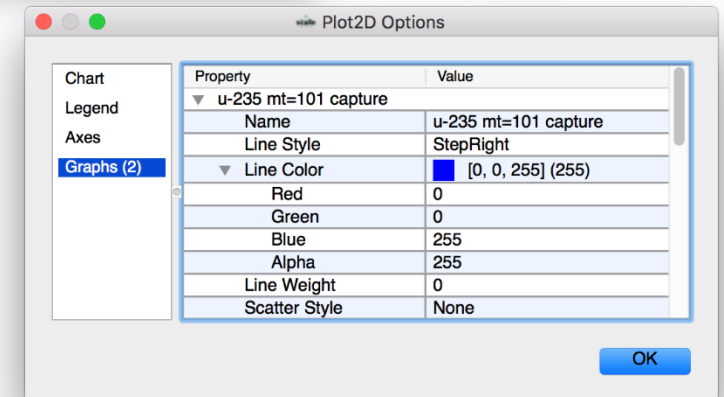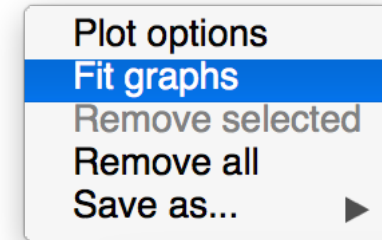
Covariance Data

Covariance Data is available at SCALE/data. Because the files do not have a unique extension, the user must load them specifically by type.

- Correlation coefficient matrix color map plots

- Covariance matrix color map plots

- Isotope Reaction Standard Deviation by energy or group graph plots
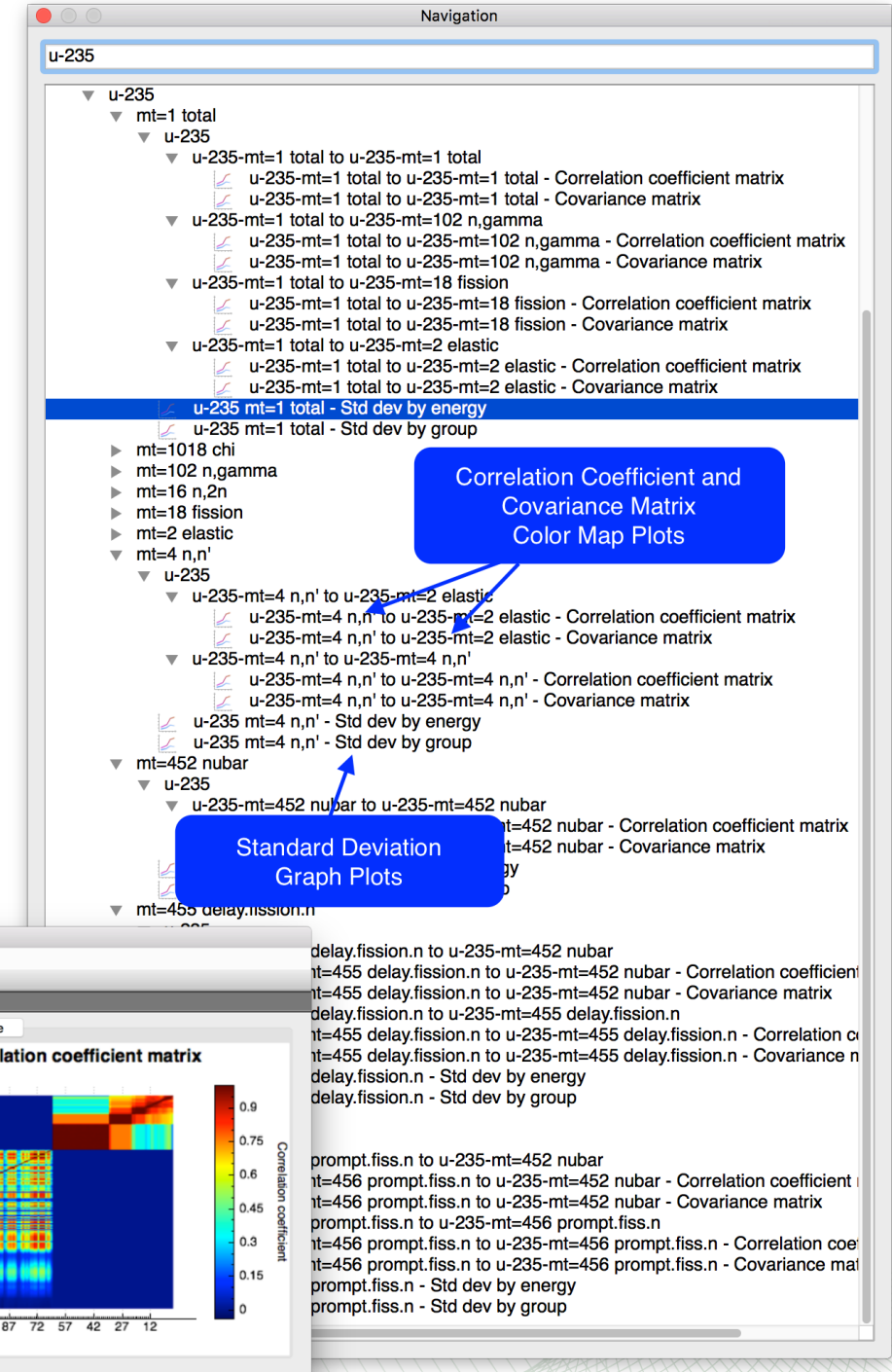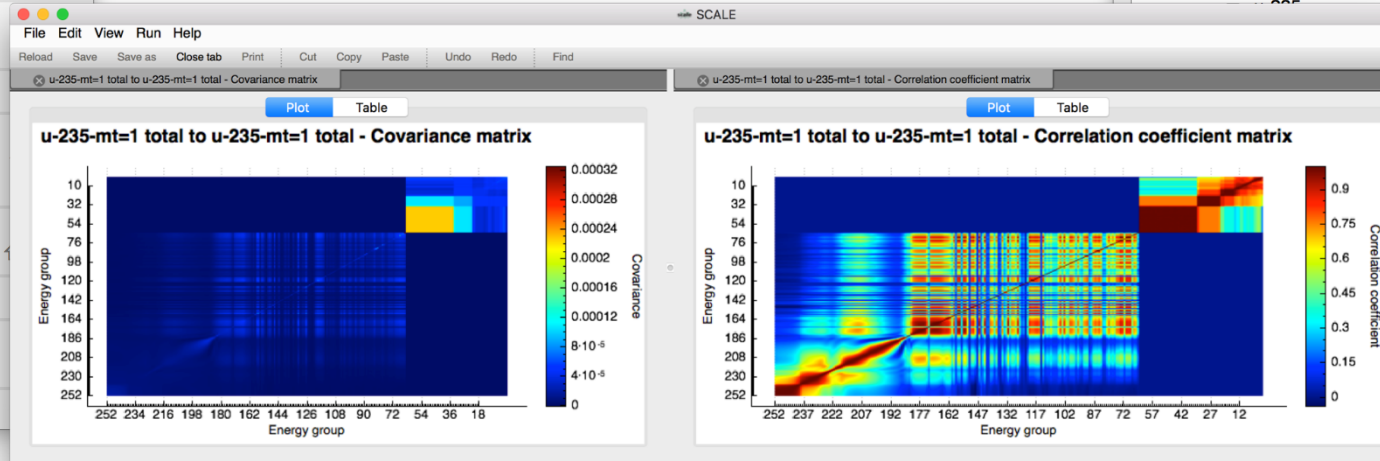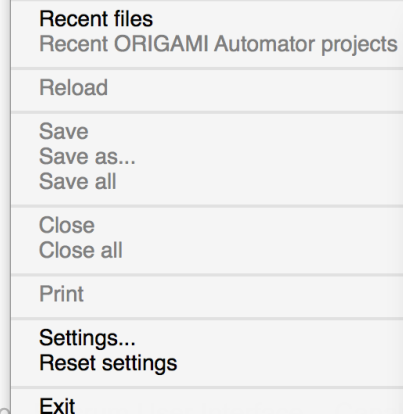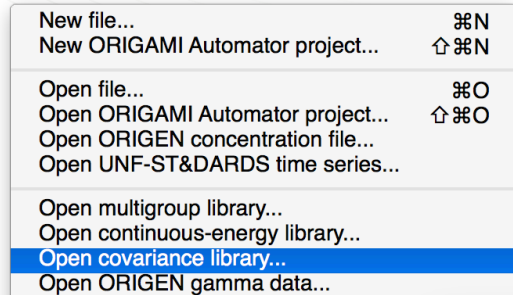
ORIGEN Isotope Concentration Data (F71)

