

# Grid Channel Ranges

Phoenix can simulate a number of different grid channels. Grid channels are the values contained in each of the voxels in the simulation grid, such as Smoke, Temperature, Liquid, Velocity, RGB, etc.

These grid channels can be loaded from cache files simulated with Phoenix's own solver, or can be imported from cache files coming from other software.

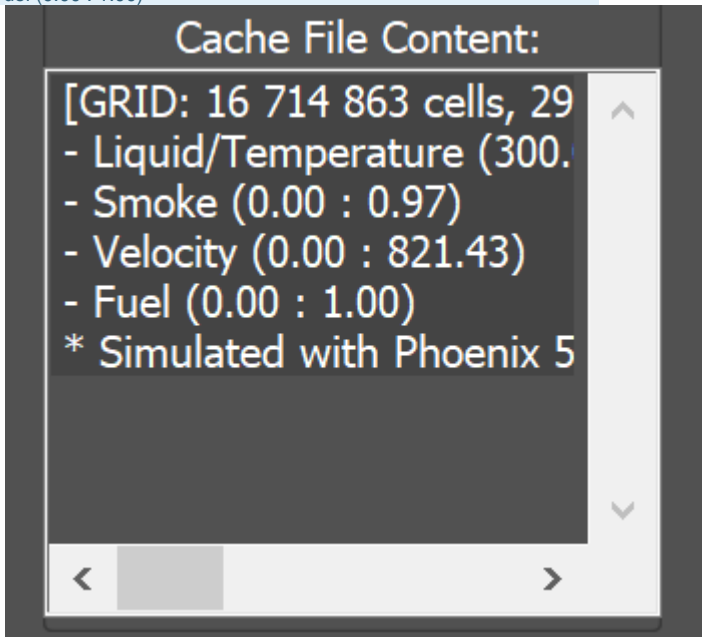
Phoenix's own grid channels have different ranges depending on the kind of channel, so when you use them in rendering for shading or during simulation for masking, it is good to be aware what are the minimal and maximal values a grid channel can have.

- Phoenix **Smoke** usually goes from **0-1**; The Phoenix **Source** won't stop you from emitting Smoke above 1 and it would look thicker in rendering, but you could also do the same using the [Volumetric options](#).
- **Fuel** goes from **0-1**; Fuel above 1 would not be able to ignite - check the [Fuel rollout info](#).
- **Temperature** is in Kelvins, so it often goes from **300-2000**, or up to a few thousand; If you simulate cold smoke, it can drop below 300, but never below 0.
- **Speed** is in Voxels/sec, so it depends on the grid size and resolution, but usually goes from **0** to several hundred. Note that Velocity is a vector, while Speed is just a scalar number. Velocity has direction and length, while Speed is just the length with no direction.

Data from simulators in other software often differs a lot from Phoenix ranges. If you are importing a foreign cache file, you can find out the grid channel ranges under the [Simulation rollout](#), in the Cache File Content box.

For example, here is the info for a frame from a simulation of the [Gasoline Explosion Quick Setup preset](#):

