
Color Palette Tips

EnSight 9.1

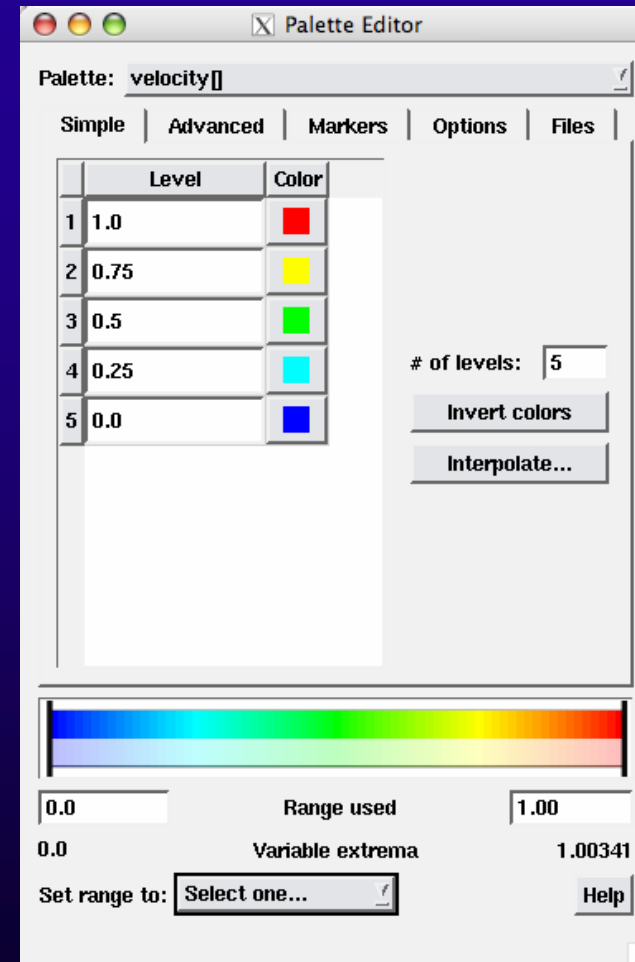
Computational Engineering International

Agenda

- Default Palette
- Editing the default palette
- Matching the color to the data
- Smoothed vs. per-element
- Adding more levels
- Seeing the Gradient
- Color blindness
- EnSight Included Palettes
- Palette transparency

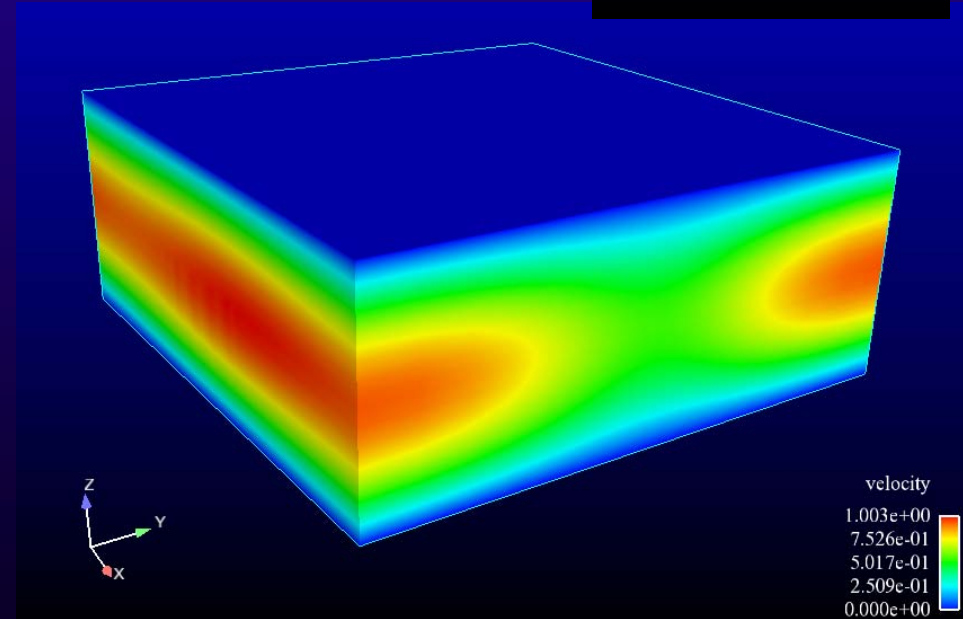
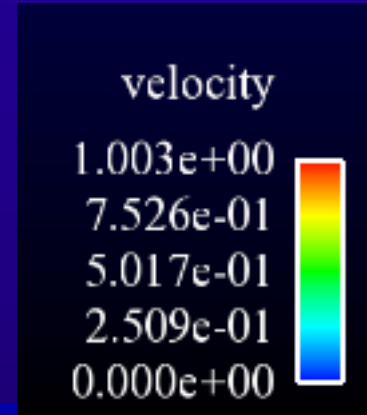
EnSight Default Palette

- Five levels
- Blue low
- Red high
- Advantage: Simple, clean
- Disadvantage: all colors are interesting.



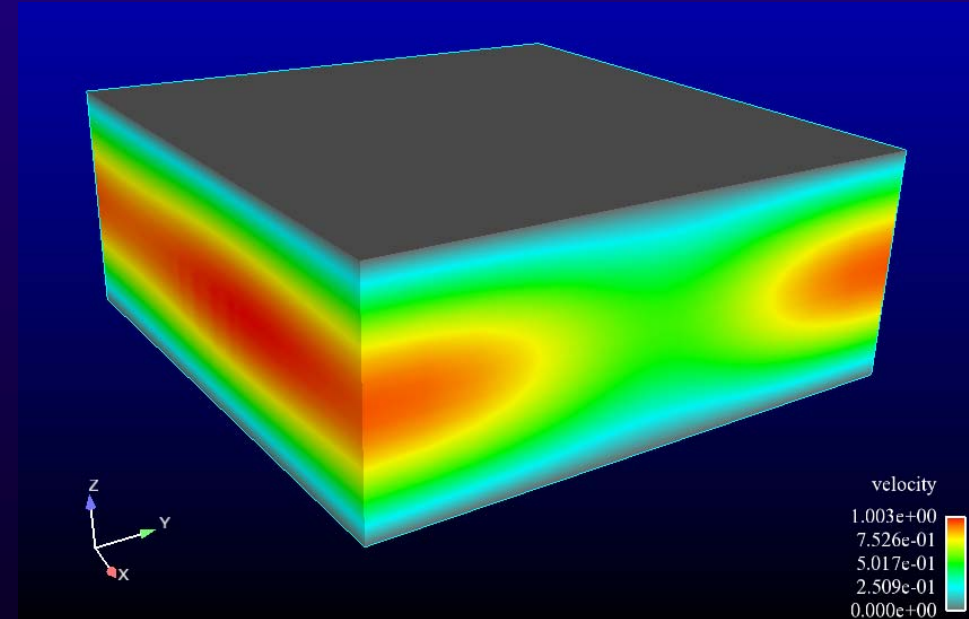
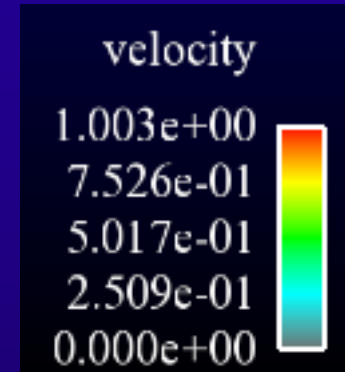
Why don't you want all colors interesting?

- The human eye is attracted to vibrant colors
- The default palette consists of 5 vibrant, saturated colors
- Zero should be uninteresting



Notice how the low value zero is now uninteresting

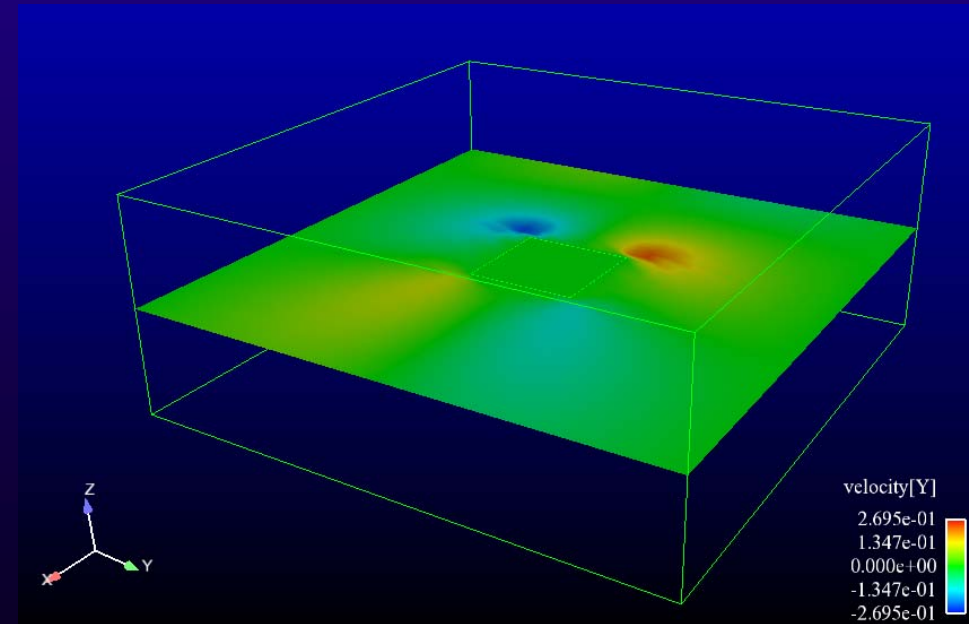
- Take advantage of the human eye
- Communicate more quickly and effectively



Zero between two extrema





- Saturated Green is too interesting
- Gray it out!

