

RW - Ocean Statistical Spectrum

This is a very complex modifier and probably the most realistic one. With this modifier you are now able to create believable ocean surfaces with cresting waves based on statistical methods. "Ocean Statistical Spectrum" takes various environmental parameters into account, such as water depth or the surface's dimensions. The result is an absolutely convincing ocean surface with natural wave behaviour and a customizable amount of "choppiness". This value is responsible for the degree of sharpness of the waves. Waves can now range from slightly round to distinctly sharp.

With "Resolution" and "Dimension" you can even adjust the level of detail:

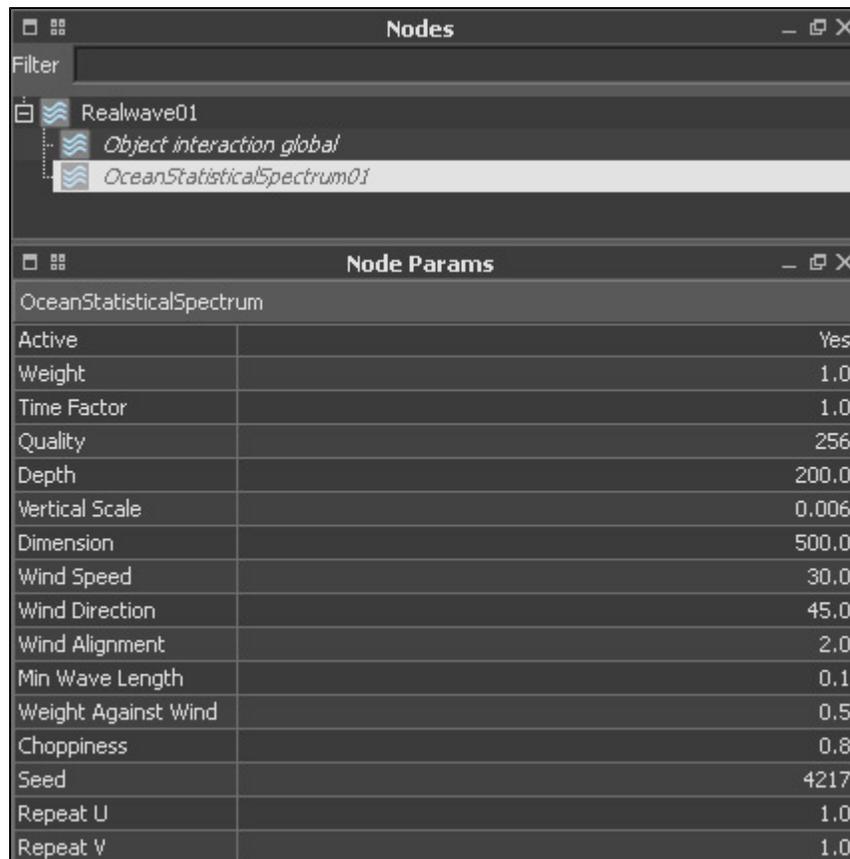
$$\text{Level of detail [m]} = \text{Dimension [m]} : \text{Resolution}$$

An example: Let's assume you have created a surface with a "Resolution" of 1024 and a "Dimension" of 400 m. The smallest structures you can observe on this ocean have a size of 0.39 m according to the formula above:

$$400 \text{ m (Dimension)} : 1024 \text{ (Resolution)} = 0.39 \text{ m}$$

If you need even more detail and smaller structures, you can either raise "Resolution" or lower "Dimensions". With higher "Resolution", RealWave needs more time to calculate the surface. Statistical waves are characterized by a typical "back and forth" movement. At the collision points of these motions, the crests appear. "Ocean Statistical Spectrum" waves are not only available with RealWave; they are also implemented in RealFlow's Hybrido solver. There you can add a custom amount of displacement to the final mesh and you will find many similar parameters.

 If you want to learn how to use RealWave for previewing Hybrido surfaces waves, please watch our ["HyFLIP - Ocean Statistical Spectrum"](#) video tutorial.