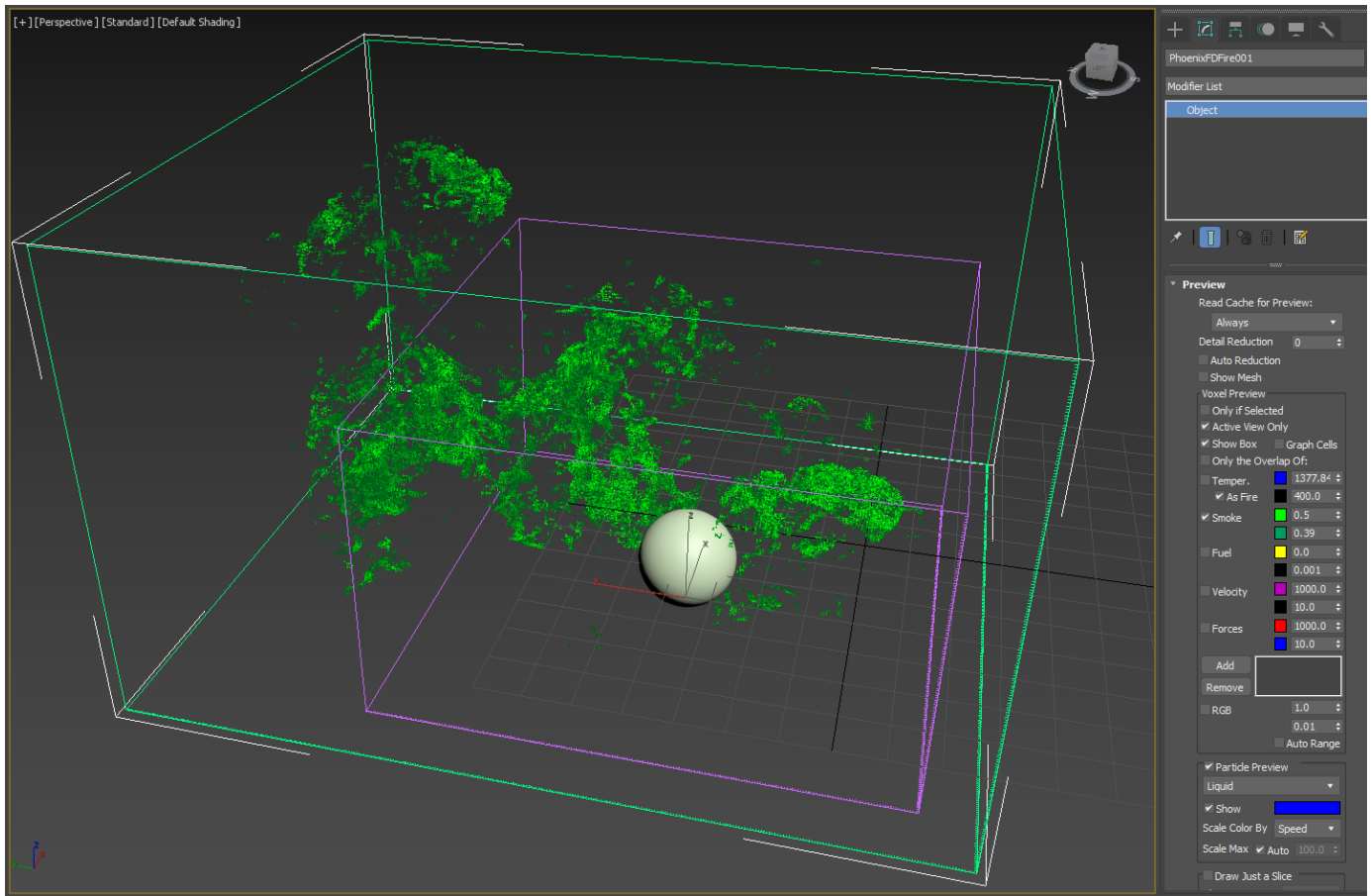
```
[GRID: 16 714 863 cells, 297x337x167]
- Liquid/Temperature (300.00 : 3980.18)
- Smoke (0.00 : 0.97)
- Velocity (0.00 : 821.43)
- Fuel (0.00 : 1.00)
```



The numbers after the channel name are the minimum and maximum value of that channel in the grid for the current timeline frame. The ranges can change as you scroll the timeline as the temperature in a cache file rises, smoke dissipates, speed changes, etc., so keep in mind that the data range for one frame might not be representative for the entire cache sequence.

If you want to study the cache and find which are the voxels where the channels have highest or lowest values, or if you are interested which voxels fit in a certain range, you can use the [Voxel Preview](#) to find out. Next to each Grid Channel there are two fields with the maximum and minimum value that will be shown in the viewport. Voxels which have channel values less than the minimum will not be shown, and voxels with values larger than the maximum will not be shown either. By default, **Auto Range** is enabled and Phoenix would automatically figure out what range to show so you would get useful viewport preview. When you want to examine the cache, turn off **Auto Range**, turn off unwanted grid channels and you will be able to adjust the minimum and maximum values visible in the viewport.

For example, here is a voxel preview of a frame from a simulation of the [Gasoline Explosion Quick Setup preset](#) where we are showing only the Smoke channel and see only the voxels where the smoke is between 0.39 and 0.5:



Here is another example of the same cache, but this time we are looking at the velocities between 90 vox/sec and 140 vox/sec:

