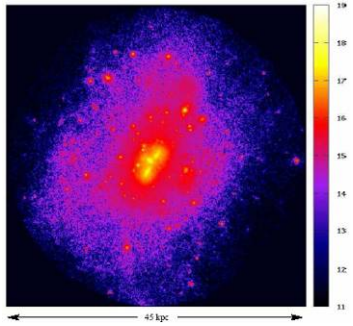
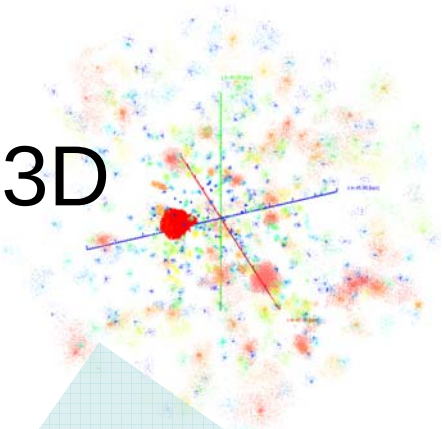
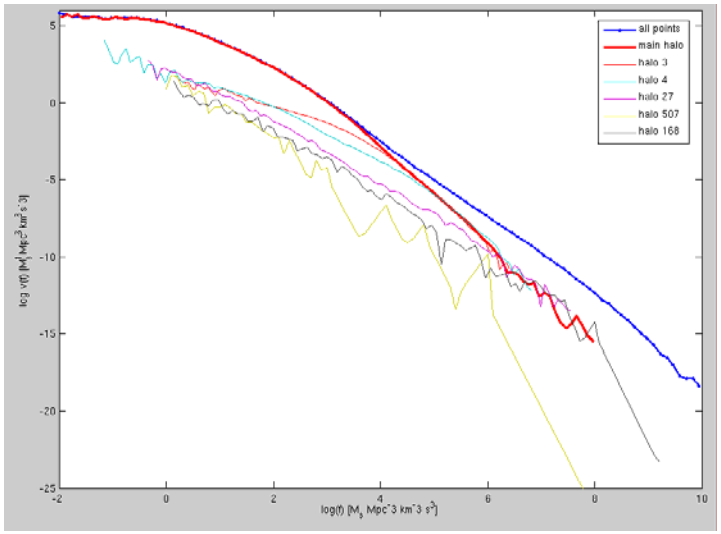


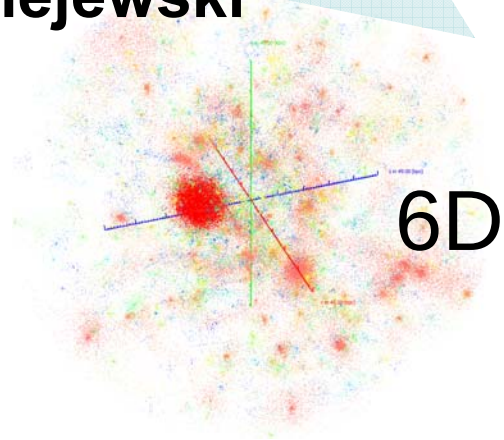
3D



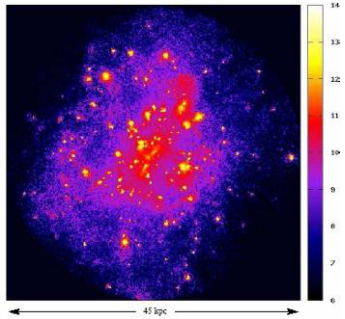


Finding and analyzing dark matter halos structures in six dimensional phase space

