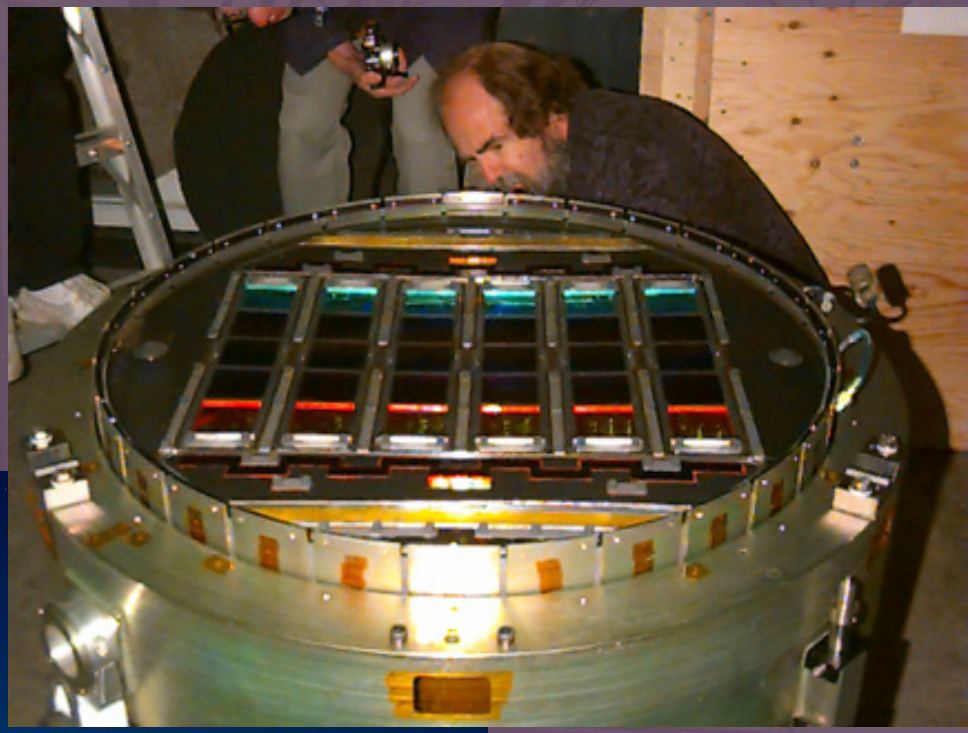

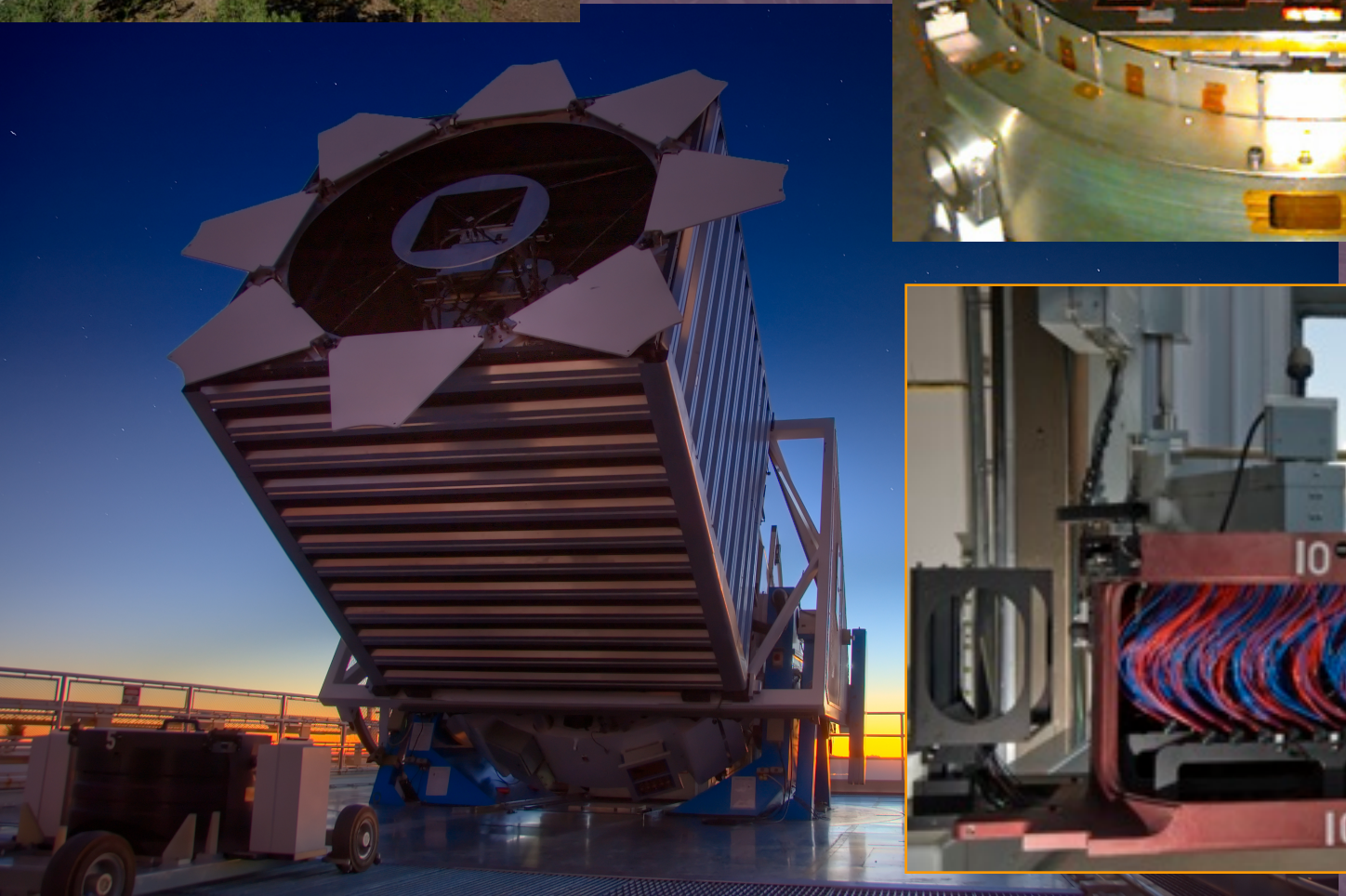

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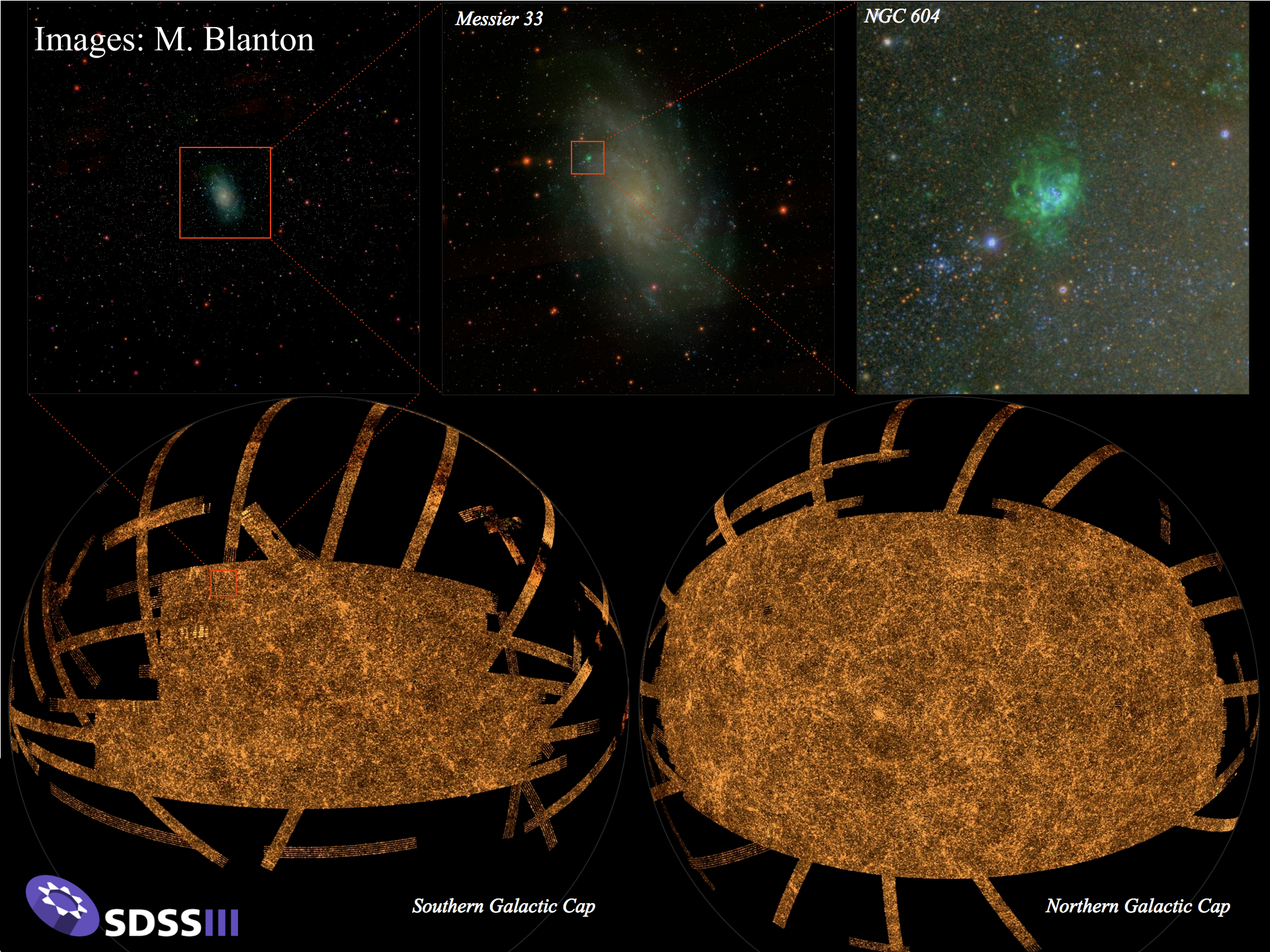
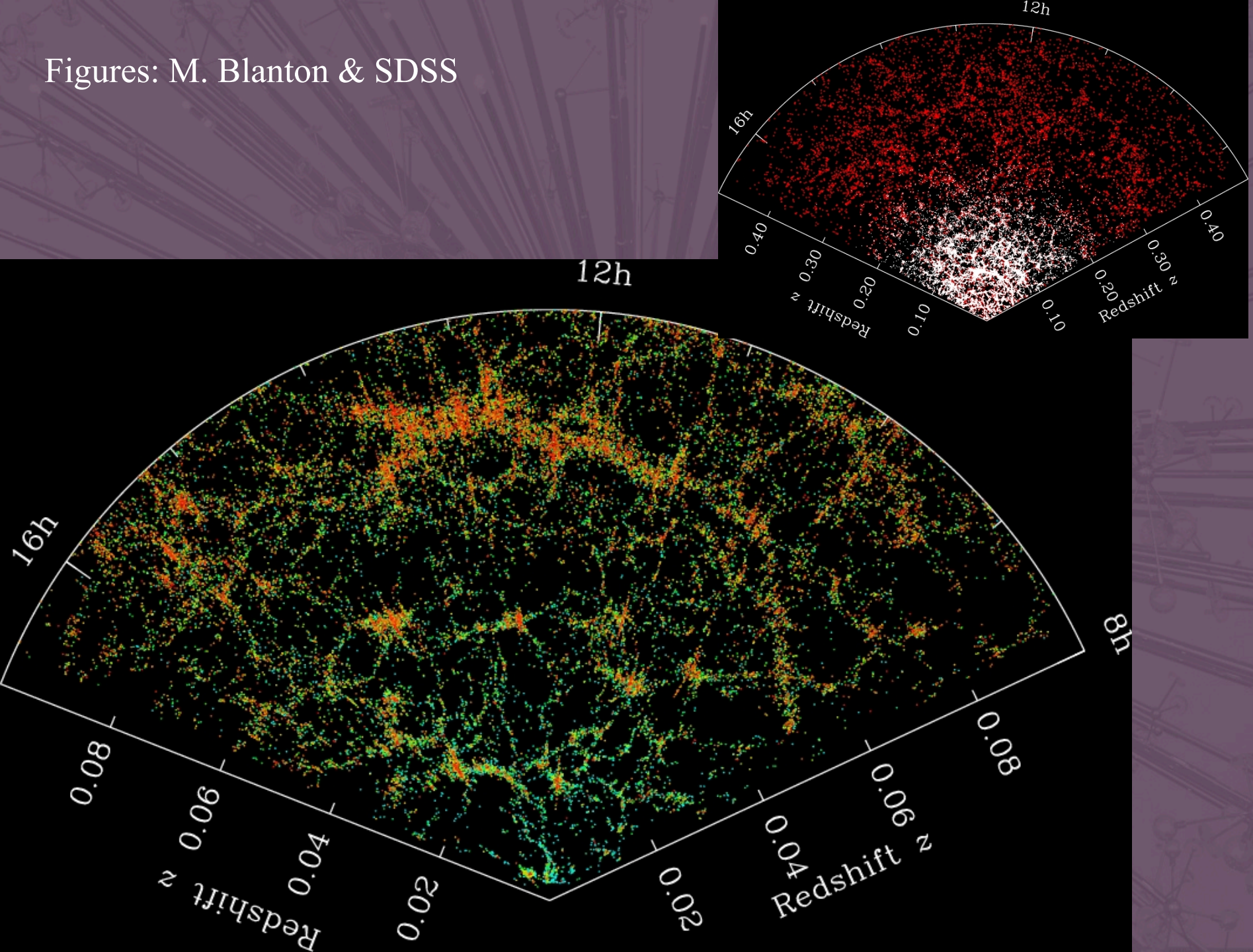
