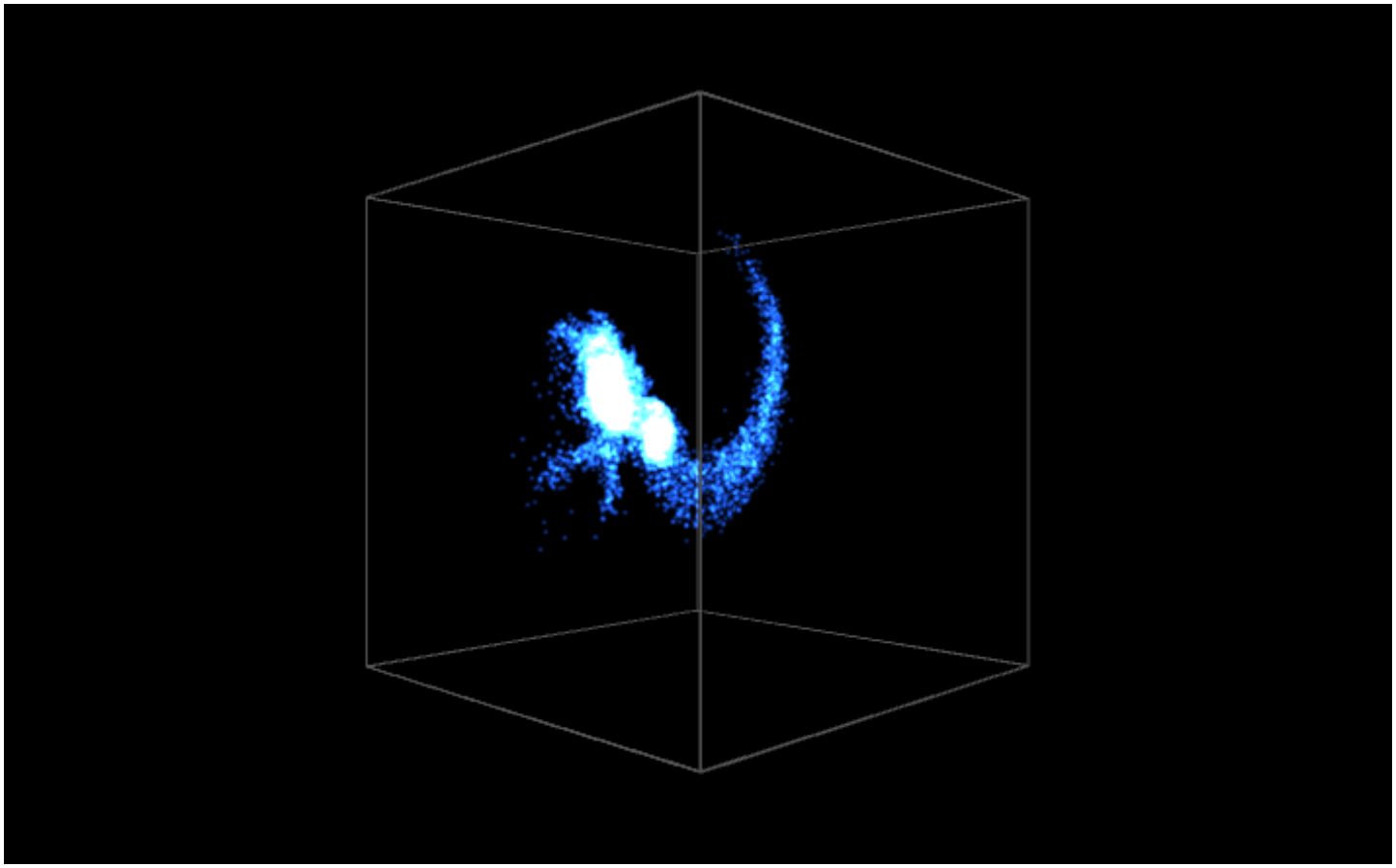
Interacting Galaxies



Swinburne Astronomy Online 3D PDF

1 Description

1.1 Spiral galaxy interaction

This simulation models the interaction between two large spiral galaxies. The galaxies comprise N-body particles only, which represent both stars and dark matter, that interact via gravity. As the galaxies come together, tidal forces start to distort them and strip off long tidal tails. Eventually the two spirals merge and become more spherical in shape. It is believed that elliptical galaxies might form from such interactions.

The simulation was run by Daisuke Kawata with an N-body code on the Swinburne supercomputer.

This 3D PDF shows one snapshot in time from the simulation, and includes two views: volume rendering and isodensity surfaces.