Origen concentration data contains results from depletion, decay, and activation calculations. The plot capabilities are centered about the expected Fulcrum interactive plot with the addition of a more familiar PlotOPUS style set of controls.

- Easy selection of state information to display.

- Easy display of nuclides or elements by id or category.

- Easily display different units (Decay, Mass, Number).
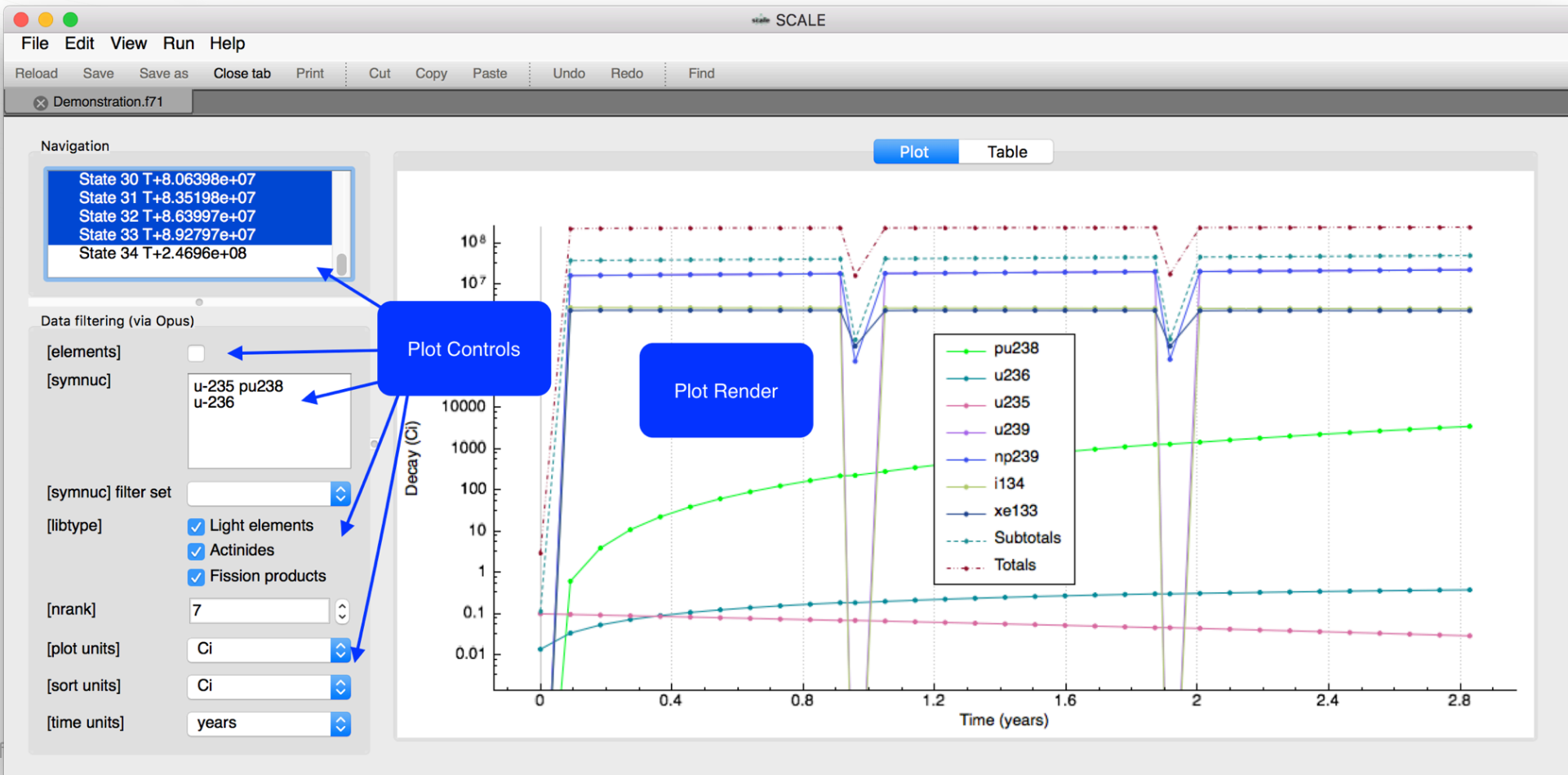
ORIGEN Gamma Data

The master photon data library, located at SCALE/data/origen_data/origen.rev##.mpdkxgam.data, provides both discrete and continuous energy gamma lines.