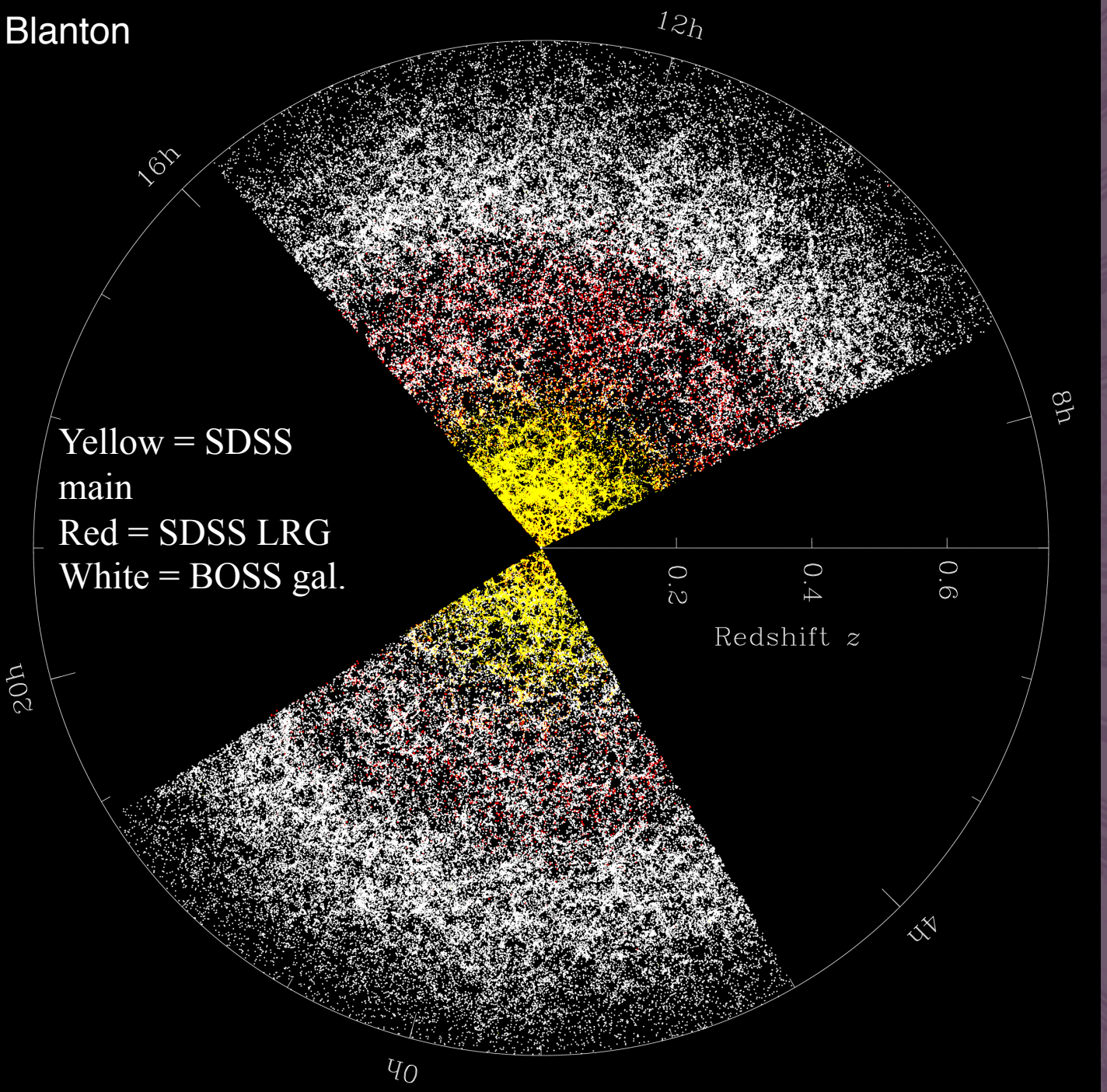
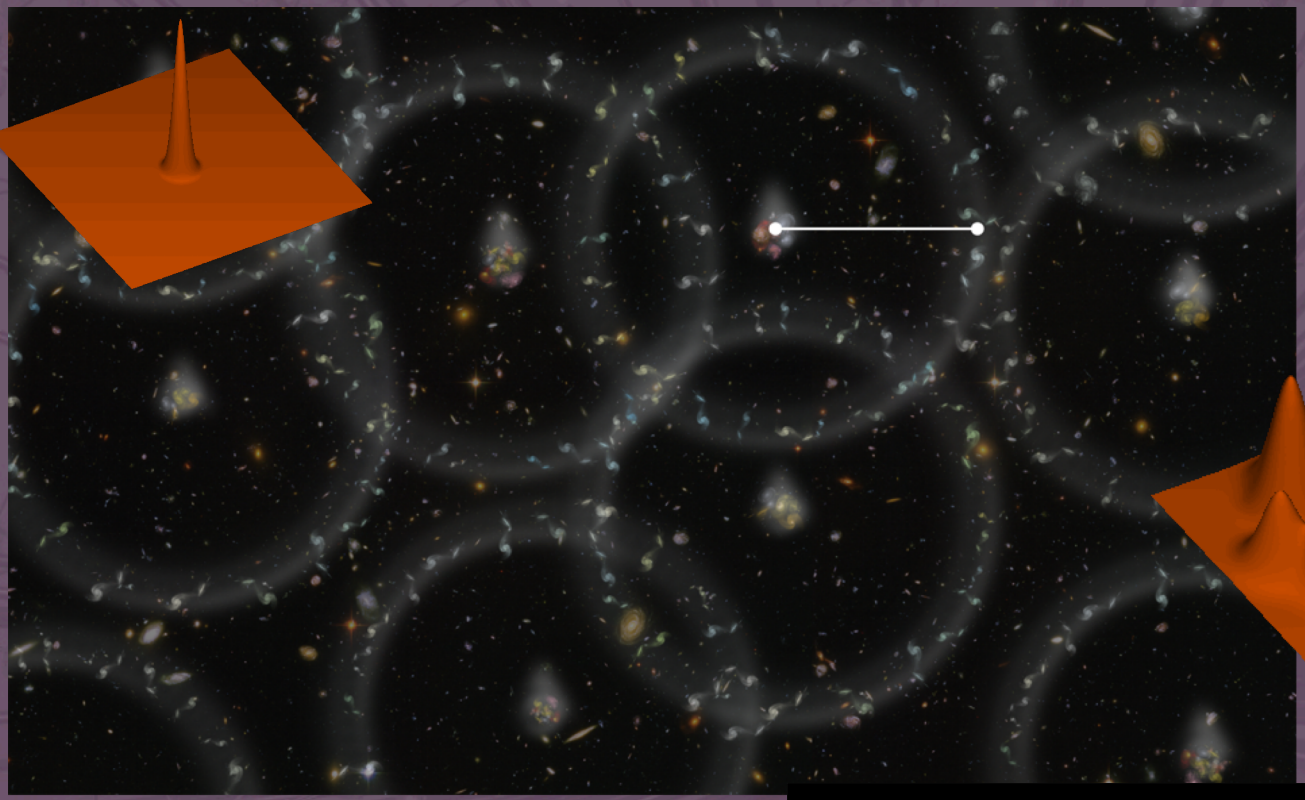

