SBMT

Working with Shape Models

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APPLIED PHYSICS LABORATORY

This SBMT tutorial explains how to:

- Select a shape model
- Manipulate shape models
- Work with shape models using the control panel
- Export a shape model

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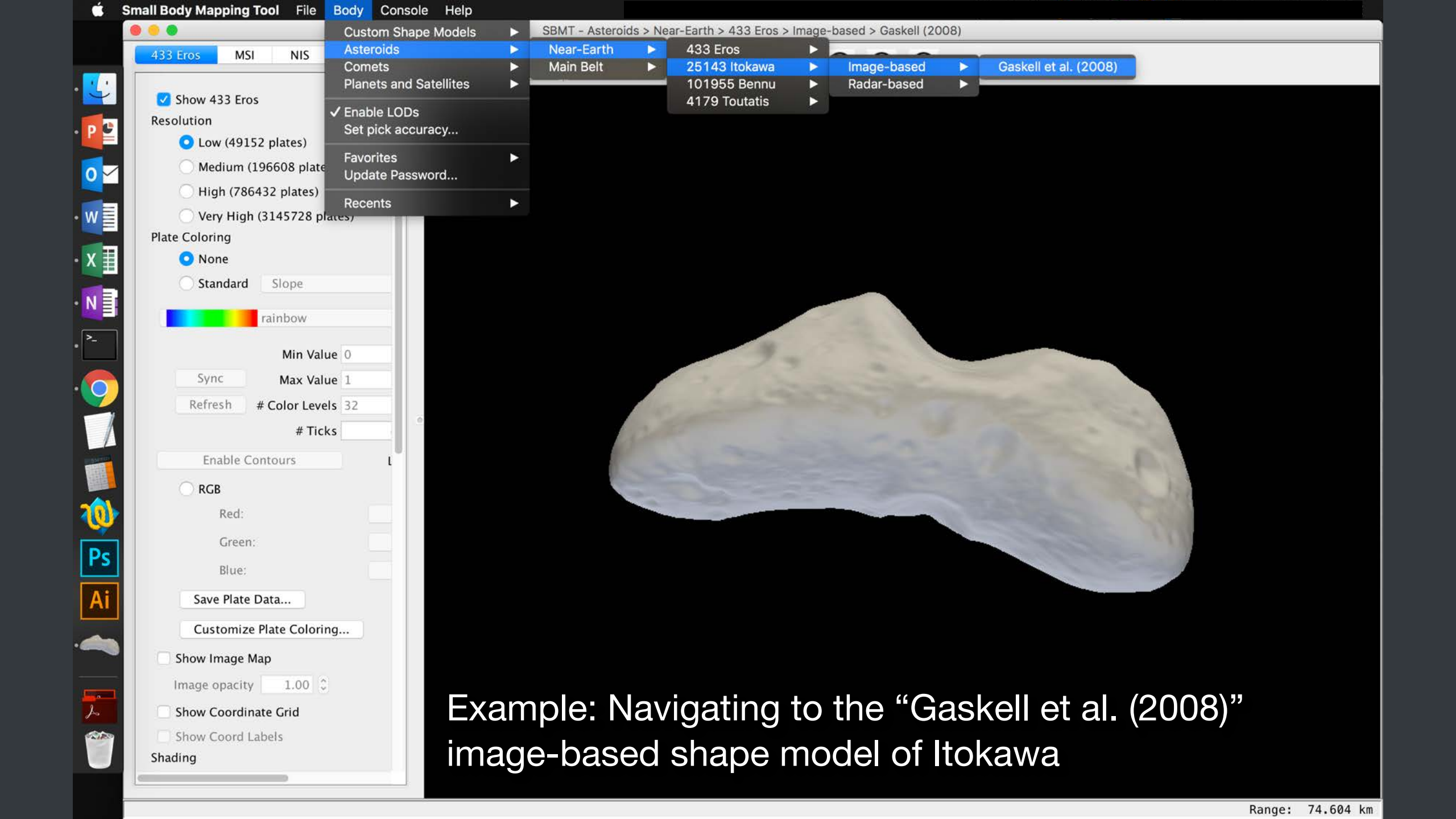
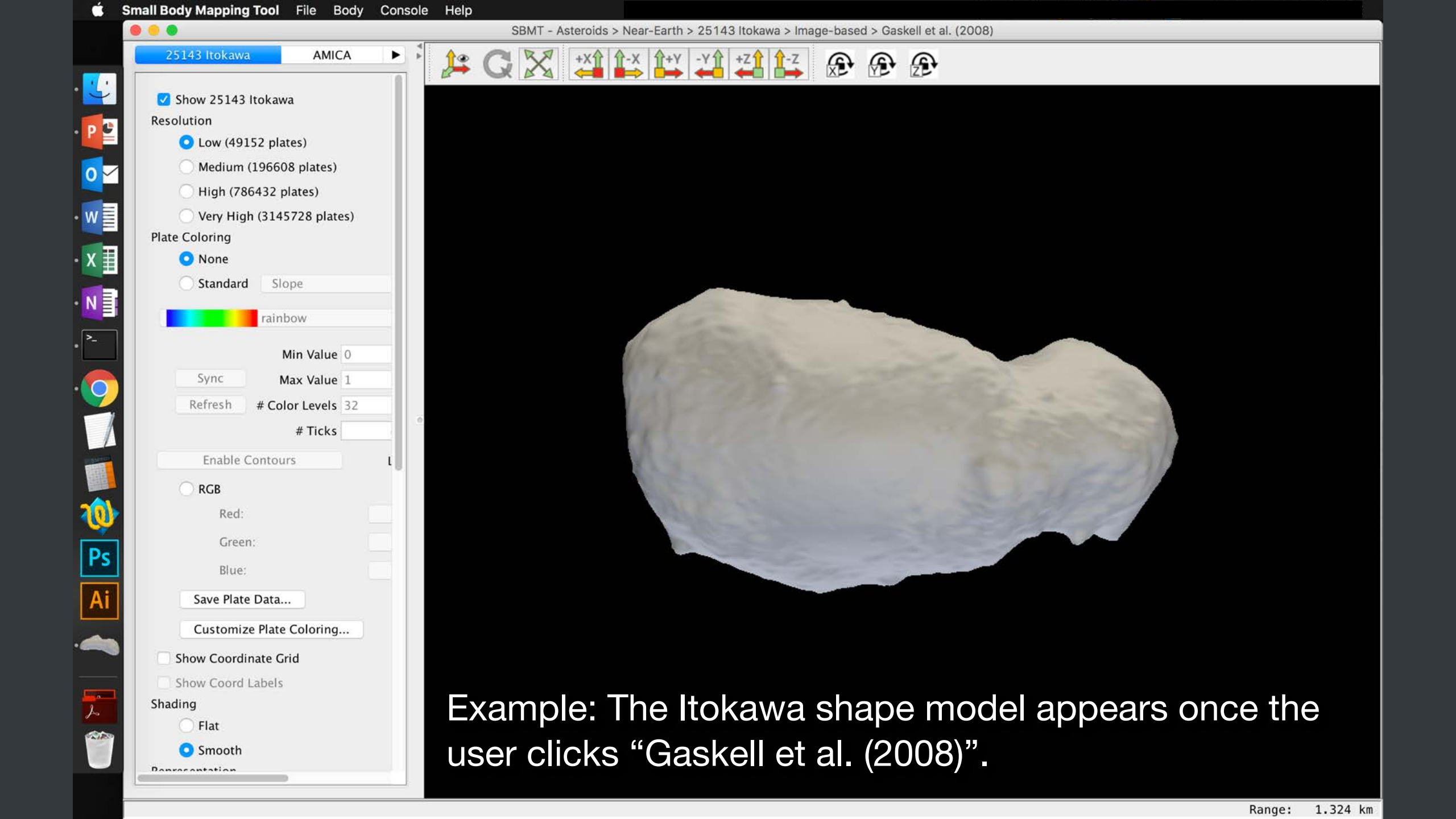
Selecting a shape model

- Click on “Body” in the menu bar
- Navigate to the object of interest
- Select a model type (e.g., image-based, radar-based)
- Click on the desired shape model
- New shape then appears in the rendering panel

Note: Only image-based shape models have spacecraft data associated with them. You can access spacecraft data in many, but not all, image-based shape models in the SBMT.



Example: Navigating to the “Gaskell et al. (2008)” image-based shape model of Itokawa


Small Body Mapping Tool File Body Console Help
SBMT - Asteroids > Near-Earth > 25143 Itokawa > Image-based > Gaskell et al. (2008)
25143 Itokawa
AMICA
Show 25143 Itokawa
Resolution
Low (49152 plates)
Medium (196608 plates)
High (786432 plates)
Very High (3145728 plates)
Plate Coloring
None
Standard
Slope
rainbow
Min Value 0
Sync
Max Value 1
Refresh
Color Levels 32
Ticks
Enable Contours
RGB
Red:
Green:
Blue:
Save Plate Data...
Customize Plate Coloring...
Show Coordinate Grid
Show Coord Labels
Shading
Flat
Smooth
Range: 1.324 km
Example: The Itokawa shape model appears once the user clicks “Gaskell et al. (2008)”.

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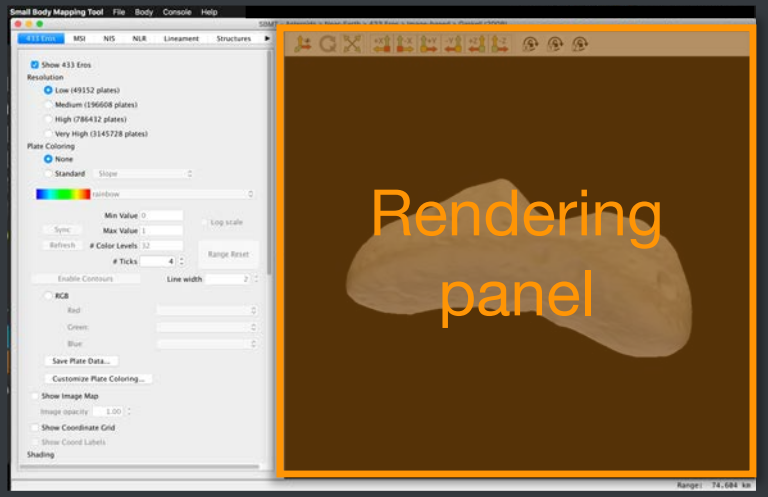
Manipulating a shape model

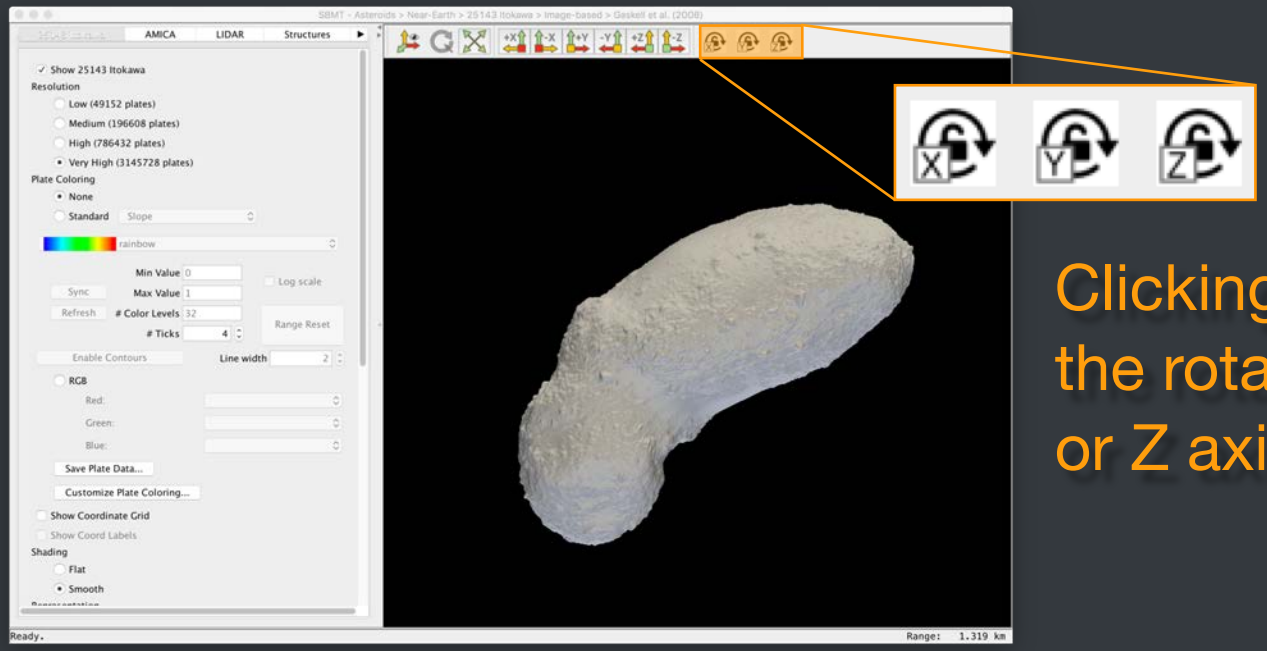
In the rendering panel, you can:

