

# FireSmoke Resimulation

This page provides information on the Resimulation rollout for a FireSmokeSim object.

## Overview

Resimulation is a process that uses existing cache files (with exported [Grid Velocity](#)) as a base for a new simulation pass, to do any of the following:

- Increase resolution and enhance details, while preserving the shape and behavior of the base simulation. For example, it's possible to add Wavelet turbulence to increase detail, or simply amplify the resolution.
- Slow down or speed up the animation, as well as animate the time scale using Phoenix's Time Bend controls. See [Slowing Down a Simulation](#), [Animating the Time-Scale](#), etc.
- Keep the grid channels such as Smoke, Temperature, etc., unchanged while modifying the dynamics or number of Drag particles, or vice versa.

You can resimulate over the already resimulated cache files. By default Phoenix reads from a cache sequence and creates another resimulated cache sequence. But you can also use the same path as Resimulation Input and Output and overwrite the simulated cache sequence each time you run a new resimulation. For example, this way you can keep increasing the resolution every time you run a new resimulation, and repeat this many times.

Due to the difference between the compression algorithms used by Phoenix's AUR format and the OpenVDB format, the resimulation process may produce a different result when using exported VDB caches as opposed to Aura caches if the **Storage Quality** option in the Output rollout is not the maximum 20 (i.e. is not Lossless).

Rendering and simulation cache paths can be set manually. For information on how to do this, see the [Tips and Tricks](#) page regarding [simulation paths](#) and [resimulation paths](#).

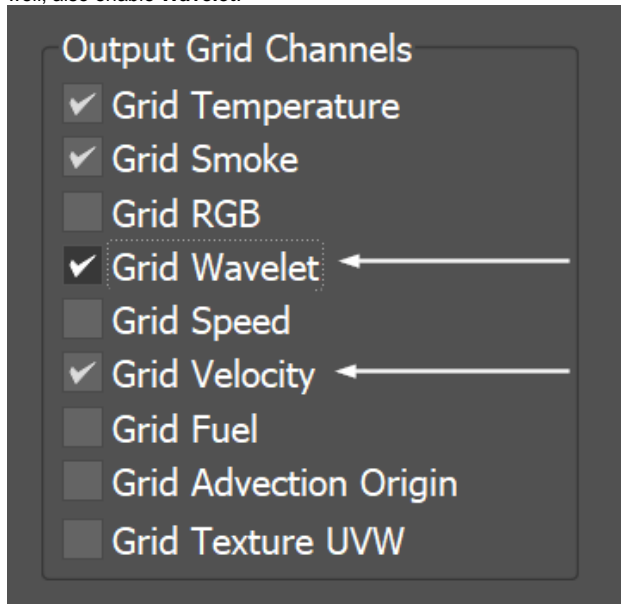
When performing a resimulation, it is recommended that you leave the [Dynamics](#) settings unchanged between running a base simulation and resimulation, unless more advanced behaviors are specifically needed.

Additionally, the scene must be intact between running the base simulation and the resimulation. Please do not remove any Sources and their emitters, obstacles or forces that interact with the simulation.

Fire/Smoke Resimulation Workflow

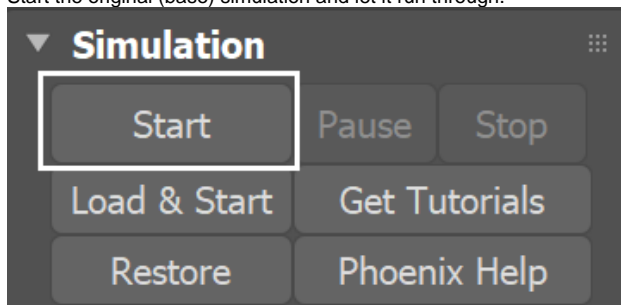
1

Enable **Velocity** in the [Output](#) rollout. If you are going to add **wavelet turbulence** as well, also enable **Wavelet**.