- Opened via File>Open ORIGEN gamma data…
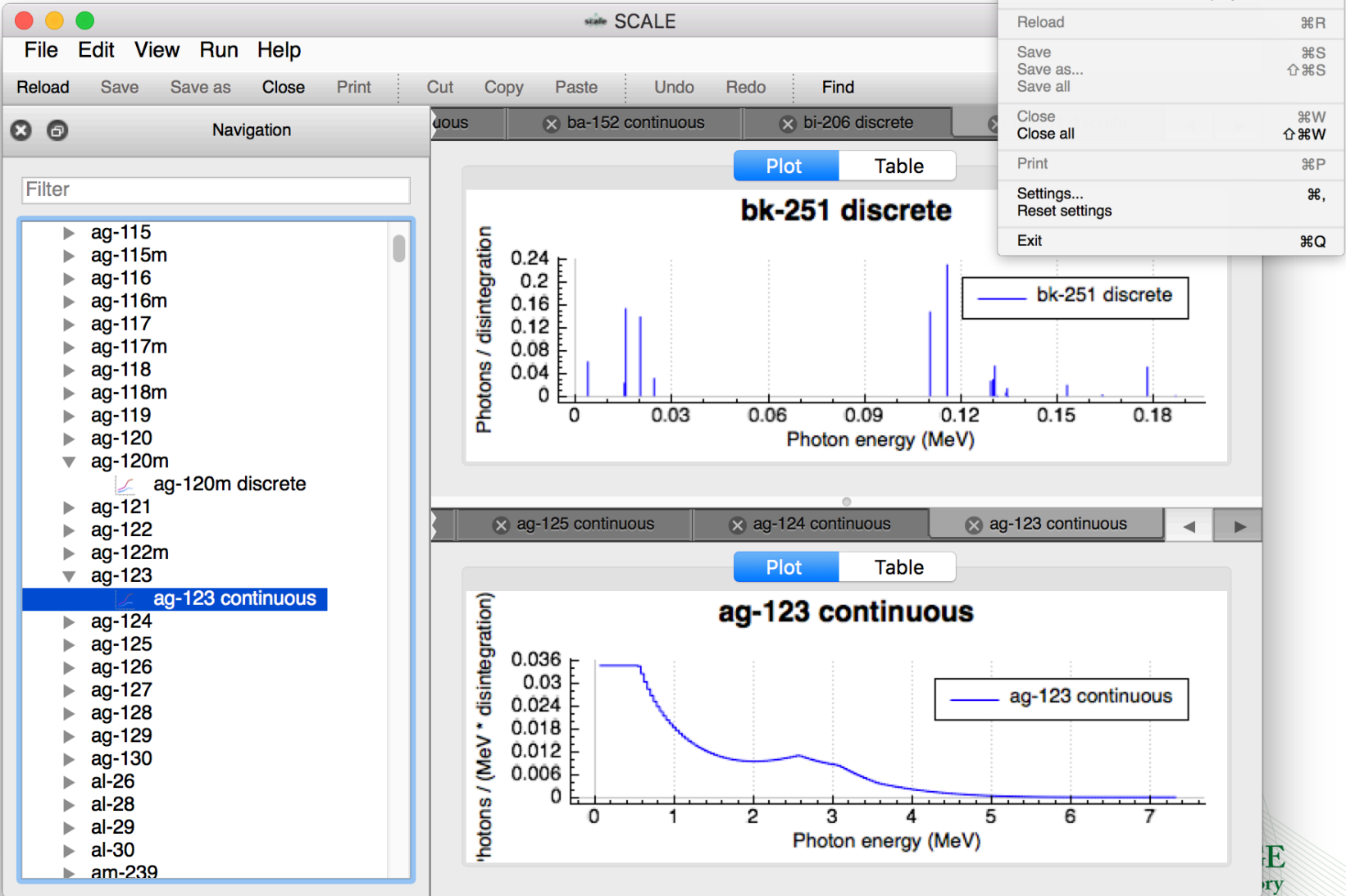
Keno Result Plots

- Plot of average k-effective by generation run

- Plot of average k-effective by generations skipped

- Final edit of fissions, absorptions, and leakage

- Frequency distributions

- Shannon Entropy

- Flux plotting
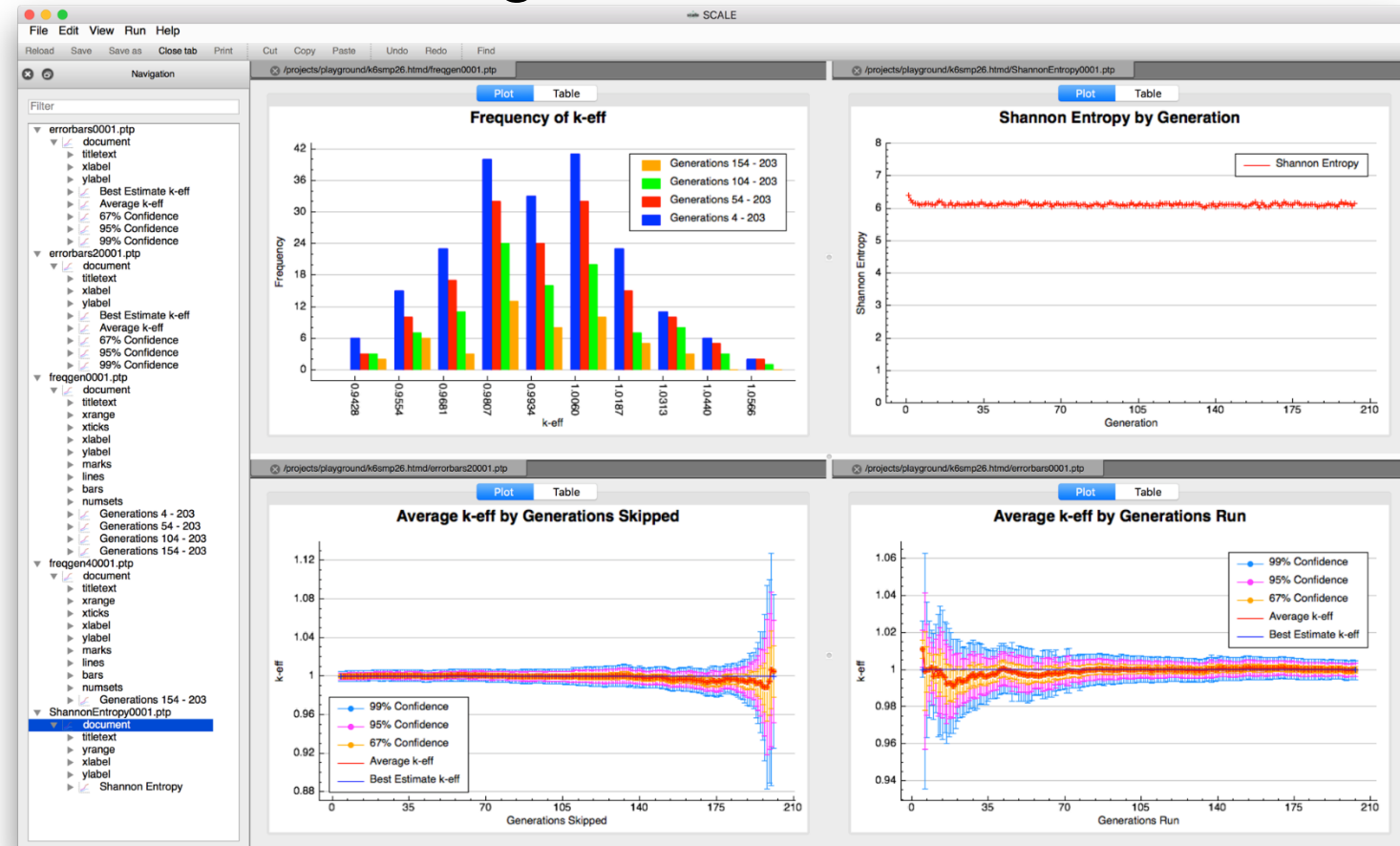
Activating the Geometry Viewer