- Rotate the shape model
- Zoom in and out of the shape model
- Pan across the shape model
- Spin the shape model
- Snap to specific views using snap-to-view buttons



Rotate a shape model

- Click and hold down the left mouse button
- Drag the mouse around the rendering panel



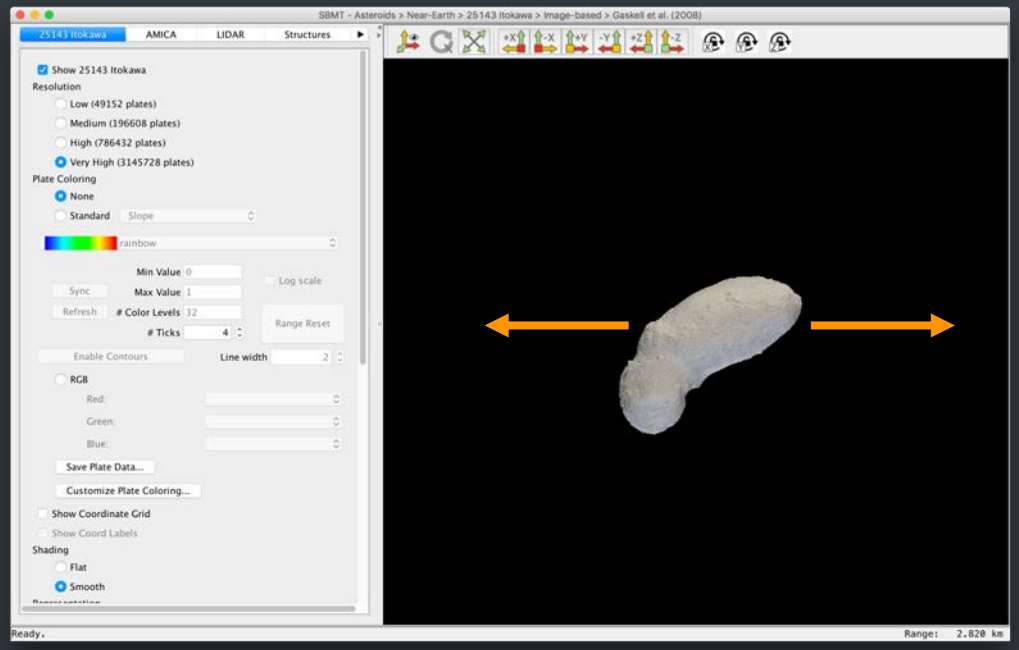
Clicking the lock-axis button fixes the rotation to be around the X, Y, or Z axis.

Zoom in and out of a shape model

- Option 1: Use the mouse wheel.
- Option 2: Use two fingers on a laptop touchpad.
- Option 3: Hold down the right mouse button and drag the mouse upward (zoom in) or downward (zoom out).

Pan across a shape model

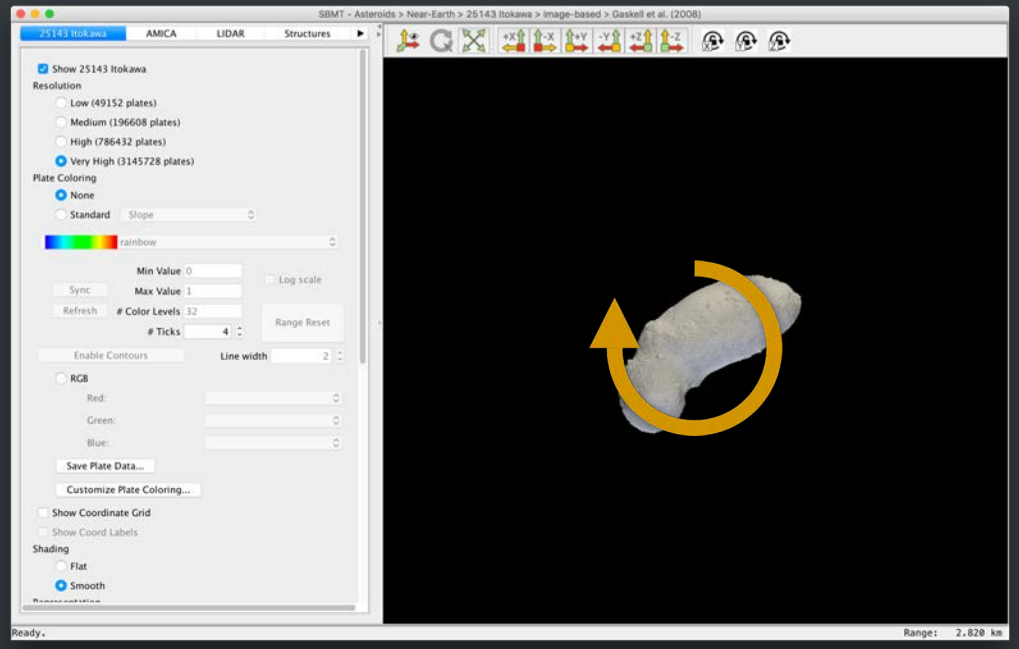
- Hold down shift
- Left click and drag the shape



Panning moves the shape model sideways or up-and-down without rotating the shape model.

Spin a shape model

- Hold down control
- Left click and drag the shape

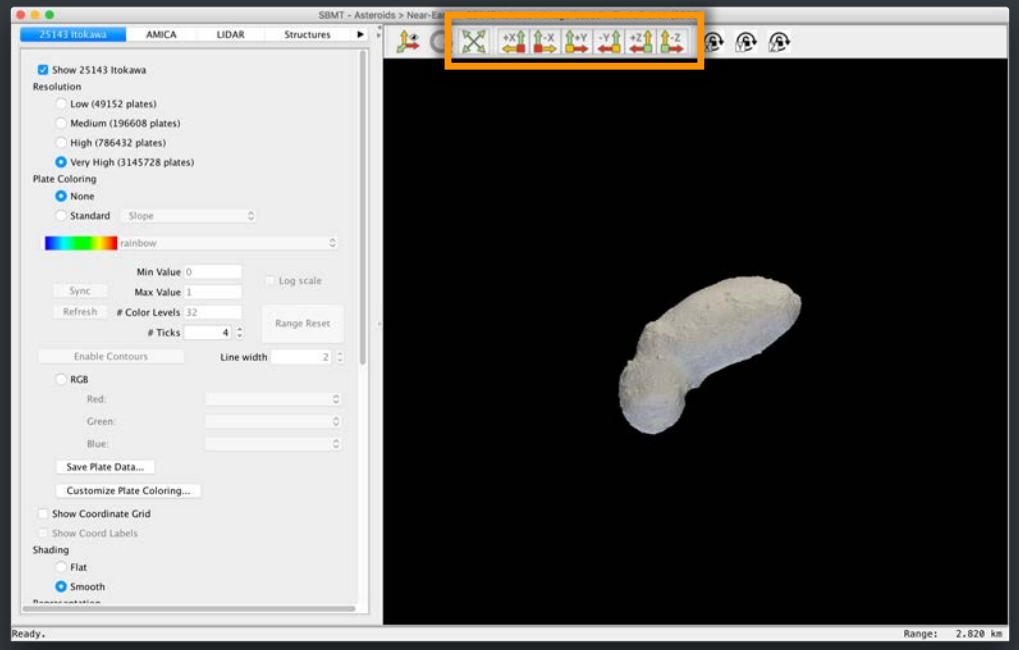


By default, the shape model spins about an axis that points into the center of the rendering panel.

To rotate around a different point, place your cursor over the point about which you wish to rotate and press “c”. Press “r” to return to the default center of rotation.