Images: M. Blanton
Messier 33
NGC 604
Southern Galactic Cap
Northern Galactic Cap
SDSSIII

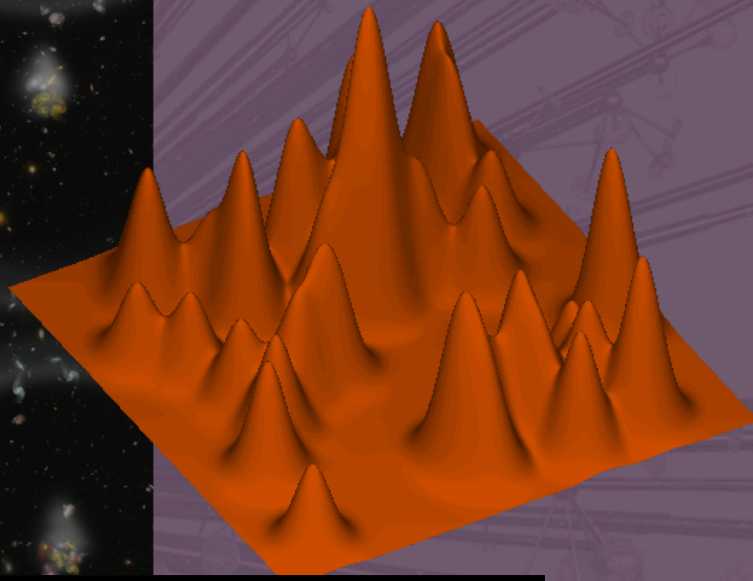
Figures: M. Blanton & SDSS

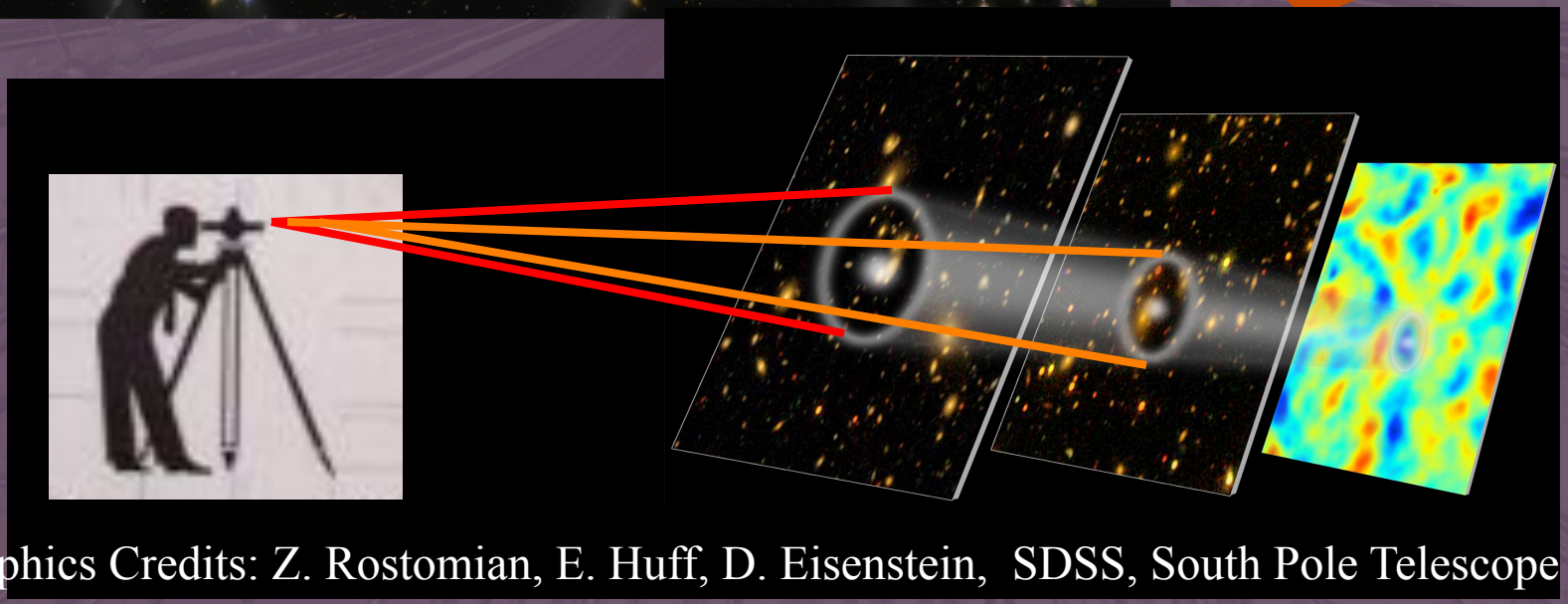


Figs by M. Blanton





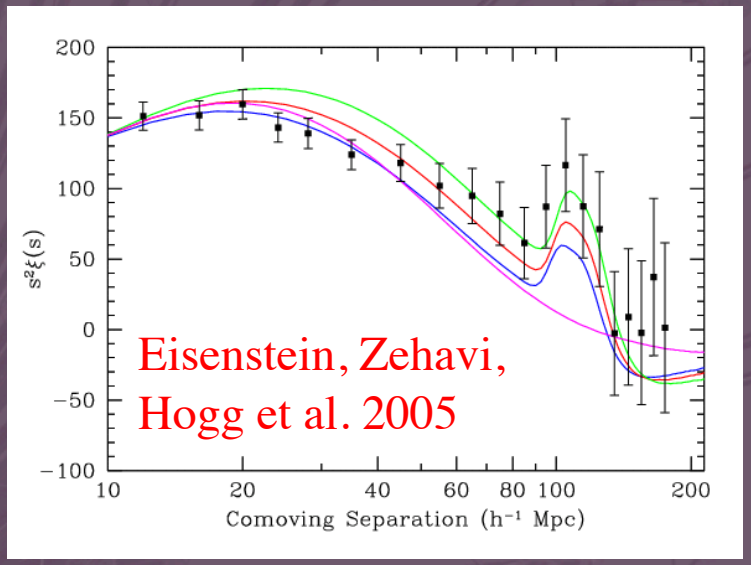


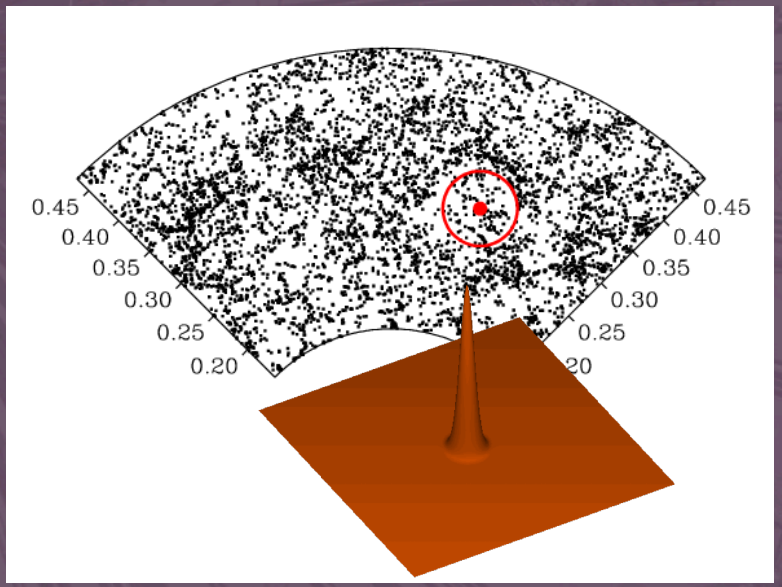


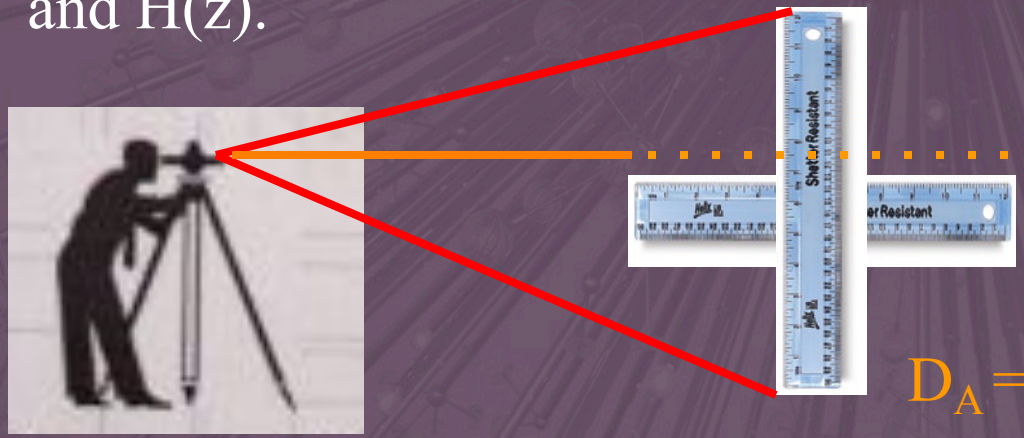
Graphics Credits: Z. Rostomian, E. Huff, D. Eisenstein, SDSS, South Pole Telescope