Activating the geometry viewer can be accomplished via the Input Editor's View…>View geometry button or the Document Navigation geometry item's popup context menu.

- If multiple geometry input blocks exist in the document, a selection will be provided.
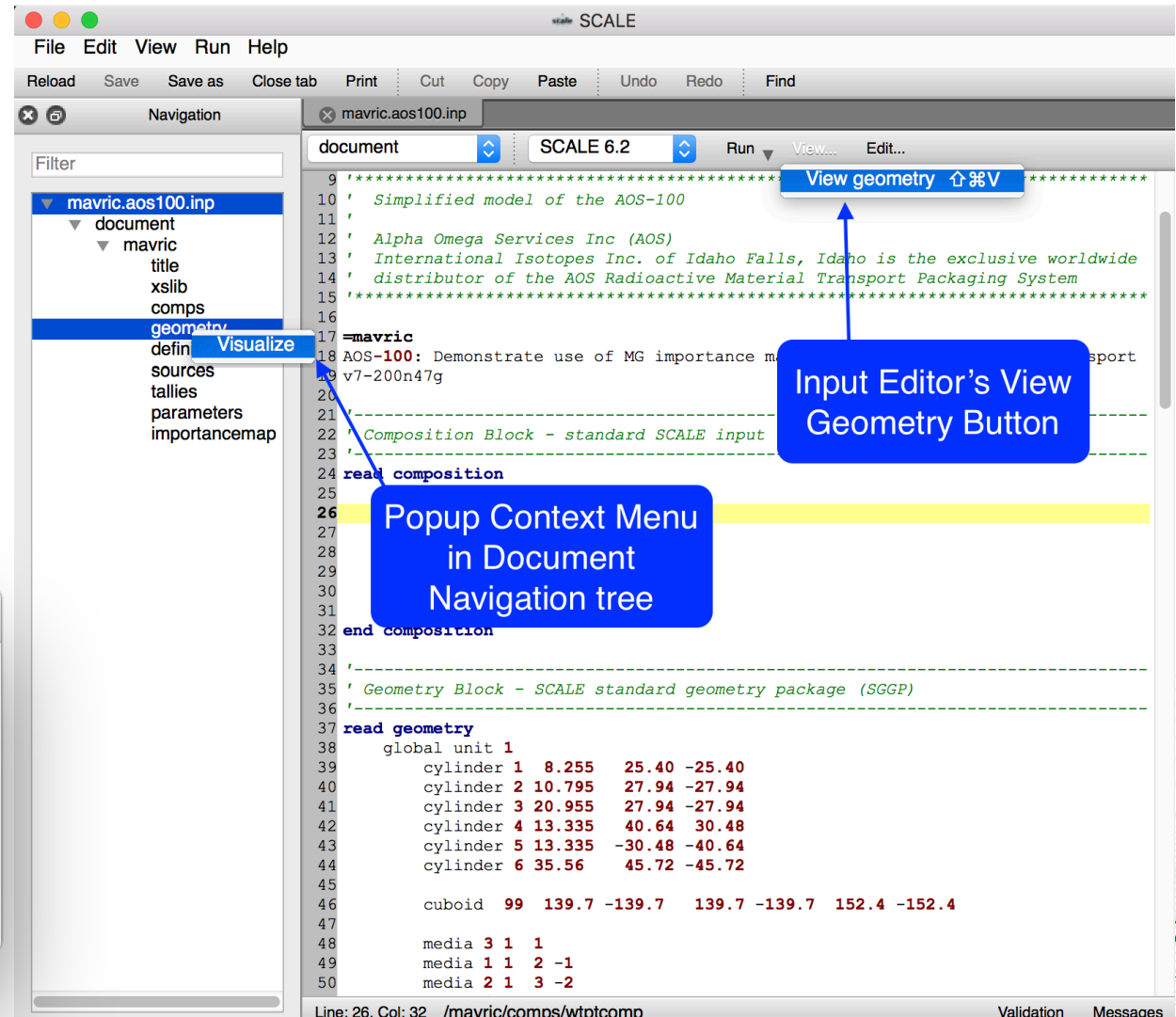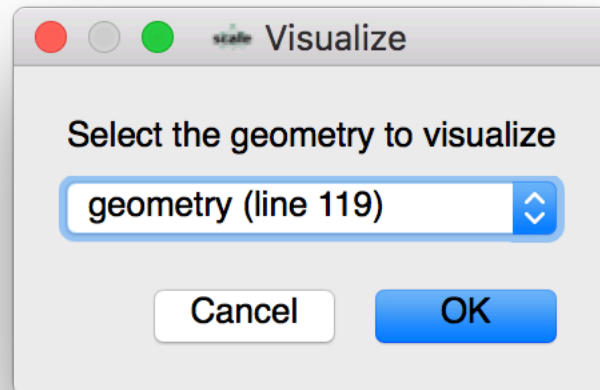
Axis Views

- Axis views provide standard orthographic model projections of the top, front, and side of the geometry.
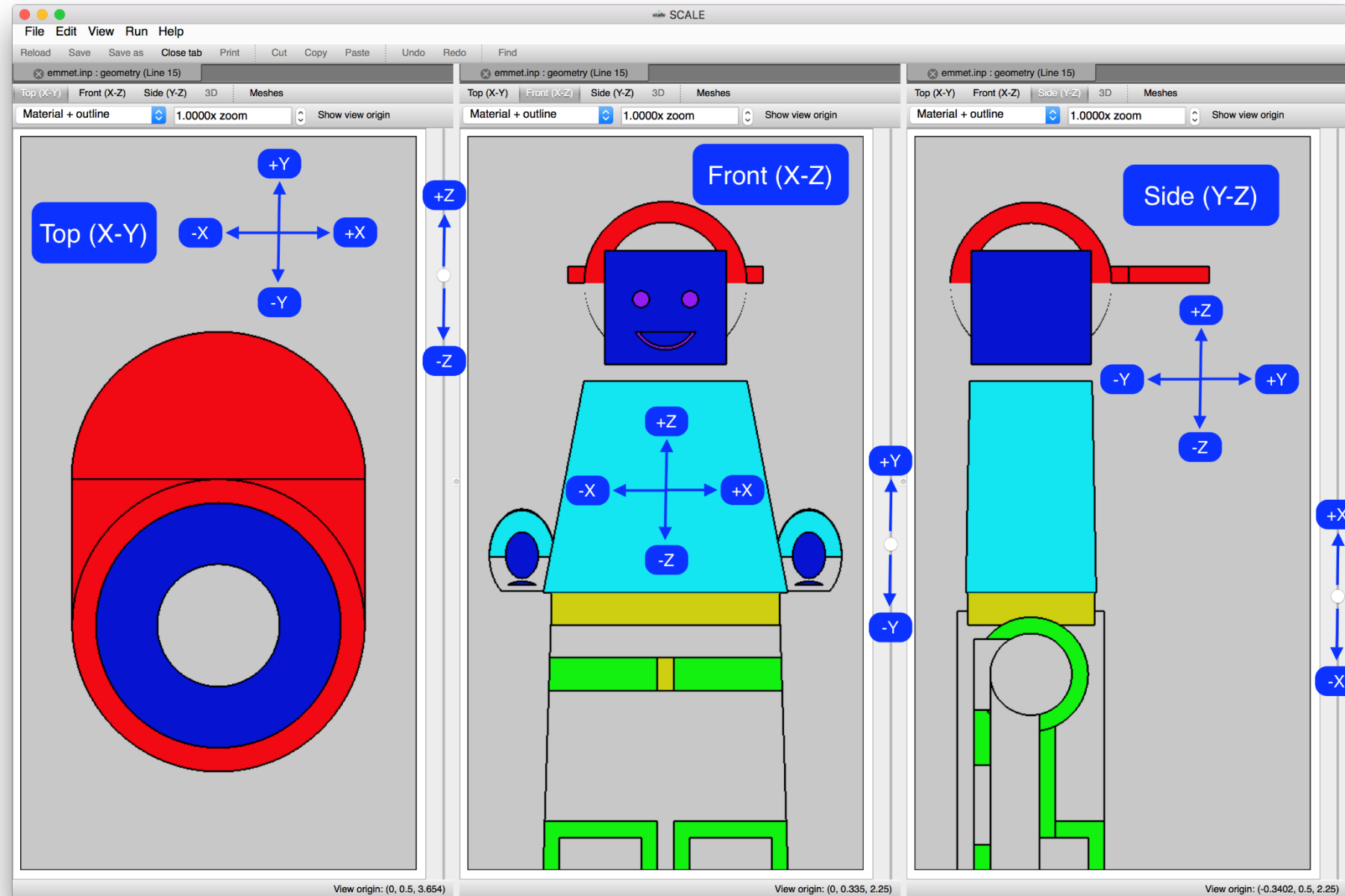
Axis Views : Elevation Control

View plane elevation is controlled via a slide control on the right side of each geometry view.

- View plane elevation corresponds to view plane control – the higher the slider control, the higher the view plane.

  – Top (X-Y) - raising the slider increases the Z intersect.

  – Front (X-Z) – raising the slider increases the Y intersect.

  – Side (Y-Z) – raising the slider increases the Z intersect.

Render Modes

Render modes control the information displayed.
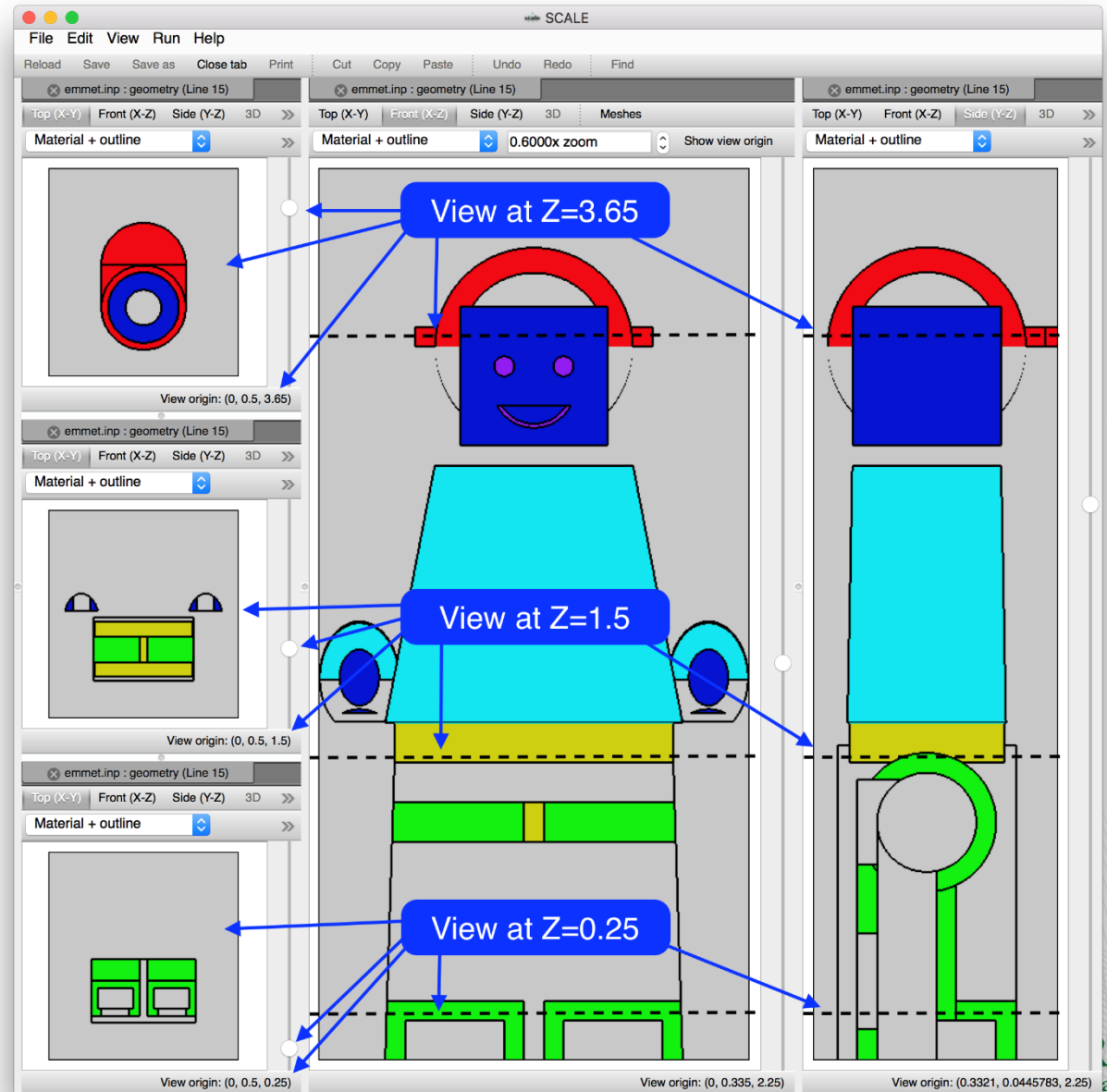
- Material displays only the materials/mixtures.
  - Can hide geometry region outlines that are the same material.

- Material + outline displays the material and the region outlines.
  - Displays region outline in black.
  - Useful for contrasting geometry regions.

- Outline displays only geometry region outlines.
  - Displays region outline in material color.

- Overlay displays geometry region outline and mesh data results.

- Overlay + boundaries displays geometry region outline, mesh boundaries*, and mesh data results
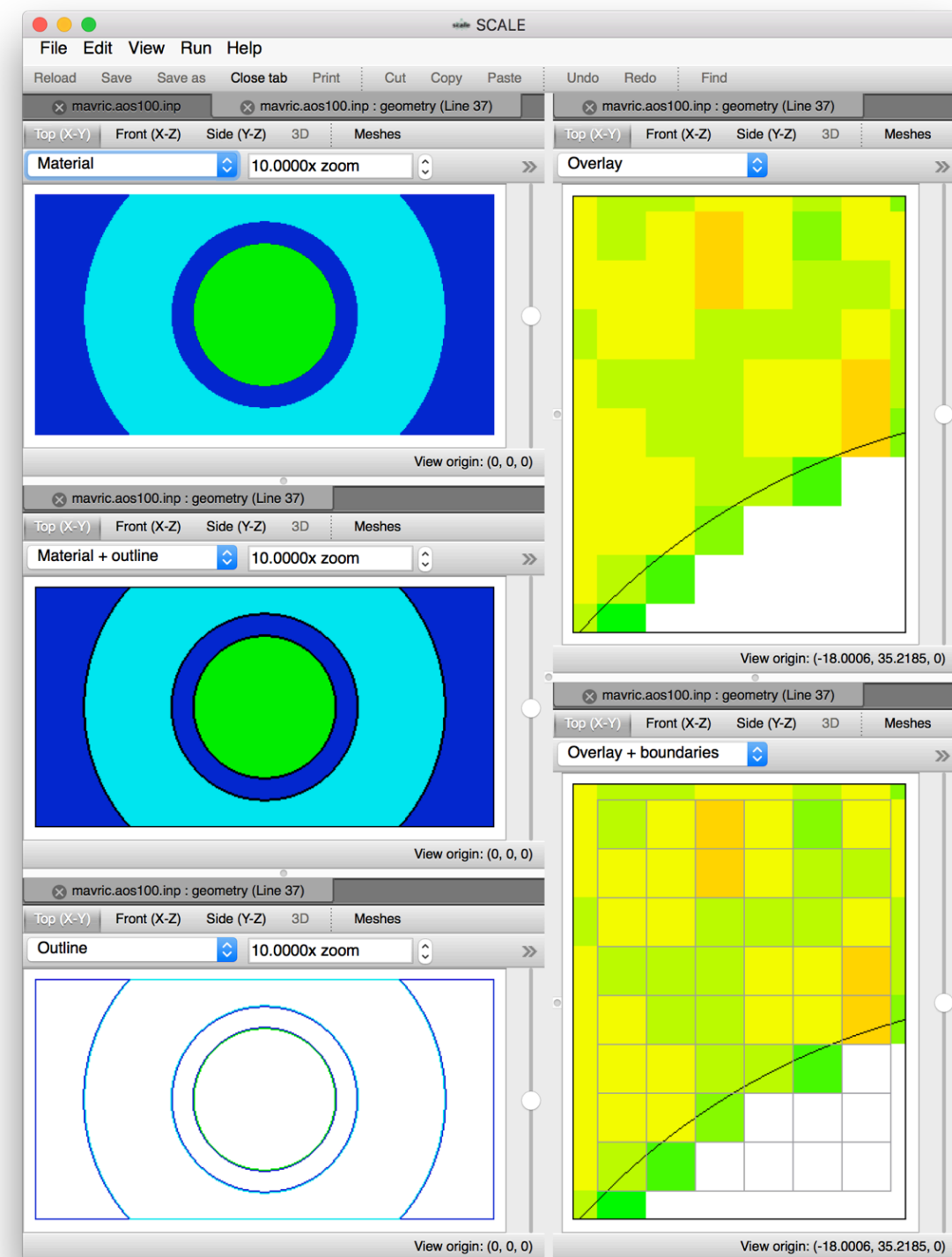
Mesh Contours, Color Legend, and Scale

- Controls influenced by MAVRIC's MeshView plot program.

- Allows changing contour count from 25 to 2 enhancing data contrast.