Snap to a view

Click one of the snap-to-view buttons to reset the view to a pre-defined state



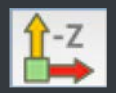

Zoom shape model to fill rendering panel

View shape model along +X direction

View shape model along -X direction

View shape model along +Y direction

View shape model along -Y direction



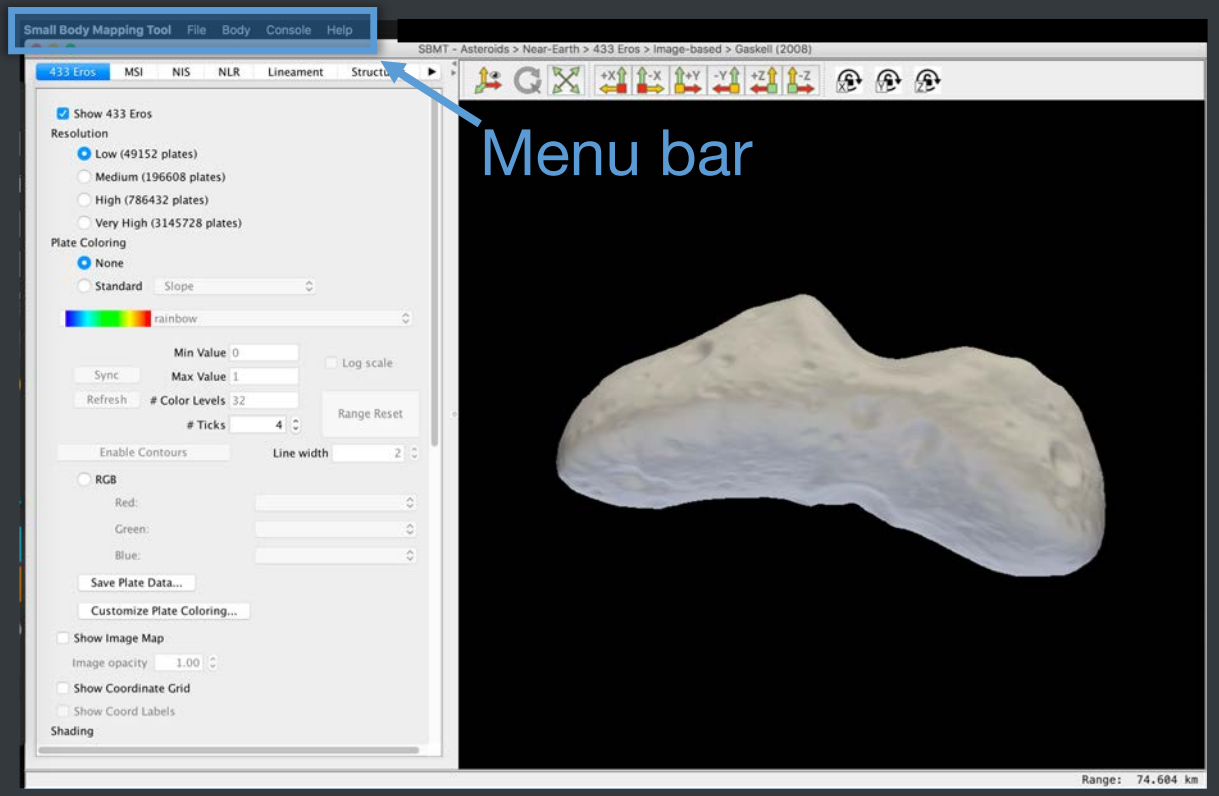
View shape model along +Z direction

View shape model along –Z direction

Manipulating a shape model

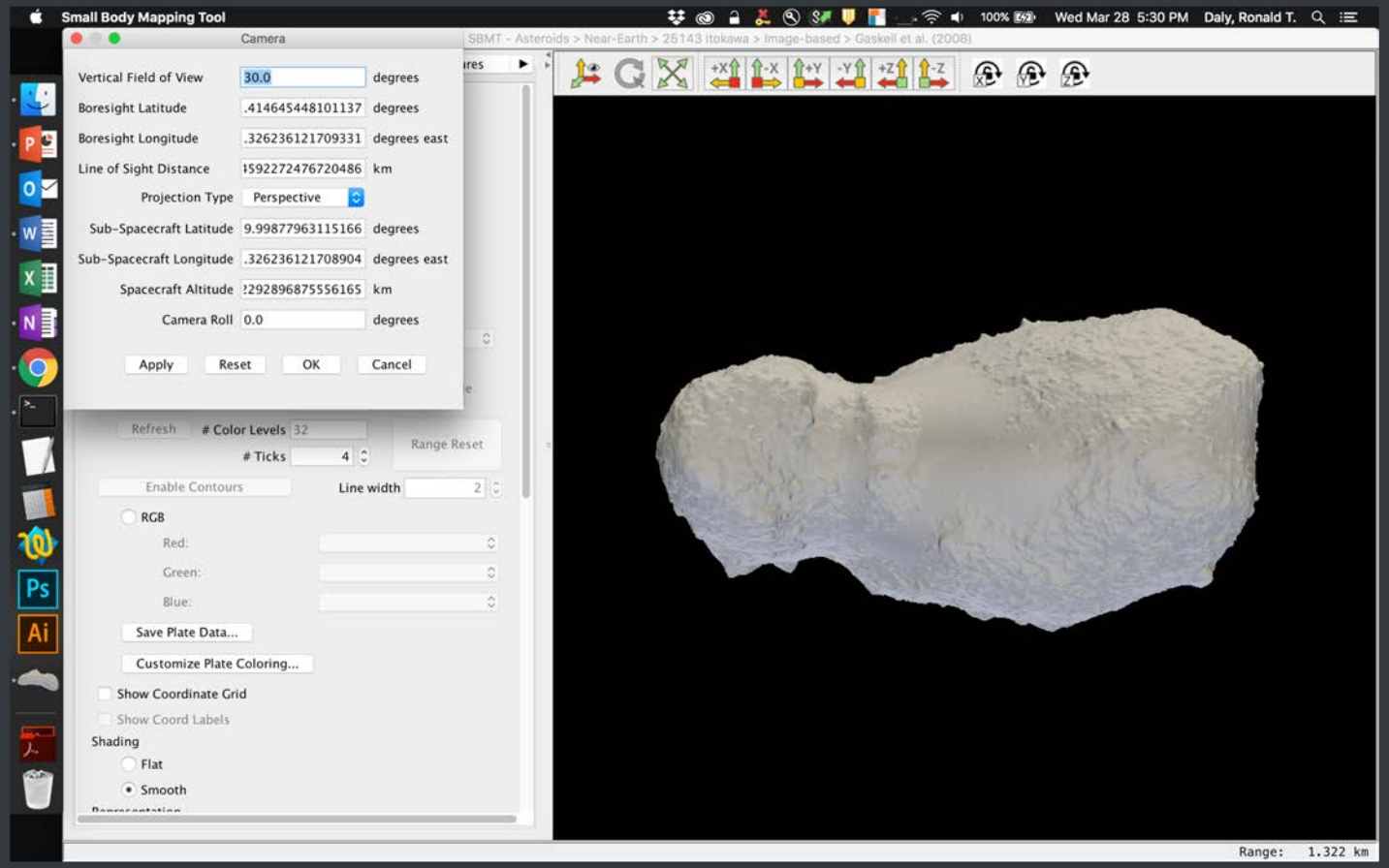
From File in the menu bar, you can

- Change the camera view



Change the camera view

Select File → Camera to open the Camera window.



By default, the vertical field of view is 30° and the distance is chosen so that the entire shape model fits in the rendering panel.

Enter new values, and click “Apply” and then “OK”.

This SBMT tutorial explains how to:

- Select a shape model
- Manipulate shape models in the rendering panel
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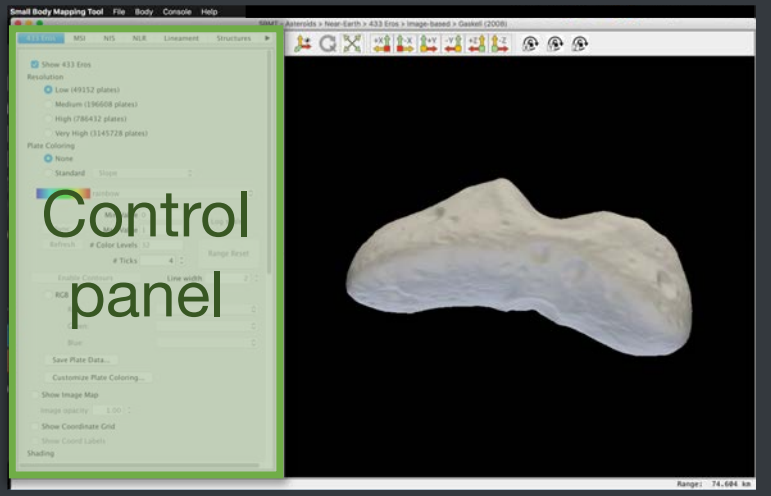
- Export a shape model

Working with a shape model

In the control panel, you can:

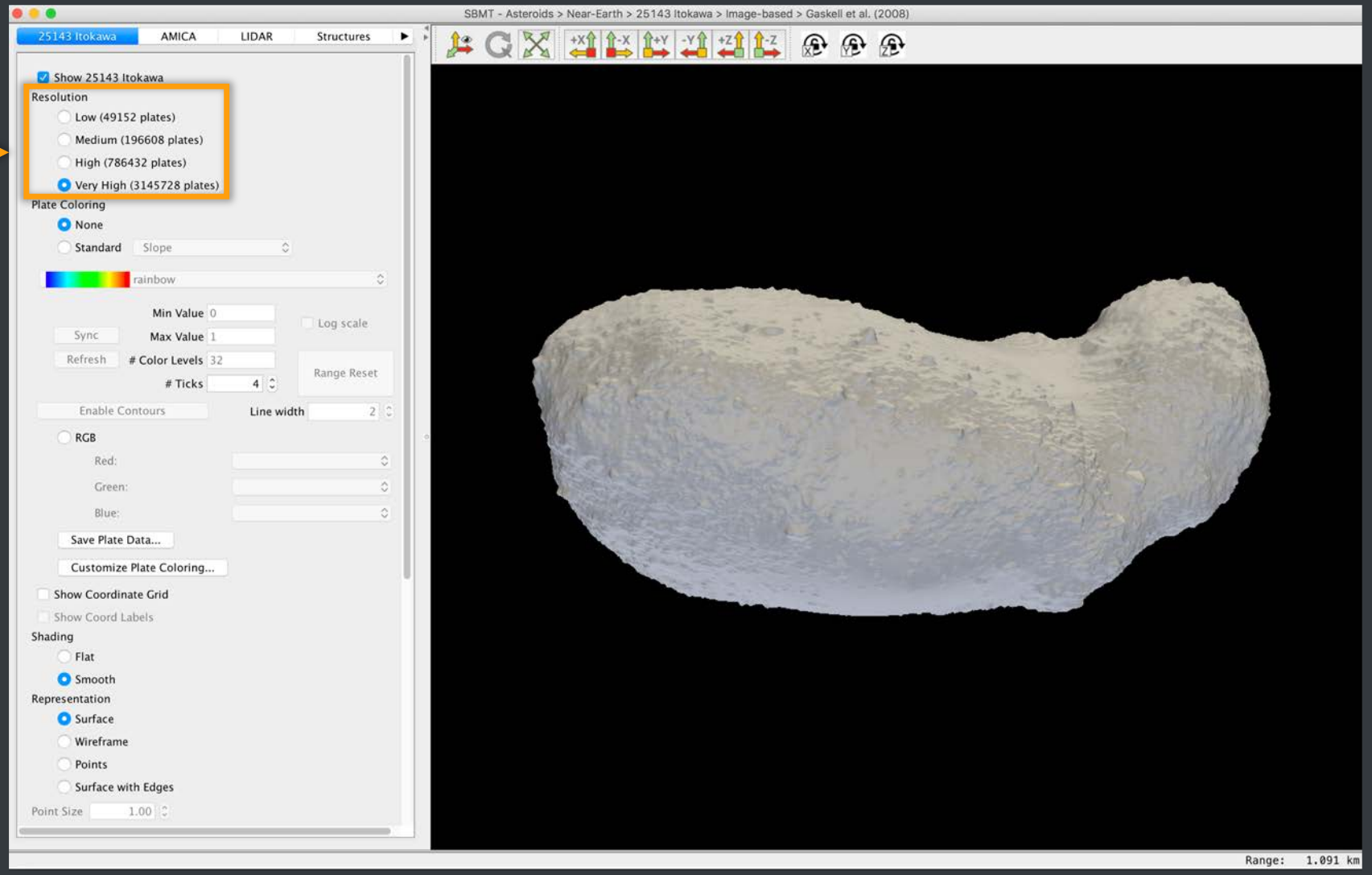
- Change shape model resolution
- Add or remove plate coloring
- Show or hide the coordinate grid
- Change the surface representation
- See shape model statistics



Change shape model resolution

Click the button next to the desired resolution

Note: It's normal for your computer to take ~30 seconds to 1 minute to load a very high resolution shape model.

