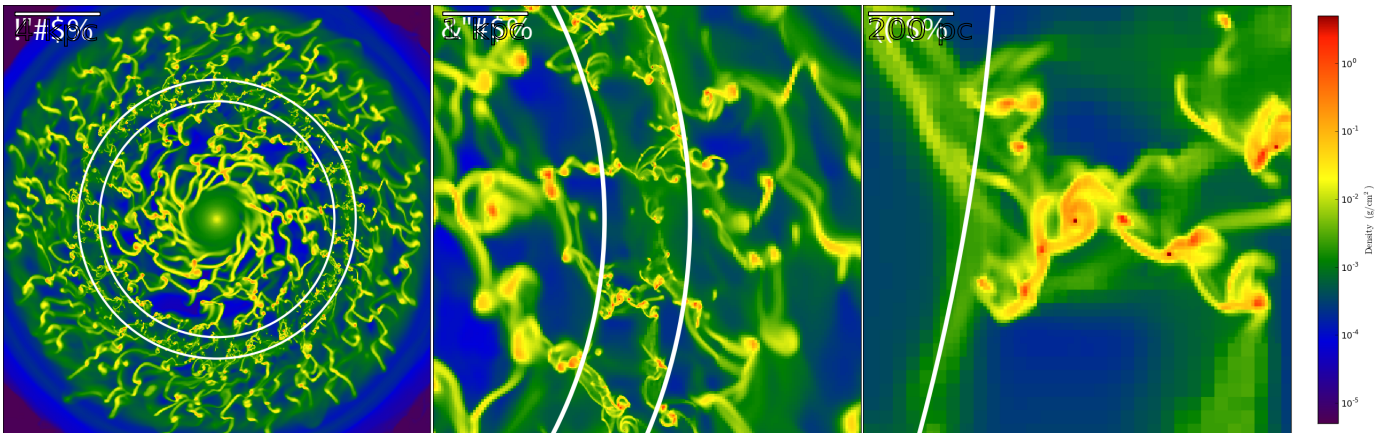
国立天文台天文シミュレーションプロジェクト成果報告書

Simulated Cloud Catagloue

Elizabeth Tasker (Hokkaido University)

利用カテゴリ　XT4A



The project completed on the XT4 last year looking at high resolution simulations of a galaxy like our Milky Way. The newest feature in this work was the addition of a rotating reference frame; a radii in the galaxy disk that remained stationary through the simulation. Gas either side of this reference point moved in opposite directions. The point of this addition was to remove the numerical support that occurs as gas moves through a cartesian grid; a feature of the astrophysics code used for this simulation. With this in place, gas collapsed via gravity to form star forming clouds that could be compared with observations of similar objects in our own galaxy.

The figure above shows images from the simulation. The far left shows the whole galaxy disc. White lines have been added to indicate the location of the rotating reference frame. The two right-hand images show close-ups of this region; the middle image shows the difference in cloud structure within the rotating frame region while the far right image shows one of the star forming cloud that we compare to observations.

We found the simulated cloud population compare well with observed star-forming clouds. Their properties of mass, radius and velocity dispersion are similar and their turbulence properties suggested that cloud interactions played a key role in their evolution. The clouds themselves were not isolated objects, but filamentary structures that accreted gas from their surrounding environment.

To further future studies of star formation, we created a “cloud catalogue” in which other members of the astrophysics community could download small data bundles that contain the structure of individual clouds and use this as starting points to their own simulations. This is a very important step in star formation simulations, which are frequently plagued by overly-simple initial conditions.

The website for this project can be found here: http://www.physics.mcmaster.ca/mcclouds/ . The paper has been submitted to The Astrophysical Journal and is currently being reviewed.