- Can improve print quality for black and white printouts.
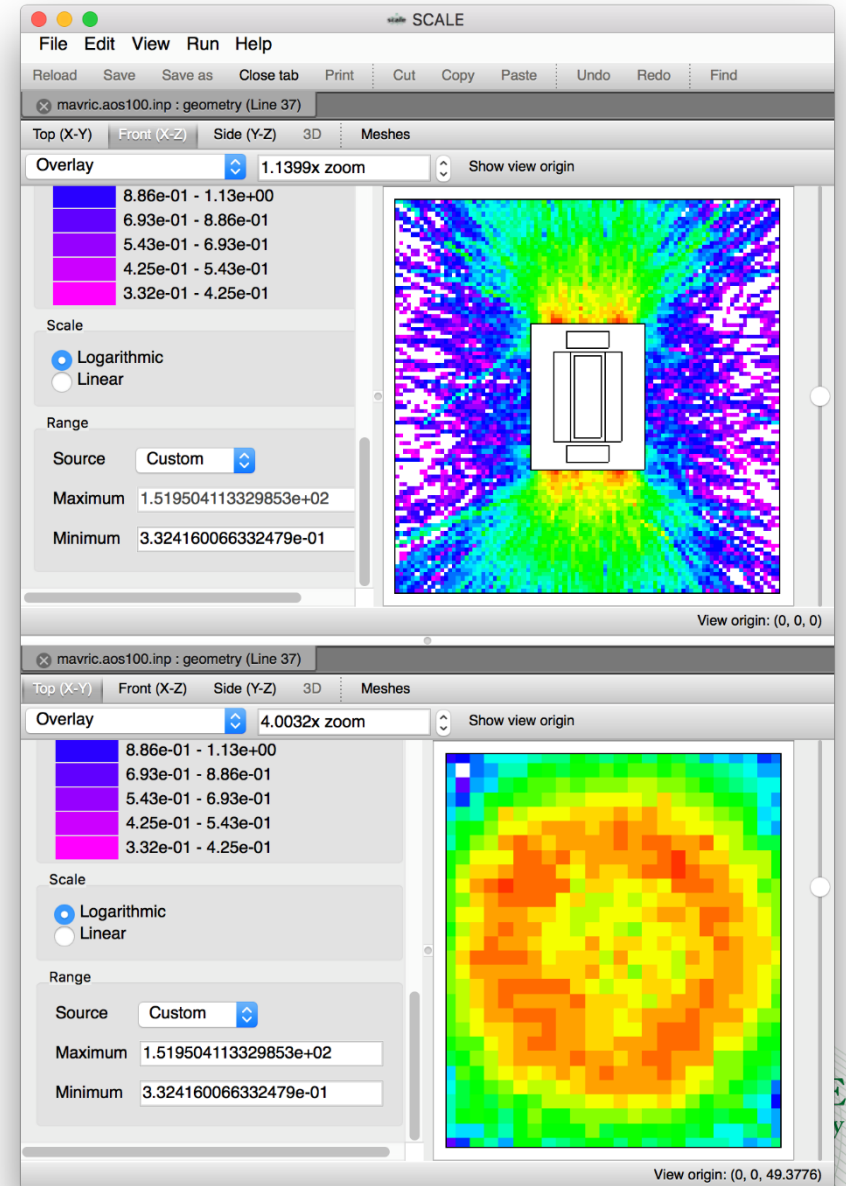
- Linear and logarithmic scale data display.
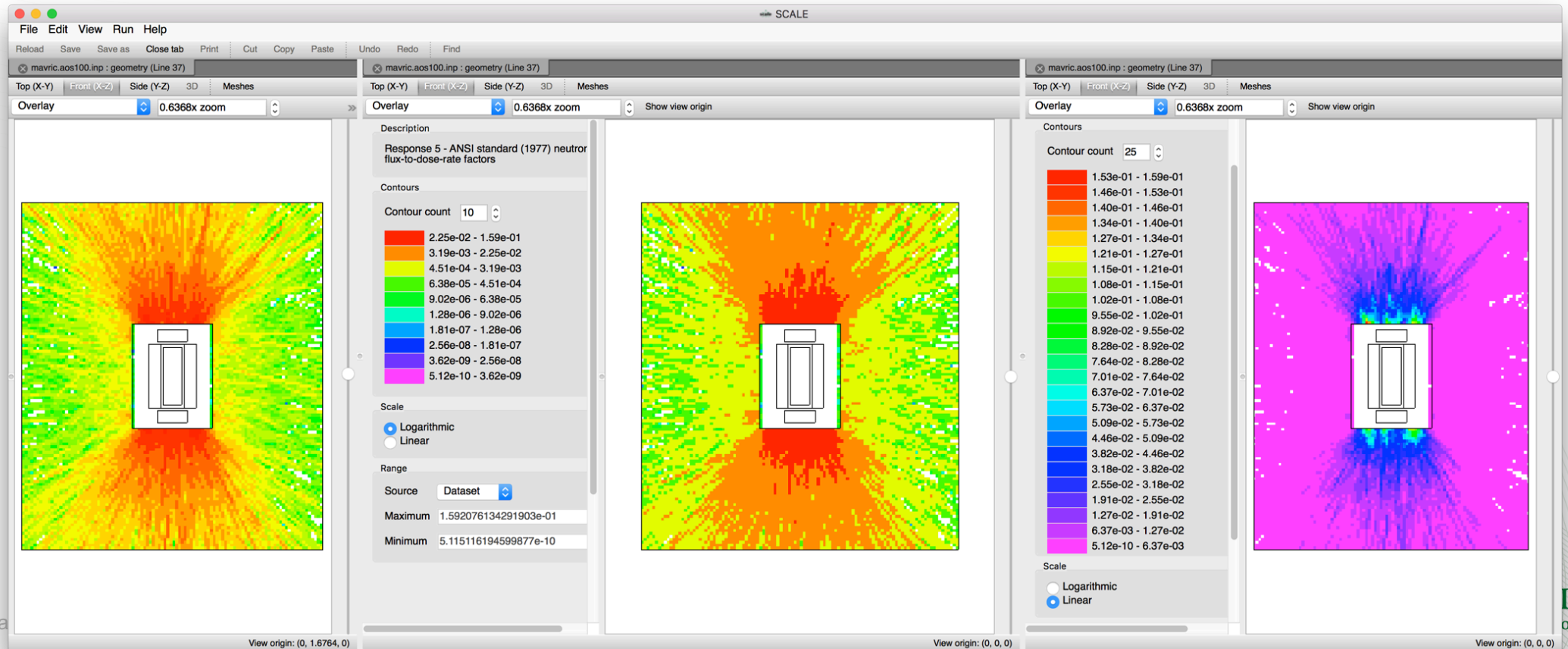
Mesh Overlay : Data Ranges

The overlaid dataset's data range can be selected as the file, family, dataset or as custom user-specified.

- The file indicates the entire mesh file context.

- The family range provides context to a selected dataset.