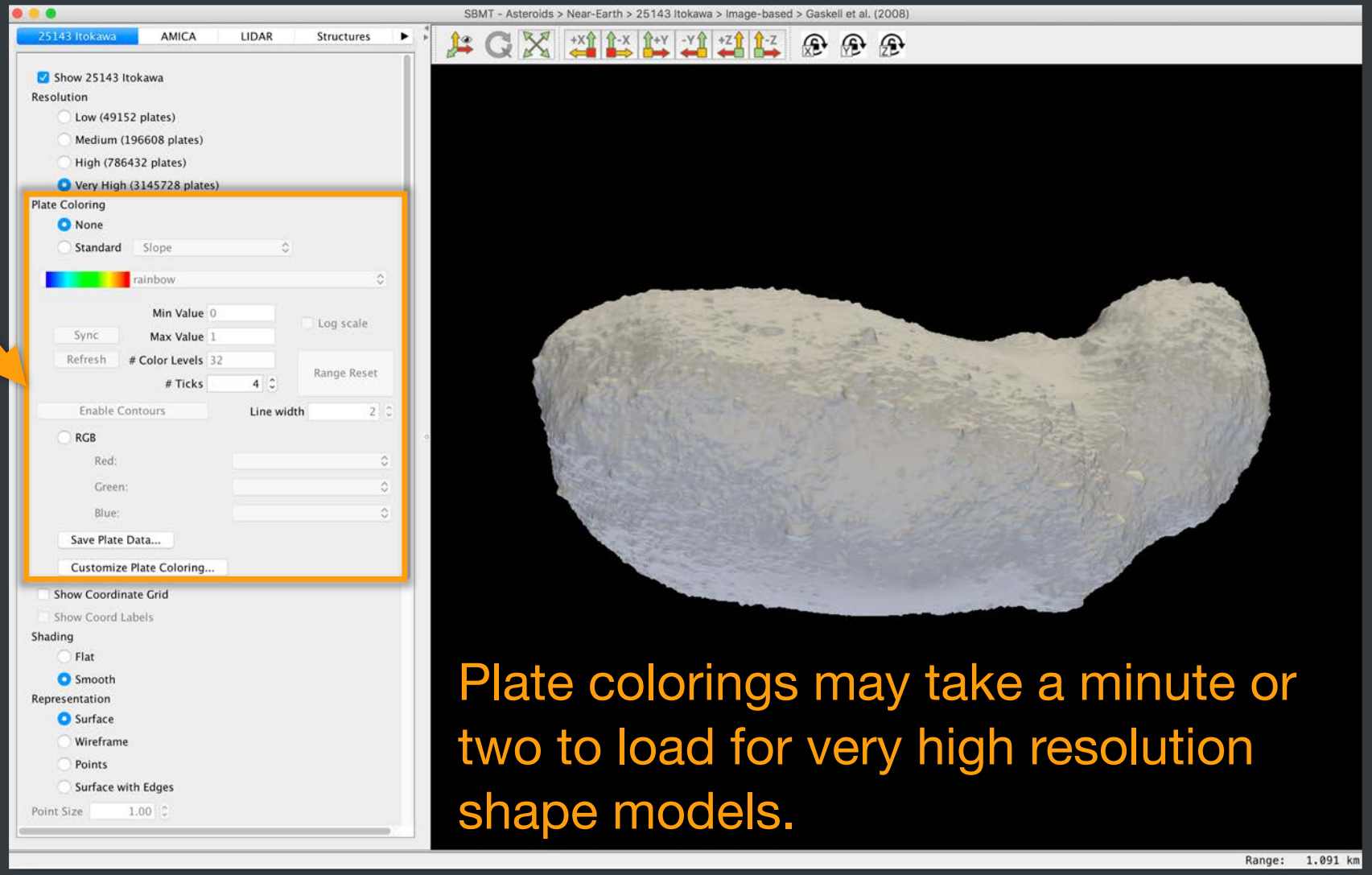


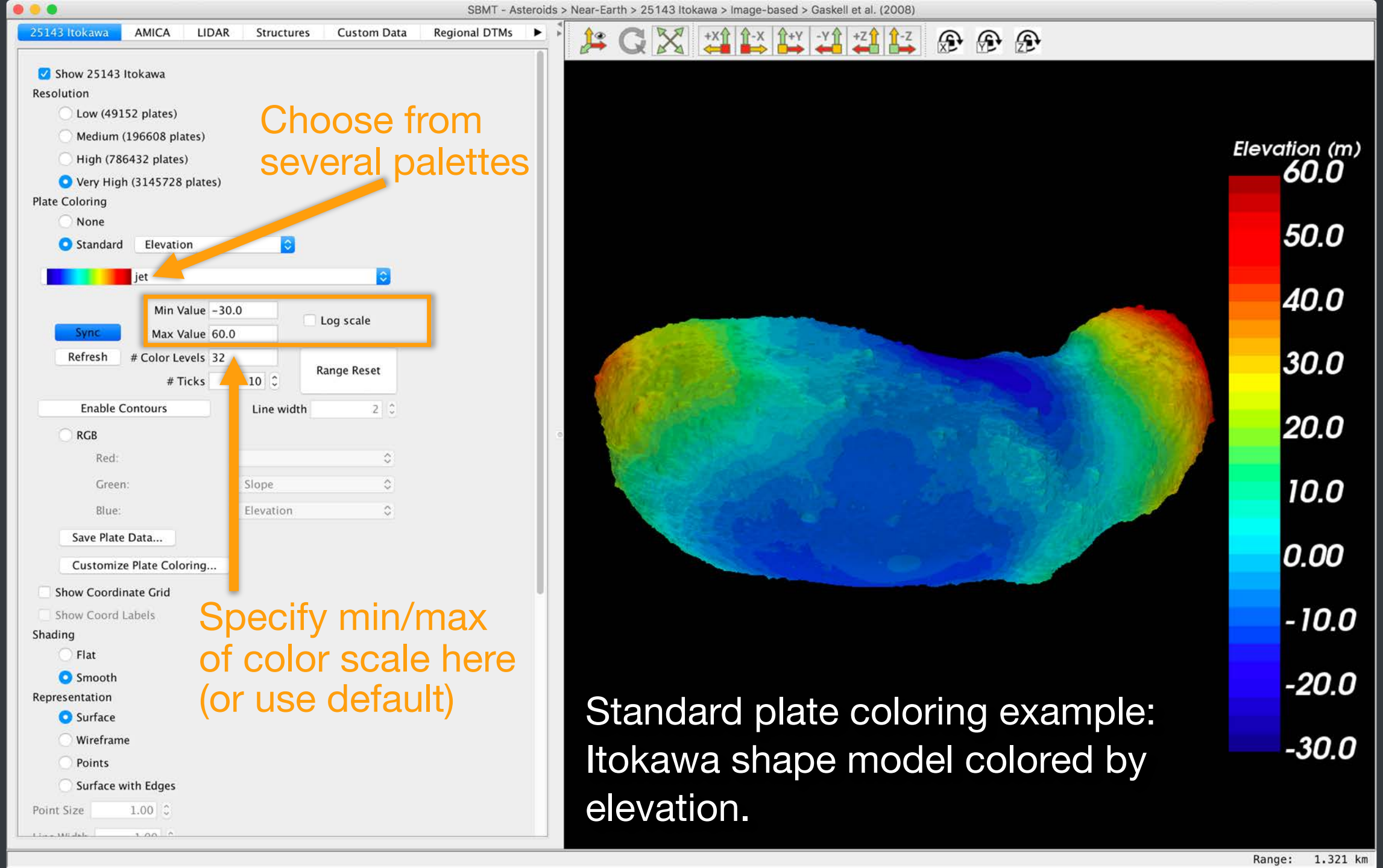
Add or remove plate coloring

Plate coloring options appear here

Standard plate colorings: slope, elevation, gravitational acceleration, gravitational potential.

“RGB” lets users display combinations of standard plate colorings.

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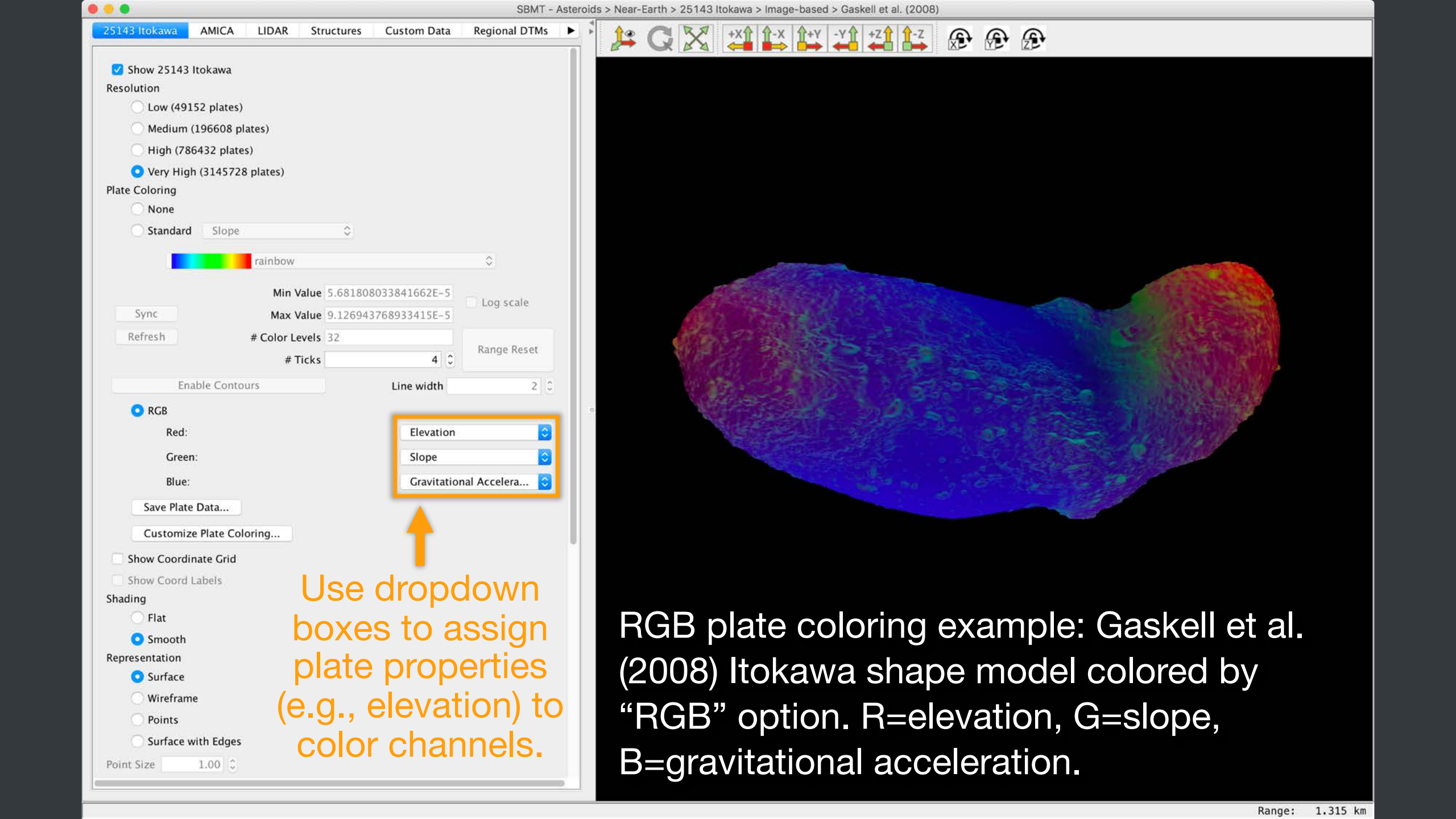
Resolution
Low (49152 plates)
Medium (196608 plates)
High (786432 plates)
Very High (3145728 plates)
Plate Coloring
None
Standard
Elevation
jet
Choose from several palettes
Min Value -30.0
Max Value 60.0
Log scale
Sync
Refresh
Color Levels 32
Ticks 10
Range Reset
Enable Contours
Line width 2
RGB
Red:
Green:
Slope
Blue:
Elevation
Save Plate Data...
Customize Plate Coloring...
Show Coordinate Grid
Show Coord Labels
Shading
Flat
Smooth
Representation
Surface
Wireframe
Points
Surface with Edges
Point Size 1.00
Specify min/max of color scale here (or use default)
Elevation (m)
60.0
50.0
40.0
30.0
20.0
10.0
0.00
-10.0
-20.0
-30.0
Standard plate coloring example: Itokawa shape model colored by elevation.
Range: 1.321 km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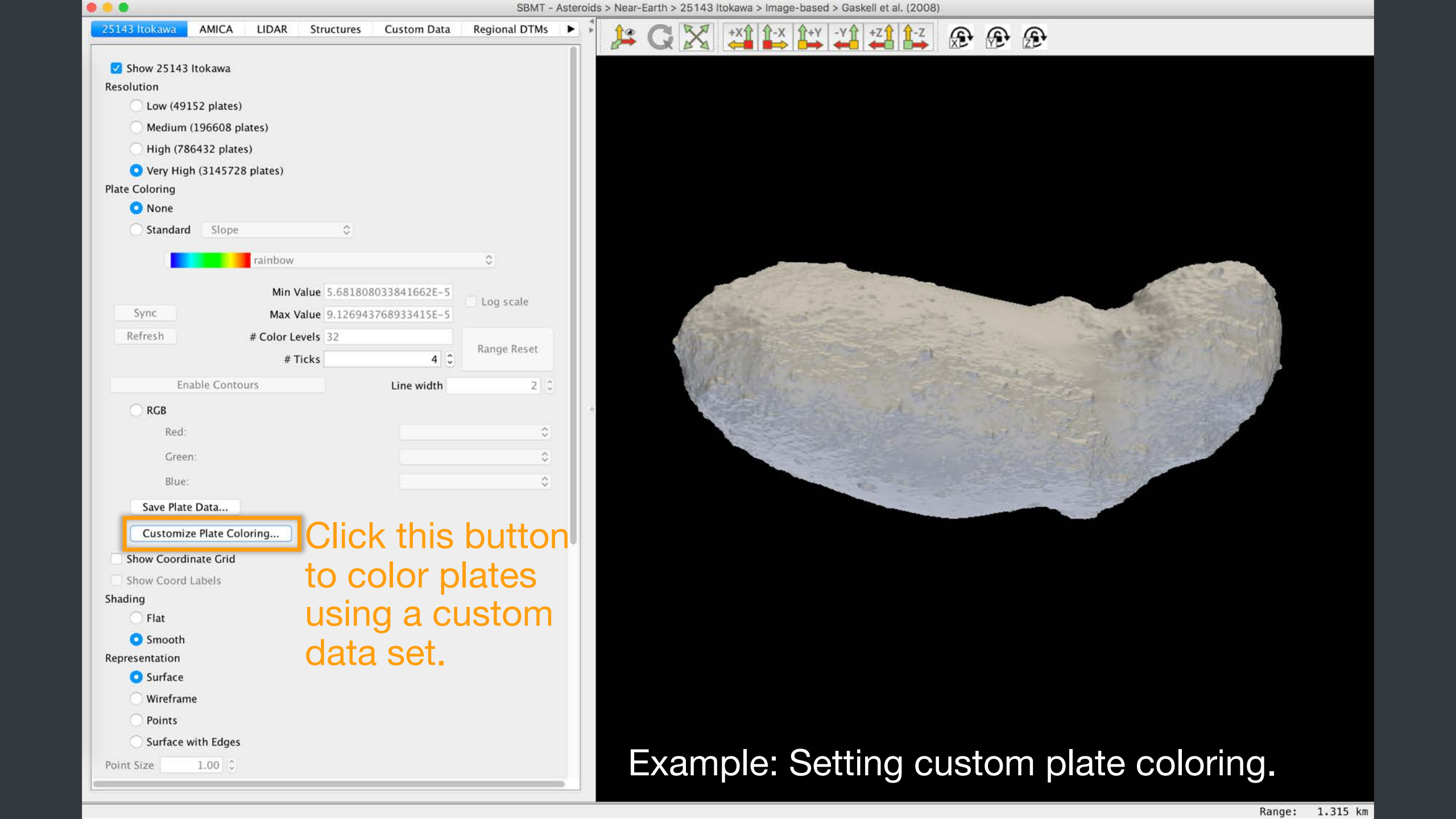
Low (49152 plates)
Medium (196608 plates)
High (786432 plates)
Very High (3145728 plates)
Plate Coloring
None
Standard
Slope
rainbow
Min Value 5.681808033841662E-5
Max Value 9.126943768933415E-5
Color Levels 32
Ticks 4
Log scale
Sync
Refresh
Range Reset
Enable Contours
Line width 2
RGB
Red:
Green:
Blue:
Elevation
Slope
Gravitational Accelera...
Save Plate Data...
Customize Plate Coloring...
Show Coordinate Grid
Show Coord Labels
Shading
Flat
Smooth
Representation
Surface
Wireframe
Points
Surface with Edges
Point Size 1.00
Use dropdown boxes to assign plate properties (e.g., elevation) to color channels.
RGB plate coloring example: Gaskell et al. (2008) Itokawa shape model colored by "RGB" option. R=elevation, G=slope, B=gravitational acceleration.
Range: 1.315 km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None
Standard
Slope
rainbow
Min Value 5.6818080338416 62E-5
Max Value 9.126943768933415E-5
Log scale
Sync
Refresh
Color Levels 32
Ticks 4
Range Reset
Enable Contours
Line width 2
RGB
Red:
Green:
Blue:
Save Plate Data...
Customize Plate Coloring...
Show Coordinate Grid
Show Coord Labels
Shading
Flat
Smooth
Representation
Surface
Wireframe
Points
Surface with Edges
Point Size 1.00
Click this button to color plates using a custom data set.
Example: Setting custom plate coloring.
Range: 1.315 km