Michał Maciejewski



6D



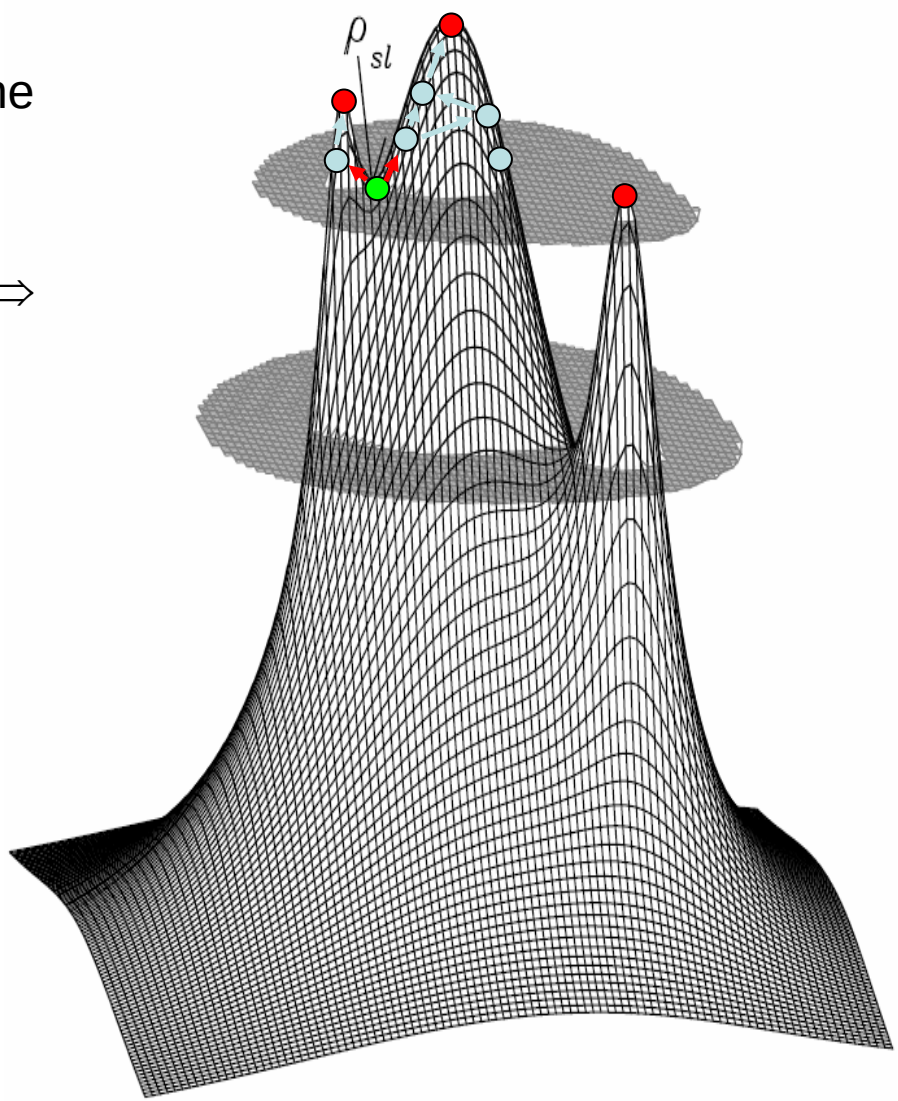
Finding substructures in 6D

1. Sort particles by denisty order (from highest)
2. For each particle find two closest one with higher density
3. We have 3 cases:
   1. Particle is the **Maximum point** ⇒ mark particle as core of new structure
   2. ***One or two particles and both belong to the same structure***

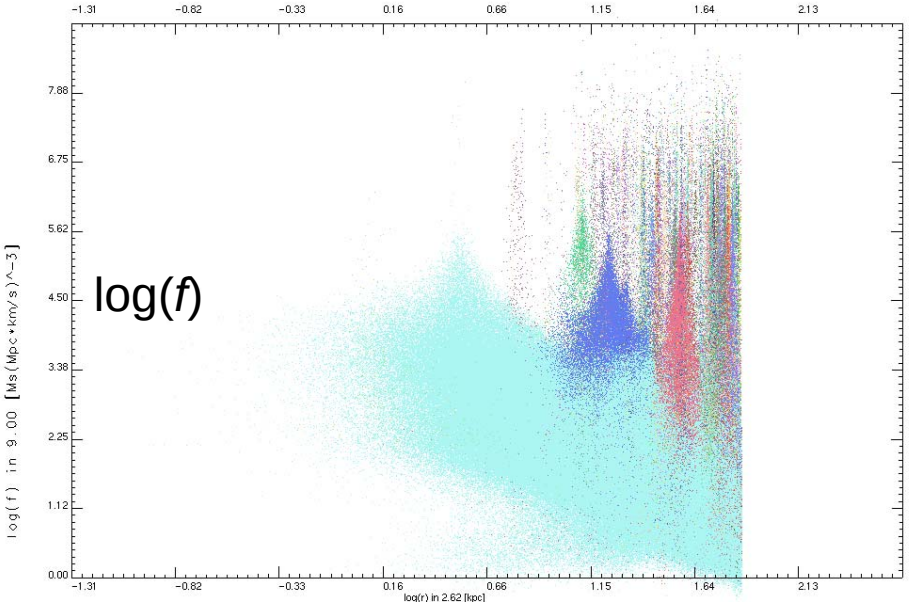
      ⇒ connect particle to this structure
   3. **There are two particles, each belong to other structure**