Active

You can choose between "Yes" and "No". The active switch is normally only needed with more than one modifier or other sources of wave creation, e.g. travelling objects. Under such circumstances you can disable the appropriate modifier and evaluate the underlying wave structure for fine-tuning.

Weight

With “Weight” it is possible to define a kind of mixing strength. By default, each set of waves contributes to the final result at equal strength and weight. To reduce the influence of a certain modifier, simply decrease its weight. The range starts with 0.0, while 1.0 stands for 100%.

Time Factor

If you have already worked with RealFlow's Graphs system or one of the demo scenes, e.g. “apply_stat_spectrum” then you have most probably already seen the “Time factor” setting. This parameter allows you to control the wave surface's speed. Values greater than 1.0 will accelerate the waves, while values smaller than 1.0 can be used to decelerate them. The advantage is that the waves' speed can be adjusted without changing any other parameter. Another plus factor is that the “Ocean Statistical Spectrum” settings from RealFlow Graphs, Hybrido, and RealWave have been unified as far as possible. This way, you will be able to get exactly the same results with identical settings in all three environments.

Quality

Besides from the mesh's polygon size this is the most critical parameter in terms of simulation time. You can choose from 6 different levels: 256, 512, 1024, 2048, 4096 and 8192. With each level simulation time will increase but, as shown in the previously given formula, you can create much finer structures.

Depth

This parameter affects the dispersion of the waves and is only noticed if the length of the wave is close to the value of the depth. In these cases this parameter has a decelerating effect on the dispersion of the wave. In most cases you will not see any effects or changes, because the depth used is normally rather high compared to the length of the waves. An ocean's depth is measured in metres [m].

Vertical Scale

To alter the height of the statistical waves, “Vertical Scale” is used. You normally have to adjust this parameter when you are changing the surface's dimension value. “Vertical Scale” has a strong influence on the credibility of the entire simulation and can also be used for the creation of heavy storms with high waves.

Dimension

“Dimension” is closely linked to “Quality” as described before. By changing “Dimension”, while keeping “Quality” untouched, you can achieve a zooming effect. To keep the relations between “Dimension”, “Quality” and objects you will probably have to adjust “Vertical Scale”. The parameter's unit is metres [.]

Wind Speed

This option introduces a wind force that directly influences the waves. The magnitude of this force is measured in metres per second [m/s].

Wind direction

To change the origin and direction of the waves this parameter is needed. The value is given in degrees [deg].

Wind alignment

With small values only waves which are totally perpendicular to the waves' direction are removed. When “Wind alignment” is increased, RealFlow will remove more and more waves; waves which are less perpendicular. If the value is very high, only those waves which are absolutely parallel to the wind direction will remain

Min Wave Length

With “Min Wave Length” the amount of detail on the surface can be controlled. Higher values flatten the surface and create fewer ripples. Please keep in mind that this parameter is connected to “Dimension”. When you enter lower values for “Dimension”, you should also lower “Min Wave Length”, to guarantee that the RealWave object still shows enough structures.

Weight Against Wind

This is a weighting parameter for waves which travelling direction has some component in the opposite direction of the wind. If “Weight Against Wind” is 0.0 then all waves against the wind are eliminated. If it is set to 1.0 then its normal strength is used. Values between determine the amount of waves to be eliminated.

Choppiness

One of the main features of statistical waves is the possibility of creating sharp crests for the waves. This parameter directly influences the sharpness of the waves. Values closer to 0 will produce “rounder” waves. Be careful with high values, because the horizontal displacement of the waves can be so strong that inner polygons may turn to the outside. This creates intersections and an unwanted look. “Choppiness” strongly depends on “Vertical Scale” and “Dimension”.

Seed

By modifying "Seed" you are able to change the initial look of your surface. With different seed values it is possible to place the waves at different initial locations. Seed accepts any positive or negative integer value.