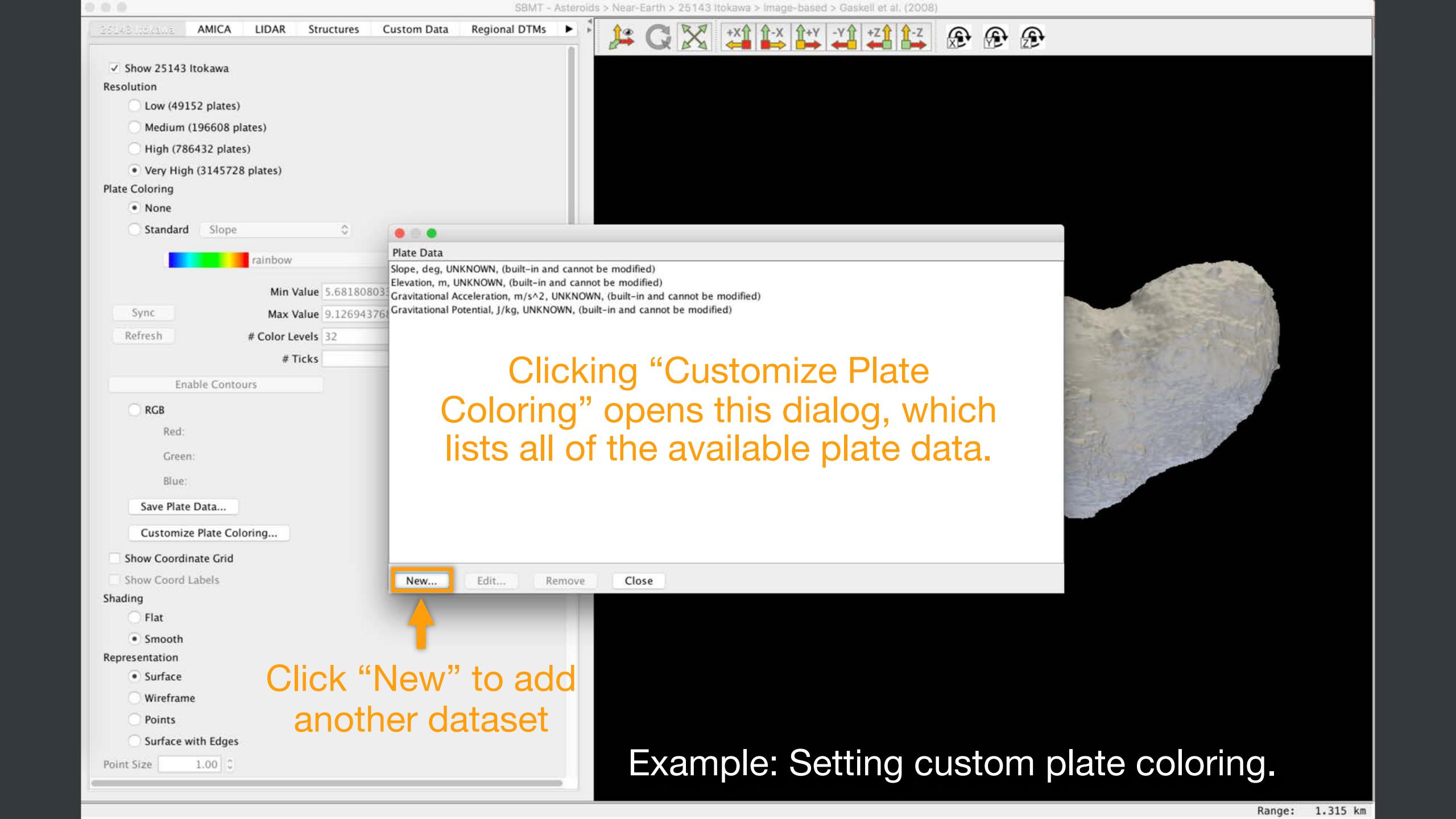
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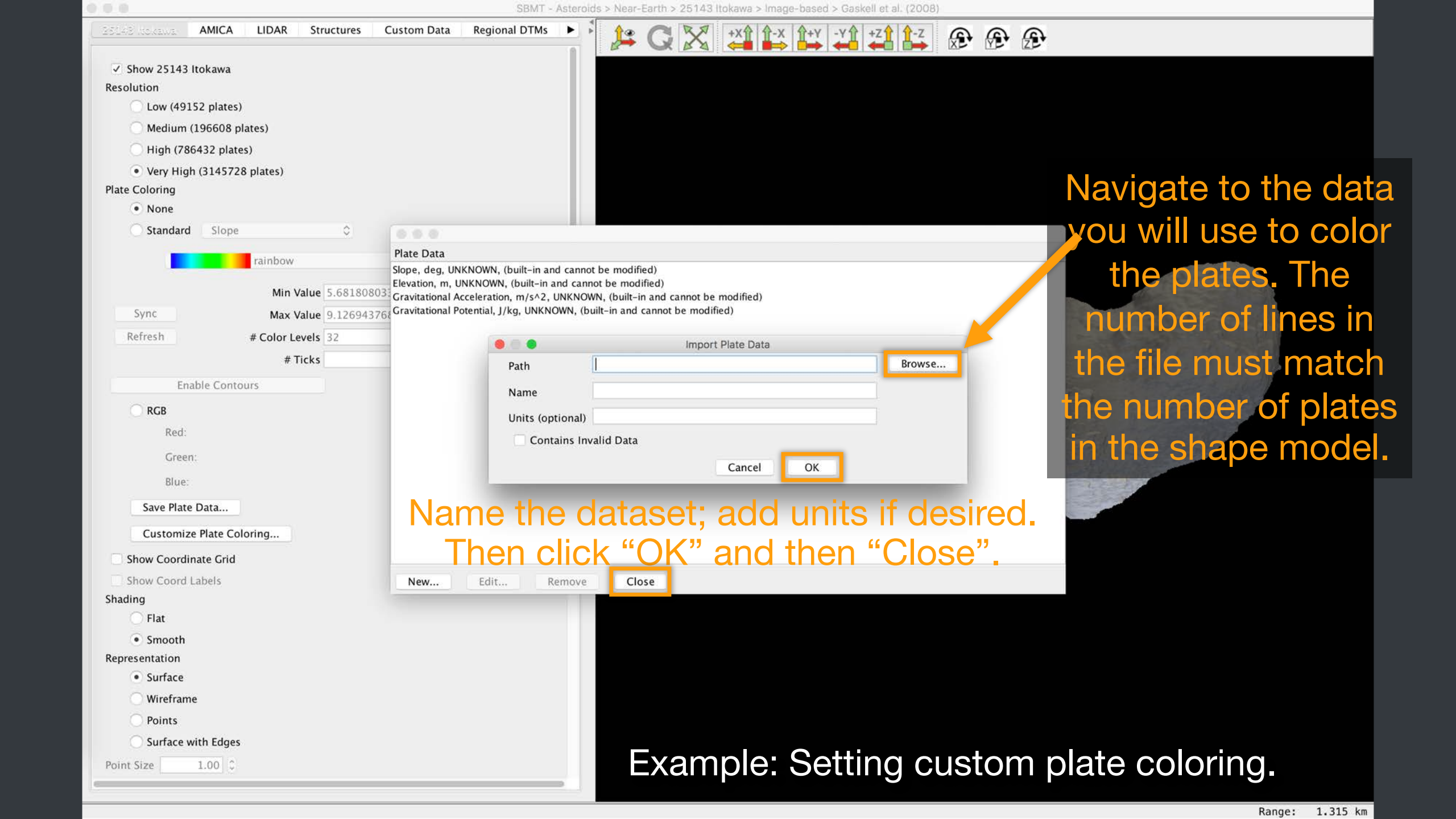
Plate Coloring
None
Standard
Slope
rainbow
Min Value
Max Value
Sync
Refresh
Color Levels
32
Ticks
Enable Contours
RGB
Red:
Green:
Blue:
Save Plate Data...
Customize Plate Coloring...
Show Coordinate Grid
Show Coord Labels
Shading
Flat
Smooth
Representation
Surface
Wireframe
Points
Surface with Edges
Point Size
1.00
+X
-X
+Y
-Y
+Z
-Z
Plate Data
Slope, deg, UNKNOWN, (built-in and cannot be modified)
Elevation, m, UNKNOWN, (built-in and cannot be modified)
Gravitational Acceleration, m/s^2, UNKNOWN, (built-in and cannot be modified)
Gravitational Potential, J/kg, UNKNOWN, (built-in and cannot be modified)
New...
Edit...
Remove
Close
Clicking “Customize Plate Coloring” opens this dialog, which lists all of the available plate data.
Click “New” to add another dataset
Example: Setting custom plate coloring.
Range: 1.315 km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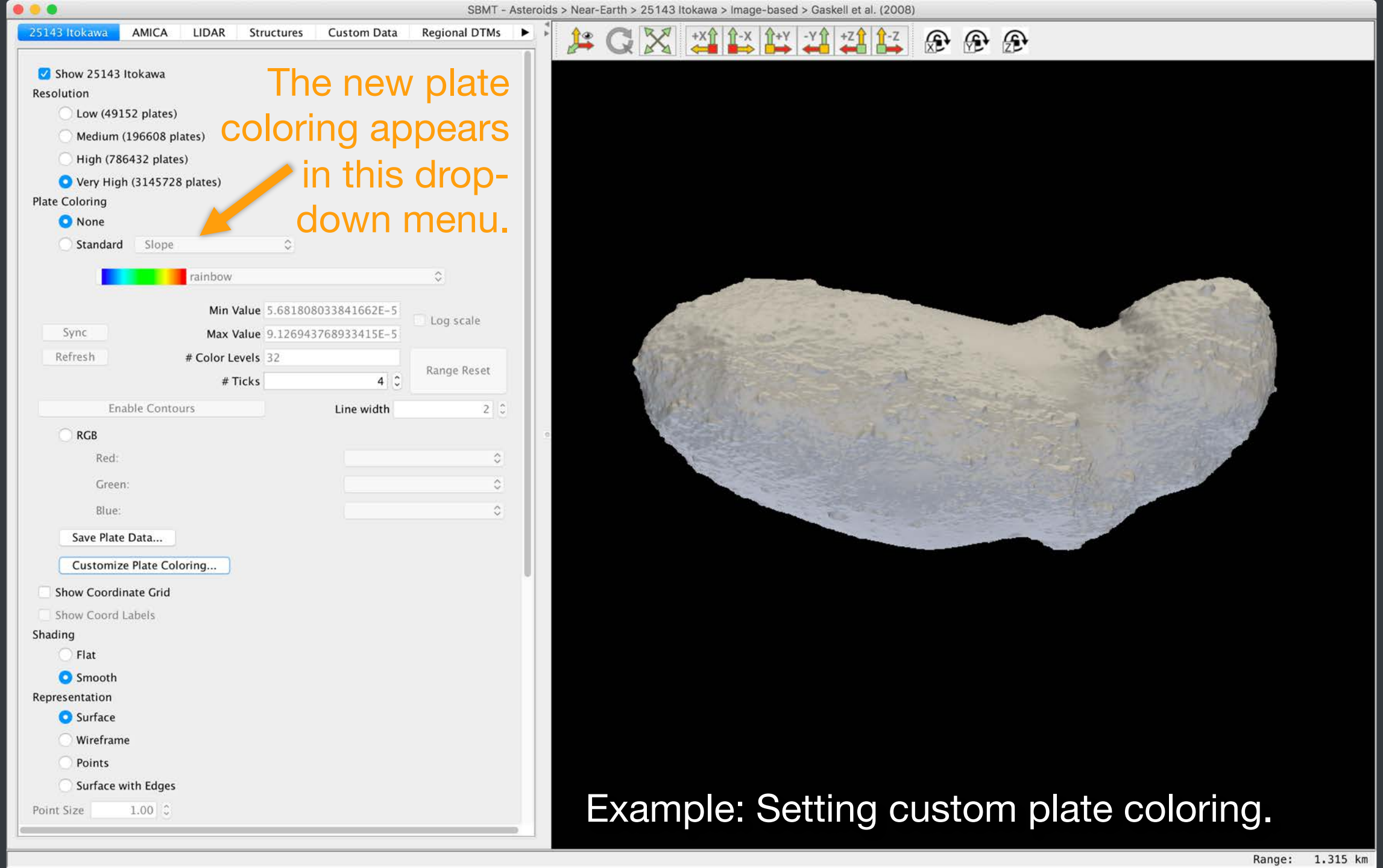
Standard
Slope
rainbow
Min Value
Max Value
Sync
Refresh
Color Levels
Ticks
Enable Contours
RGB
Red:
Green:
Blue:
Save Plate Data...
Customize Plate Coloring...
Show Coordinate Grid
Show Coord Labels
Shading
Flat
Smooth
Representation
Surface
Wireframe
Points
Surface with Edges
Point Size
1.00
Plate Data
Slope, deg, UNKNOWN, (built-in and cannot be modified)
Elevation, m, UNKNOWN, (built-in and cannot be modified)
Gravitational Acceleration, m/s^2, UNKNOWN, (built-in and cannot be modified)
Gravitational Potential, J/kg, UNKNOWN, (built-in and cannot be modified)
Import Plate Data
Path
Browse...
Name
Units (optional)
Contains Invalid Data
Cancel
OK
New...
Edit...
Remove
Close
Navigate to the data you will use to color the plates. The number of lines in the file must match the number of plates in the shape model.
Name the dataset; add units if desired. Then click “OK” and then “Close”.
Example: Setting custom plate coloring.
Range: 1.315 km

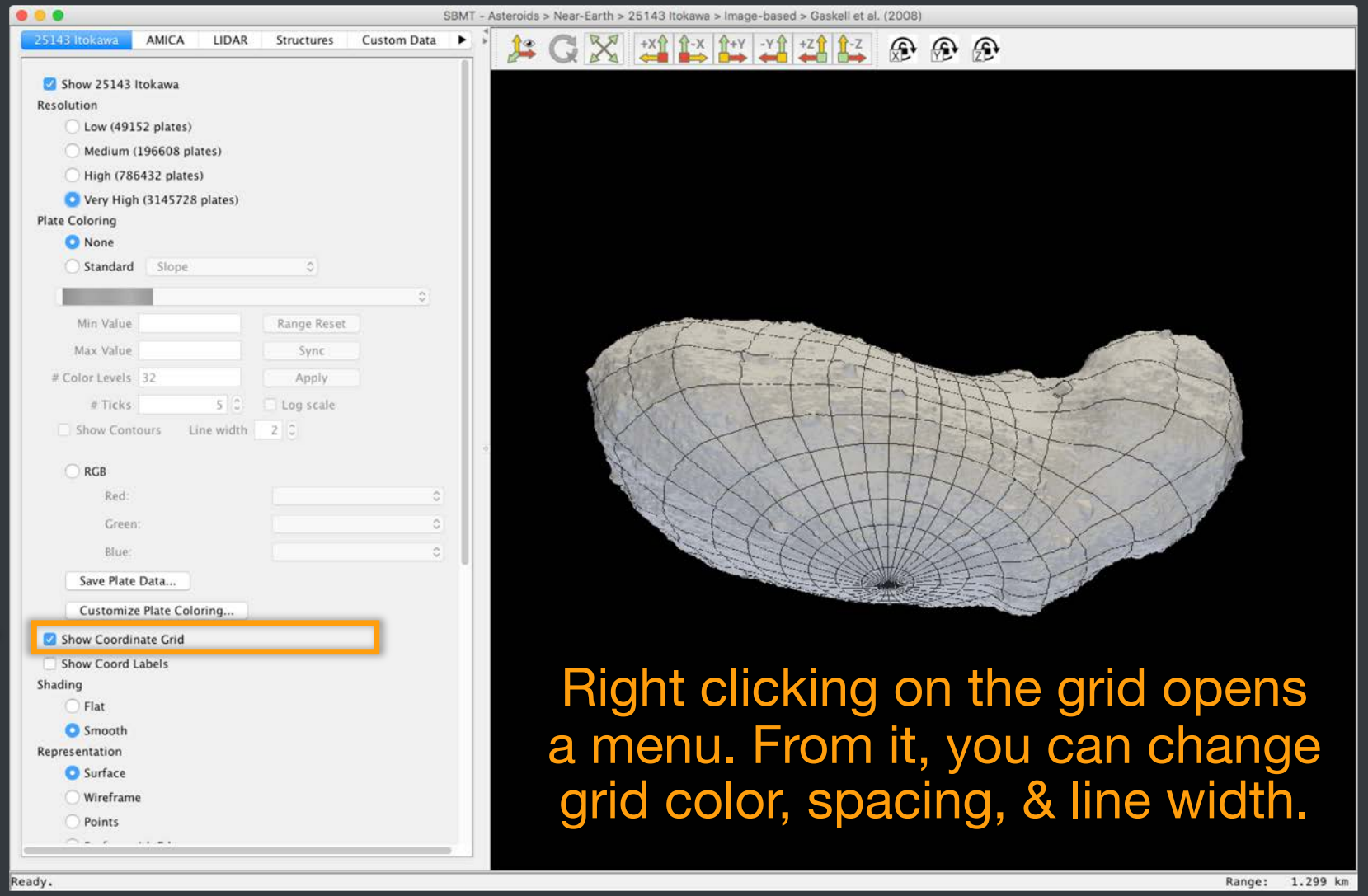


The new plate coloring appears in this drop-down menu.

Example: Setting custom plate coloring.

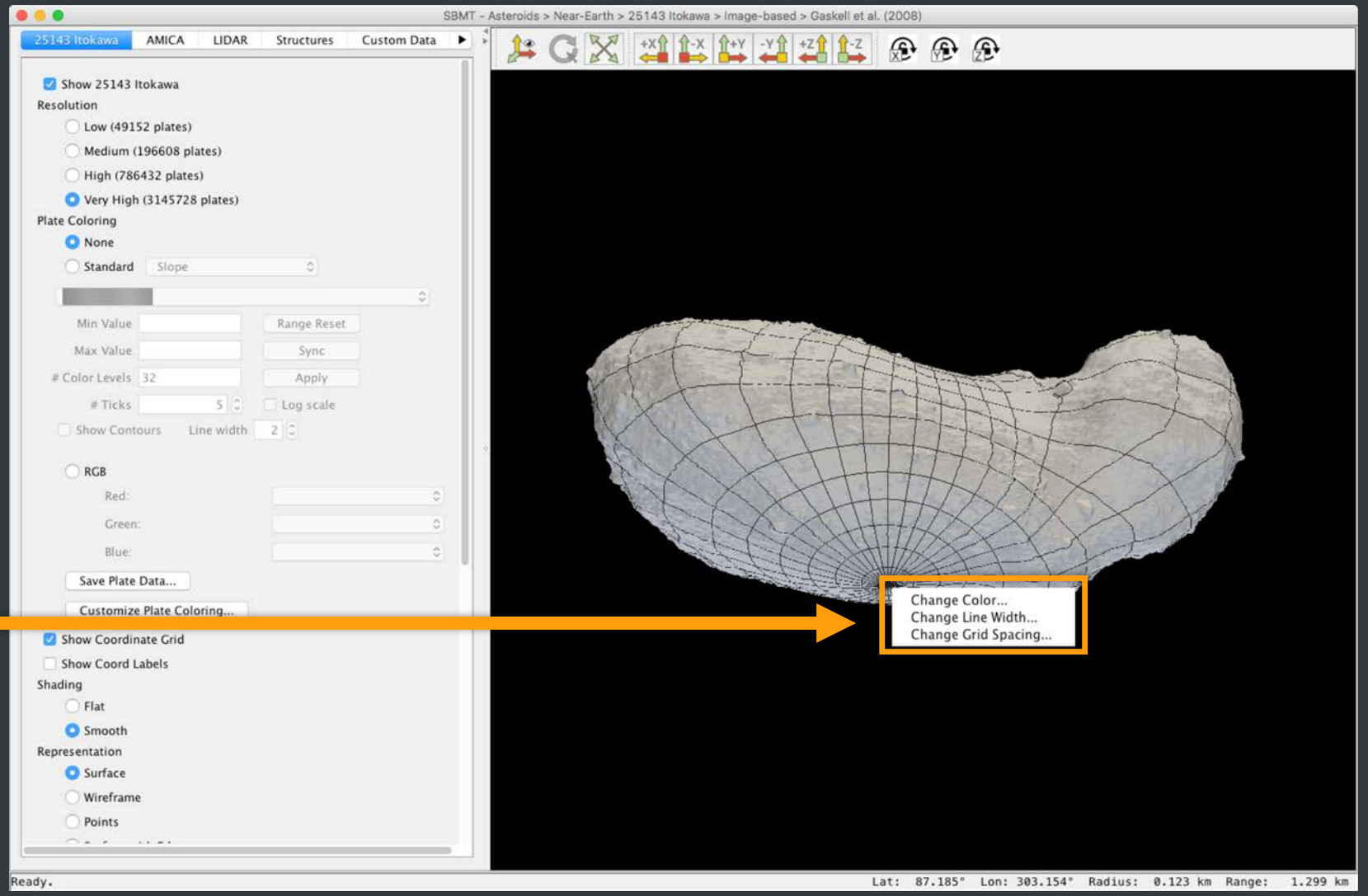
Show or hide coordinate grid

Click the button to toggle the grid on and off



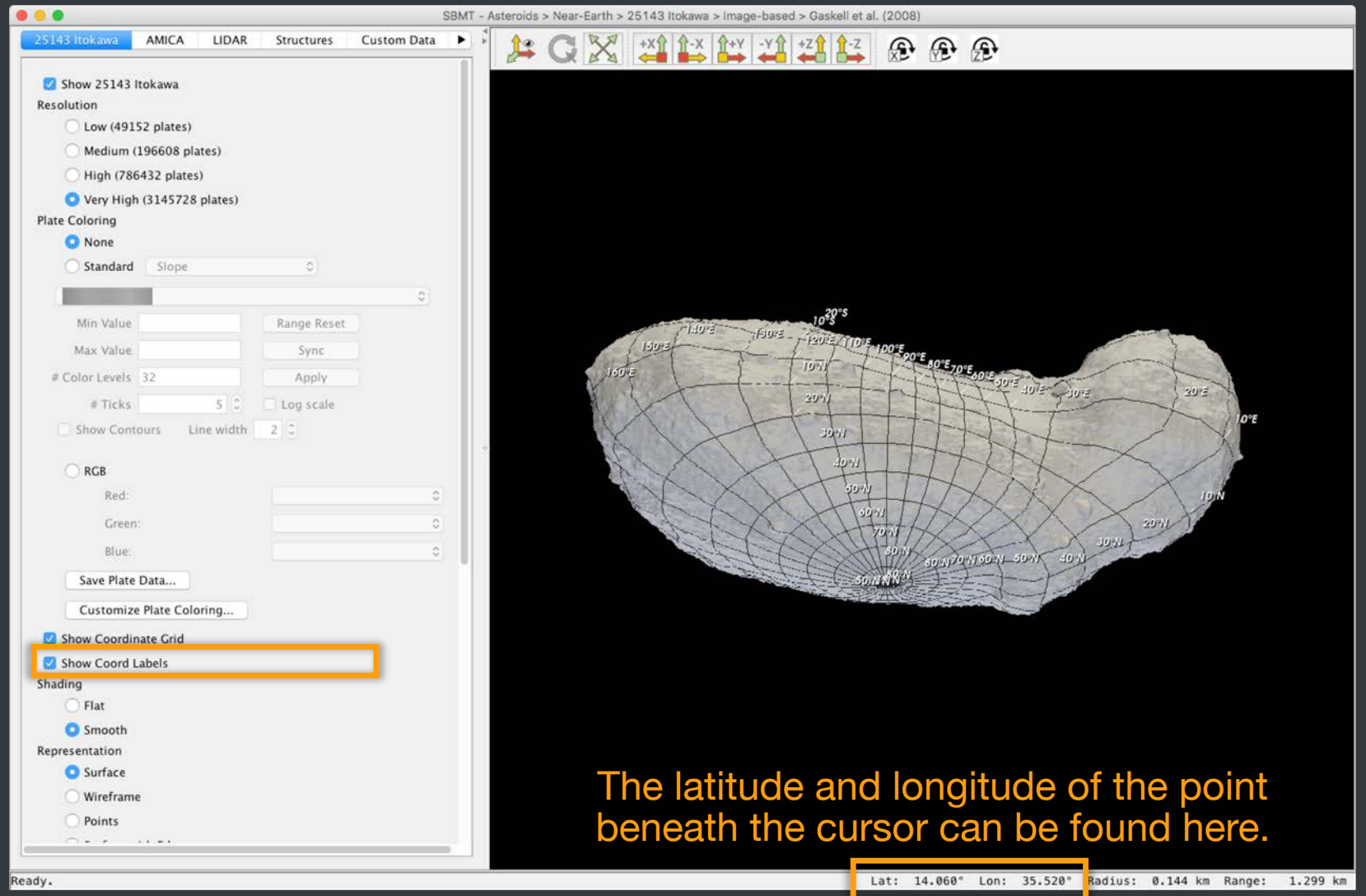
Show or hide coordinate grid

Right clicking on the grid opens a menu where you can change grid color, spacing, & line width.