- Volume rendering is one way to represent the density of particles in 3D, whereby the colour scale represents the local density of particles. The lowest density regions in the tidal tails are shown in blue and the highest density regions at the core of each galaxy is shown in red.
- Isodensity surfaces are another way to represent the density information. Like contour lines on a standard map, an isodensity surface contains all of the particles above a particular 3D space density level. Thus the isodensity surface represents a volume density cut. In this 3D PDF there are three levels of isodensity surfaces: low, medium, and high density. By toggling between these three isodensity levels, you can see into the density structure of the 3D volume. You can view progressively higher levels by hiding the lower isodensity surfaces. Start by hiding the low level (blue) surface, which will allow you to see the medium level (green) surface. Then hide the medium level surface to see the high level (brown) surface.

1.2 How to use this 3D PDF

The interactive 3D content appears on the next page of this document. You can interact with the 3D content in a variety of ways. Most of these can be found in the 3D toolbar (see below) that appears when you move the mouse cursor over the 3D figure.

To start, click and hold the left mouse button anywhere within the 3D figure. Then move the mouse around and see how the orientation changes. You can use the right mouse button in the same way to zoom in and out. Other interaction modes are also available. You can explore these by clicking on the drop-down menu of the left-most icon on the 3D toolbar.

Every 3D figure has a default view, which can be returned to by selecting `View 1` from the toolbar `Views` menu. Some figures may also have other interesting views available for you to try.

There are some additional keyboard shortcuts for you to use. (Note that you must first left mouse click on the 3D figure to utilise these shortcuts.)

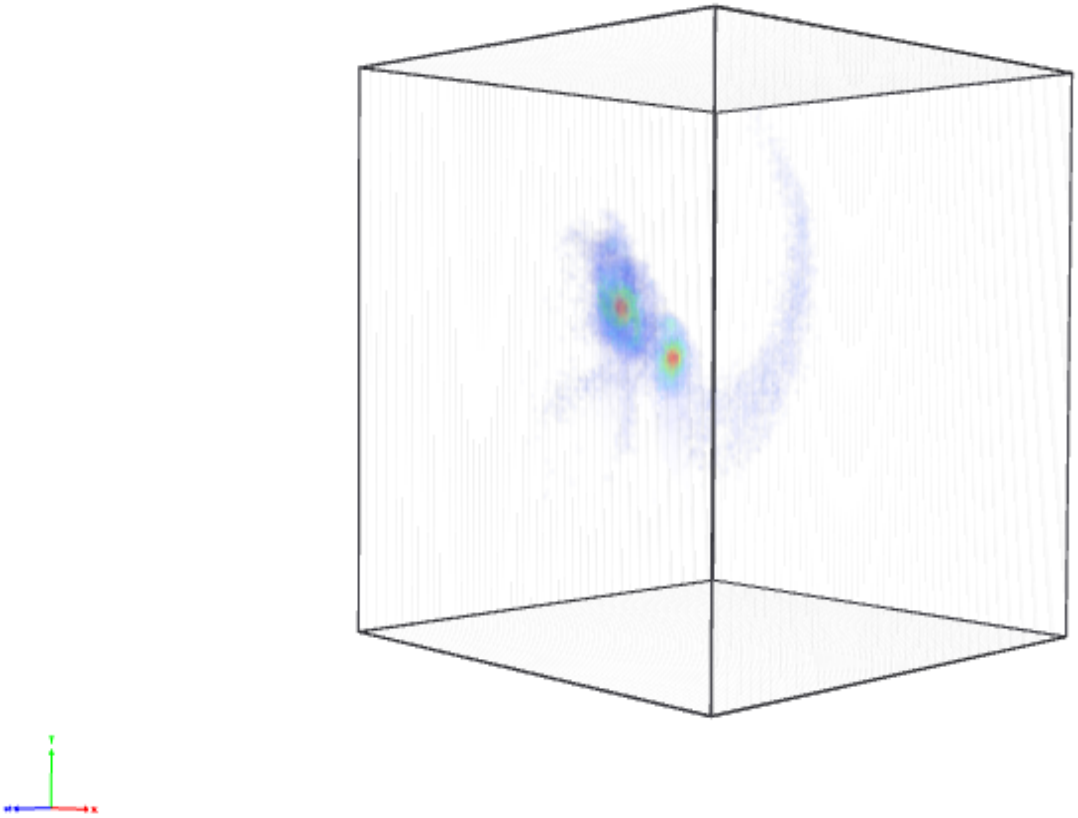
arrow keys (up, down, left, right)	rotate the object
+ , -	zoom in or out
a	autospin
* , /	increase, decrease the autospin speed
[,]	roll the object clockwise, anti-clockwise
h	return to the default view

