

Custom Validators and Info Items

```
In [4]: import numpy as np
import yt
from yt.analysis_modules.level_sets.api import *

ds = yt.load("IsolatedGalaxy/galaxy0030/galaxy0030")
```

Set up the same as before.

```
In [5]: data_source = ds.disk([0.5, 0.5, 0.5], [0., 0., 1.],
                             (8, 'kpc'), (1, 'kpc'))
field = ("gas", "density")
step = 2.0
c_min = 10**np.floor(np.log10(data_source[field]).min() )
c_max = 10**np.floor(np.log10(data_source[field]).max()+1)
master_clump = Clump(data_source, field)
```

Make a custom validator function.

The function must take at least one argument.

```
In [6]: def min_cell_mass(clump, m_min):
        # clumps are data containers
        cell_mass = clump.quantities.total_quantity("cell_mass")
        return cell_mass >= m_min
```

Add this to the list of available validators.

```
In [7]: add_validator("minimum_cell_mass", min_cell_mass)
```

Now make this the validator to use here.

```
In [8]: master_clump.add_validator("minimum_cell_mass", ds.quan(1e7, "Msun"))
```

Make a custom info item to write out for each clump.

This is similar to making a new validator. It is a function that must take at least one argument.

```
In [10]: def average_temperature(clump):
         t_mean = clump.quantities.weighted_average_quantity("temperature",
                                                             "cell_mass")
         return "Mean temperature: %e K." % t_mean
```

Add this to the list of available info items.

```
In [11]: add_clump_info("average_temperature", average_temperature)
```

Now add it to the list of used info items.

```
In [13]: master_clump.add_info_item("average_temperature")
```

Begin clump finding!

```
In [14]: find_clumps(master_clump, c_min, c_max, step)
```

Write out clump information.

```
In [15]: write_clump_index(master_clump, 0, "%s_clump_hierarchy.txt" % ds)
         write_clumps(master_clump, 0, "%s_clumps.txt" % ds)
```

```
In [16]: !cat galaxy0030_clump_hierarchy.txt
```

```
Clump at level 0:
Cells: 100134.
Mass: 1.296926e+09 Msun.
Jeans Mass (mass-weighted): 4.746875e+09 Msolar.
Jeans Mass (volume-weighted): 1.223489e+11 Msolar.
Max grid level: 8.
Min number density: 1.661908e-04 cm^-3.
Max number density: 5.601262e+00 cm^-3.
Mean temperature: 1.349015e+04 K.
Mean temperature: 1.349015e+04 K.
```

```
Clump at level 1:
Cells: 94.
Mass: 1.784123e+07 Msun.
Jeans Mass (mass-weighted): 6.287895e+07 Msolar.
Jeans Mass (volume-weighted): 6.269044e+07 Msolar.
Max grid level: 8.
Min number density: 3.149490e+00 cm^-3.
```

Max number density: 4.996931e+00 cm⁻³.
Mean temperature: 1.344124e+04 K.
Mean temperature: 1.344124e+04 K.

Clump at level 1:
Cells: 106.
Mass: 2.025443e+07 Msun.
Jeans Mass (mass-weighted): 6.306800e+07 Msolar.
Jeans Mass (volume-weighted): 6.325248e+07 Msolar.
Max grid level: 8.
Min number density: 3.251722e+00 cm⁻³.
Max number density: 4.065772e+00 cm⁻³.
Mean temperature: 1.426605e+04 K.
Mean temperature: 1.426605e+04 K.

Clump at level 1:
Cells: 104.
Mass: 1.966537e+07 Msun.
Jeans Mass (mass-weighted): 8.874298e+07 Msolar.
Jeans Mass (volume-weighted): 8.754599e+07 Msolar.
Max grid level: 8.
Min number density: 3.161182e+00 cm⁻³.
Max number density: 5.285985e+00 cm⁻³.
Mean temperature: 1.558691e+04 K.
Mean temperature: 1.558691e+04 K.

Clump at level 1:
Cells: 179.
Mass: 3.434637e+07 Msun.
Jeans Mass (mass-weighted): 8.451847e+07 Msolar.
Jeans Mass (volume-weighted): 8.390353e+07 Msolar.
Max grid level: 8.
Min number density: 3.178488e+00 cm⁻³.
Max number density: 5.601262e+00 cm⁻³.
Mean temperature: 1.520796e+04 K.
Mean temperature: 1.520796e+04 K.

In [17]: !cat galaxy0030_clumps.txt

Clump:
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Mass: 1.784123e+07 Msun.
Jeans Mass (mass-weighted): 6.287895e+07 Msolar.
Jeans Mass (volume-weighted): 6.269044e+07 Msolar.
Max grid level: 8.
Min number density: 3.149490e+00 cm⁻³.
Max number density: 4.996931e+00 cm⁻³.
Mean temperature: 1.344124e+04 K.
Mean temperature: 1.344124e+04 K.