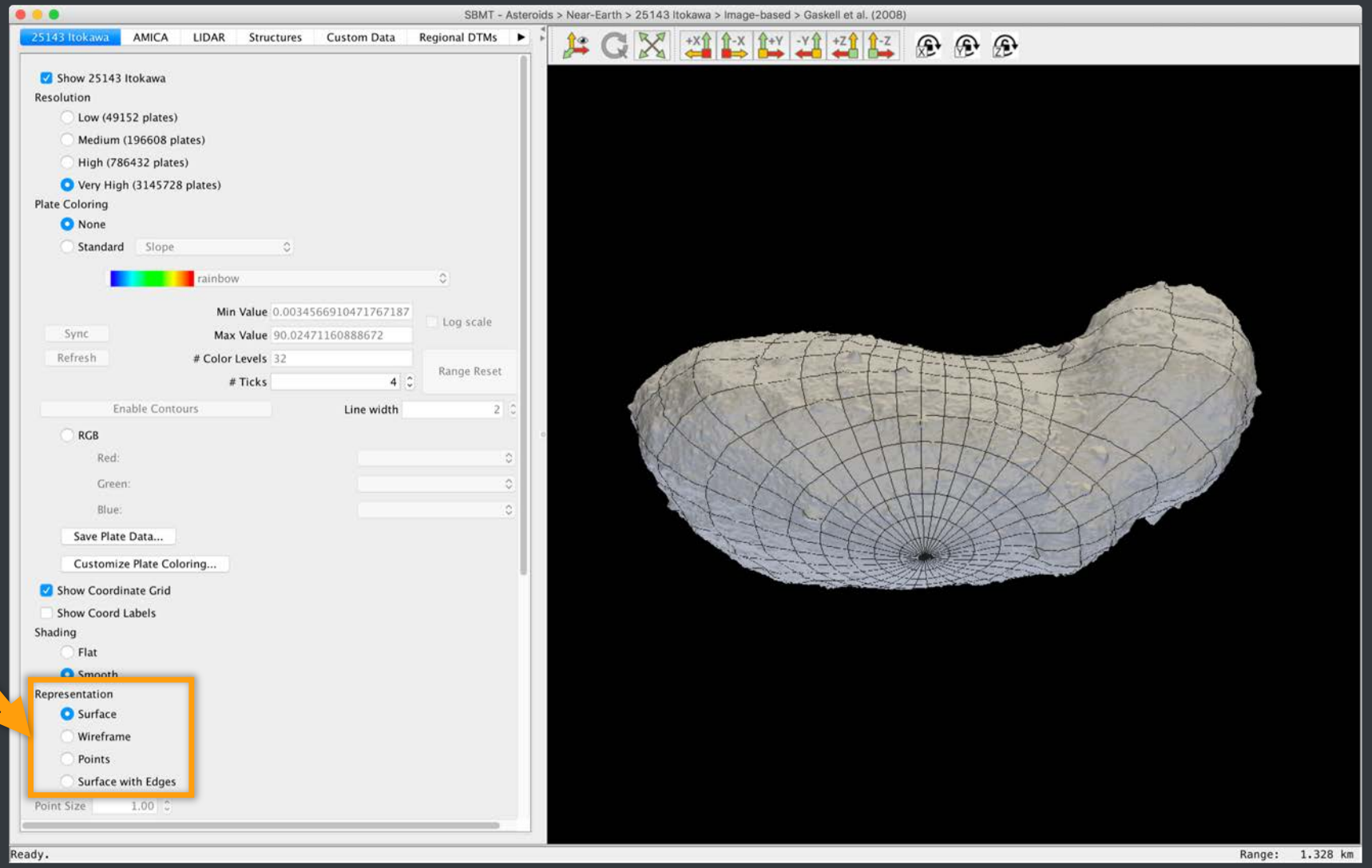
Show or hide coordinate labels

Click to toggle the coordinate labels

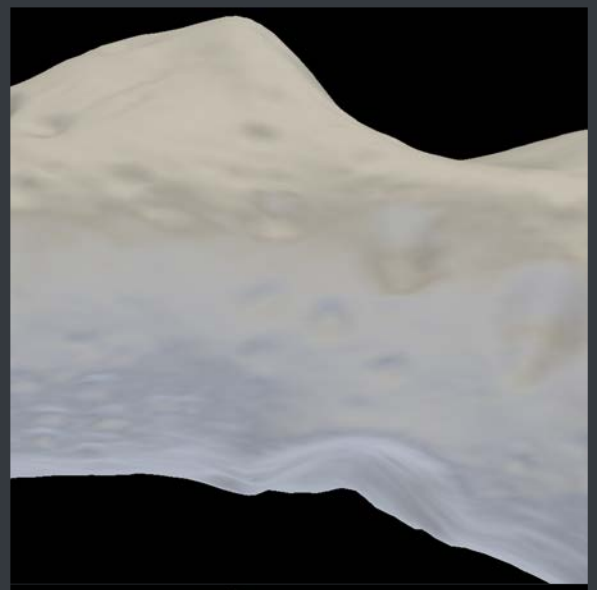


Change surface representation

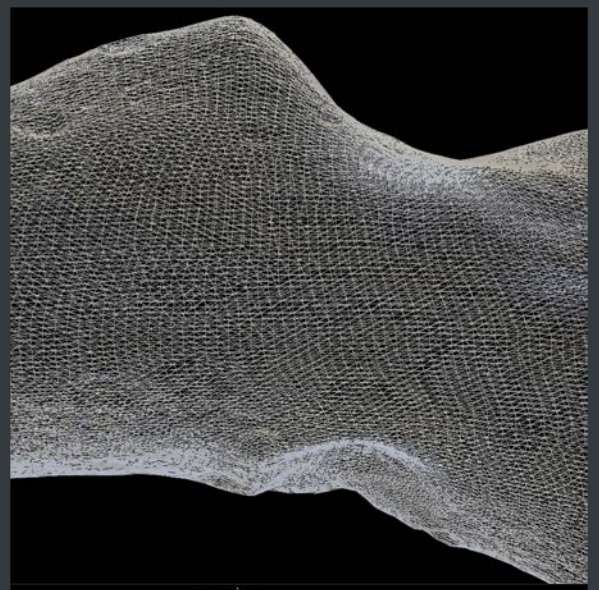
Use buttons to select your preferred representation



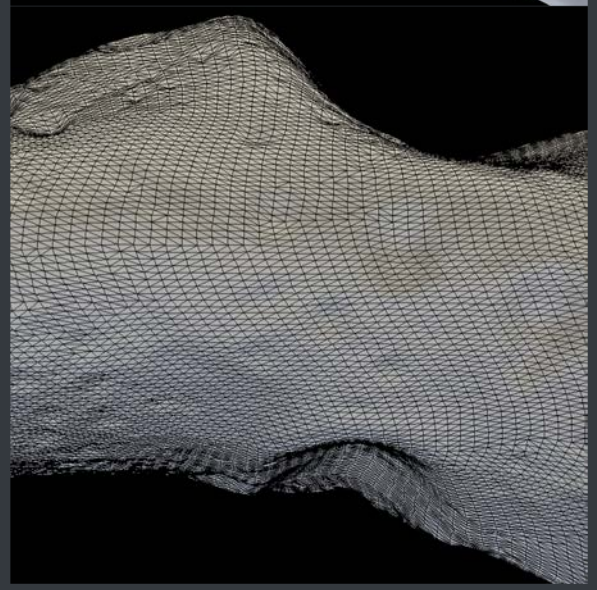
Surface



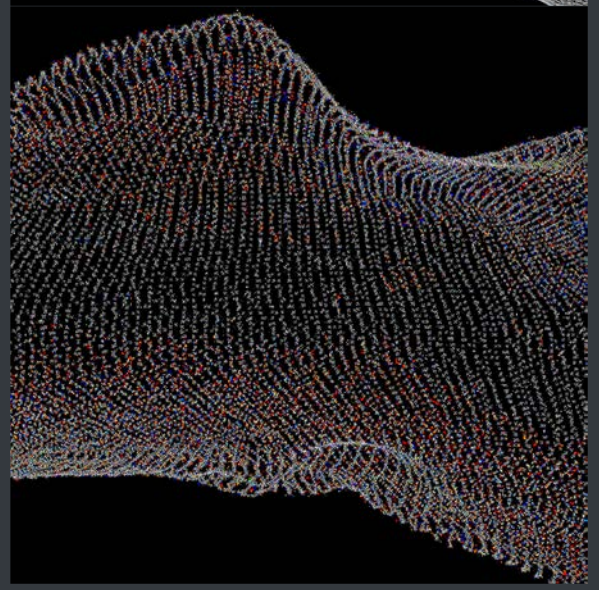
Wireframe



Surface with Edges



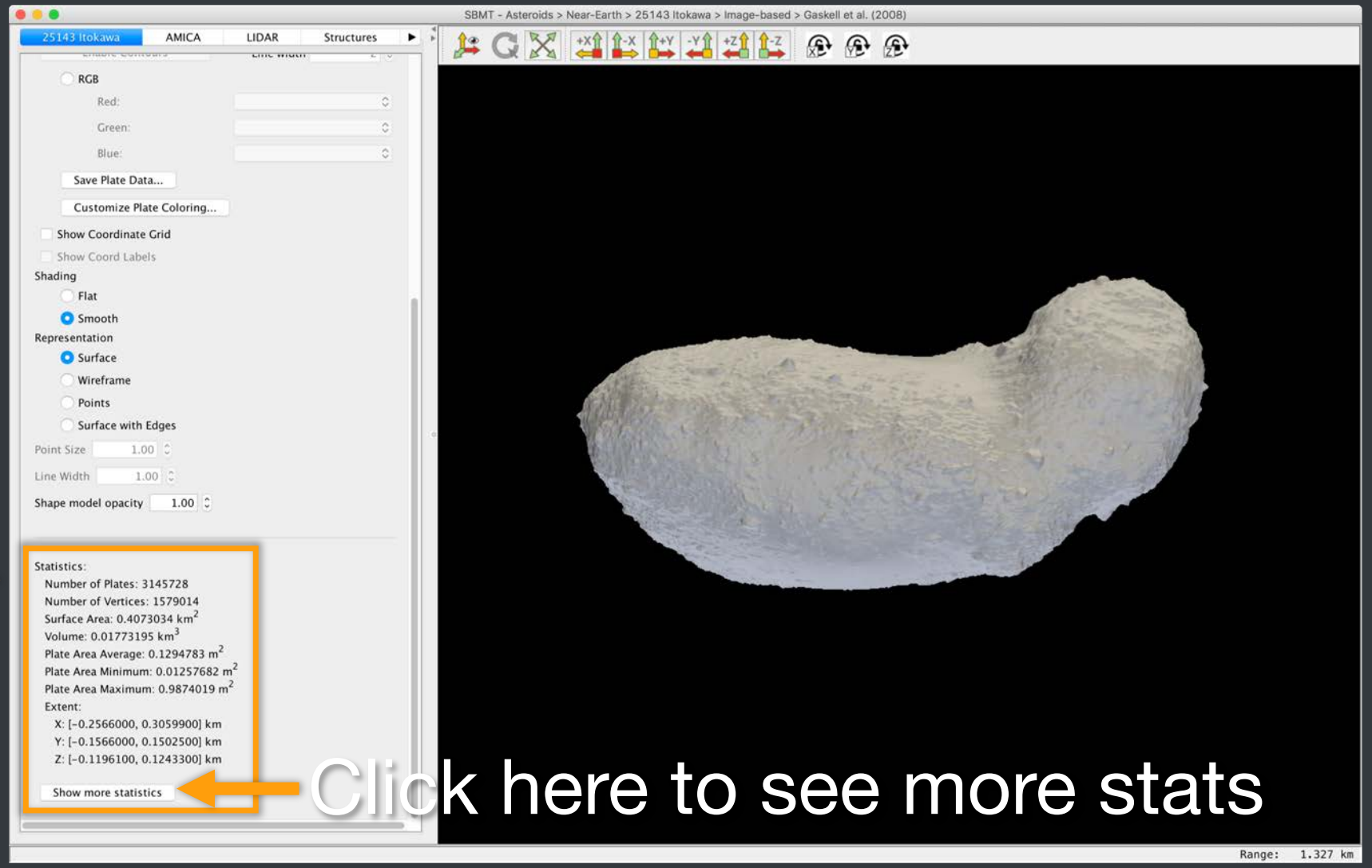
Points



Example: Identical regions of a shape model displayed by the four different representations.

See shape model statistics

Scroll to bottom of control panel



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Points

Surface with Edges

Point Size 1.00

Line Width 1.00

Shape model opacity 1.00

Statistics:
Number of Plates: 3145728
Number of Vertices: 1579014
Surface Area: 0.4073034 km^2
Volume: 0.01773195 km^3
Plate Area Average: 0.1294783 m^2
Plate Area Minimum: 0.01257682 m^2
Plate Area Maximum: 0.9874019 m^2
Extent:
X: [-0.2566000, 0.3059900] km
Y: [-0.1566000, 0.1502500] km
Z: [-0.1196100, 0.1243300] km

Number of Edges: 4718592
Reference Potential: -0.014684684411415587 J/kg
Plate Area Standard Deviation: 0.05370479 m^2
Edge Length Average: 0.5972759 m
Edge Length Minimum: 0.1315280 m
Edge Length Maximum: 2.263674 m
Edge Length Standard Deviation: 0.1924139 m
Is Surface Closed? Yes
Centroid:
[7.041067e-05, -1.385976e-05, -4.549023e-05] km
Moment of Inertia Tensor Relative to Origin:
[0.0001125640, 1.296387e-05, -7.127515e-07]
[1.296387e-05, 0.0003764662, -2.820284e-07]
[-7.127515e-07, -2.820284e-07, 0.0003962564]
Moment of Inertia Tensor Relative to Centroid:
[0.0001125640, 1.296385e-05, -7.128083e-07]
[1.296385e-05, 0.0003764660, -2.820172e-07]
[-7.128083e-07, -2.820172e-07, 0.0003962563]

It's normal for the SBMT to be unresponsive for 30 – 60 seconds after clicking "Show more statistics" for very high resolution shape models.

Example: The view after clicking "Show more statistics".

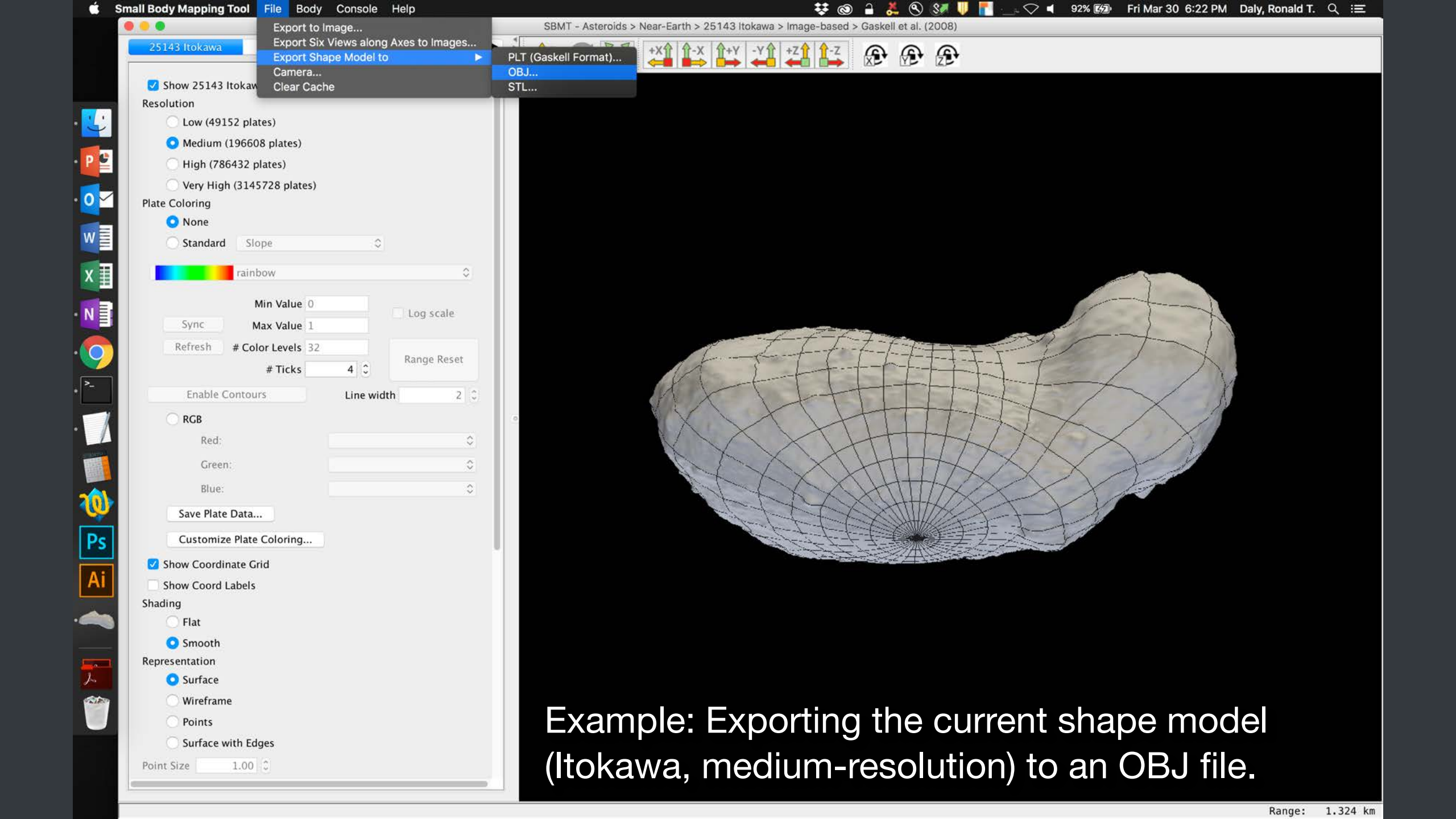
Range: 1.327 km

This SBMT tutorial explains how to:

- Select a shape model
- Manipulate shape models in the rendering panel
- Work with shape models using the control panel
- Export a shape model

Exporting a shape model

- In the menu bar, click “File”, then “Export shape model to”.
- Select the file format of your choice (PLT, OBJ, STL).
- Give the file a name.
- Click “Save”.


Small Body Mapping Tool
File
Body
Console
Help
Export to Image...
Export Six Views along Axes to Images...
Export Shape Model to
Camera...
Clear Cache
PLT (Gaskell Format)...
OBJ...
STL...
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Very High (3145728 plates)
Plate Coloring
None
Standard
Slope
rainbow
Min Value 0
Max Value 1
Color Levels 32
Ticks 4
Log scale
Sync
Refresh
Range Reset
Enable Contours
Line width 2
RGB
Red:
Green:
Blue:
Save Plate Data...
Customize Plate Coloring...
Show Coordinate Grid
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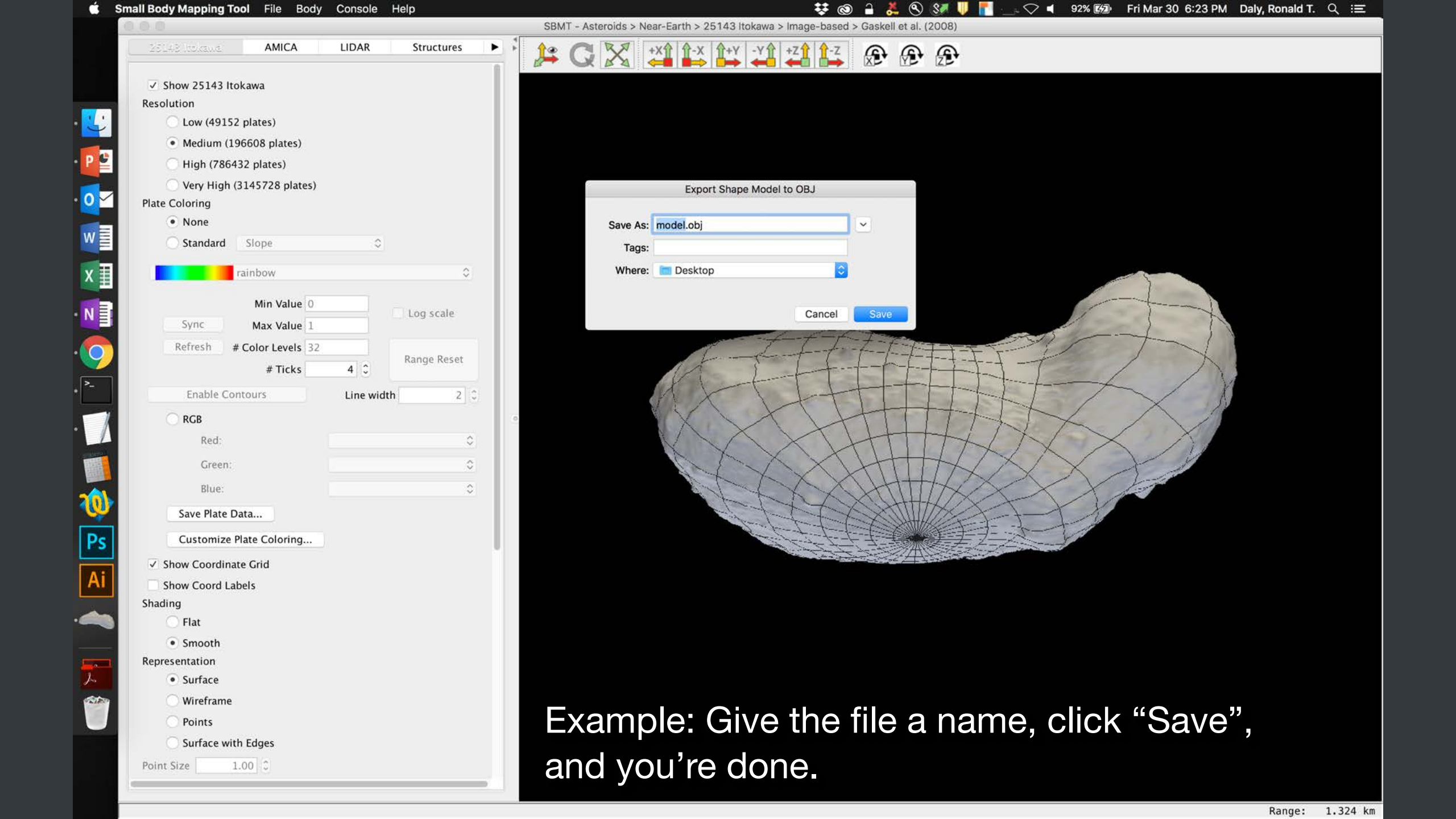
Points
Surface with Edges
Point Size 1.00
Range: 1.324 km
Example: Exporting the current shape model (Itokawa, medium-resolution) to an OBJ file.


Small Body Mapping Tool File Body Console Help
92% Fri Mar 30 6:23 PM Daly, Ronald T.
SBMT - Asteroids > Near-Earth > 25143 Itokawa > Image-based > Gaskell et al. (2008)
25143 Itokawa AMICA LIDAR Structures
Show 25143 Itokawa
Resolution
Low (49152 plates)
Medium (196608 plates)
High (786432 plates)
Very High (3145728 plates)
Plate Coloring
None
Standard
Slope
rainbow
Min Value 0
Max Value 1
Color Levels 32
Ticks 4
Log scale
Sync
Refresh
Range Reset
Enable Contours
Line width 2
RGB
Red:
Green:
Blue:
Save Plate Data...
Customize Plate Coloring...
Show Coordinate Grid
Show Coord Labels
Shading
Flat
Smooth
Representation
Surface
Wireframe
Points
Surface with Edges
Point Size 1.00
+X -X +Y -Y +Z -Z
Export Shape Model to OBJ
Save As: model.obj
Tags:
Where: Desktop
Cancel
Save
Example: Give the file a name, click “Save”, and you’re done.
Range: 1.324 km

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For more information, visit sbmt.jhuapl.edu.

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