- Custom allows down-selection.
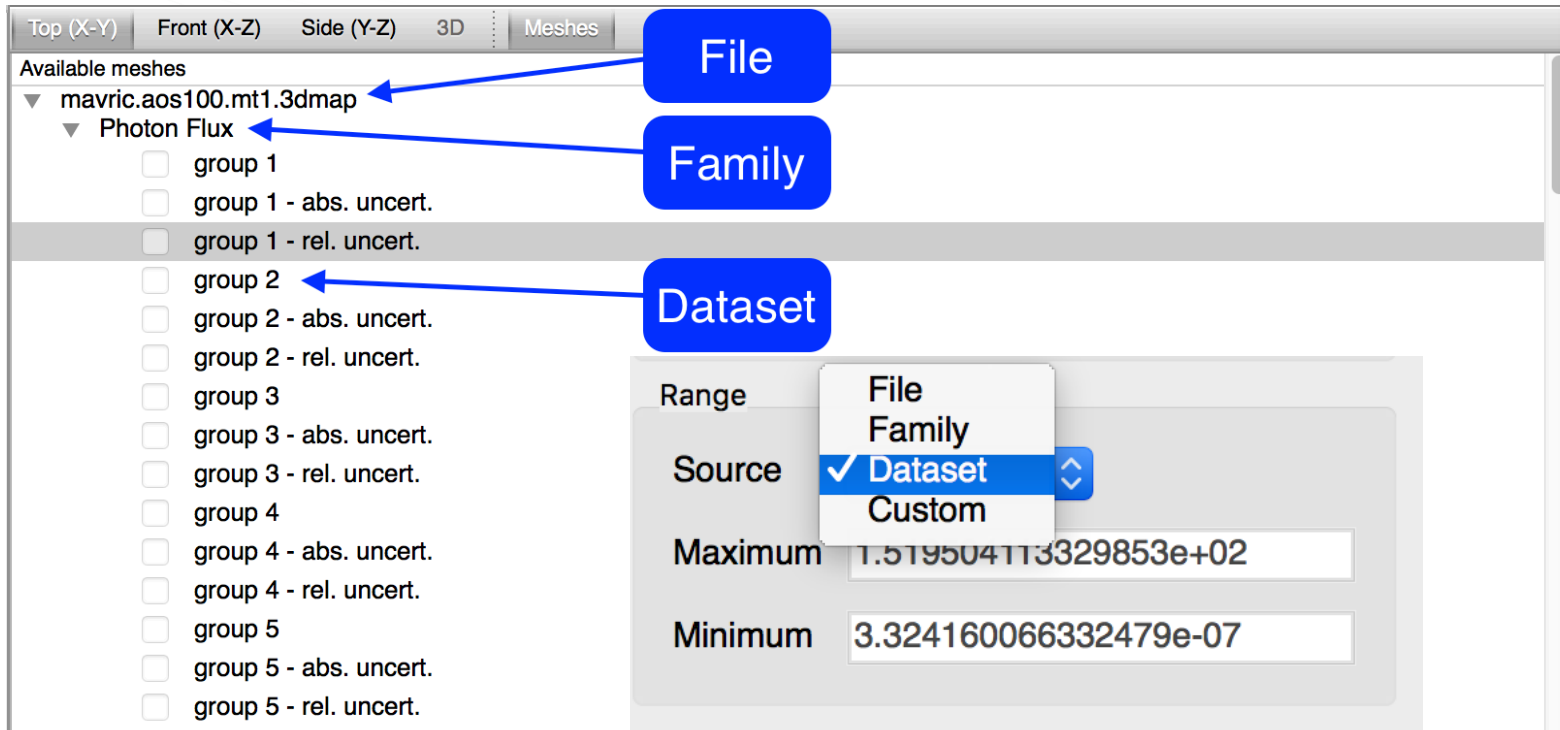
Mesh Overlay : Integrated 2D Plot Creation

Mesh data can be further investigated via the integrated 2D plot creation capability. 2D Plot creation is available via the Create plot popup context menu.

- Plot options include
  - Independent axis
    - Cartesian X,Y, and Z.
    - Cylindrical Radial, Theta, and Z.
    - Group when group-wise data is available.
  - Plot using values or indices.
  - When data is group-wise axis interval widths can optionally be divided linearly or logarithmically.
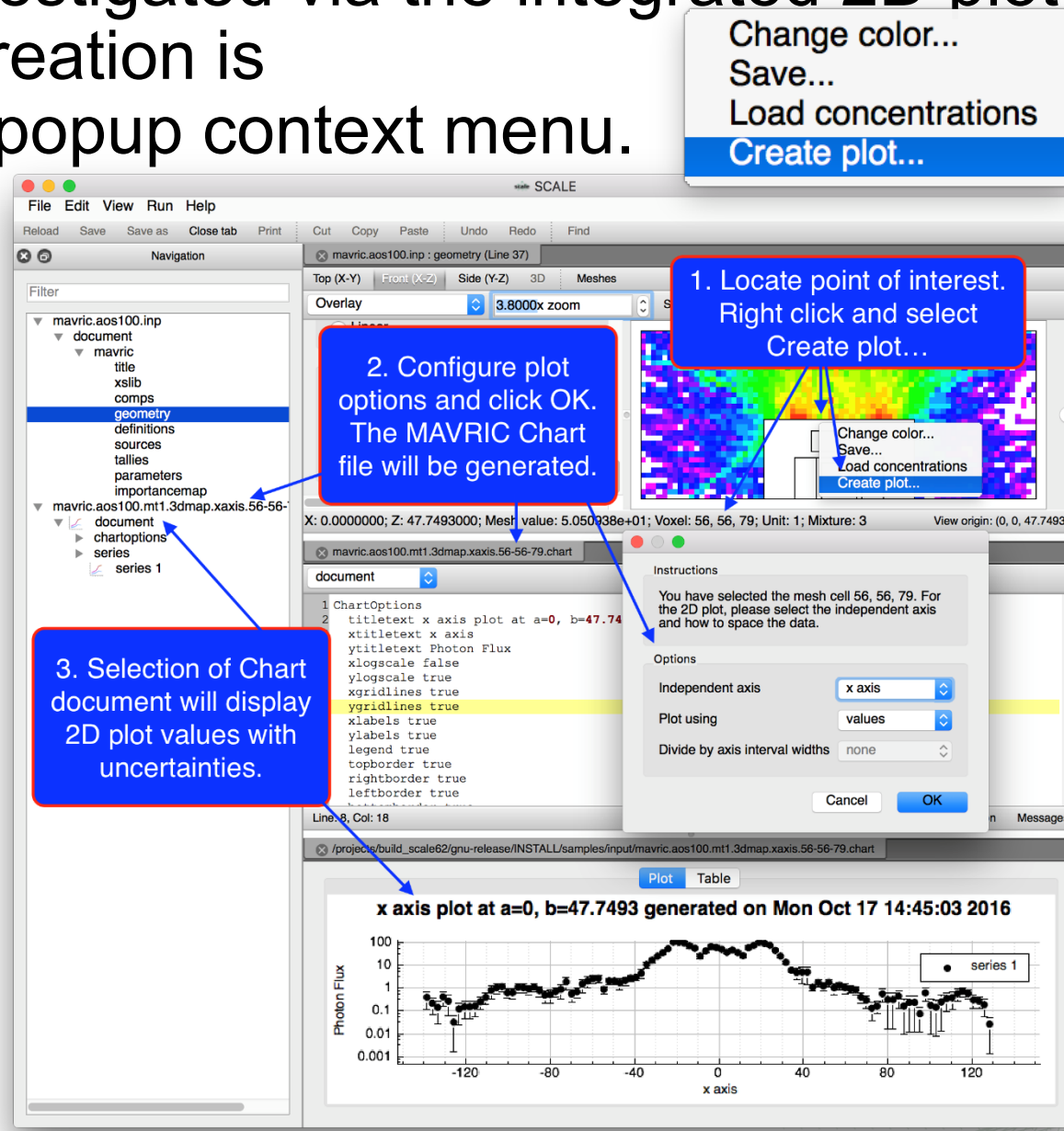
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- Questions?

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