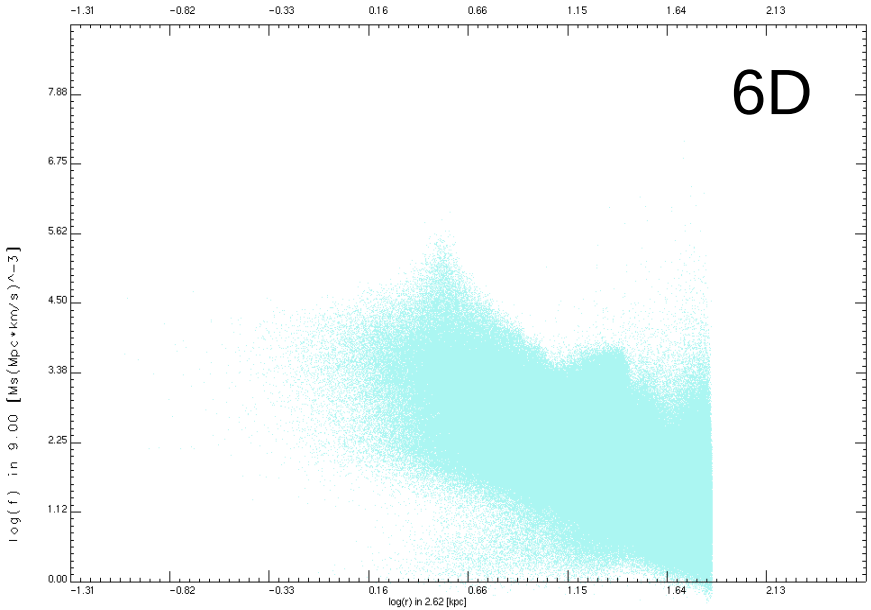
      ⇒ saddle point

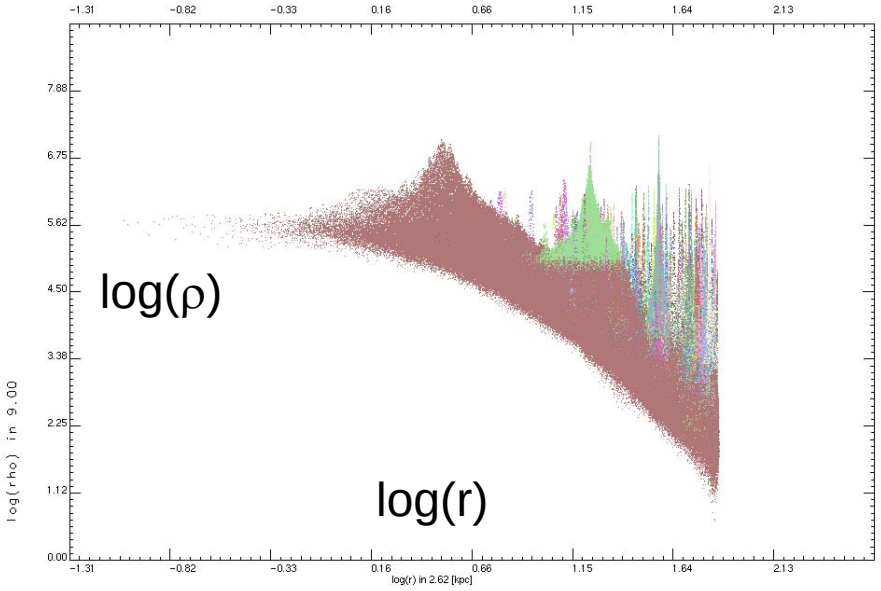
      ⇒ put smaller structure on list, join both list of particles
4. Additional ⇒ bound structures **(using velocities)**