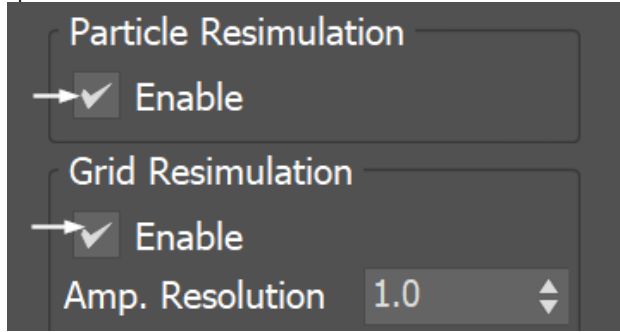
2

Start the original (base) simulation and let it run through.



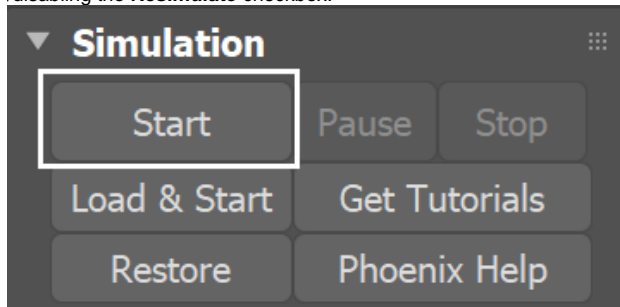
3

Enable **Particle Resimulation** or **Grid Resimulation**. Adjust the resimulation options in this rollout if needed.



4

Start the simulation again - this time the **Resimulation** will take place. You can switch between preview and render of the base and resimulated caches by enabling/disabling the **Resimulate** checkbox.



UI Path: ||Select Fire Smoke Simulator|| > **Modify panel** > **Resimulation rollout**

## Parameters

**Expand** – Opens a floating dialog that contains the selected rollout and automatically folds the command panel rollout.

**Re-Center** – Resets the position of the floating rollout.

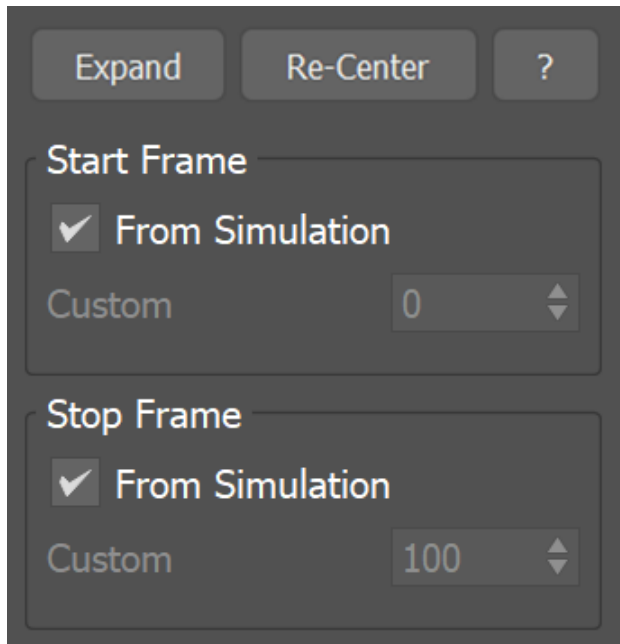
**?** – Opens up the help documents for the Fire/Smoke Resimulation.

### Start Frame

- **From Simulation** | *rs\_start\_from\_sim* – When enabled, the Resimulation will run **from the first frame of the base simulation** to the simulation End Frame or the Custom Stop Frame, depending on the options.
- **Custom** | *resim\_startframe* - Explicitly sets the Start Frame of the Resimulation. This can also be a negative number.

### Stop Frame

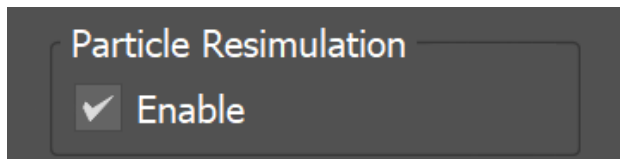
- **From Simulation** | *rs\_stop\_from\_sim* – When enabled, the Resimulation will run from the base simulation Start Frame or the Custom Start Frame **to the last frame of the base simulation**.
- **Custom** | *resim\_stopframe* - Explicitly sets the End Frame of the Resimulation. This can also be a negative number.



