Variation of the IMF in early-type galaxies

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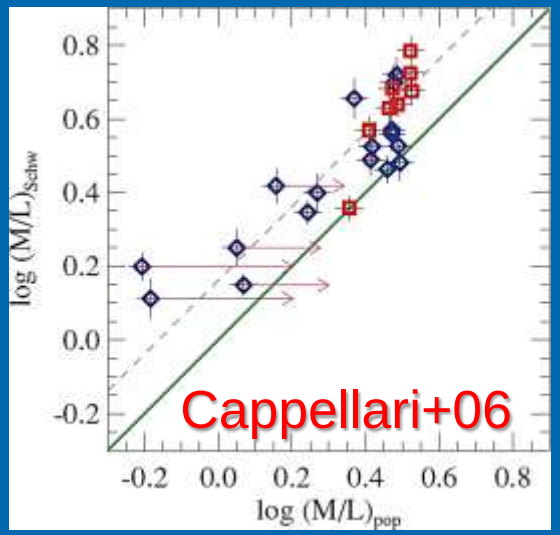
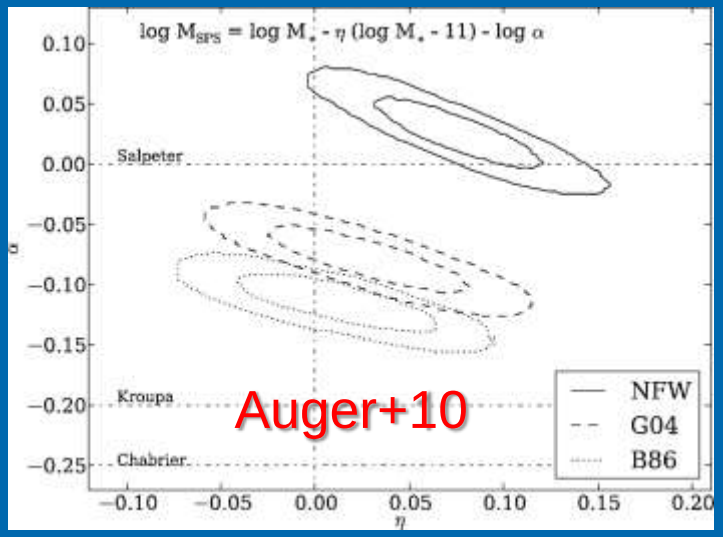
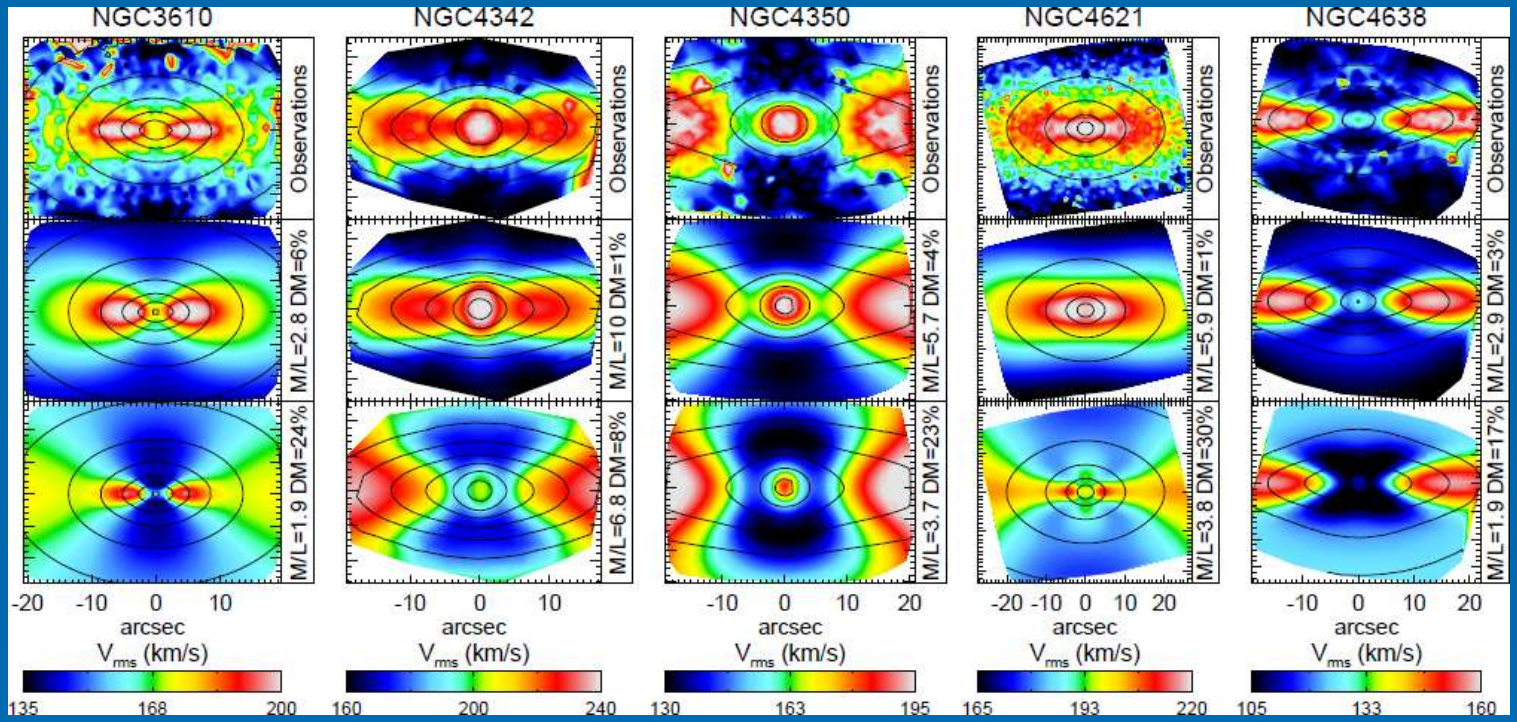
Mass excess in early-type galaxies