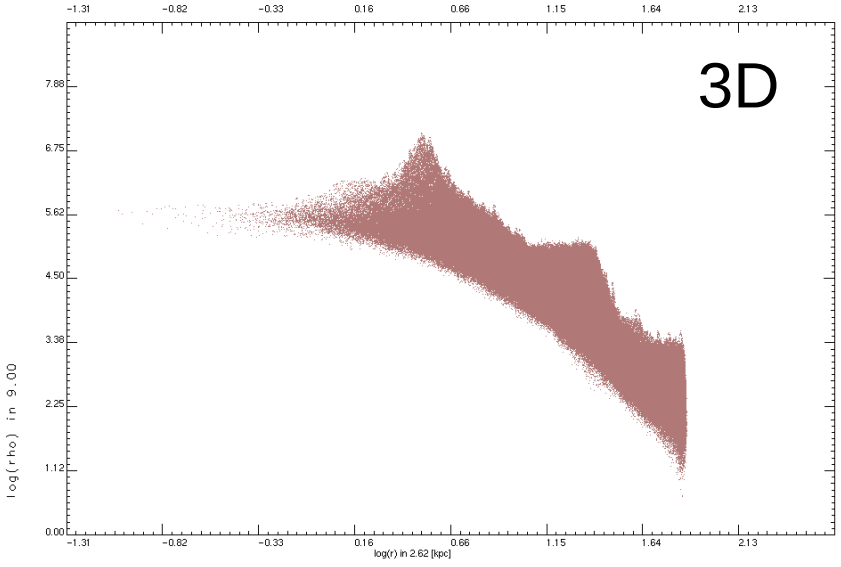


Results - 6D vs. 3D



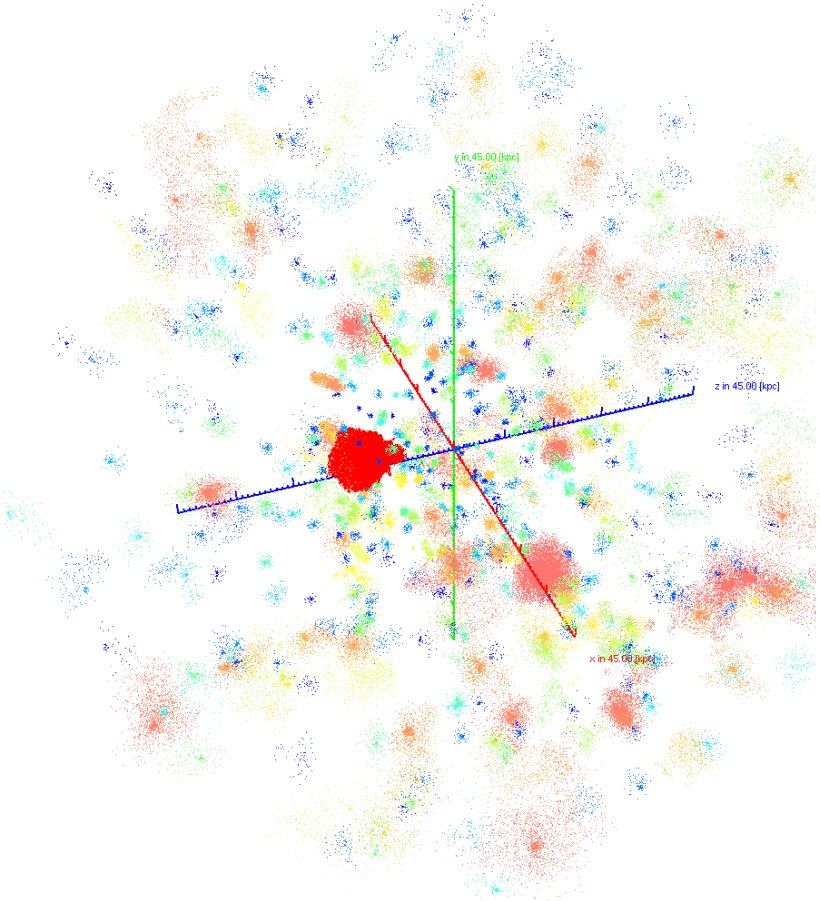






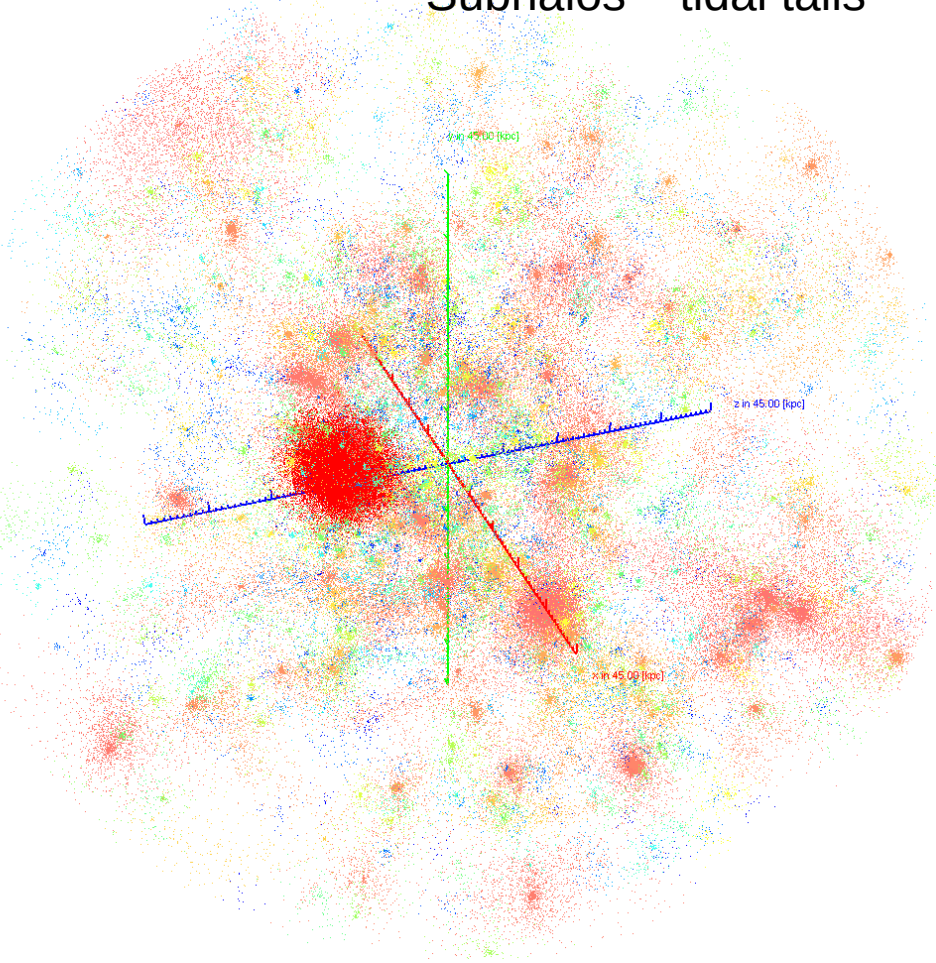