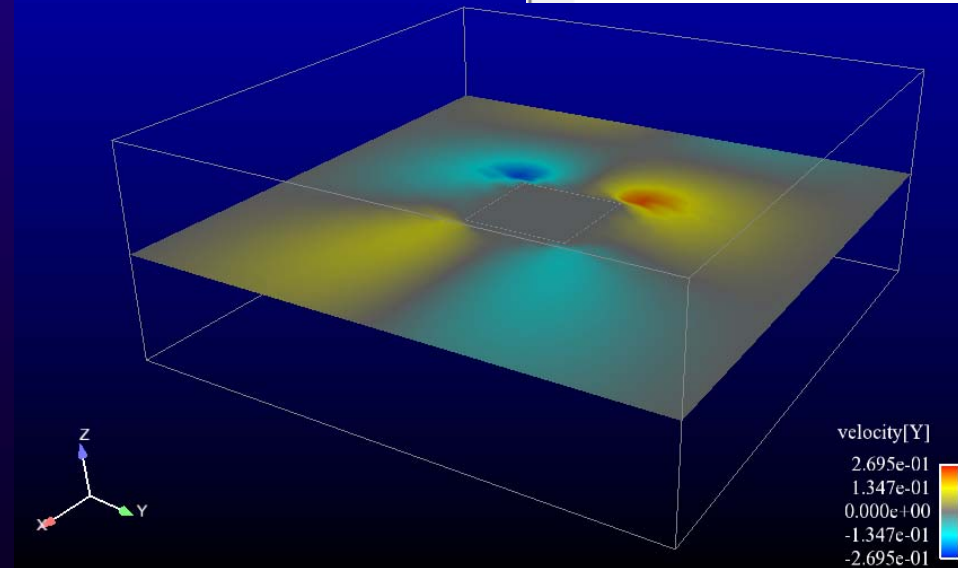
velocity[Y]
2.695e-01
1.347e-01
0.000e+00
-1.347e-01
-2.695e-01



Gray Zero highlights the extrema

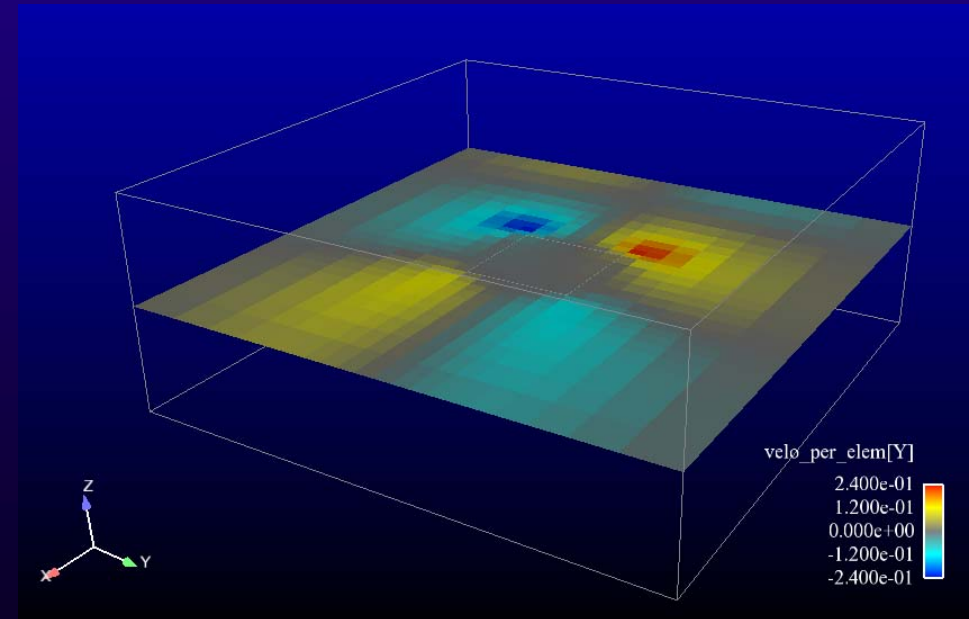
- Don't make your observer work hard to understand
- Make Important values have **Important** colors!

	Level	Color
1	0.269500	
2	0.134750	
3	0.0	
4	-0.134750	
5	-0.269500	



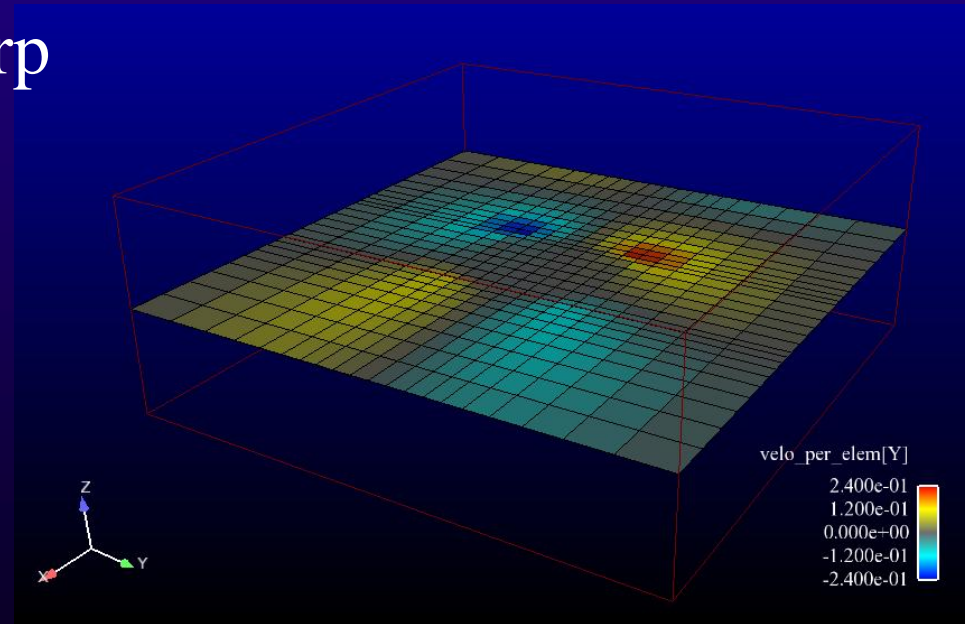
Why do my Per-Element variables look 'chunky'

- Per element values: one color for one element
- No interpolation



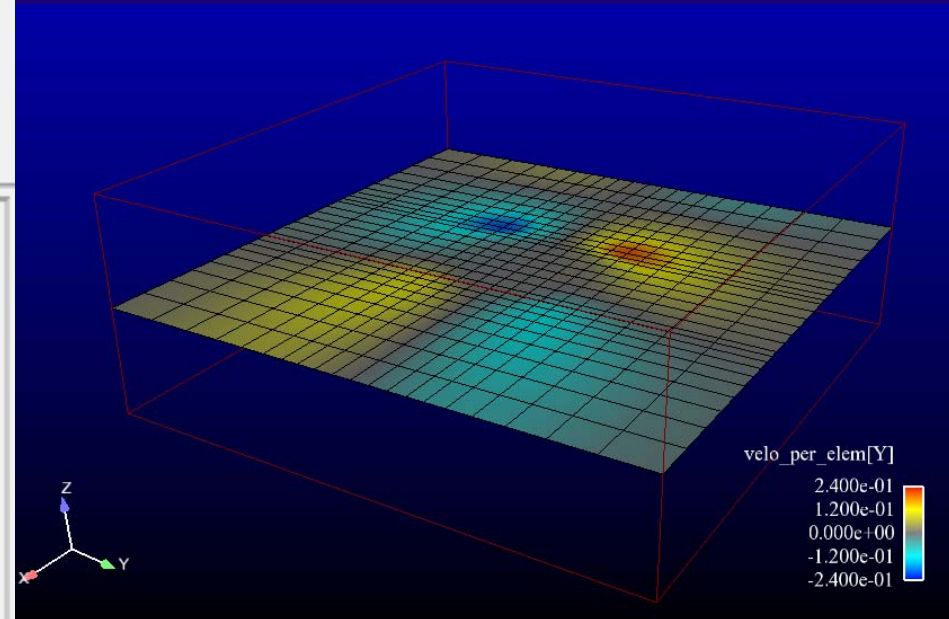
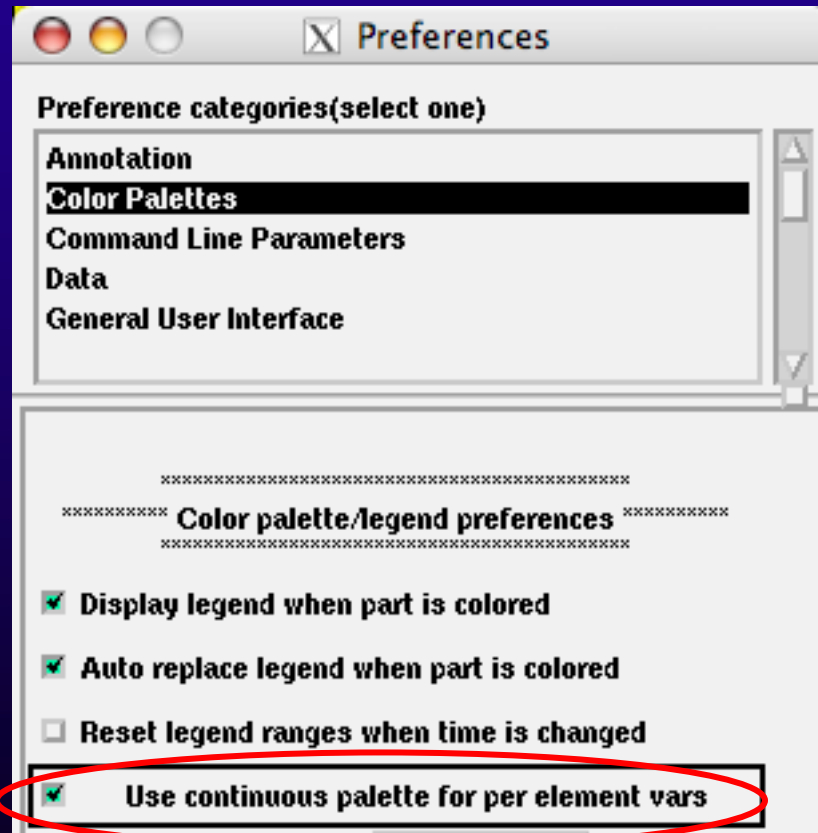
Look at the coloring on each element

- See that each element has one color
- No blending between elements
- Coarse mesh with sharp gradient is 'chunky'



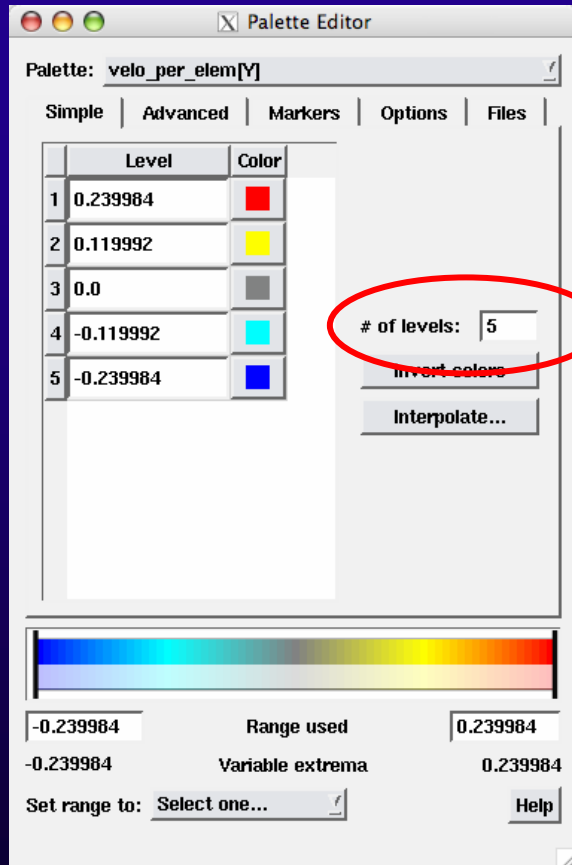
EnSight can interpolate per element variables, smoothing the coloration

- Edit>Preferences Color Palettes



When should I add more levels?