- Total and stellar central M/L don't agree
  (Cappellari+06, Tortora+09, Treu+10, Dutton+11, Barnabé+11, Thomas+11)
- 'light' IMF in Milky Way and other spirals
  (Bell+deJong01, Kassin+06, Bershady+11, Brewer+12)
- 'heavy' IMF in 8 massive ellipticals from spectra
  (van Dokkum+Conroy10, Nature)
- 'heavy' IMF from spherical Hernquist with fixed halos
  (Auger+10; but see Barnabé+11 , Deason+12, Tortora+12)

Stellar M/L from dynamics



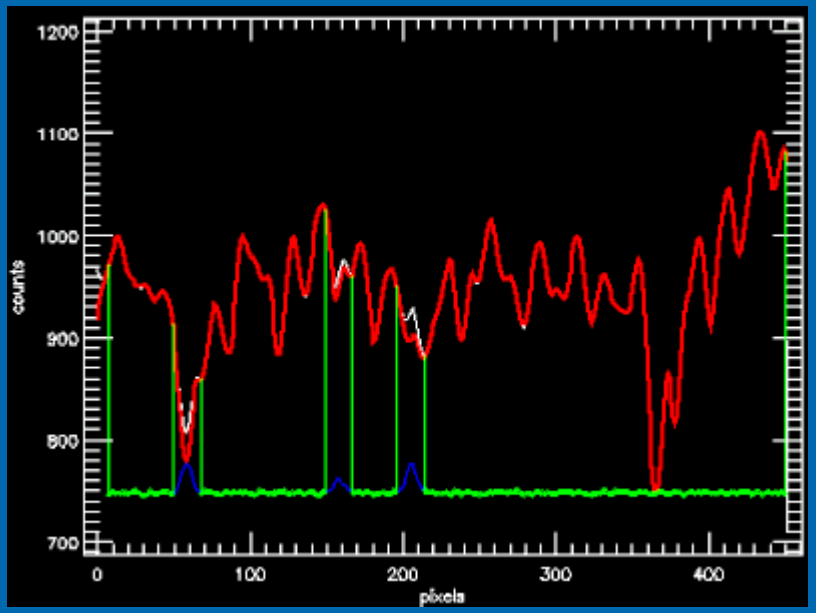
V_{rms} Data

$$\frac{M}{L} \equiv \left(\frac{M}{L}\right)_{best}$$

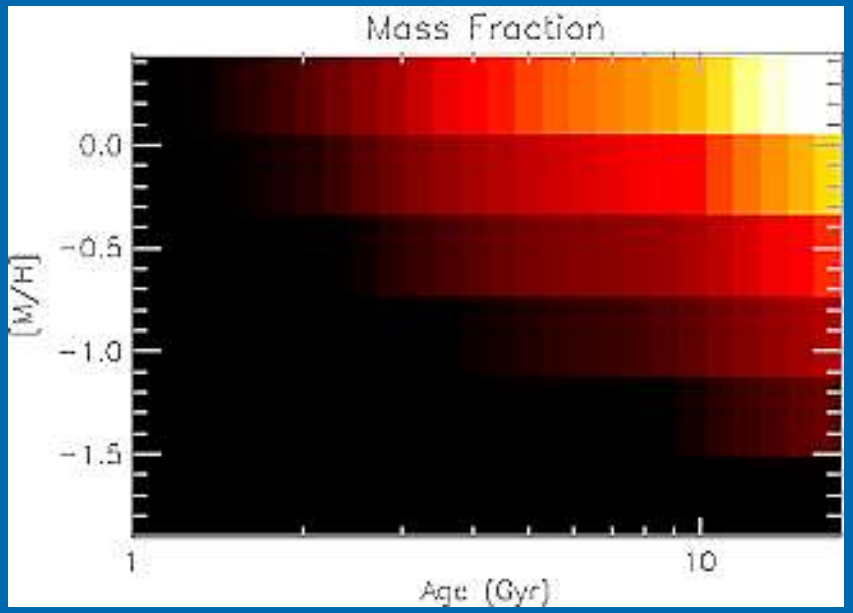
$$\frac{M}{L} = 0.6\left(\frac{M}{L}\right)_{best}$$