Baryon Acoustic Oscillations

- Pressure waves travel in hot early universe. Imprint characteristic scale on the galaxy distribution.
- Detected in 2005 by SDSS and 2dFGRS. SDSS detection from LRG sample.
- Physical scale determined by CMB constraints plus straightforward physics.
- Provides standard ruler 150 Mpc ($100h^{-1}$ Mpc) long for measuring $D_A(z)$ and H(z).



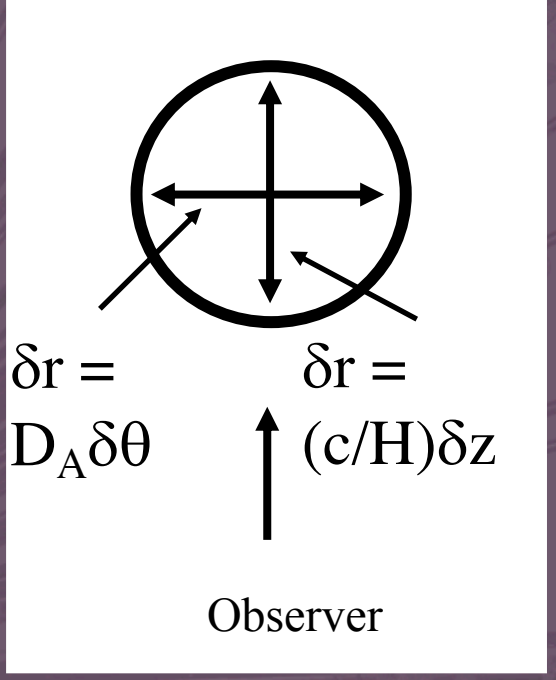


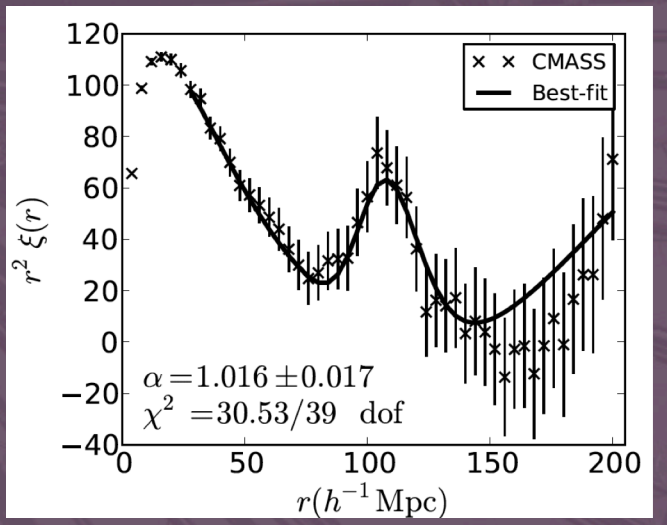


$D_A = L / \theta \; ; H = c \, \Delta z / L$

Baryon Acoustic Oscillations

- BAO imprint a "standard ruler" scale on the clustering of matter.
- Length (153.2 ± 1.7 Mpc) can be calculated given cosmological parameters measured by CMB anisotropies.
- Measurable in distribution of galaxies or intergalactic gas.
- Angular scale of oscillation peak yields $D_A(z)$.
- Line-of-sight scale yields $H(z)$.