- The default is 5
- The max is 21
- When is more better?



Palette: velo_per_elem[Y]


Simple | Advanced | Markers | Options | Files

Level	Color
1 0.239984	Red
2 0.119992	Yellow
3 0.0	Grey
4 -0.119992	Cyan
5 -0.239984	Blue

of levels: 5

Invert colors

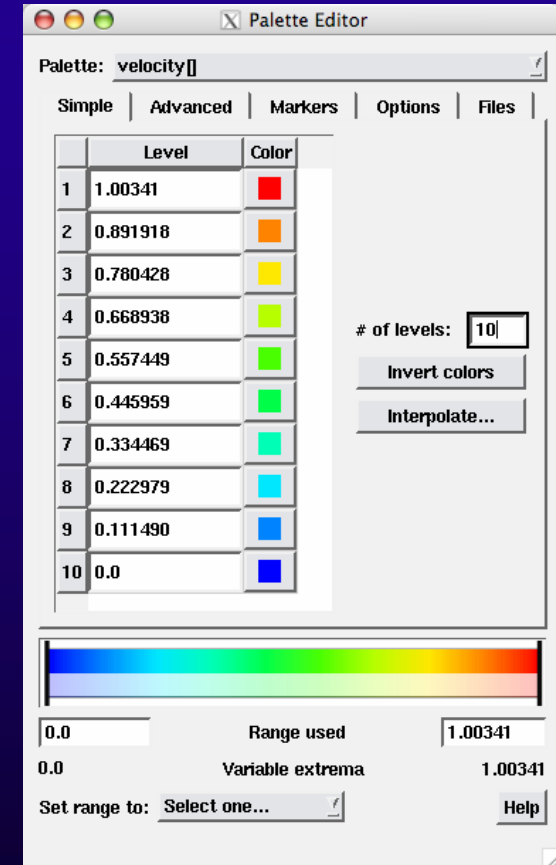
Interpolate...



-0.239984 Range used 0.239984

-0.239984 Variable extrema 0.239984

Set range to: Select one... Help



Palette: velocity[]


Simple | Advanced | Markers | Options | Files

Level	Color
1 1.00341	Red
2 0.891918	Orange
3 0.780428	Yellow
4 0.668938	Light Green
5 0.557449	Green
6 0.445959	Dark Green
7 0.334469	Cyan
8 0.222979	Light Blue
9 0.111490	Blue
10 0.0	Dark Blue

of levels: 10

Invert colors

Interpolate...



0.0 Range used 1.00341

0.0 Variable extrema 1.00341

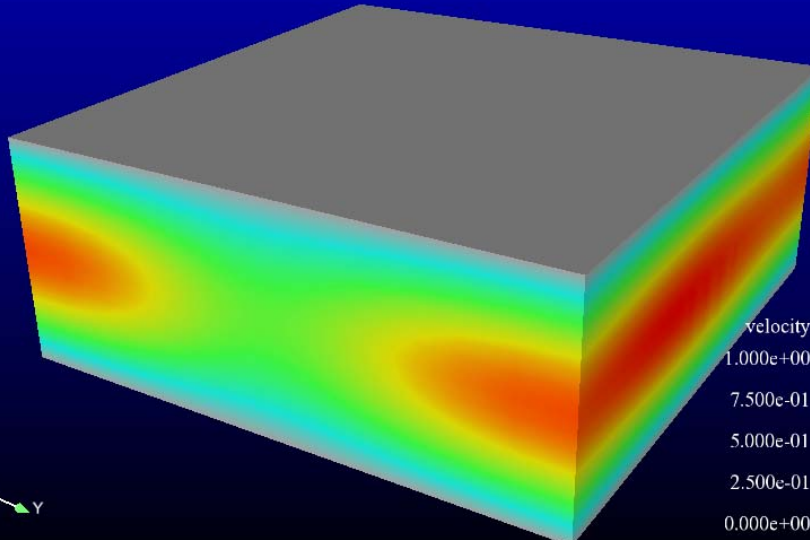
Set range to: Select one... Help

Are more levels 'better'?

Palette: velocity[]

Simple | Advanced | Ma

	Level	Color
1	1.0	Red
2	0.75	Yellow
3	0.5	Green
4	0.25	Cyan
5	0.0	Grey



velocity

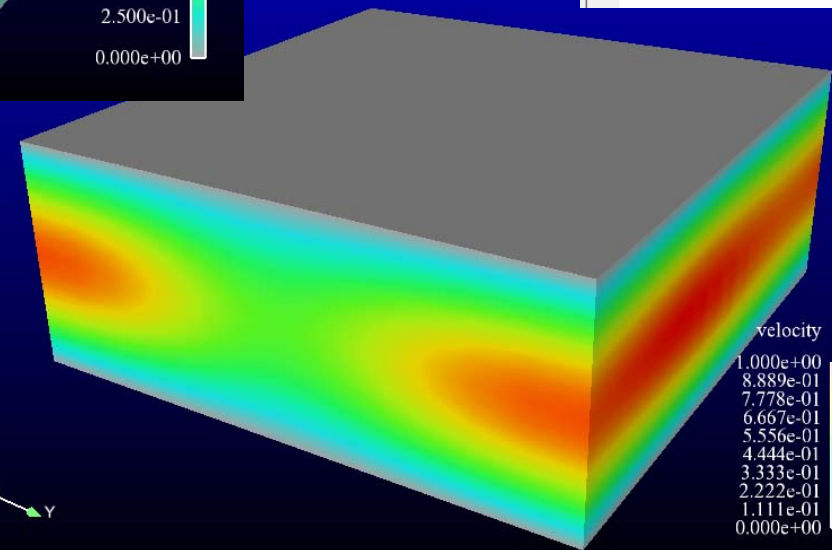
1.000e+00
7.500e-01
5.000e-01
2.500e-01
0.000e+00

Range used: 0.0 to 1.00

Variable extrema: 0.0 to 1.00341

Set range to: Select one... Help

	Level	Color
1	1.0	Red
2	0.888889	Orange
3	0.777778	Yellow
4	0.666667	Light Green
5	0.555556	Green
6	0.444444	Light Green
7	0.333333	Cyan
8	0.222222	Light Cyan
9	0.111111	Light Blue
10	0.0	Grey



velocity

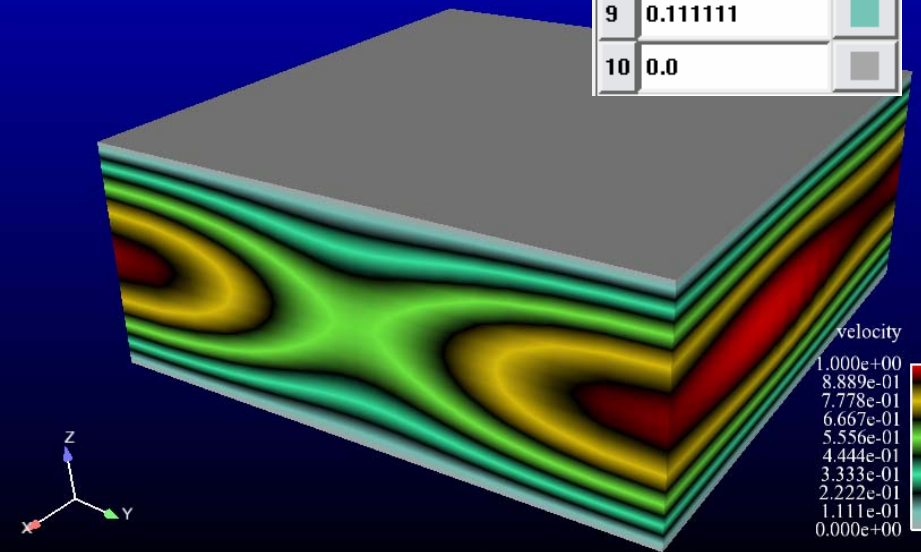
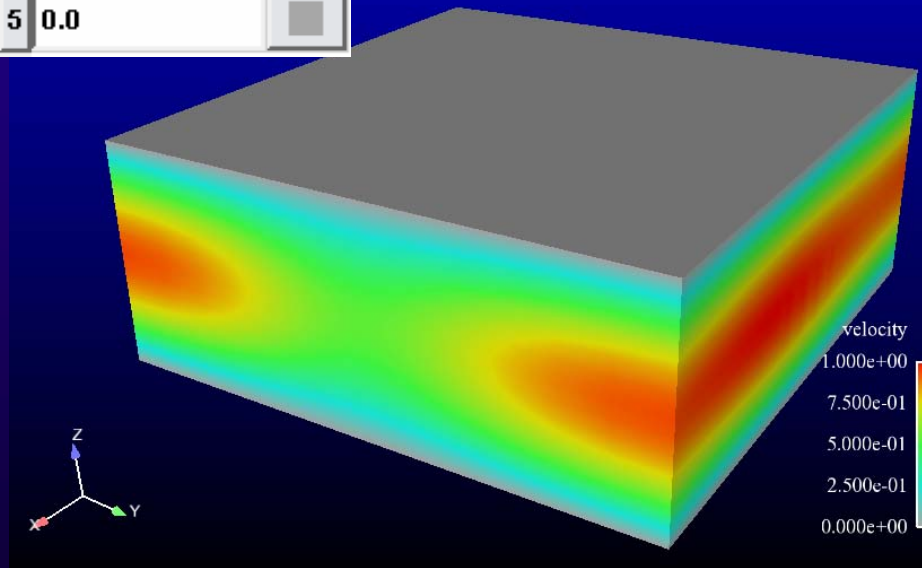
1.000e+00
8.889e-01
7.778e-01
6.667e-01
5.556e-01
4.444e-01
3.333e-01
2.222e-01
1.111e-01
0.000e+00

What if we make every other level black?






	Level	Color
1	1.0	Red
2	0.75	Yellow
3	0.5	Green
4	0.25	Cyan
5	0.0	Grey

- See gradients in a dramatic fashion.







	Level	Color
1	1.0	Red
2	0.888889	Black
3	0.777778	Yellow
4	0.666667	Black
5	0.555556	Green
6	0.444444	Black
7	0.333333	Cyan
8	0.222222	Black
9	0.111111	Light Cyan
10	0.0	Grey

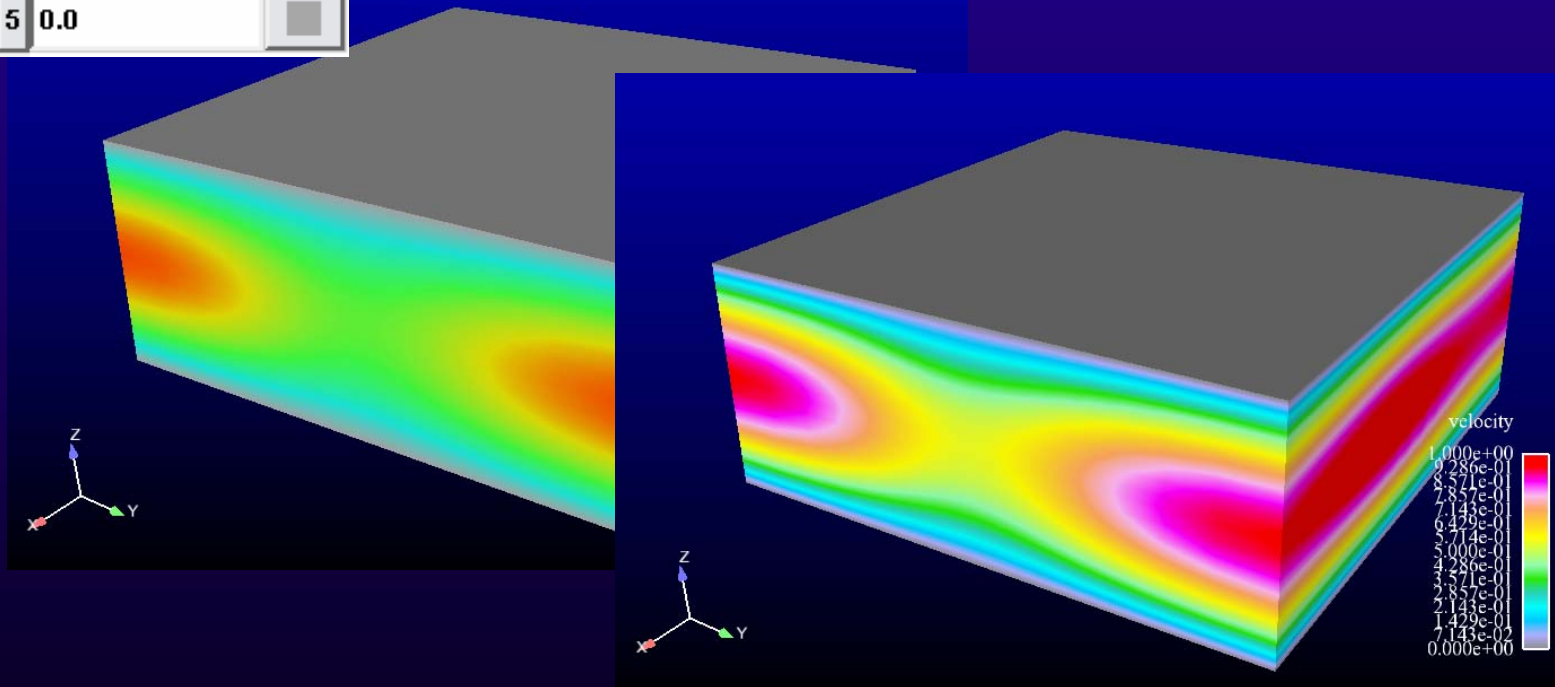


Light/Dark banded colors are more subtle

	Level	Color
1	1.0	
2	0.75	
3	0.5	
4	0.25	
5	0.0	

- every other band is light dark of the same color
- Use both sides of your brain!

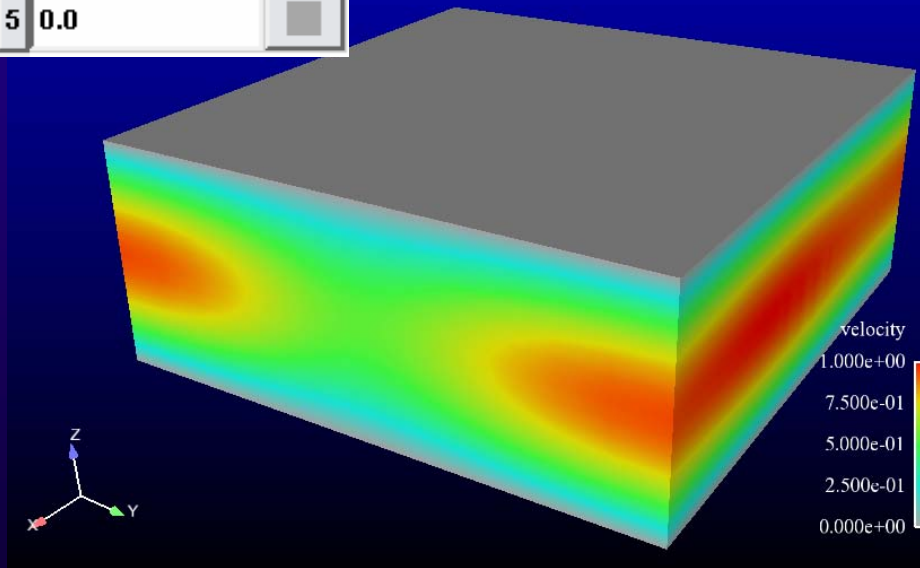
	Level	Color
1	1.0	
2	0.928571	
3	0.857143	
4	0.785714	
5	0.714286	
6	0.642857	
7	0.571429	
8	0.5	
9	0.428571	
10	0.357143	
11	0.285714	
12	0.214286	
13	0.142857	
14	0.0714286	
15	0.0	



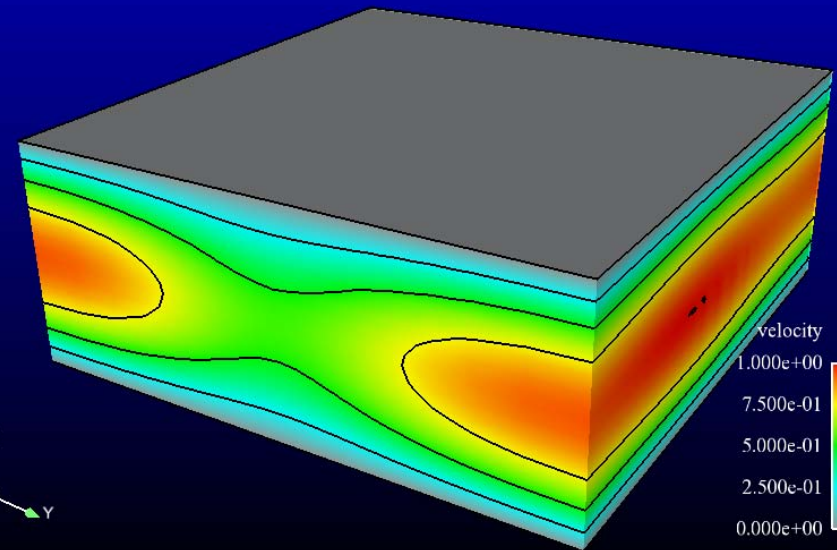
Contours can act as dividers

	Level	Color
1	1.0	Red
2	0.75	Yellow
3	0.5	Green
4	0.25	Cyan
5	0.0	Grey

- Create a contour part colored black to emphasize level boundaries



velocity
1.000e+00
7.500e-01
5.000e-01
2.500e-01
0.000e+00



velocity
1.000e+00
7.500e-01
5.000e-01
2.500e-01
0.000e+00

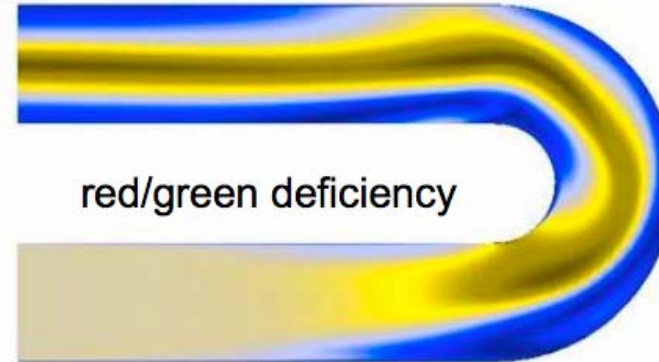
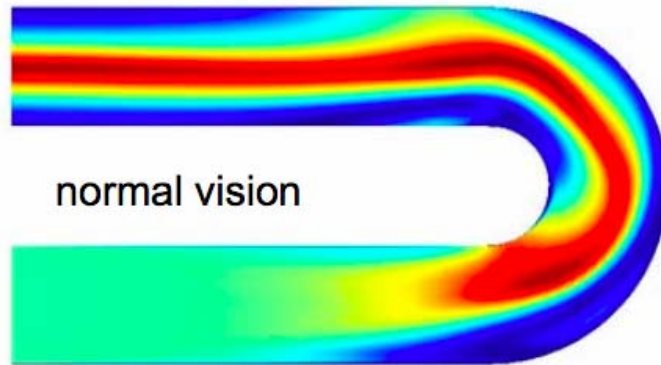
Color Deficiency

- Common in Asians and Caucasians
 - 8% caucasian males
 - 5% asian males
 - EnSightColorDef Pre-defined palette
- Most common forms
 - six types of dyschromatopsia have been identified
 - most are dichromatic, only two of three primary colors seen
 - typically, either red- or green-sensitive pigment is missing
 - actual “color-blind” are only 0.003% of caucasian males