Results - 3D vs. 6D

Subhalos

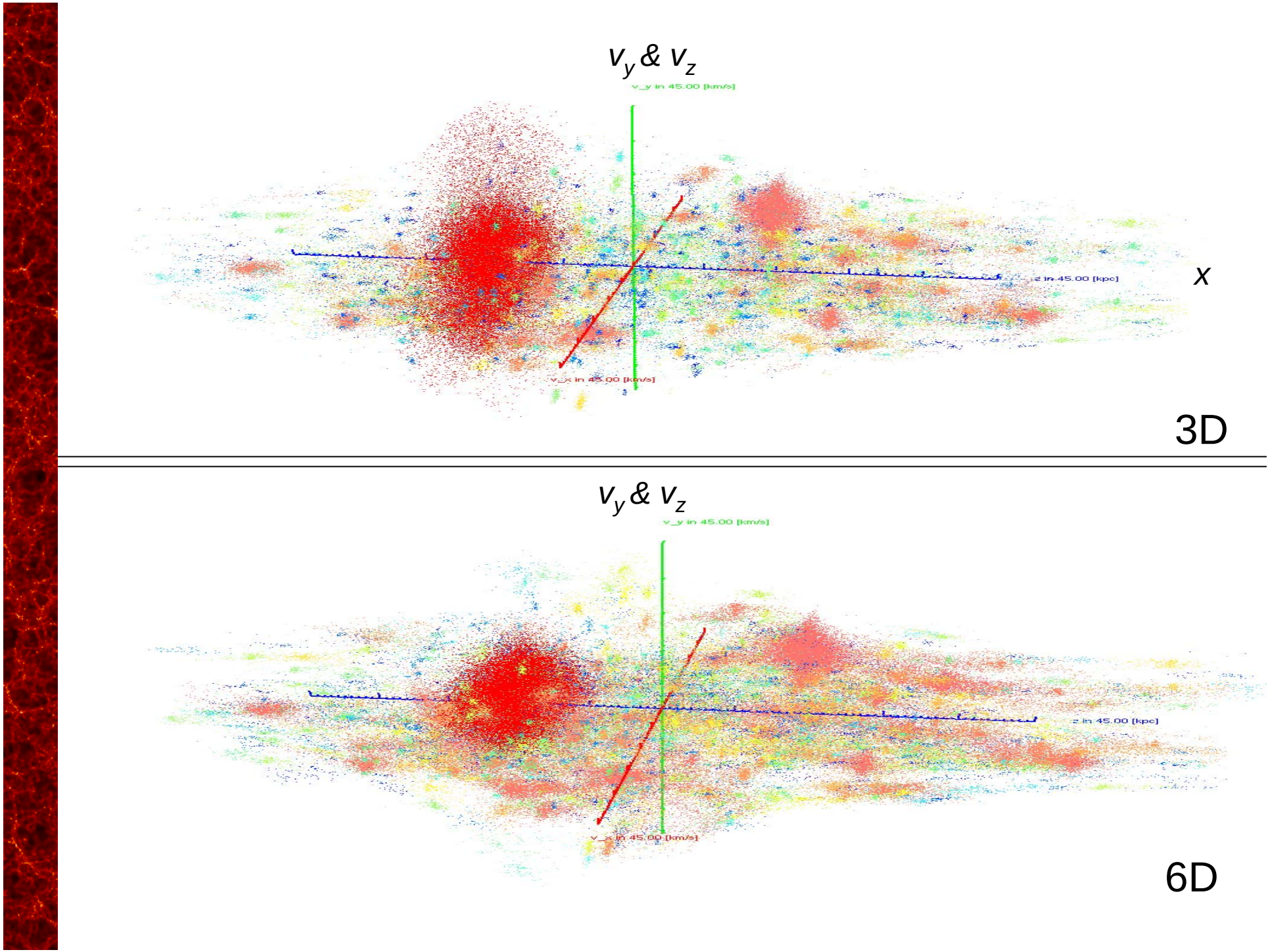


3D

Subhalos – tidal tails

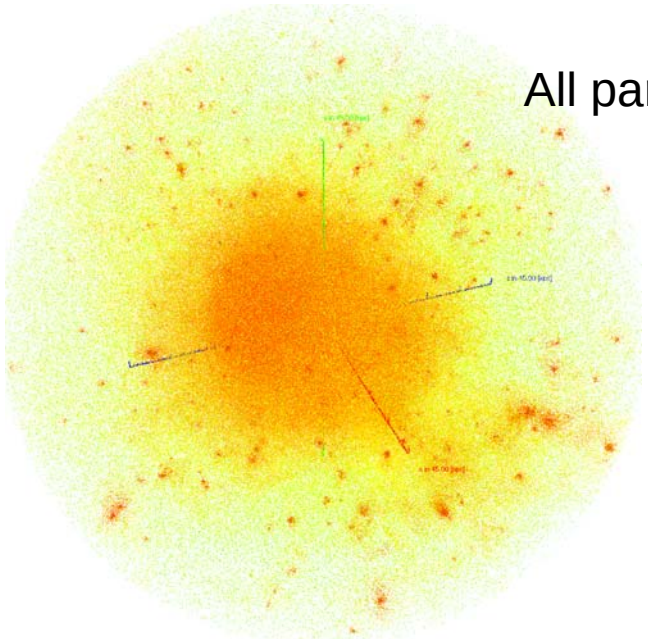


6D

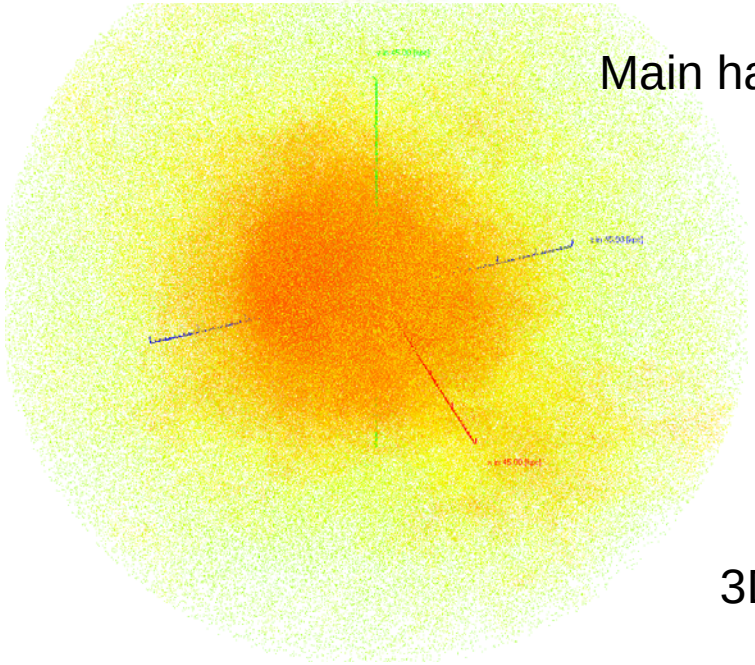

v_y & v_z
v_y in 45.00 [km/s]
z in 45.00 [kpc]
v_x in 45.00 [km/s]
x
3D
v_y & v_z
v_y in 45.00 [km/s]
z in 45.00 [kpc]
v_x in 45.00 [km/s]
6D

Results - 3D vs. 6D

All particles

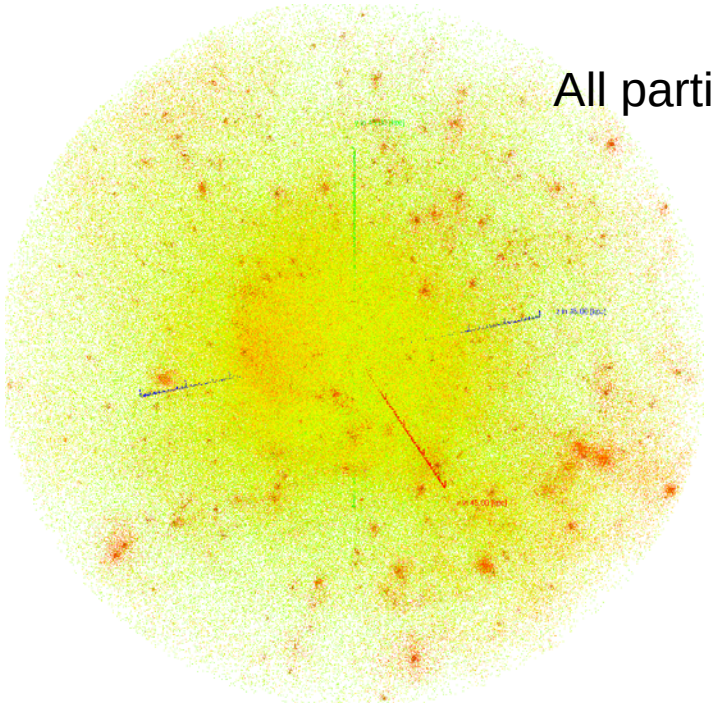


Main halo

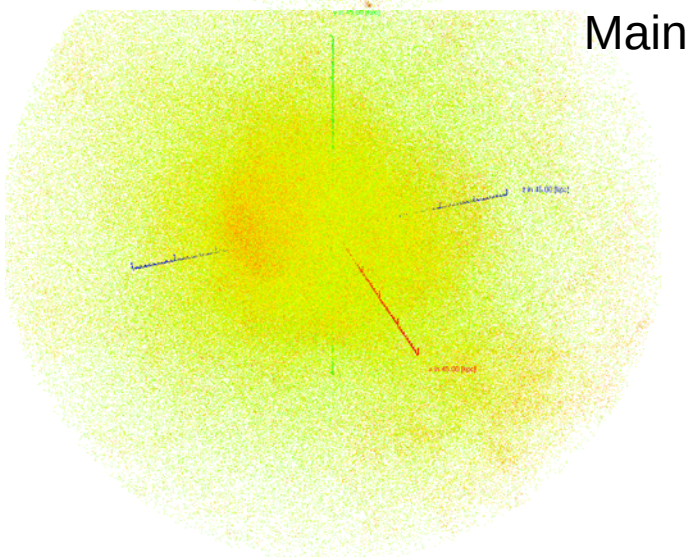


3D

All particles



Main halo



6D

Results - SUBFIND 6D

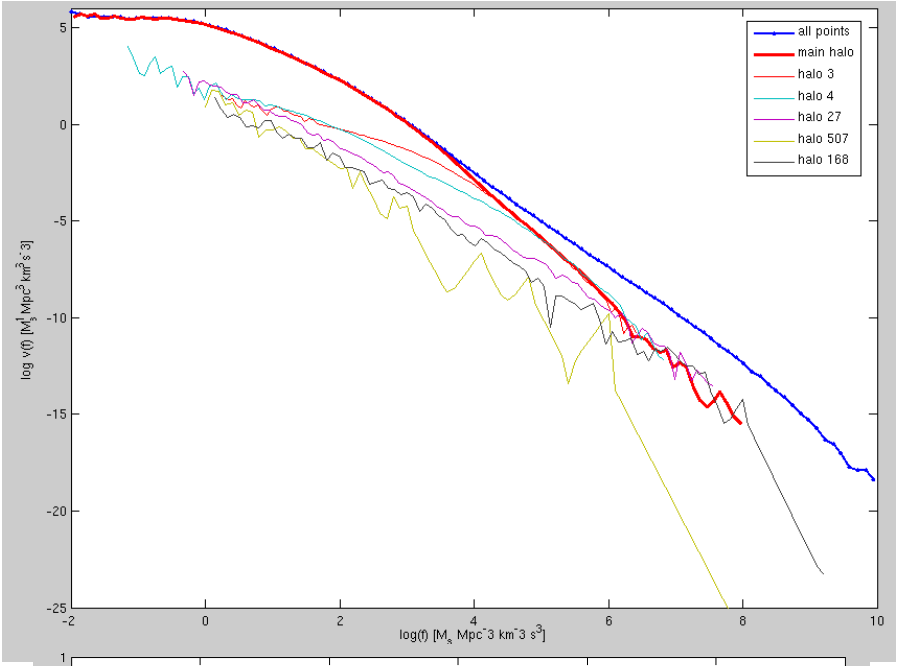
$$v(f) = \int_0^{\mu M} \frac{dn}{dm} v_m(f) dm \propto f^{-(4-\gamma)}$$

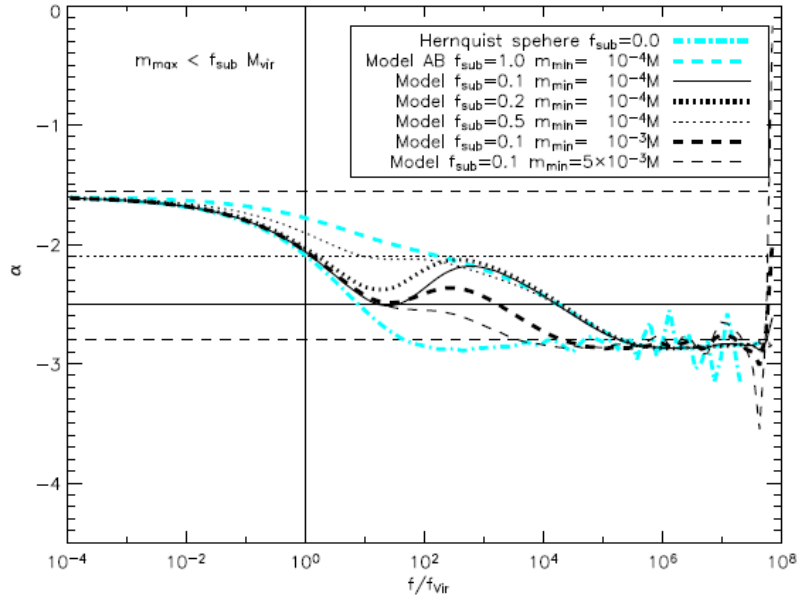
Hernquist profile

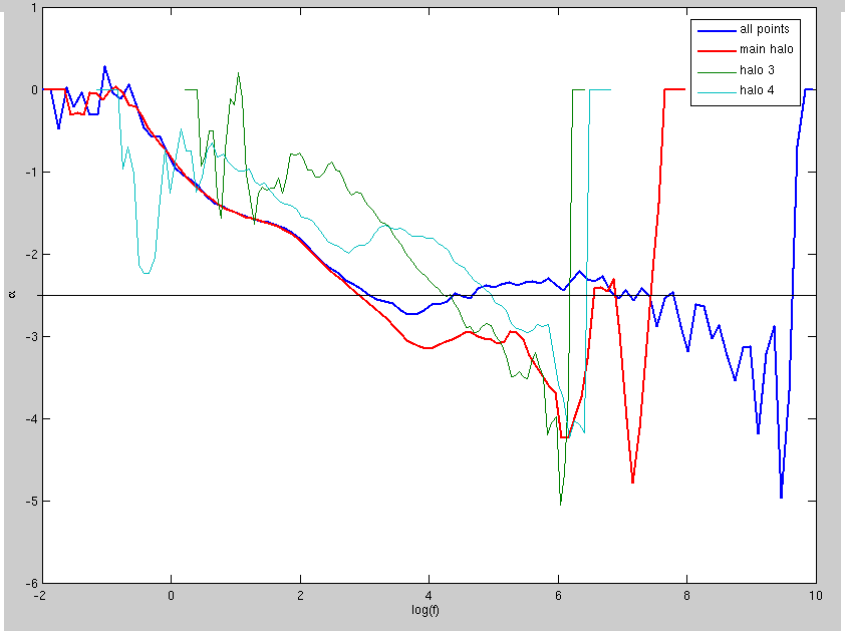
γ=1.9

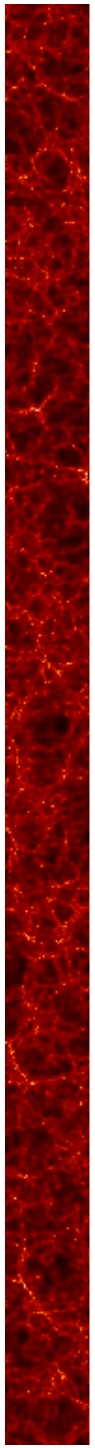
$v(f \to 0)$ α = -1.56

$v(f \to \infty)$ α = -2.80









Thank you