

# Water Simulation in Jupiter Ascending

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**Figure 1:** Some examples of water shots in Jupiter Ascending

## Abstract

We knew from the beginning that we would be working with Directors renowned for their visual creativity and it would be the responsibility of VFX to help bring the Wachowski's wonderful imaginings to dazzling yet realistic fruition. One of the major sequences in the film is the Chicago Chase, a futuristic dog fight including multiple interactions with the Chicago river. The complex and unusual nature of the chase choreography meant that our highly experienced water team encountered fresh problems. In this talk we will look at the unusual challenges the Chicago Chase Sequence set our team and the technical and artistic solutions found to resolve those challenges.

## 1 The Production

As with any show, we began by analysing the sequence, identifying possible issues and splitting the sequence down into separate major tasks:

- *Large scale simulations*
- *Manage different levels of detail throughout the length of the shots*
- *Built accurate and reliable collisions systems*
- *Managing huge amount of data*
- *Controlling and "sculpting" the simulations based on the Wachowski's requirements*

## 1.2 Large Scale Simulations

Simulating everything in one go (using one single huge container) would be ruinous and counter-productive. In order to get lighter and more manageable simulations, we split it into smaller manageable sections and then combined them back together once properly simulated.

## 1.3 OPEN VDB as Resource

OpenVDB was a massively important asset for our team, enabling us to render and manipulate dense simulations, and perfectly integrate extra elements into the main sim.

## 1.4 Dynamic Animations

The Jupiter Ascending spaceships were designed to appear almost fluid (shapeshifting at high speed throughout the sequence). The solution to dealing with these 'dynamic' spaceships was to rotate and "deform" the animations, forcing them to follow the straightest line possible, parallel to the containers and then "counter-rotate" them post-simulation.

## 1.5 River and SQUIRT OCEAN

*SQUIRT OCEAN*, developed by Double Negative, allowed us to match the water pattern of the real Chicago River. It creates seamless water patterns by easily picking up "cascade files" from our library. Its simplicity was a key factor in the delivery of the shots, as it allowed lighters or layout artists to be able to build replacement water patches, freeing up our FX team to problem-solve the more complex challenges within the scene.

## 1.6 Flexibility

We came up with a few more useful tricks in the setup to make it even more flexible and predictable. The interaction between the spaceships and the water was completely managed by additional volume fields constrained to each aircraft in order to create custom water behaviours. We developed tools to manipulate the water as post-sim processes, and to detect and delete isolated "crazy" droplets and to generate velocity masks, which were not only used consistently by FX TDs to modify the simulations, but also highly appreciated by lighters too.

## 2 Conclusions

The task of creating CG water continues to become easier as our R&D develops great tools and thanks to the growing computing power. Experience, smart tricks, and clever ideas were the extra ingredients that helped us achieve stunning results whilst avoiding any waste of resources and keeping the production on target.

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