## Particle Resimulation

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**Enable** | *resim\_resimulate\_particles* – Enable/disable the Particle Resimulation. Use this option to modify the look of Drag particles. The resimulation will produce the exact same result as the base simulation only with [Steps per Frame](#) = 1 in the [Dynamics](#) rollout. With a higher number of steps, the intermediate steps cannot be reconstructed, so full simulation is needed.



## Grid Resimulation

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**Enable** | *resim\_resimulate\_grid* – Enables/disables the Grid Resimulation. Use this option when the grid detail has to be improved by increasing the resolution, by eventually adding wavelet turbulence, or if you need to re-time your simulation using Time Bend effects. The resimulation will produce the exact same result as the base simulation only with [Steps per Frame](#) = 1 in the [Dynamics](#) rollout. With a higher number of steps, the intermediate steps cannot be reconstructed, so full simulation is needed.

**Amp. Resolution** | *resim\_ampres* – Magnifies the grid resolution. A value of 0.0 means no change, 1.0 means doubling the voxel amount in all axes ( $2 \times 2 \times 2 = 8$  times the resolution), 2.0 means tripling ( $3 \times 3 \times 3 = 27$  times the resolution), etc. Non-integer values can also be entered, however, they are slightly slower to calculate. The resolution can also be decreased by using a negative value.

**Amp. Method** | *resim\_ampmeth* – When the grid resolution is increased, this parameter specifies which method to use to read the velocity from the base cache files.

**Interpolate** – Use interpolation. The velocity channel is stretched from the lower resolution to the amplified one.

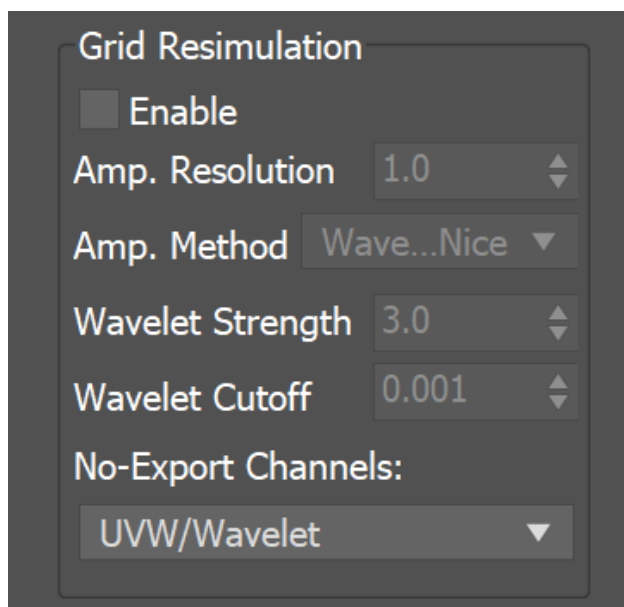
**Wavelet Fast** – Use wavelet turbulence to create fine detail. Needs a Grid Wavelet channel exported to be base simulation cache files. This is a slightly faster approximation method.

**Wavelet Nice** – Use wavelet turbulence to create fine detail. Needs a Grid Wavelet channel exported to be base simulation cache files.

**Wavelet Strength** | *resim\_wvstr* – Specifies the strength of the wavelet turbulence.

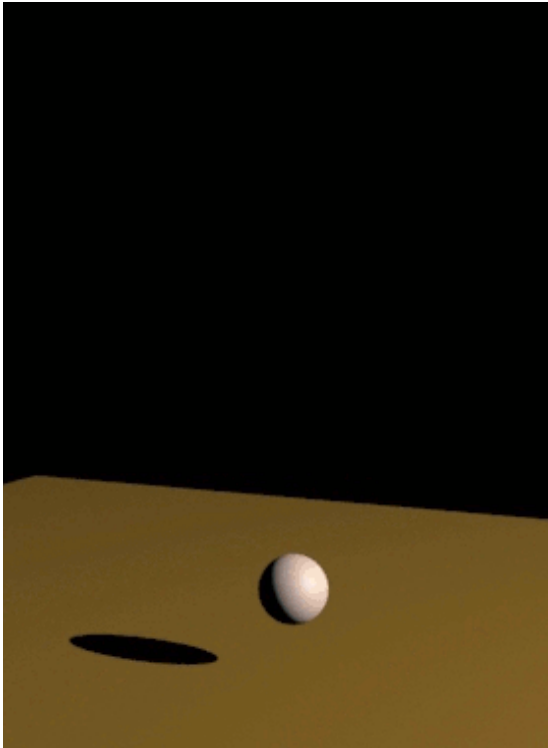
**Wavelet Cutoff** | *resim\_wvcut* – Turbulence with smaller amplitude will be cut off to reduce calculation time.

**No-Export Channels** | *resim\_tmppchan* – Specifies the channels that are used just for resimulation, which will not be exported to the resimulation output cache. For example, for wavelet turbulence, removing the UVW /Wavelet and Velocity channels from the final simulation will reduce the cache size.

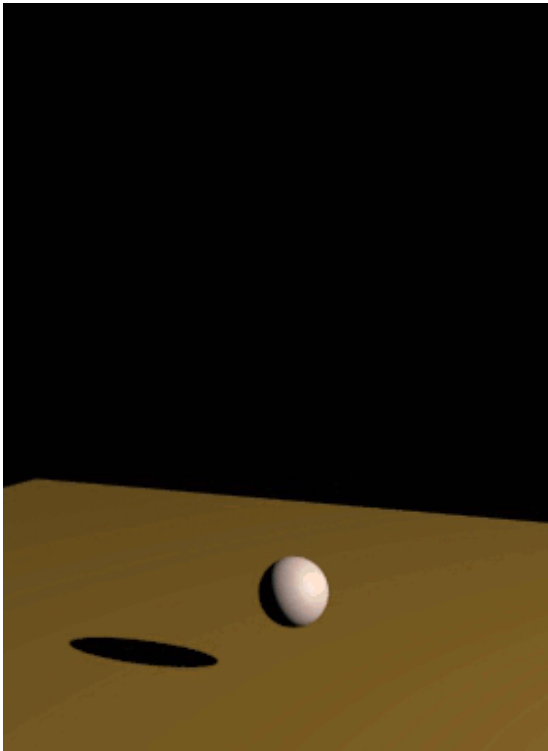


### Example: Resimulation with Wavelet Turbulence

The example below shows the difference between a base Fire/Smoke simulation and the Resimulation result when using **Wavelet Turbulence**.



Base Simulation



Resimulated with **Amplify Resolution = 1**  
and **Wavelet Nice** Method

## Time Bend Resimulation

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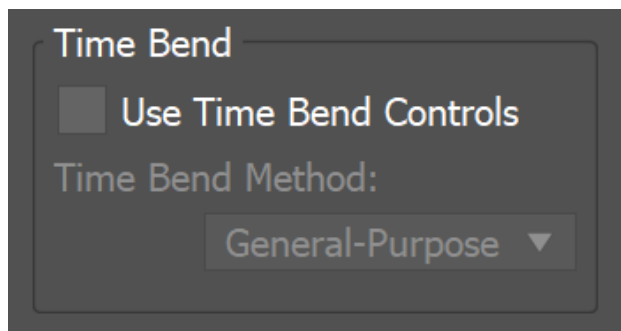
Phoenix has many tools for changing the animation timing of a cache sequence after it is simulated. Resimulation with enabled Time Bend Controls can produce smoother playback in cases where the [Input](#) Time Bend controls are insufficient. For more information on Resimulating with Time Bend, see the [Tips and Tricks](#) topic on [How to slow down a simulation, animate the time scale, etc.](#)

**Use Time Bend Controls** | *resim\_grid\_timebend* – Change the time scale of the base simulation according to the [Time Bend Controls](#) in the Input rollout. You need to re-scale the animation of all other interacting objects and sources in the scene as well. For constant play speed, use 3ds Max's Rescale Time feature.

**Time Bend Method** | *resim\_grid\_timebend\_method* – A method to use when scaling the time of the resimulation. Note that both methods work best when **Steps per Frame** on the [Dynamics](#) rollout is set to 1. Note that speeds below 0.2 may produce unsatisfactory results when using either method.