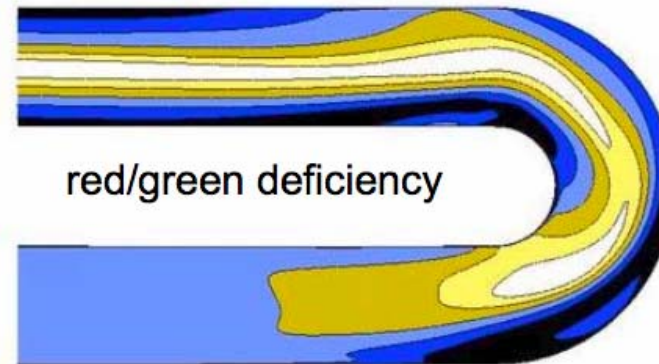
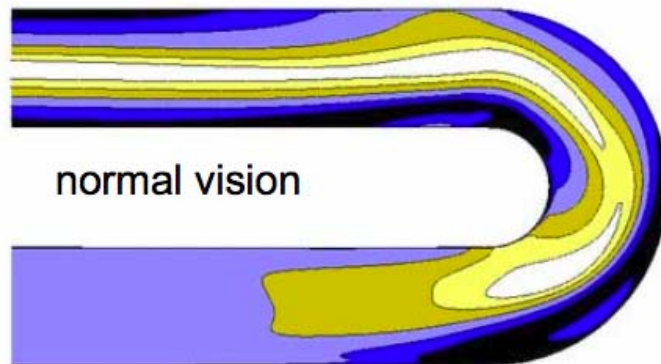
Color blindness

- To help the color deficient
 - Avoid red and green in palettes and in part coloring
 - Use banded colors and black to delineate colors
 - Use one color with brightness to indicate levels
 - Gray scales
 - EnSightColorDef Pre-defined palette
- Check your images
 - VISCHECK website:
 - input your image
 - Output is image with various color deficiencies

Color blindness










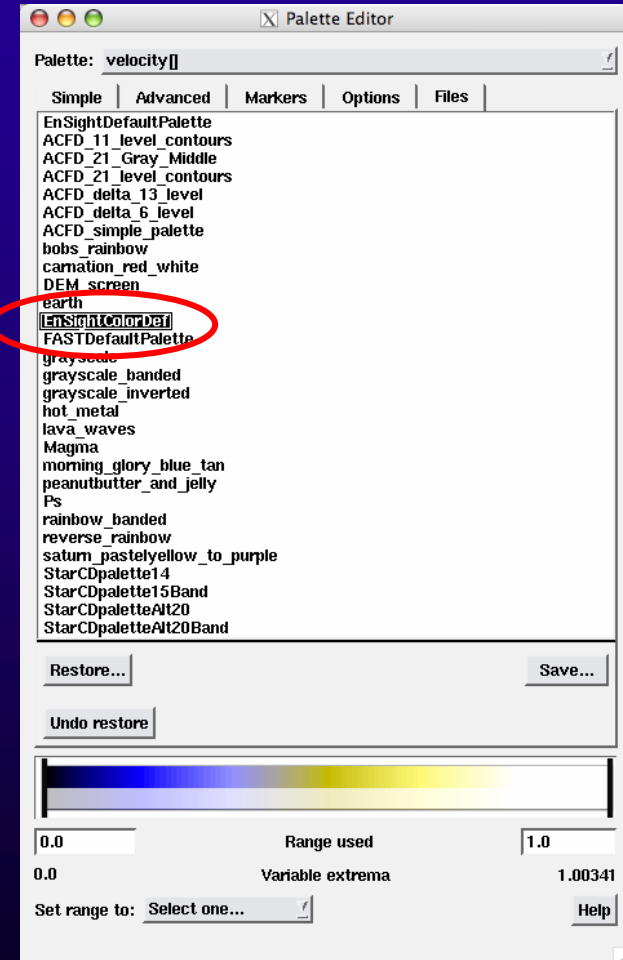
Above: typical rainbow color palette, below: special palette for color red/green deficiency



EnSight includes a Palette for Red/Green Color Deficiency








- Just Load (Restore) and go
- Click on Files Tab
- Choose EnSightColorDef

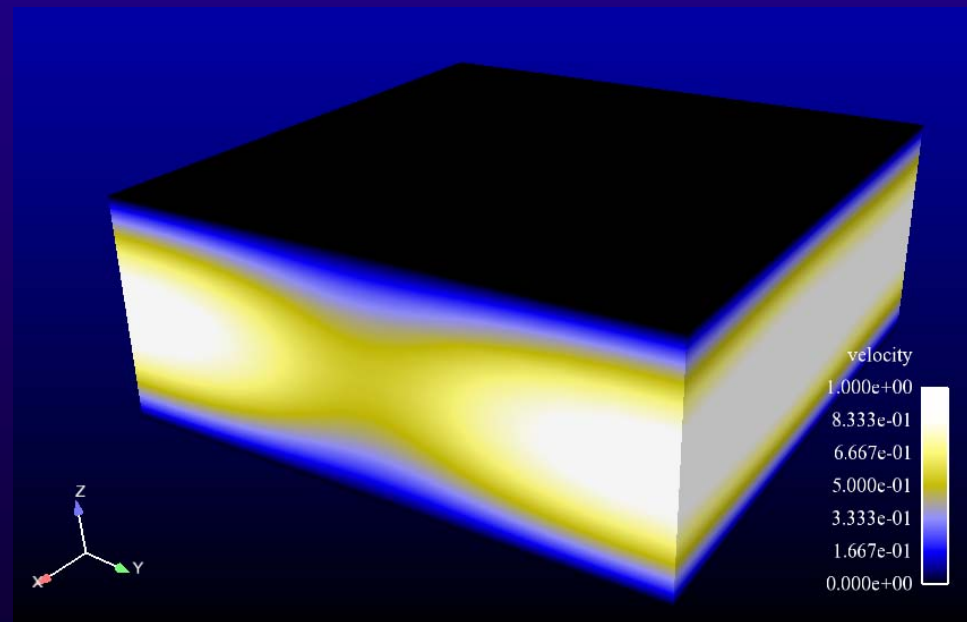
	Level	Color
1	1.0	
2	0.833333	
3	0.666667	
4	0.5	
5	0.333333	
6	0.166667	
7	0.0	



Color blindness

- EnSightColorDef - Special Palette for Color blindness

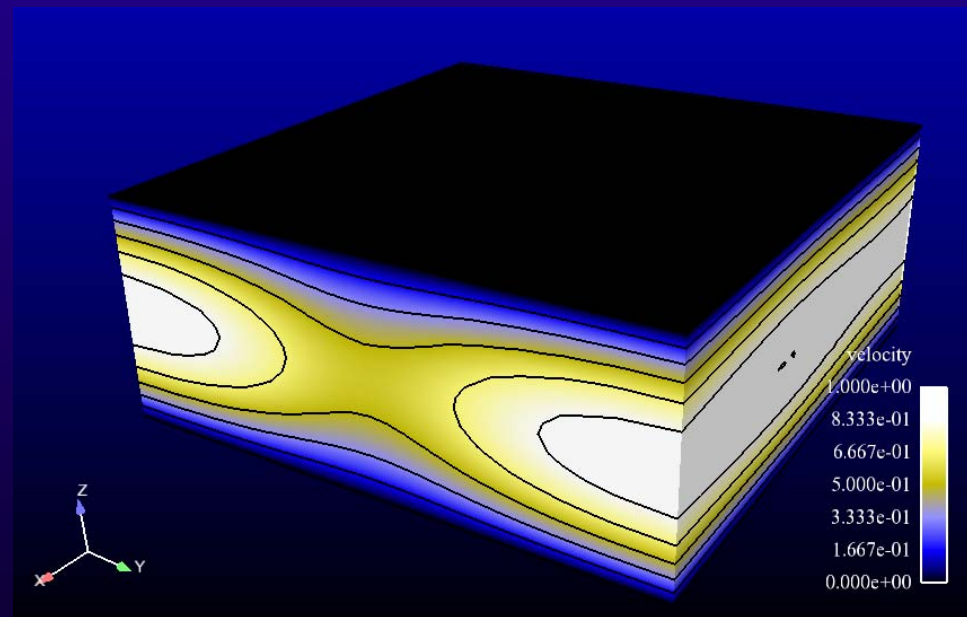
	Level	Color
1	1.0	
2	0.833333	
3	0.666667	
4	0.5	
5	0.333333	
6	0.166667	
7	0.0	