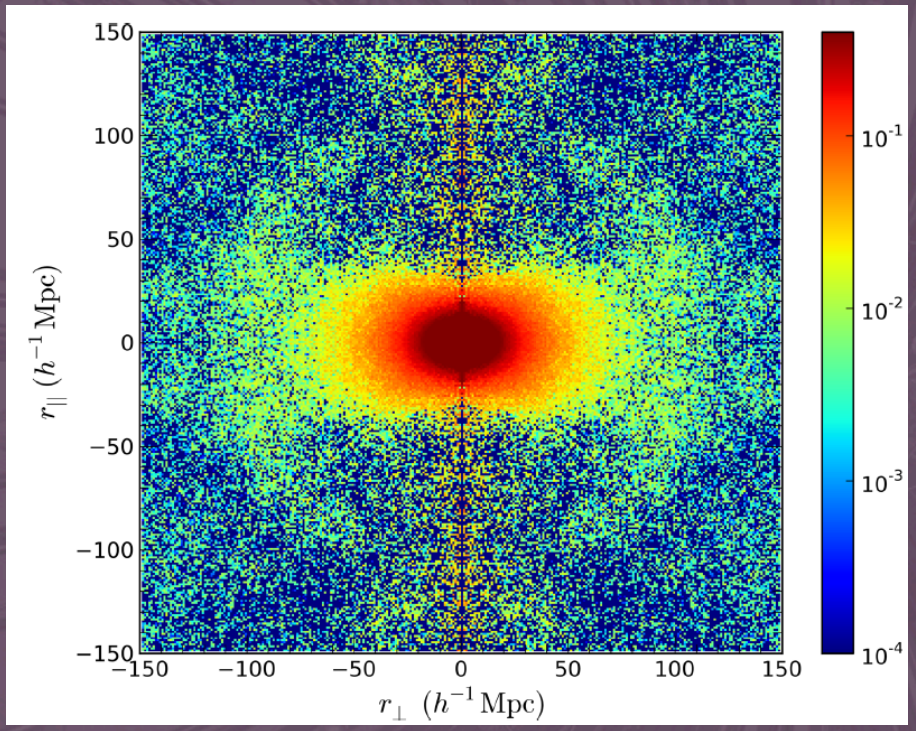




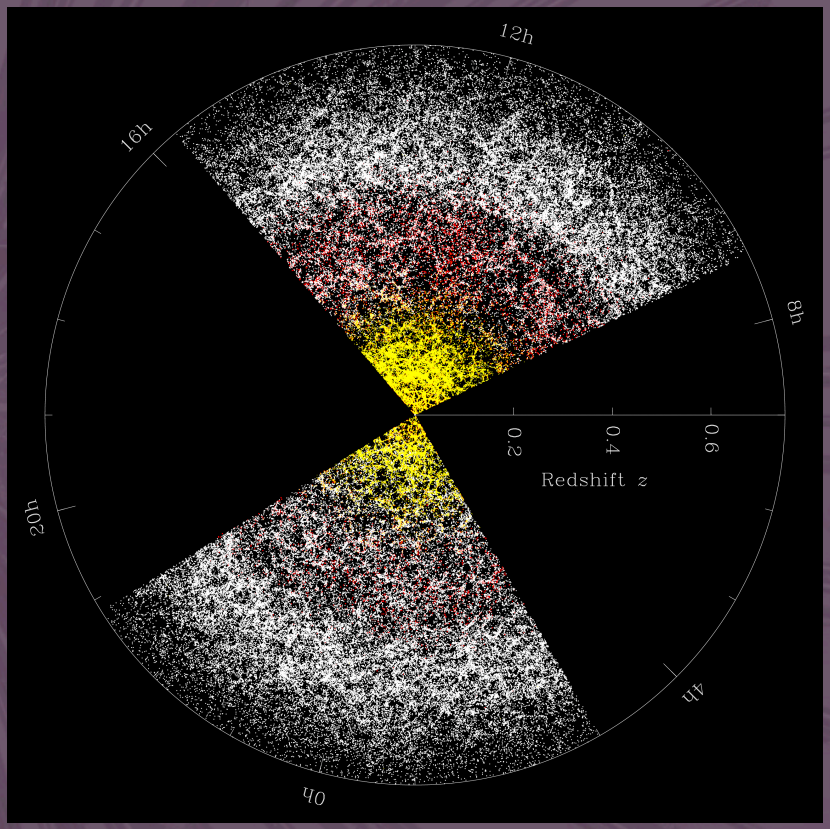
Anderson et al. 2012 (BOSS)

2-d galaxy correlation function: Redshift-space distortion and the BAO ring.

line-of-sight



transverse



Samushia, Reid, White et al. 2014