# Dispersion of tidal debris in the Via Lactea II Halo

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**Abstract**

We simulate the tidal disruption of an N-body globular star cluster in 100 different orbits in spherical and realistic dark matter halos, and in each case with and without subhalos predicted in the ΛCDM cosmology. Our goal is to demonstrate the importance of using realistic halos for tidal stream simulations.

**Progenitor and orbits**

The stream progenitor is a self-gravitating globular cluster with 50,000 particles of 1 $M_\odot$ each following a King profile with tidal radius 0.15 kpc. The initial positions and velocities of the orbits are randomly distributed, but only the ones with galactocentric radii less than 30 kpc for 10 Gyr are selected.

**Halos and subhalos**

The spherical halo is modelled using the NFW profile, whereas the realistic halo is constructed from the Via Lactea II simulation using the self-consistent field method. The subhalos orbit around the underlying halos, but all of them are constructed using only the z=0 snapshot and are not evolving in time.

## Spherical halo

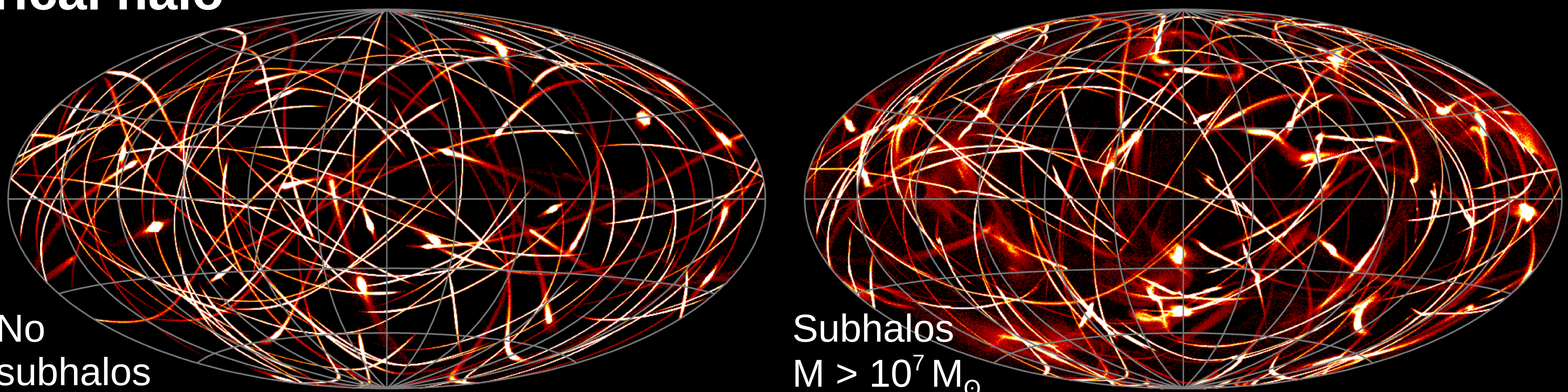


**FIGURE 1:** Hammer-Aitoff equal-area sky projections of 100 streams at 6 Gyr in the spherical halo, as seen from the galactic center. Each panel shows the combined surface density of particles in 0.3° cells, where brighter regions are denser. Under the influence of subhalos (right panel), the streams travel in different orbits and are more dispersed than their counterparts in the smooth halo (left panel). However, the dispersion is small compared to the effect caused by the halo's shape (see below).

## Realistic halo

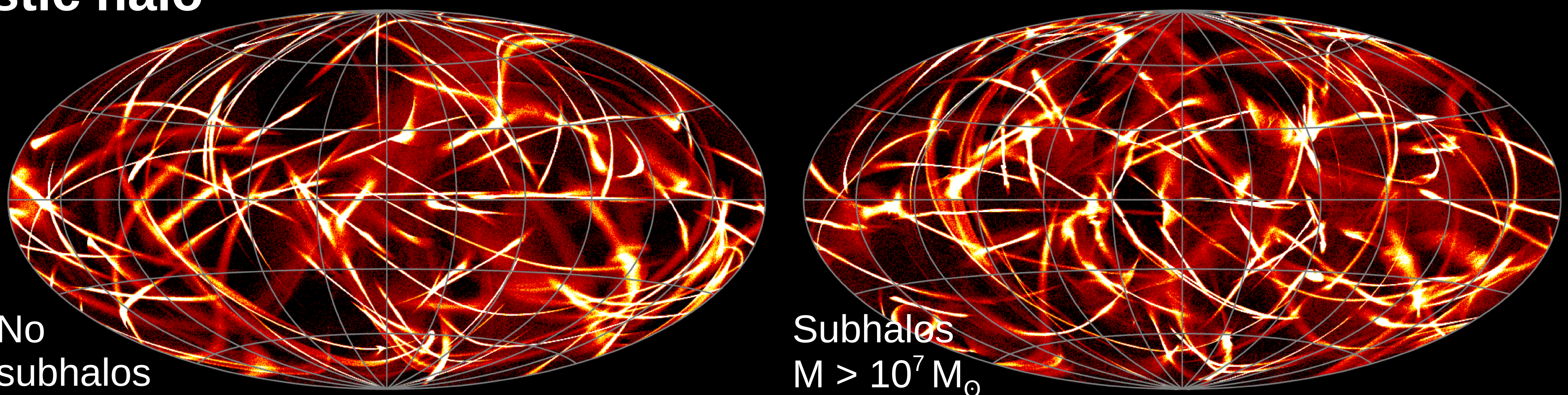


**FIGURE 2:** Sky projections of 100 streams at 6 Gyr in the Via Lactea II halo. The color scale is the same as Figure 1 above. The dispersion of streams caused by the halo's shape is much larger than that caused by subhalos. However, the streams' clumpiness caused by subhalos are slightly denser than the streams in the smooth halo.

## Realistic halo

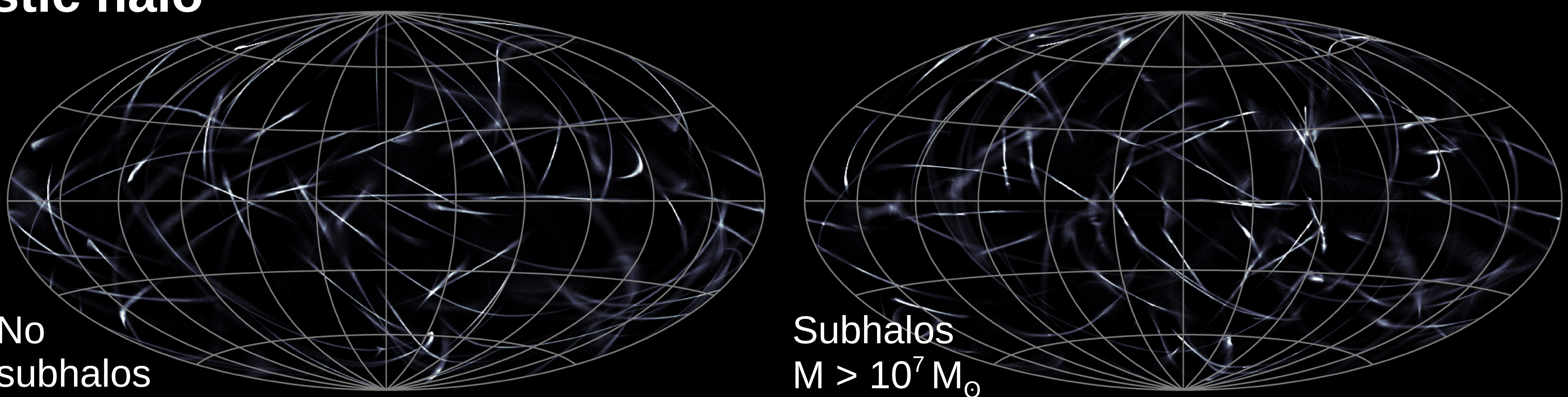


**FIGURE 3:** Same panels as Figure 2 above, but the color scale is changed to emphasize the densest streams. These streams have the highest surface brightness, hence the easiest to observe. Note that many of the streams can survive as thin structures for a Hubble time in a realistic halo, with or without subhalos.