Color blindness

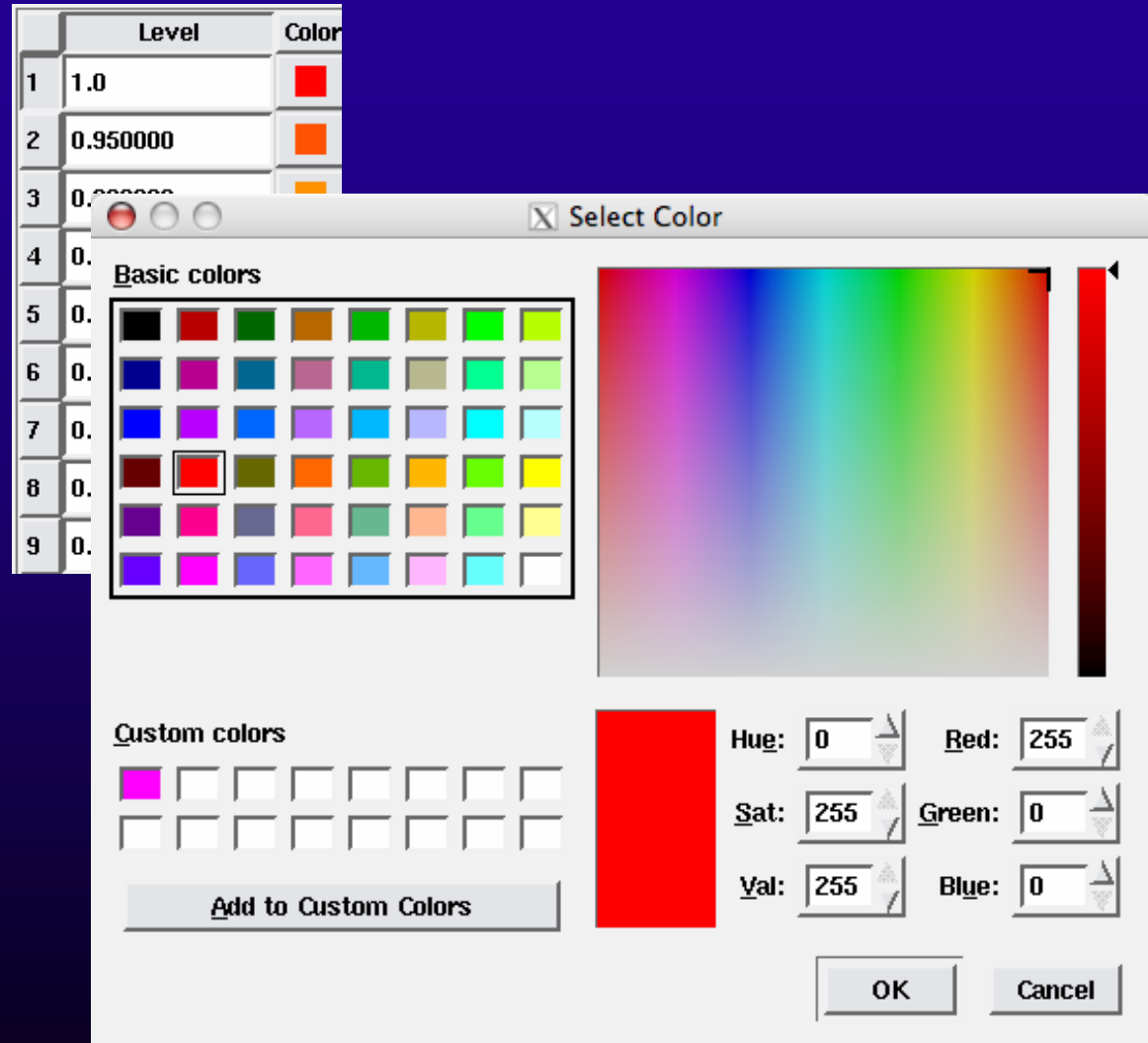
- EnSightColorDef - Special Palette for Color blindness
- Use contours to further set the colors apart

	Level	Color
1	1.0	White
2	0.833333	White
3	0.666667	Yellow
4	0.5	Gold
5	0.333333	Light Blue
6	0.166667	Blue
7	0.0	Black

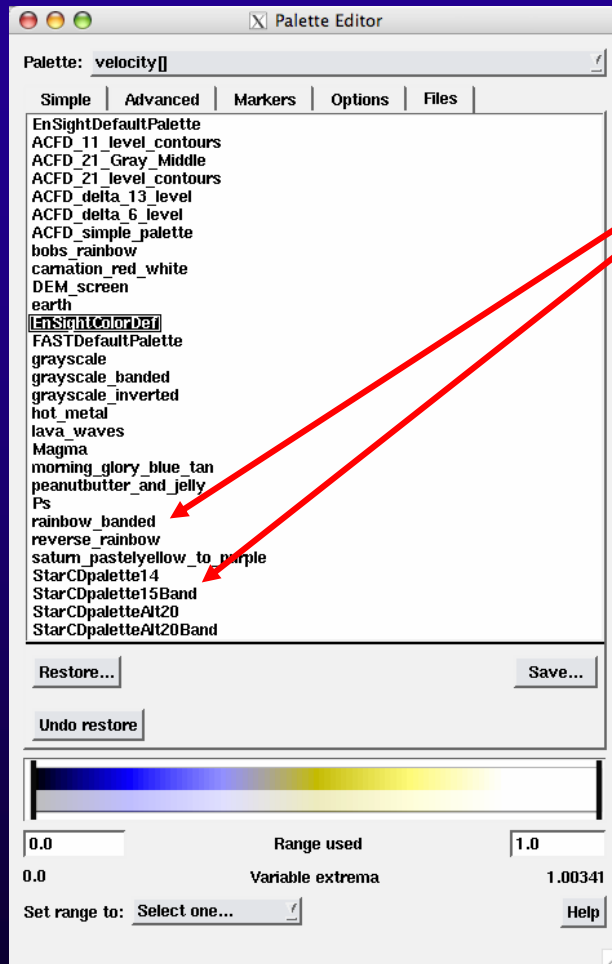


How to make my own Palette?

- Pick your number of levels
- Edit the colors by clicking on them
- Use the color selector to pick a color
- Save to disk

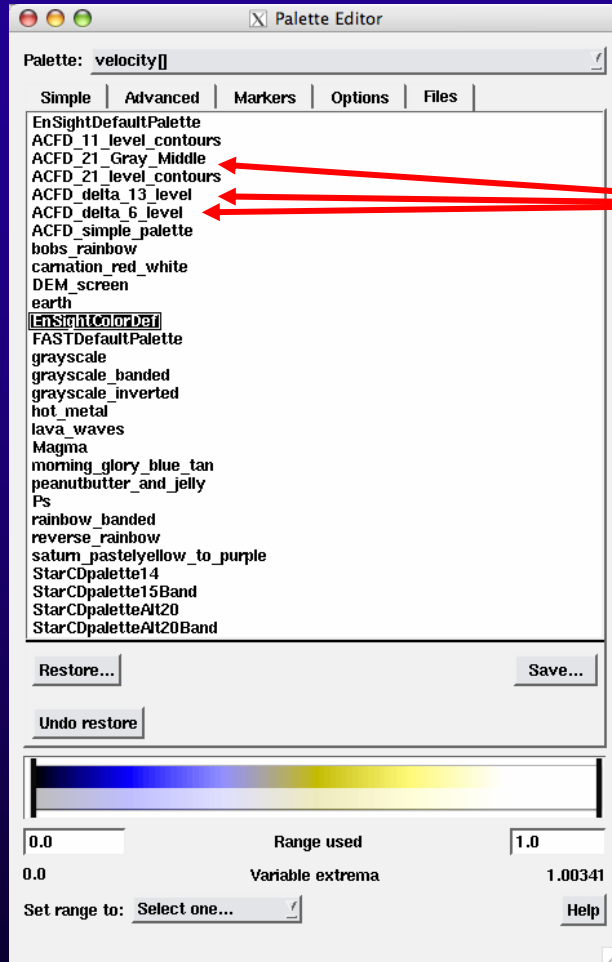


What other palettes are included?



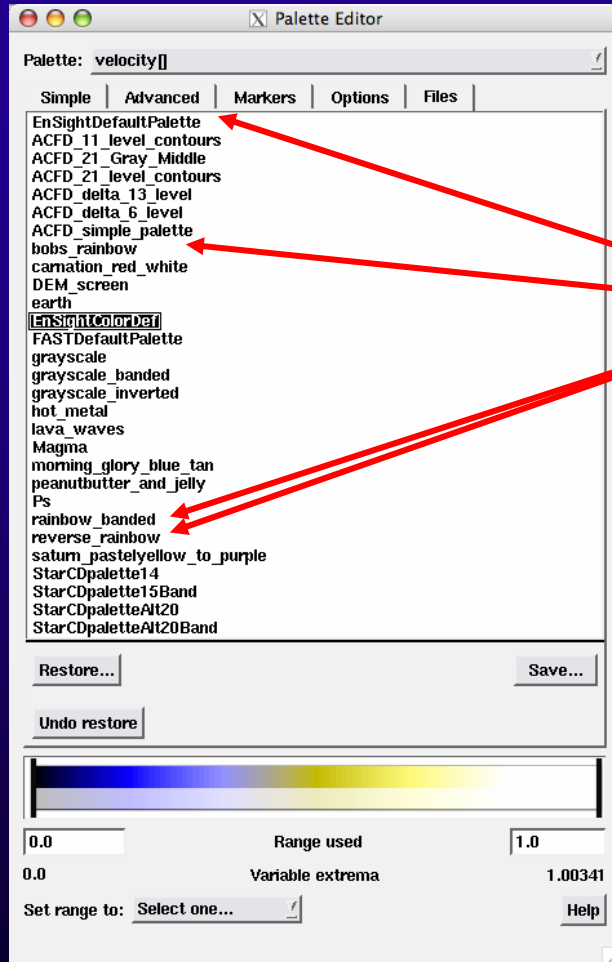
• Palettes that have banding

What other palettes are included?



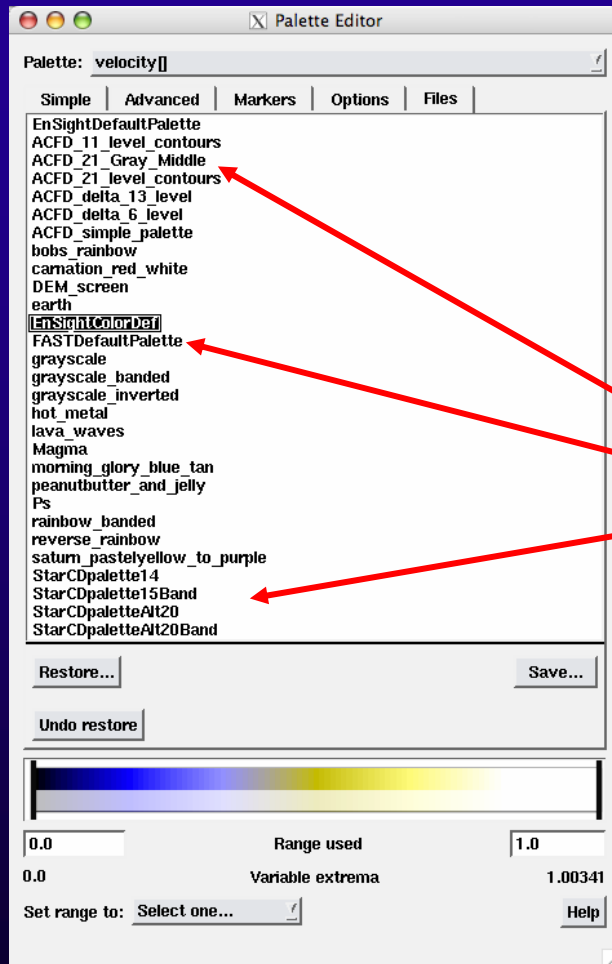
- Palettes that have banding
- Grayed out middle

What other palettes are included?



