



Explore halo mergers
with simulation databases!

Simulation database: Merger tree example



1. Open **Topcat** version 4.1 (in Linux: `java -jar topcat-*.jar`).
2. Open **www.cosmosim.org** in a browser. **Login**, if you have an account already, register or proceed to **Query** as a guest. Note that guest users cannot use SAMP in step 7.
3. Choose one of the **example queries** below the SQL query form, e.g. [Progenitors of a halo](#). A click on the example inserts the corresponding SQL query into the SQL form.
4. Write a **new result table name** below the SQL query form, e.g. progenitor-test.
5. **Submit** the query, **confirm** the query plan and the message.
6. A new job with the given result name appears in the **Jobs list** on the left side. Once it is finished, click on the **job name** and choose the **Results Table** tab for the main area.
7. Click on [Register with SAMP](#) below the **result table**. Click [yes](#) to authorize the connection, enter your [password](#) and click [Send table to topcat](#). (For guests, SAMP is not enabled. Go to the Download tab, save the file and open it in Topcat manually.)
8. In **Topcat** a new table appears. Click on **Cube Plot** (Graphics, Cube Plot) and choose as columns: [p__x](#) for X-axis, [p__y](#) for Y-axis and [p__z](#) for Z-axis, i.e. plot the halos' positions.
9. Adjust the **color** of the dots: Go to the **Form tab**, choose **Shading Mode aux** and select [p__treesnapnum](#) (~ time) as **Aux-axis**. Adjust marker size and opacity to your liking.
10. You can see now the positions of the progenitor halos colored with time that merged to the final halo (see **picture** overleaf). Such merger histories are important to understand present day properties of a dark matter halo.

Experiment with different parameters/halo numbers in the query, browse the documentation on the website and plot different columns to explore the capabilities of simulation databases and Topcat.