**General-Purpose** – Works for all play speeds including backwards playback. It resimulates more quickly, but might produce flickering or jittering in the movement of the fluid. Sources, obstacles, or forces do not need to be present in the scene for this method. However, this method may not produce satisfactory results with animated sources.

**Slow Down** – Works only for play speeds between 0 and 1. It will produce smooth playback without flicker or jitter but will add more dissipation in the long run, so it's better to combine it with [Multi-Pass Advection](#). This method requires all used sources, obstacles and forces to be present in the scene. Any animation in the scene will need to be adjusted accordingly and slowed down to the play speed of the resimulation.



### Example: Time Bend Resimulation

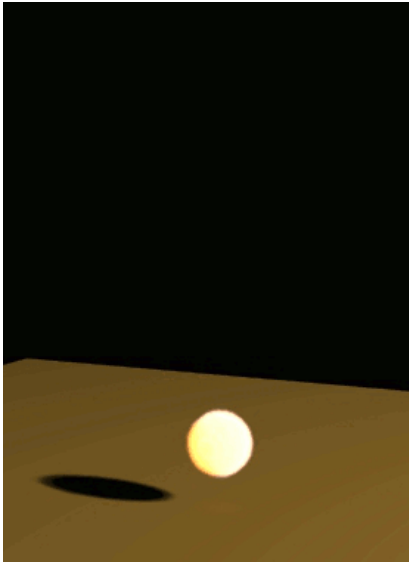
The example below shows the difference between the Input rollout **Grid Blend** Interpolation used to slow down without resimulating, the Resimulation Slow Down Time Bend Method and the Resimulation General-Purpose Time Bend Method.



Input Play Speed = 0.2, Interpolation Blend



Slow Down method + Wavelet



General-Purpose method + Wavelet

## Resimulation Cache Files

During resimulation, Phoenix reads cache files from the **Base Cache Files Path**, performs resimulation operations, and then saves a new cache sequence in the **Output and Render Path**.

For more information on how to set up resimulation paths, see the [Tips and Tricks](#) page.

**Wait if caches are missing** | *resim\_cachewaiting* – When enabled, waits if the base cache file is not yet available. This can be used if another instance of 3ds Max is simulating the base cache at the same time (on the same or other computer).

**Base Cache Files Path** | *resim\_inpath* – Specifies the base simulation caches which will be used as base for resimulation. **\$(same\_as\_output)** by default.

**Output and Render Path** | *resim\_outpath* – Specifies the path for writing the output cache files from Fire/Smoke resimulation. See [Output Path](#) for more details on the **\$(...)** macros you can use. **\$(scene\_path)** by default (will append **"\_resim"** to the end of the file name).

Click the "..." button to open a menu with the following options:

**Browse** - Opens a dialog where you can select where the resimulation caches will be written to. The filename you type in must contain # signs so each resimulation frame will be written to a differently numbered file. Also, you can choose between two file formats - AUR and VDB cache files.

**Delete Cache Files** - Clears the resimulation files.

**Reset to Default** - Resets the resimulation path to default.

**Help** - Opens [this help page](#).



Resimulation Cache Files

☐ Wait If Cache Are Missing

Base Cache Files Path:  

\$(same\_as\_output)

...

Output and Render Path:  

\$(scene\_path)

...

You can use the same **Output and Render Path** as the **Base Cache Files Path**, and this way Phoenix will not create a separate cache sequence for resimulation, but will overwrite the base simulation caches instead. It's valid to do so if you need a more complicated setup or when not enough disk space is available. This way you can increase the resolution more and more each time you start a resimulation.

The following error message may appear when you start a Resimulation:

"Cannot start the Re-Simulation! Please make sure the simulation was run with the 'Velocity' channel checked under the 'Output' rollout, and that the cache files in the Resimulation Input path exist."

The reason may be that either the files in the Input Simulation Path do not exist at all, or they do not have Grid Velocity Channel exported when you have simulated them beforehand. Of course, you may use more complicated setups where you resimulate over an already resimulated cache file, or you may Load an existing base cache file as the initial state of the resimulation. These are all possible; you just need to have velocity in the base cache and an existing path to it.