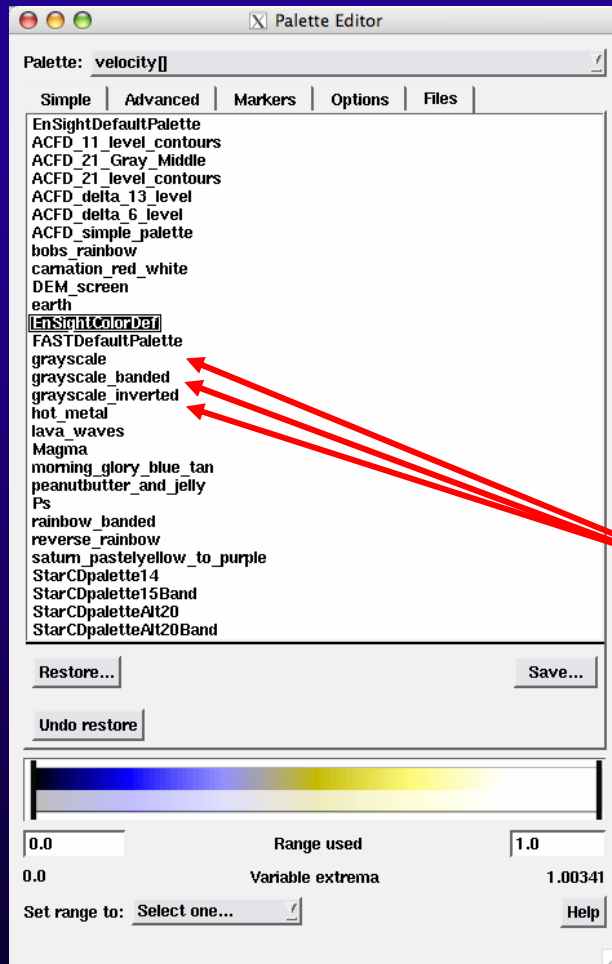
- Palettes that have banding
- Grayed out middle
- Rainbow and reverse rainbow

What other palettes are included?



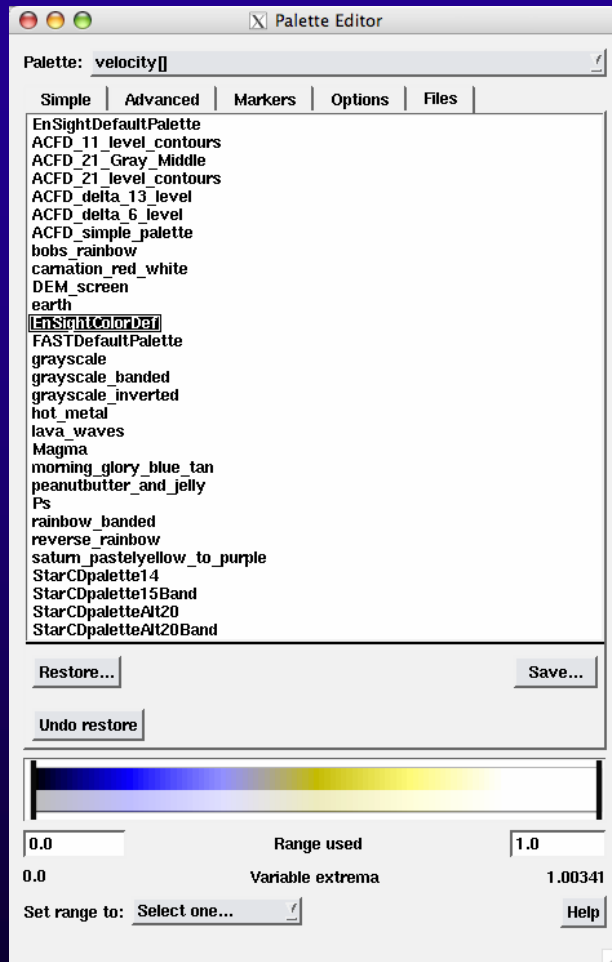
- Palettes that have banding
- Grayed out middle
- Rainbow and reverse rainbow
- Custom solver palettes

What other palettes are included?



- Palettes that have banding
- Grayed out middle
- Rainbow and reverse rainbow
- Custom solver palettes
- Grayscale

What other palettes are included?

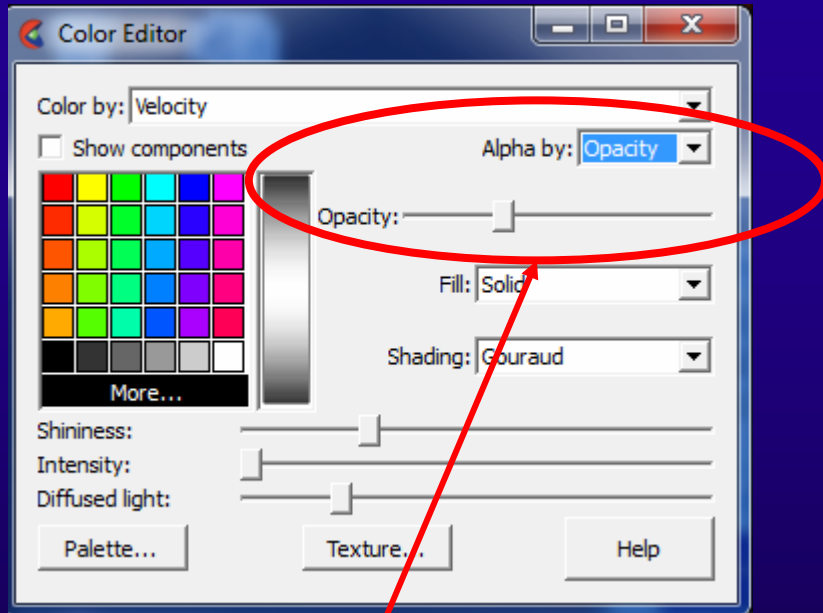


- Over two-dozen pre-defined palettes
- The most requested
- The best of the best
- Art class meets Engineering
- Consider your target audience
- Consider the possible media

New feature: palette alpha

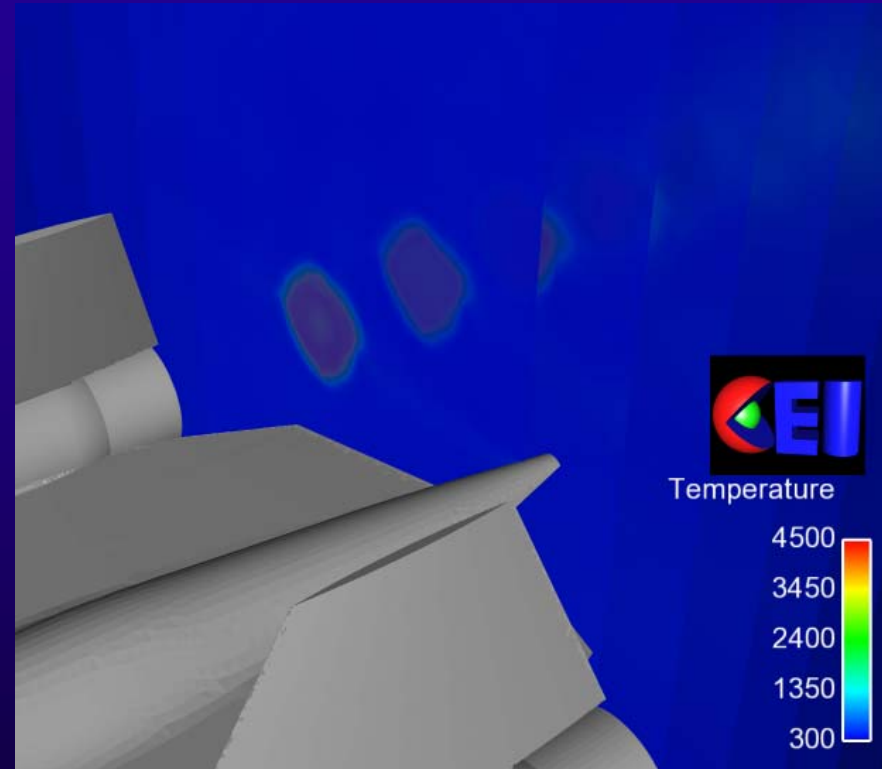
Vary the transparency based on the values of a variable

Constant transparency



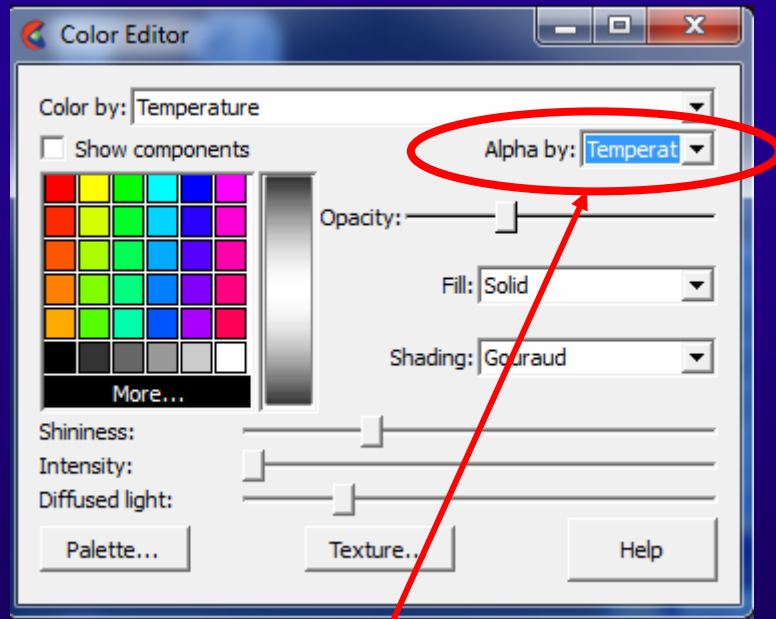
Alpha by: **Opacity**

Using Opacity: slider
choose an opacity value from 0 to 1



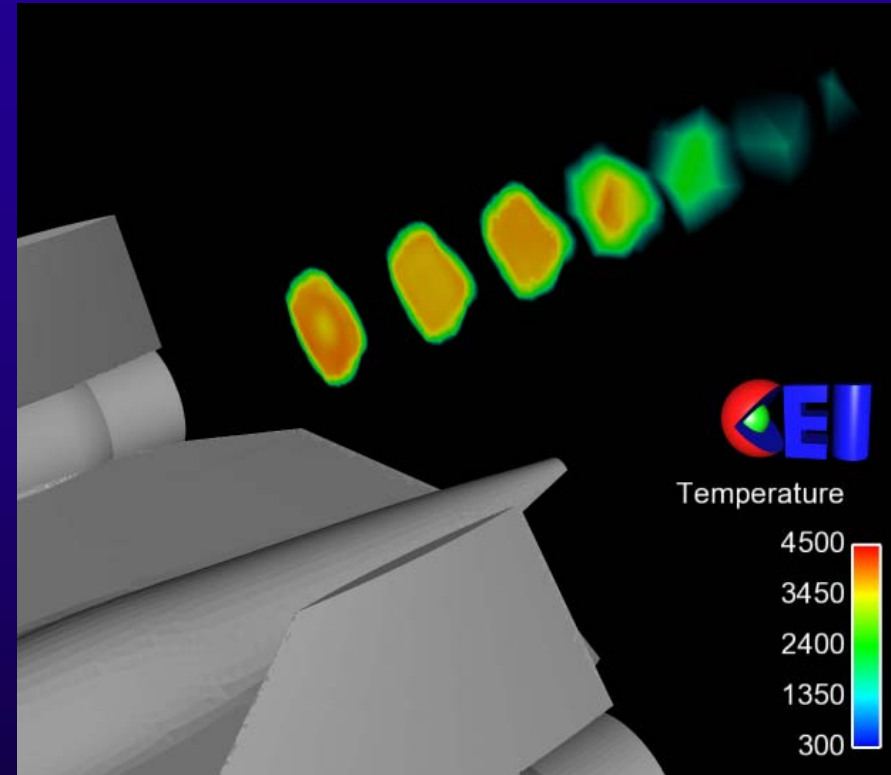
Multiple clip planes
with constant partial transparency