- Fit very sensitive to changes in $f_{DM}(R_e)$
- Accurate measure of M/L_{stars}

Stellar M/L from population



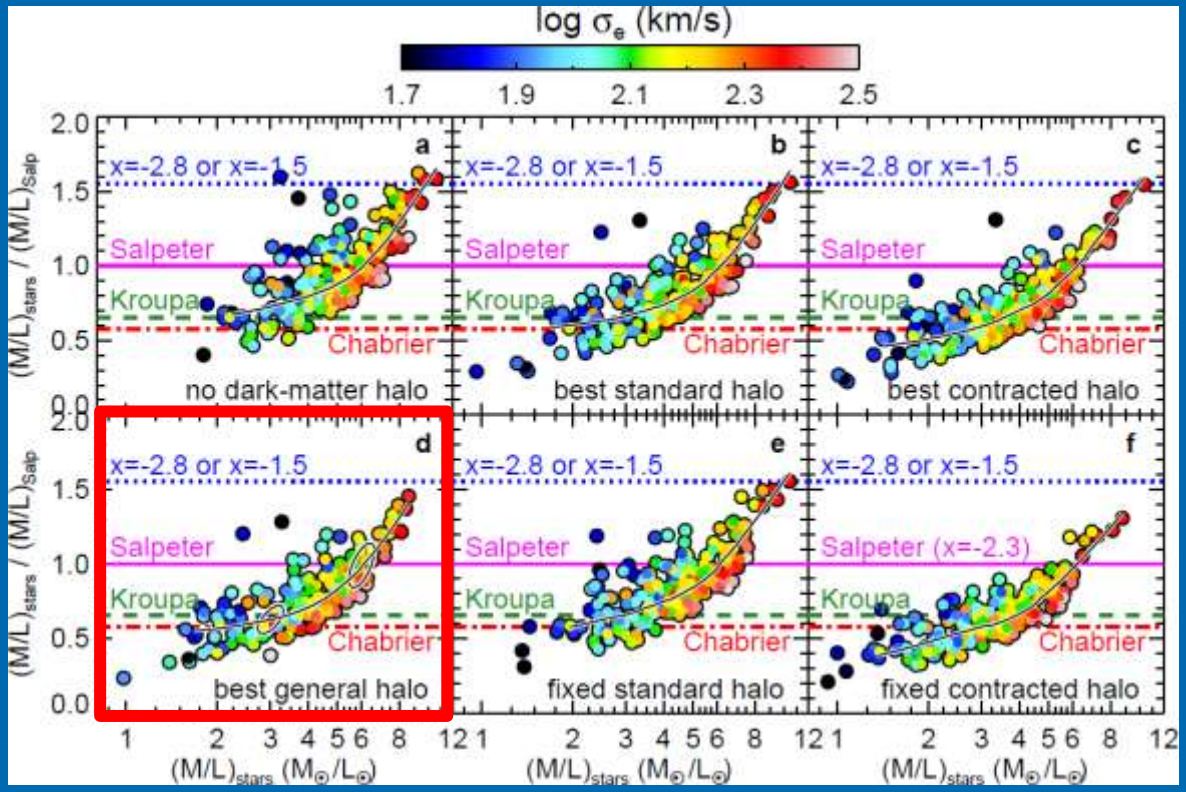
Fit to SAURON spectrum



pPXF regularized population

- Use pPXF for full-spectrum fitting
  (Cappellari & Emsellem 2004)
- Provides proper weighting of M/L_{pop}

Variation of the IMF in early-types



(Cappellari+12, Nature in press arXiv:1202.3308)

- Models describe images and kinematics in detail
- IMF variation required even with general halo (gNFW)
- Halo contraction/expansion cannot explain observations
- IMF variation not inconsistent with LCDM halos