ZTF bulk flow and shear simulations

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Reminder

Results of SNfactory bulk flow/dipole study (Feindt et al. 2013):
- No evidence for backside infall to Shapley
- Mass of Shappley insufficient to explain velocities
- Sloan Great Wall may explain remaining velocity

Velocity tidal field:
- Adds 6 new parameters (1 monopole, 5 quadrupole/shear)
- Can estimate distance to attractor
- Only few shear analyses in the literature so far

$$\vec{v}(\vec{x}) = \boxed{\vec{v}_0} + \boxed{H}\vec{x} + \boxed{\Sigma} \cdot \vec{x}$$

constant velocity

local boost to H_0

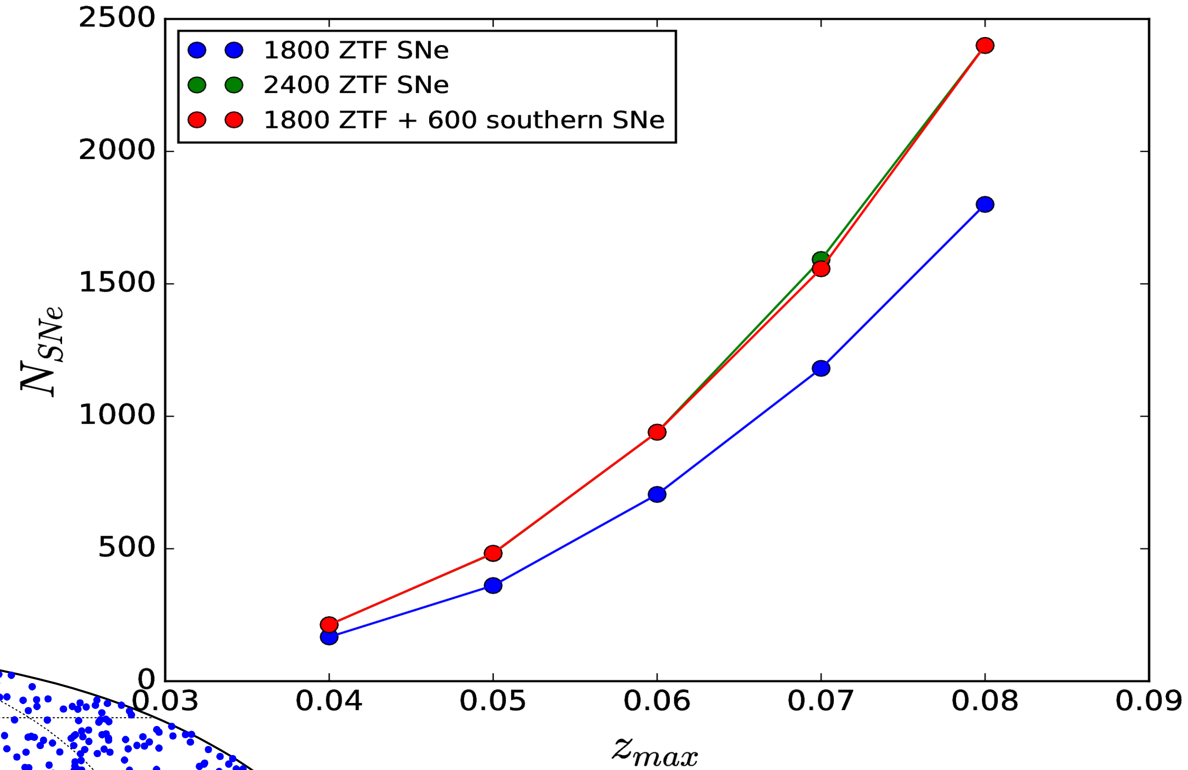
Convergence of peculiar velocities
➔ **Constrains distance to attractor**

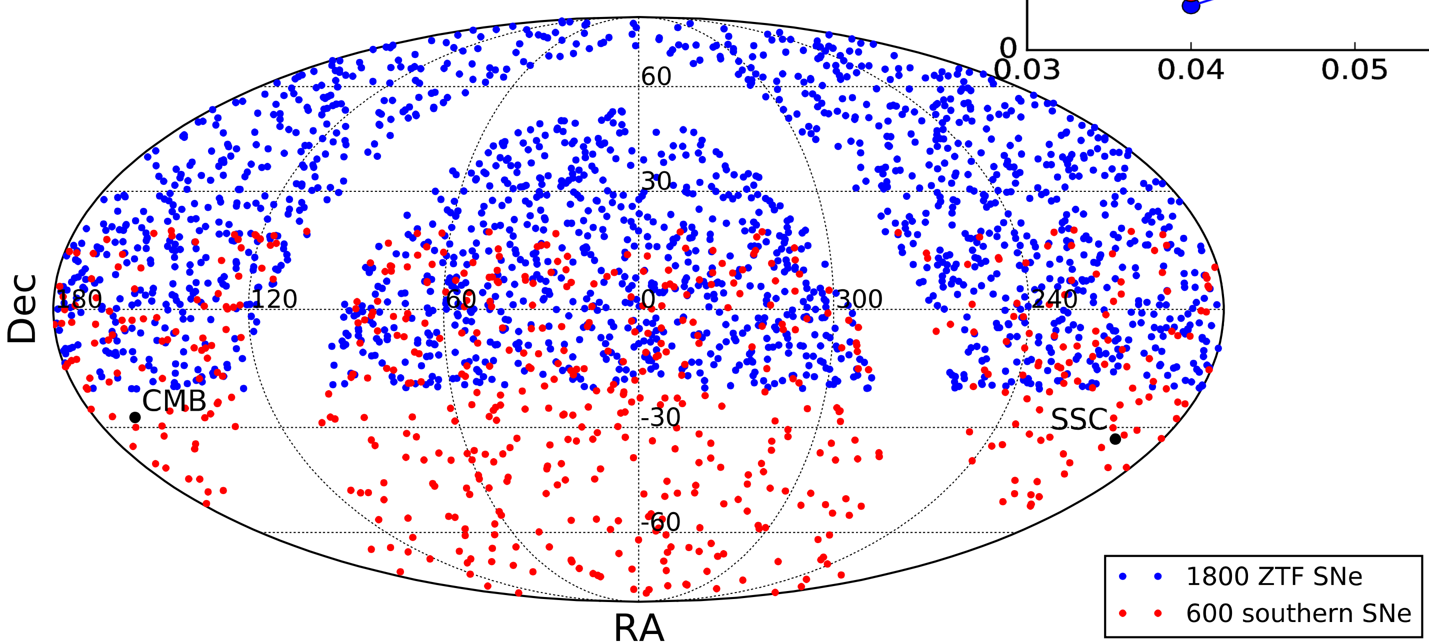
Simulated SNe

ZTF SNe: Dec > -20 deg
Southern: Dec < 20 deg
Both: |b| < 10 excluded

Redshift drawn assuming constant volumetric rate

SN dist. mod. uncertainty: 0.14 mag on average

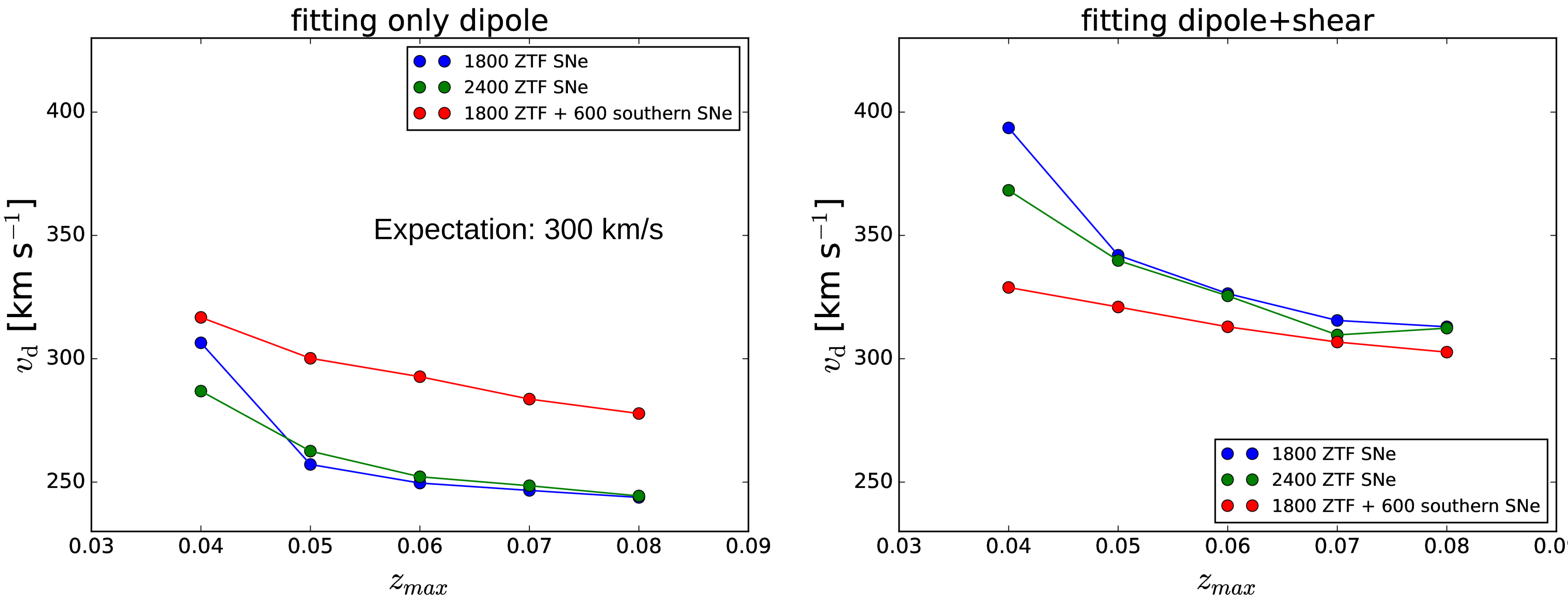




Sphere fits to constant dipole+shear

(v = 300 km/s, l = 300 deg, b = 30 deg, shear = 1.5 km/s/Mpc in dipole direction)

Dipole velocity amplitude



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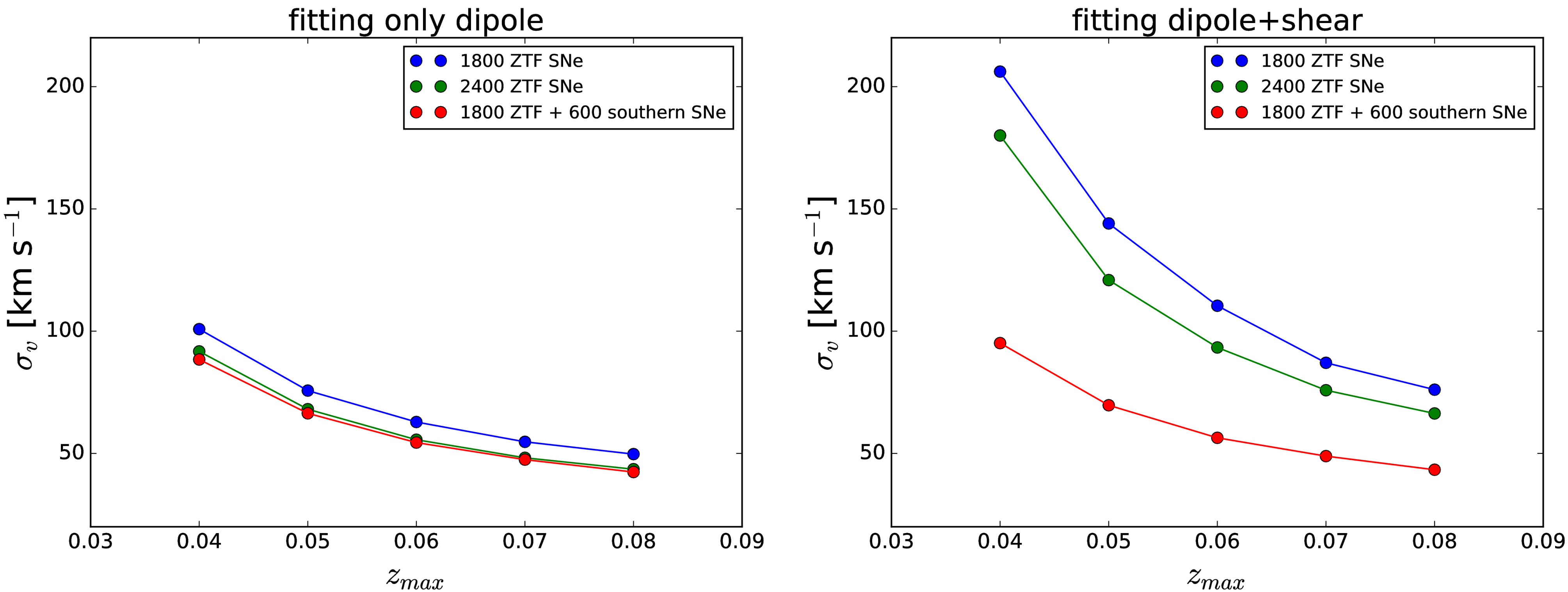

➔ If we want to fit dipole and shear, southern SNe will be essential.

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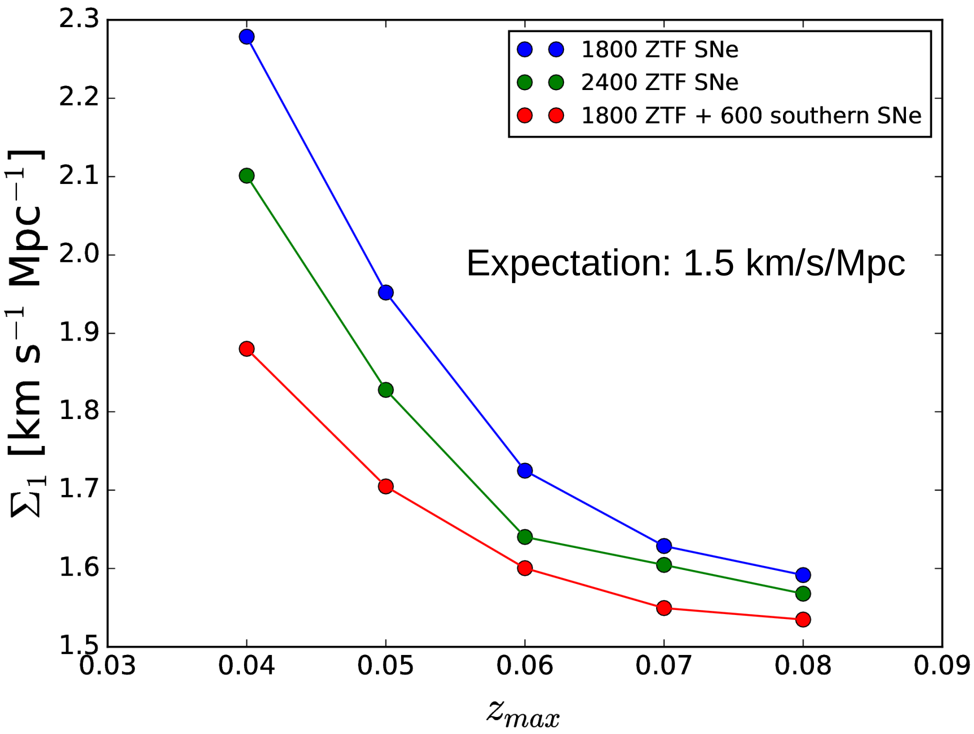
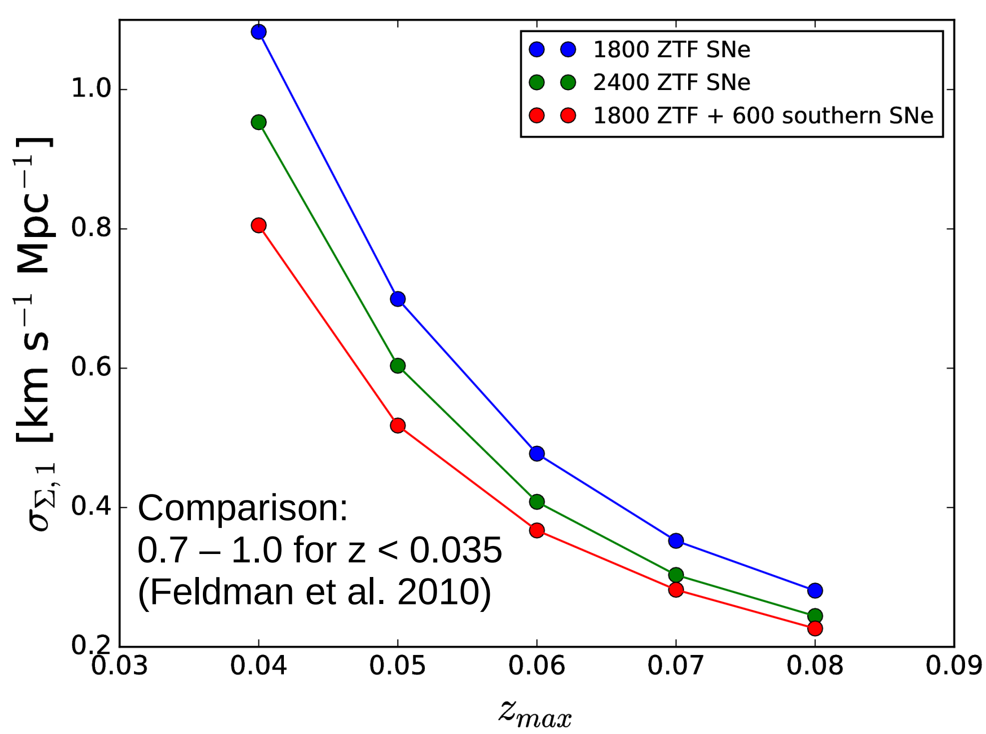
First shear eigenvalue





➔ Adding 600 southern SNe improves uncertainties by 20-30% (instead of 13% from √N)

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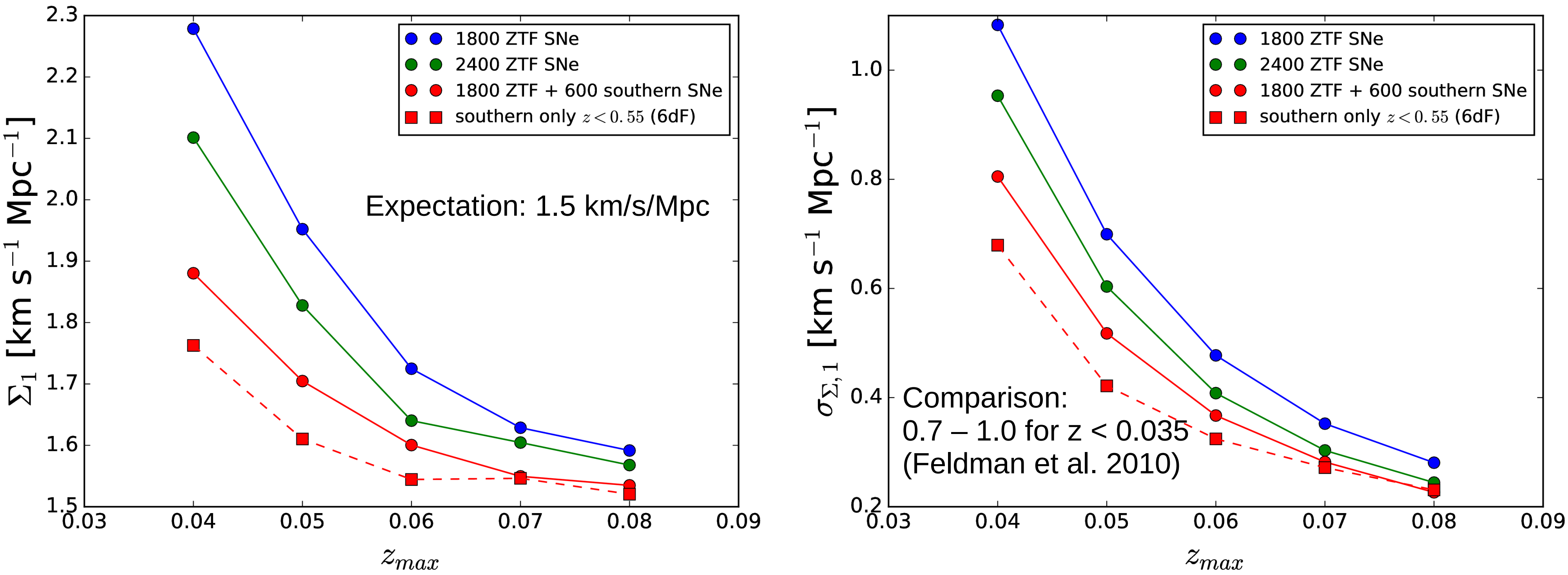
How about using galaxies?



6dFGRS has ~10^4 FP distances on southern hemisphere (~3-4 times larger uncertainties)
➔ Corresponds to ~600 Sne

Extends only to z ~ 0.055 but this actually helps the analysis

Backup

(same slides as 3-7 but show redshift shells)

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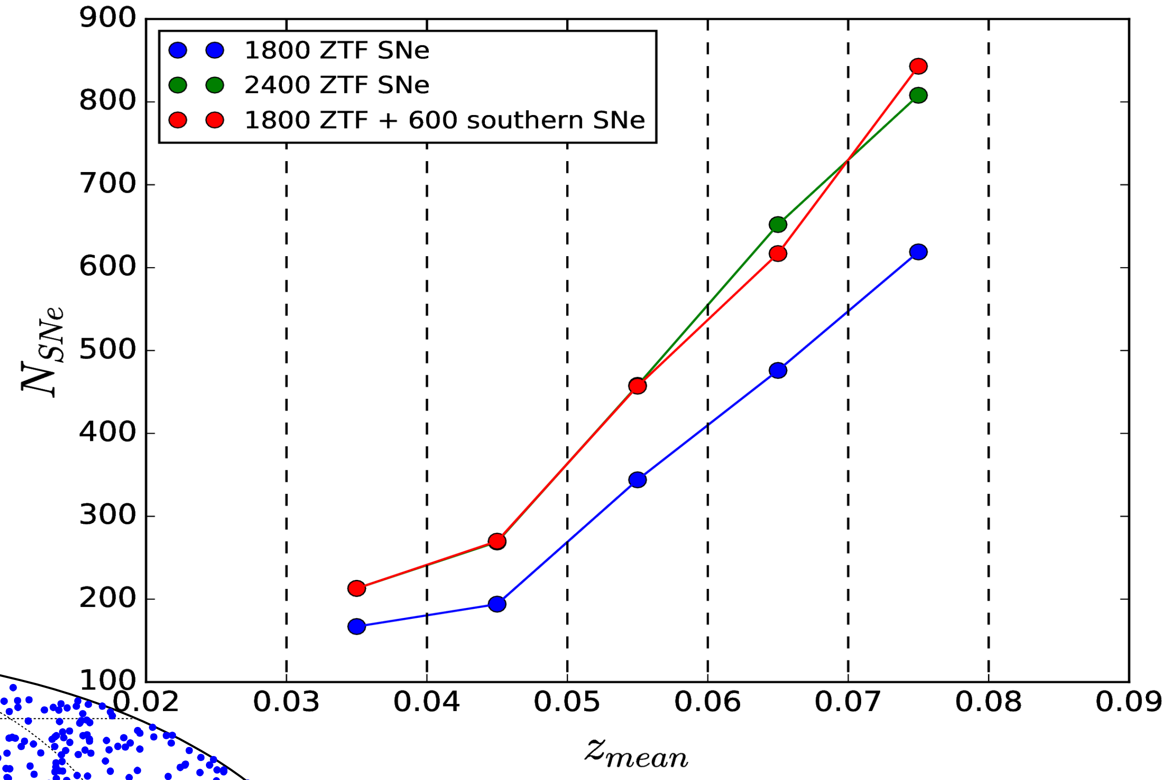
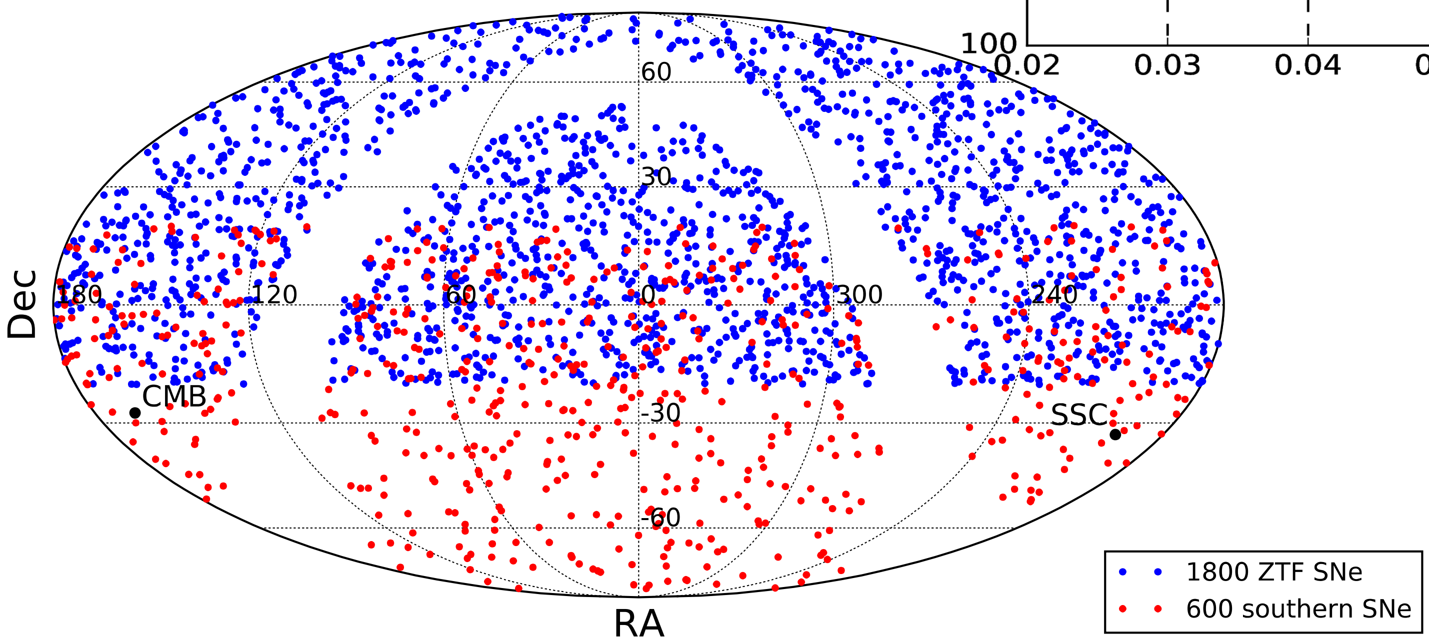
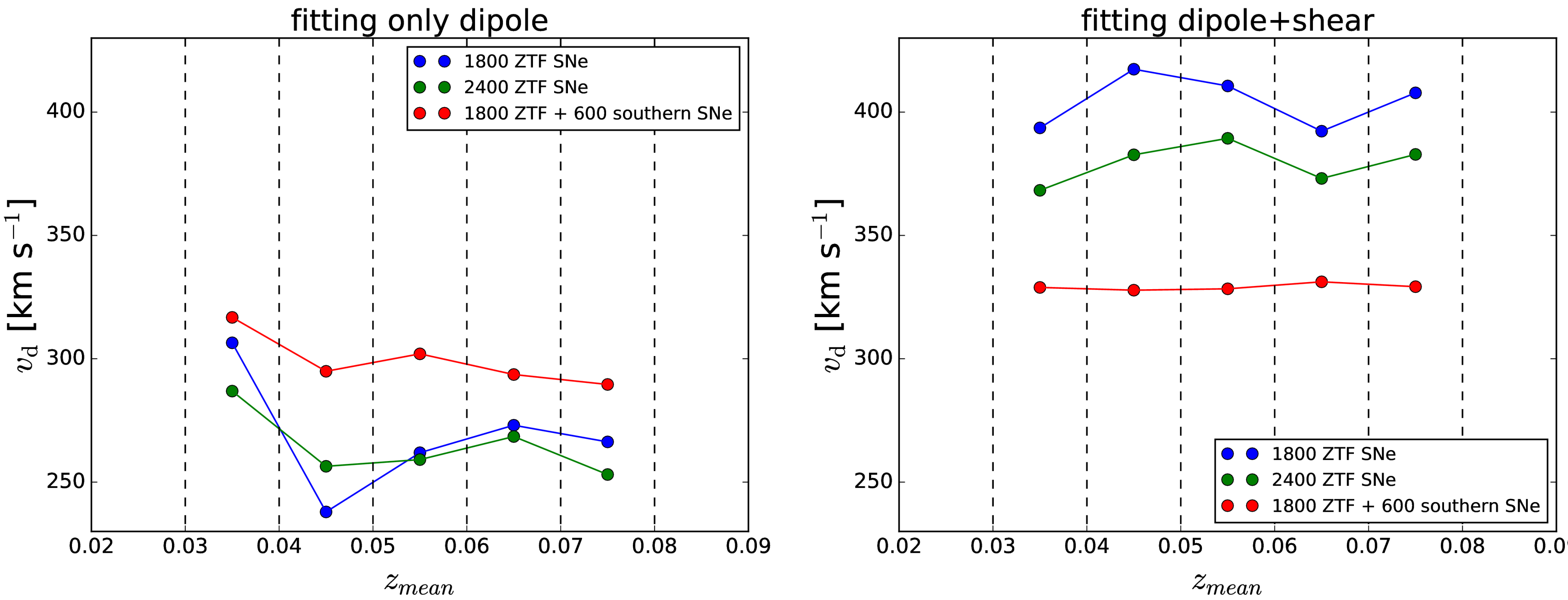




Shell fits to constant dipole+shear

(v = 300 km/s, l = 300 deg, b = 30 deg, shear = 1.5 km/s/Mpc in dipole direction)

Dipole velocity amplitude



Expectation: 300 km/s

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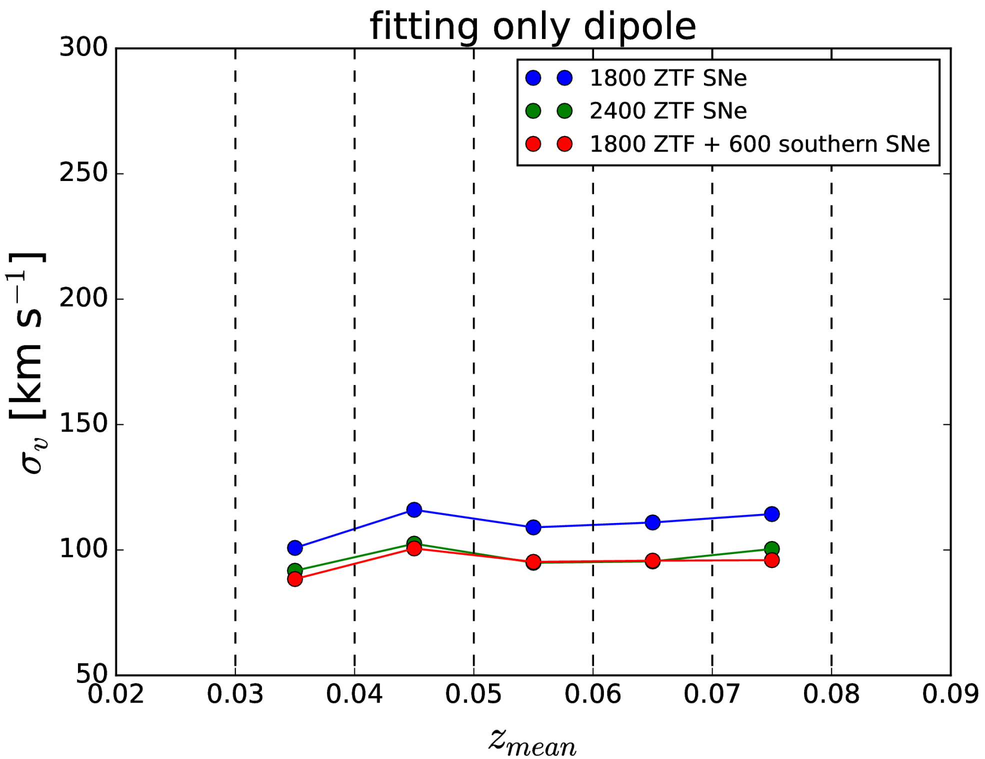
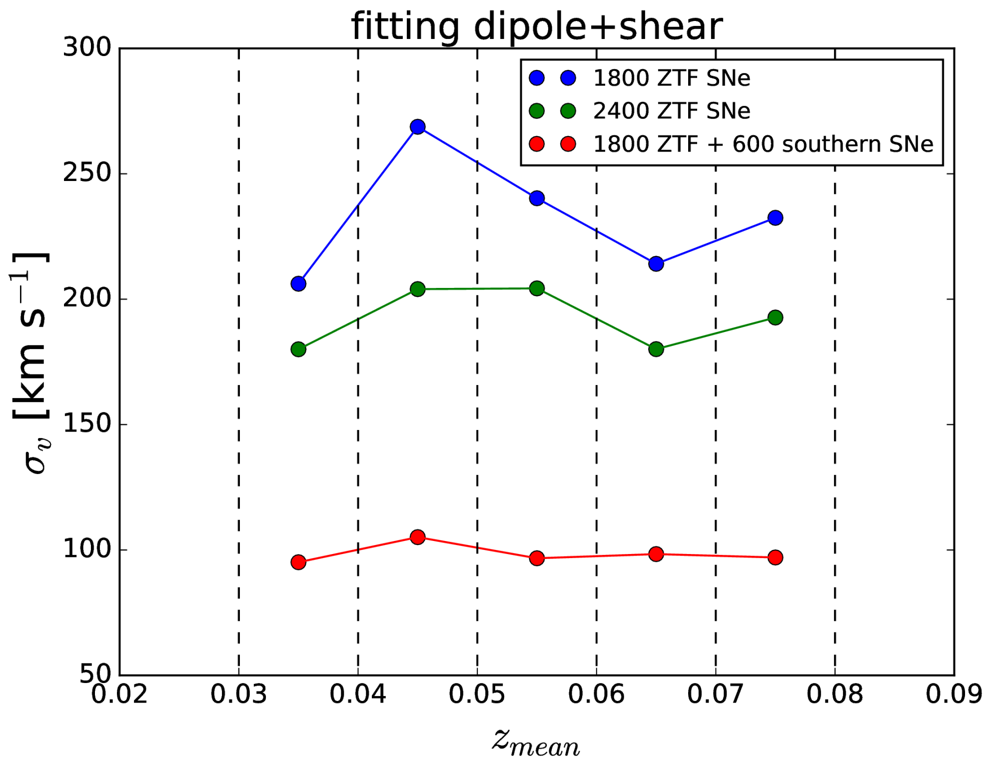
Dipole velocity uncertainty





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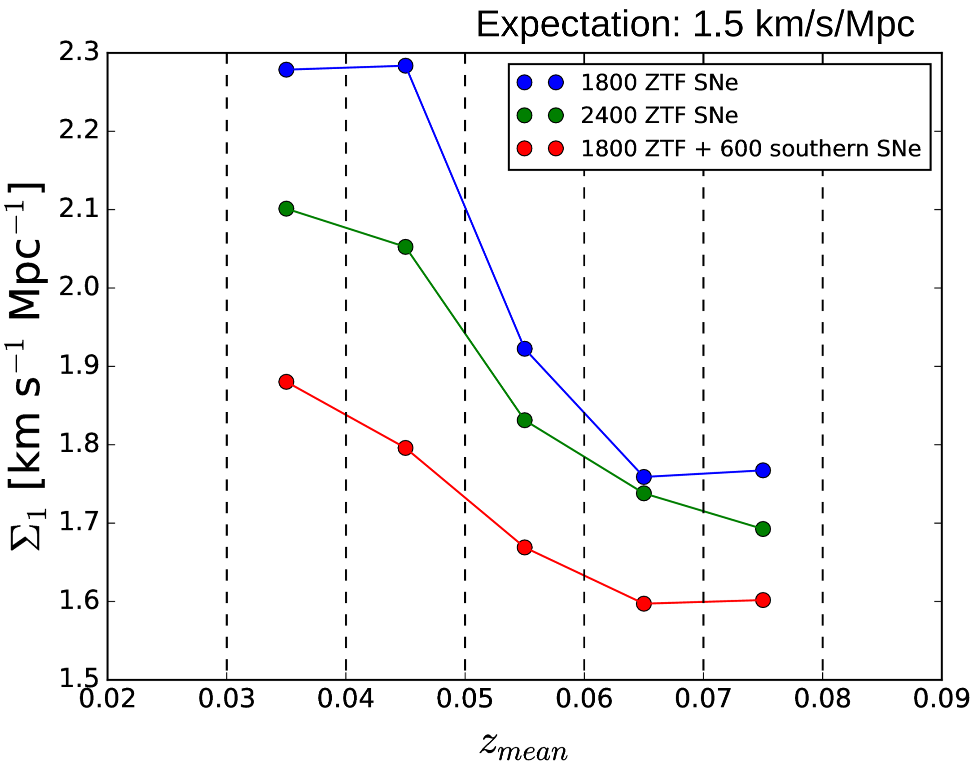

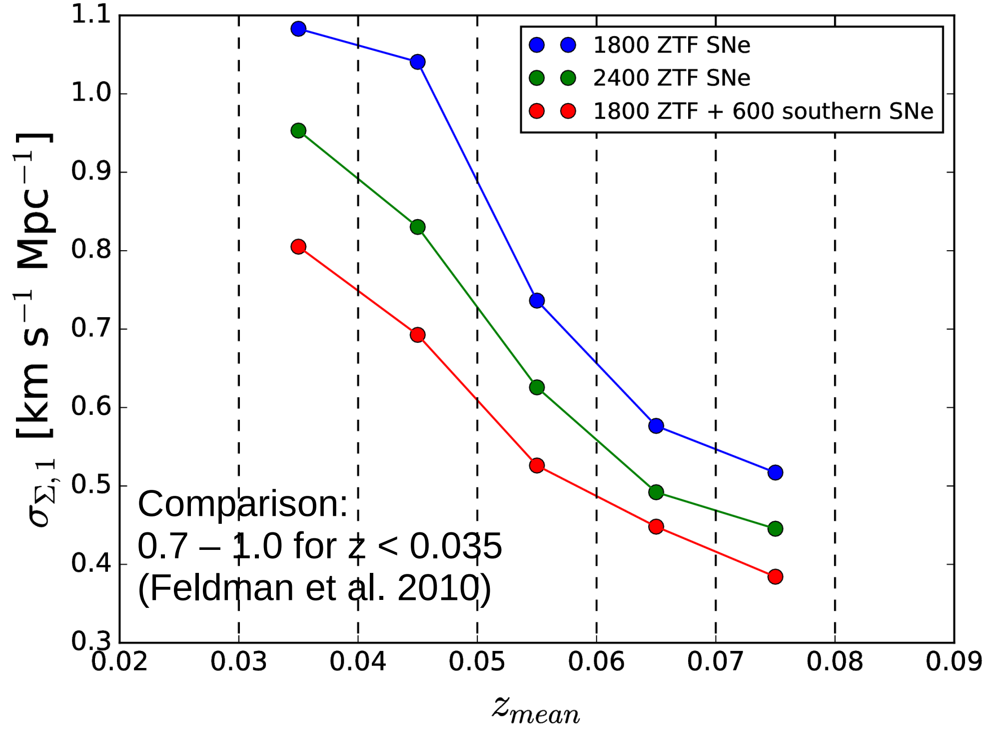

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