Palette transparency



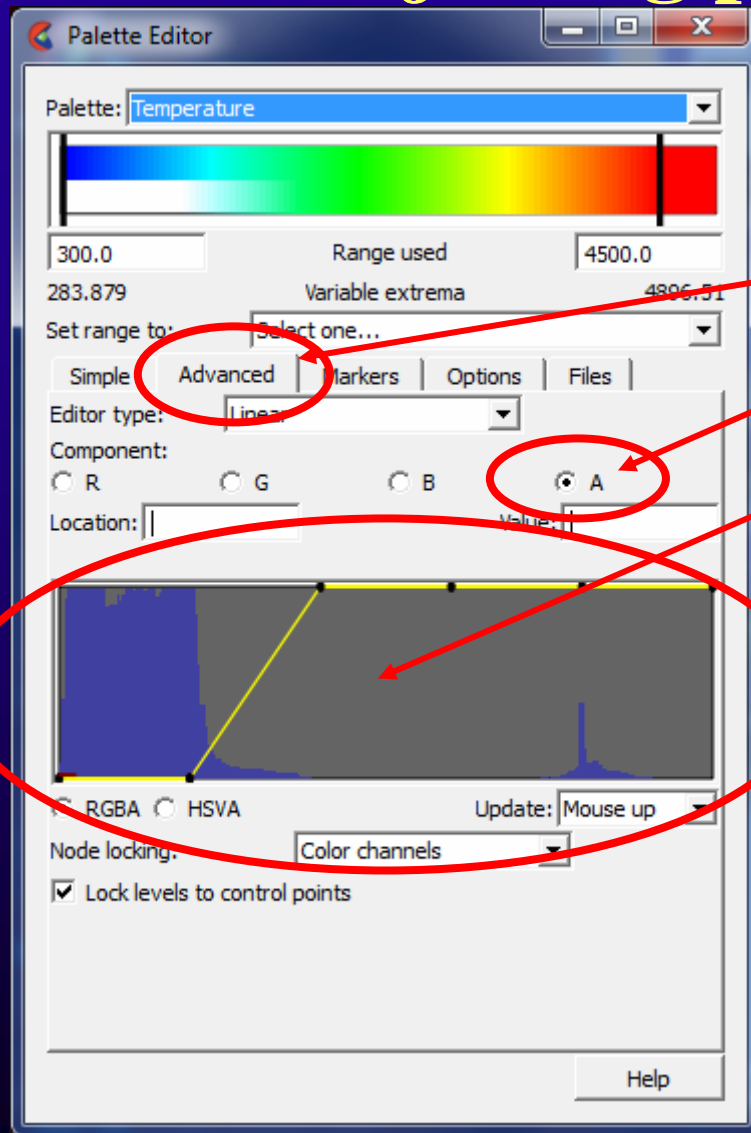
Alpha by: **Variable name**

Then set the opacity in the palette editor
(Opacity: slider has no effect)



Multiple clip planes
with selective transparency

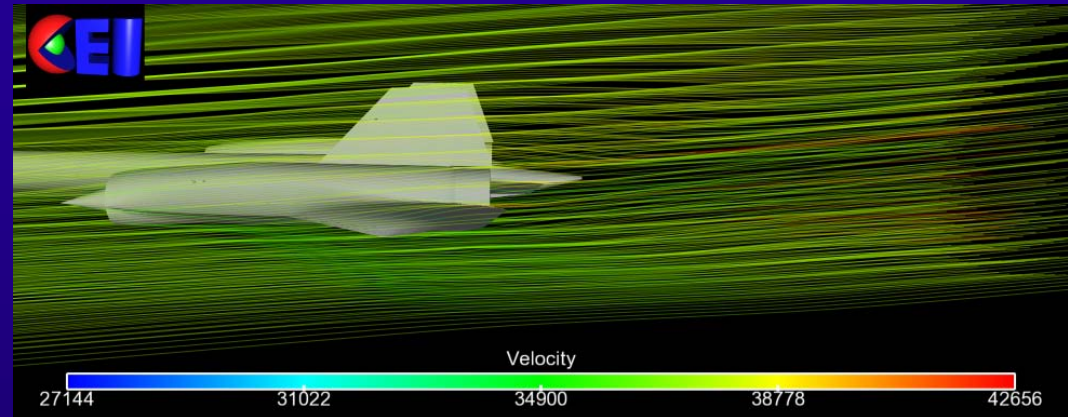
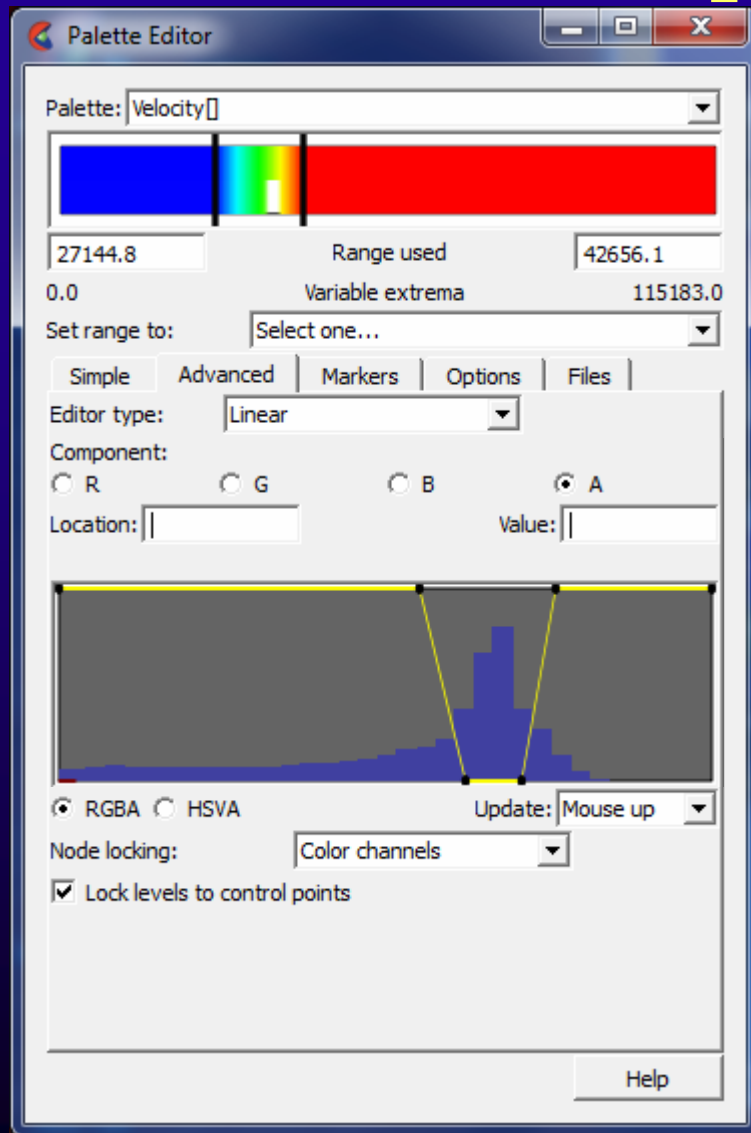
Adjusting palette transparency



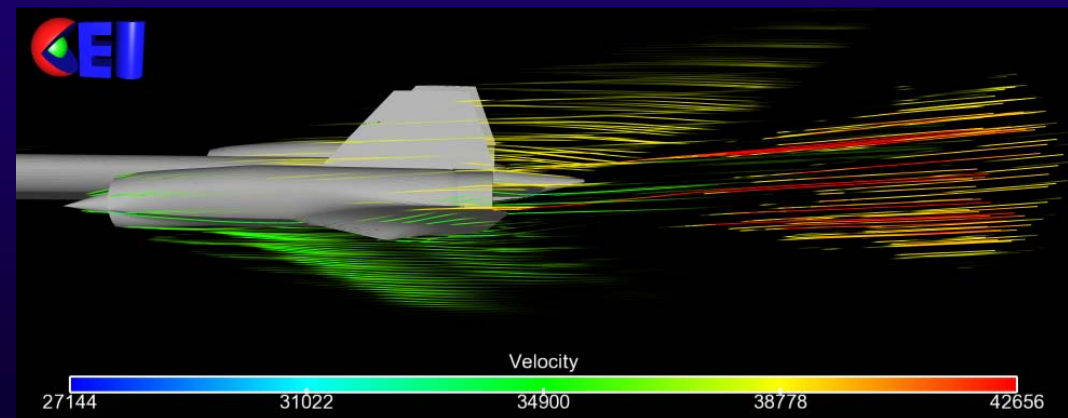
Palette editor window

- Advanced tab
- Component: A (alpha)
- See histogram of variable values and set alpha function
- Similar effects can also be achieved using:
 - Options tab, Limit fringes: By invisible, or
 - By creating isovolumes

Example: Streamlines



Too many streamlines (400) can't see clearly



Make uninteresting middle values transparent