Some 3D figures may also allow you to show or hide certain types of objects from view. If available, this option will appear as a text link below the 3D figure, e.g. `Click here to....`

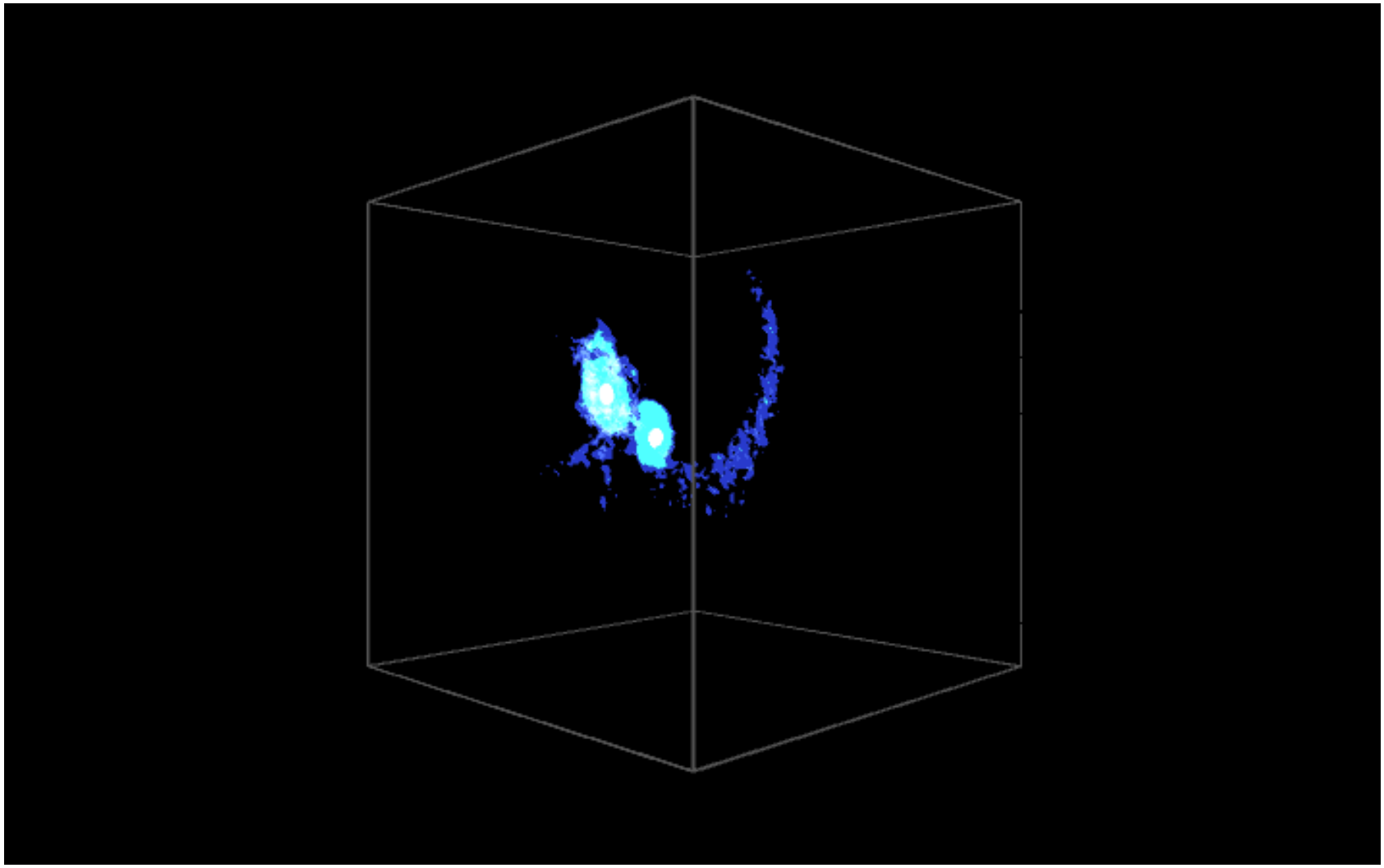
Note: The free Adobe Reader (Version 8 or higher) is required for these 3D PDFs.

2 Spiral galaxy interaction

2.1 Volume rendering



2.2 Isodensity surfaces



Click here to hide/show the low level surface.

Click here to hide/show the medium level surface.

3 Credits

The data used for this PDF was provided courtesy of Daisuke Kawata and the simulation was run on the Swinburne supercomputer.

The 3D content in this PDF document was prepared with S2PLOT (Barnes et al., 2006, PASA, 23, 82; Barnes & Fluke, 2008, New Astronomy, 13, 599).

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