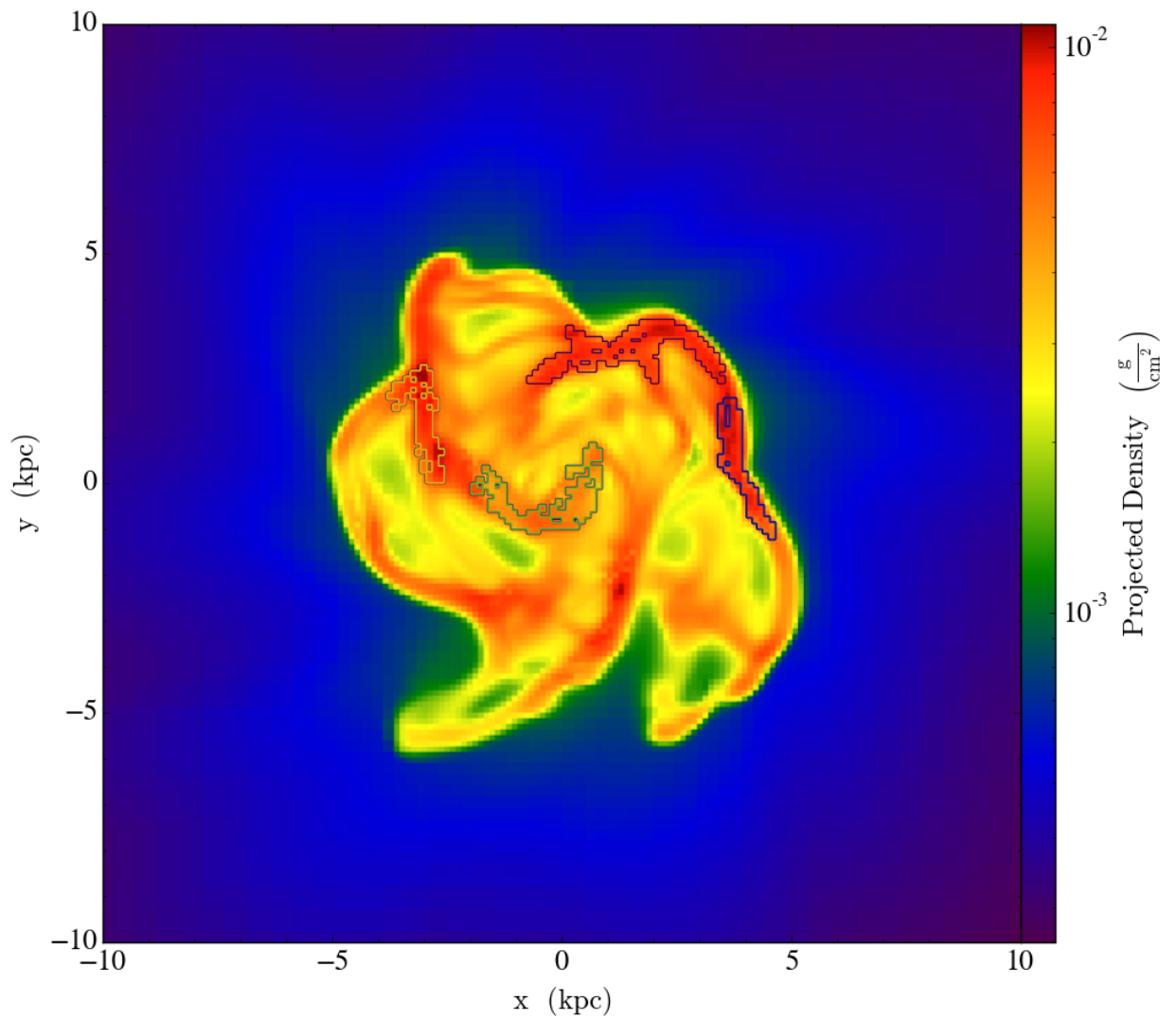
Clump:
Cells: 106.
Mass: 2.025443e+07 Msun.
Jeans Mass (mass-weighted): 6.306800e+07 Msolar.
Jeans Mass (volume-weighted): 6.325248e+07 Msolar.
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Get a list of the leaf clumps and display them in a projection.

```
In [18]: leaf_clumps = get_lowest_clumps(master_clump)
prj = yt.ProjectionPlot(ds, 2, field, center='c', width=(20,'kpc'))
prj.annotate_clumps(leaf_clumps)
prj.show()
```



In []: