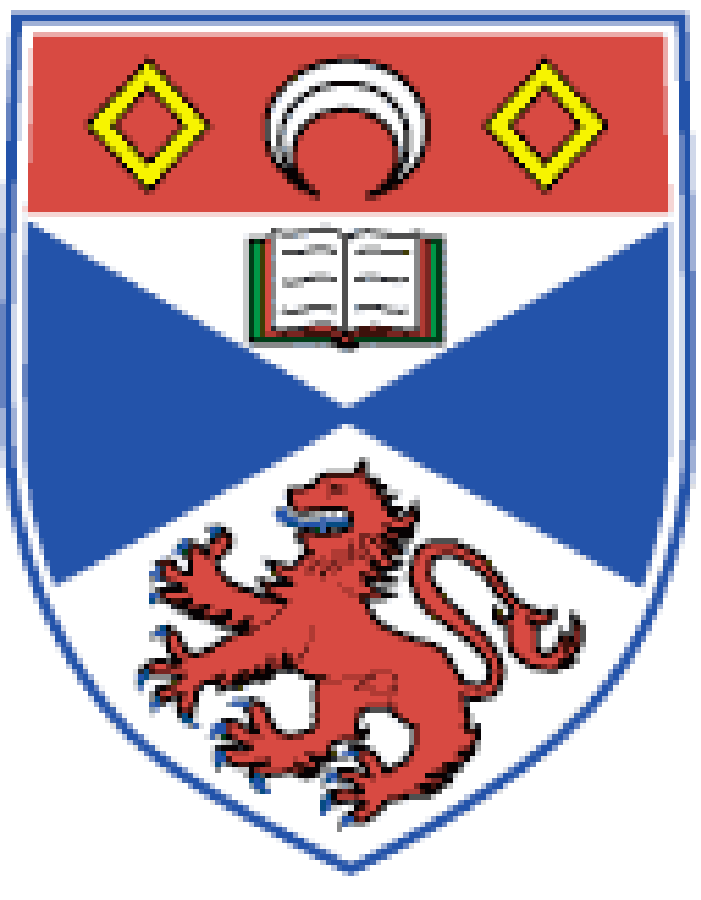




Differences in UV- and H α -SFRs predicted by the IGIMF



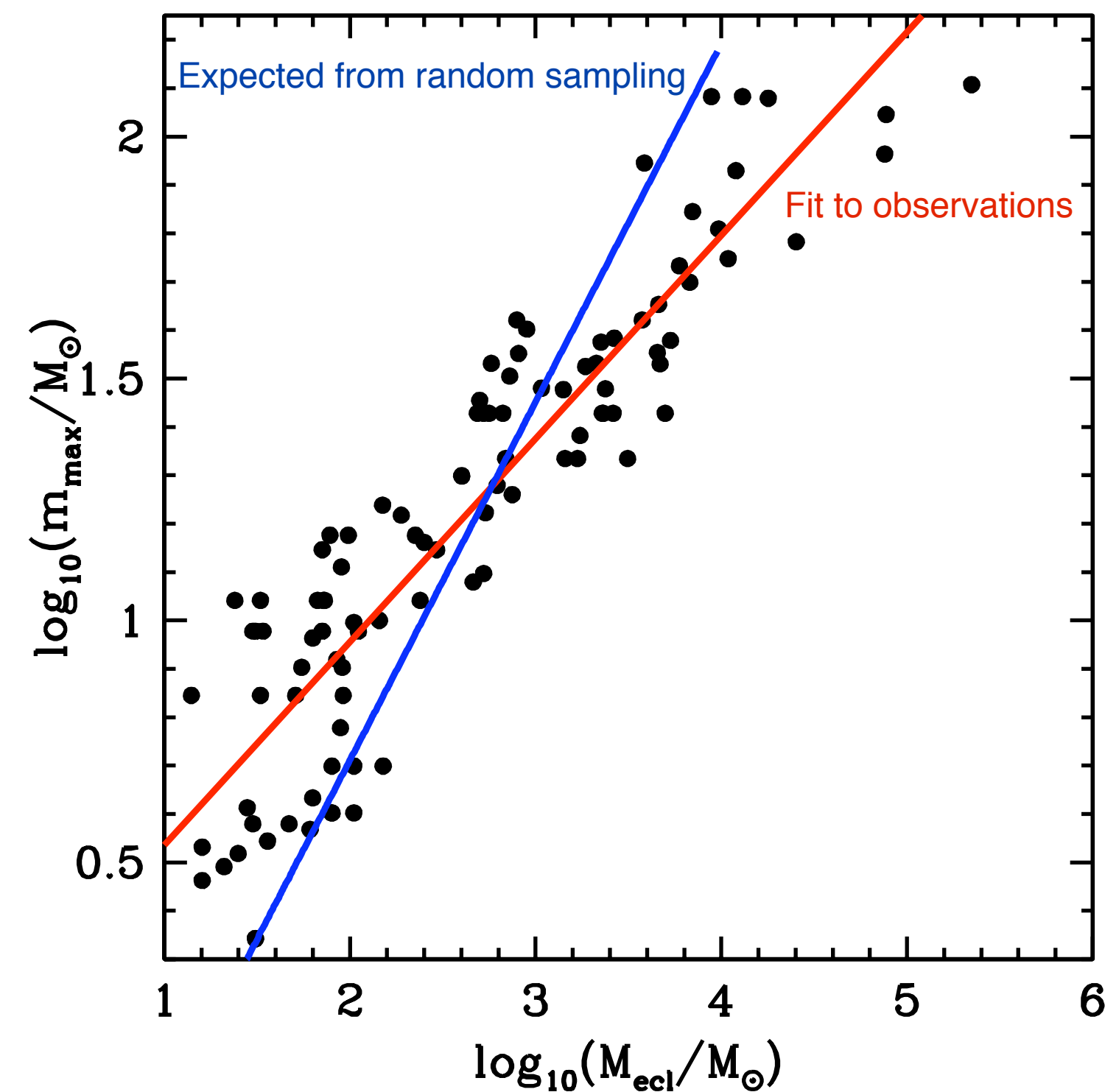
Carsten Weidner
Scottish Universities Physics Alliance (SUPA)
School of Physics & Astronomy
University of St Andrews

IGIMF - Basics

IGIMF - Integrated Galactic Initial Mass Function

$$\xi_{\text{IGIMF}}(m, t) = \int_{M_{\text{ec1, min}}}^{M_{\text{ec1, max}}(\text{SFR}(t))} \xi_{\text{Mec1}}(m \leq m_{\text{max}}(M_{\text{ec1}})) \xi_{\text{ec1}}(M_{\text{ec1}}) dM_{\text{ec1}}$$

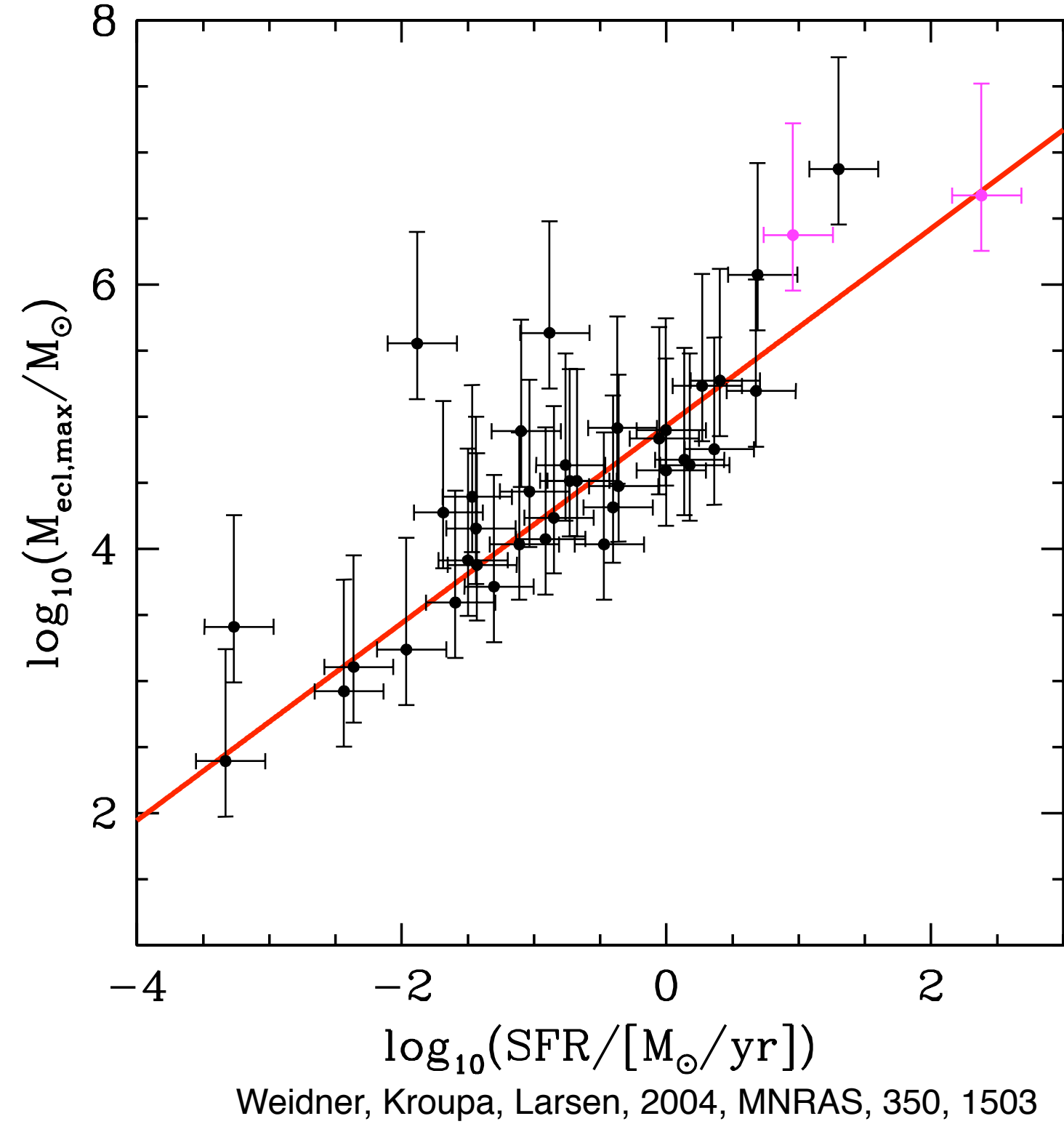
Most massive star - star cluster mass relation



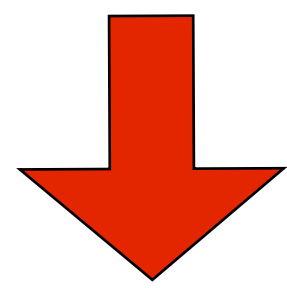
Weidner, Kroupa, 2006, MNRAS, 365, 1333
Weidner, Kroupa, Bonnell, 2009, MNRAS, submitted



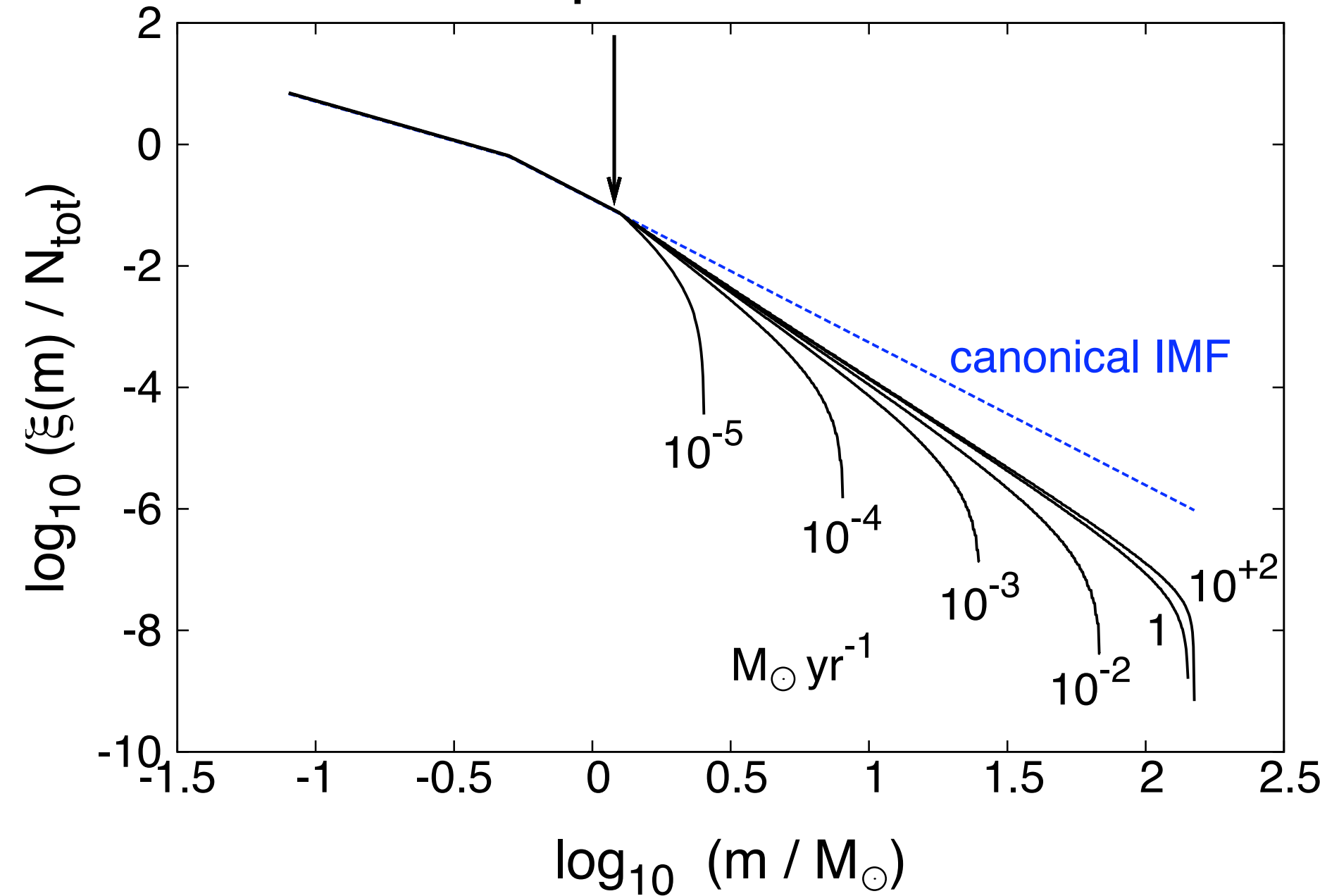
SFR - most massive young star cluster relation



Weidner, Kroupa, Larsen, 2004, MNRAS, 350, 1503



IGIMF dependence on the SFR



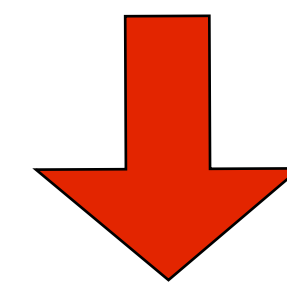
Pflamm-Altenburg, Weidner, Kroupa, 2007, ApJ, 671, 1550

Abstract

General Overview:

- Stars forming in star clusters following a canonical IMF but are being limited by the size of the cluster.
- The masses of star clusters themselves follow a cluster mass function.
- The SFR of a galaxy regulates the most-massive cluster formed.

The integrated Galactic Initial Mass Function is different (steeper) than the IMF within individual star clusters and varies with the SFR!



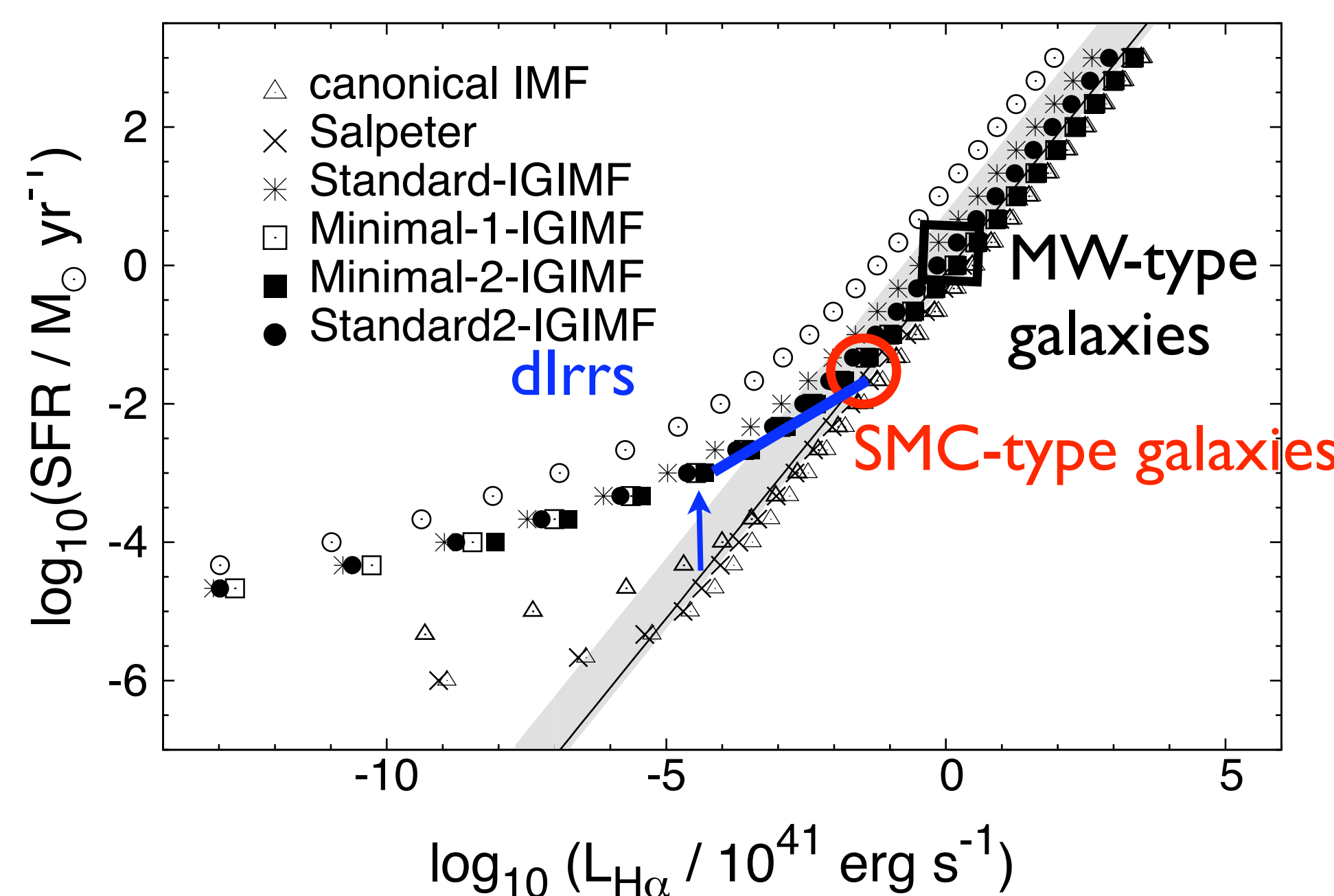
Implications:

Low star-formation regions/galaxies have steeper galaxy-wide IMFs (IGIMFs) than high star-formation regions/galaxies and are thus expected to have lower SFRs when measured with H α compared to SFRs derived from UV as H α traces stars of higher masses than the UV.

Furthermore, the IGIMF leads intrinsically to a mass-metallicity for galaxies, is able to explain the observed H α cutoff in star-forming galaxies and results in a non-linear Kennicutt-Schmidt law.

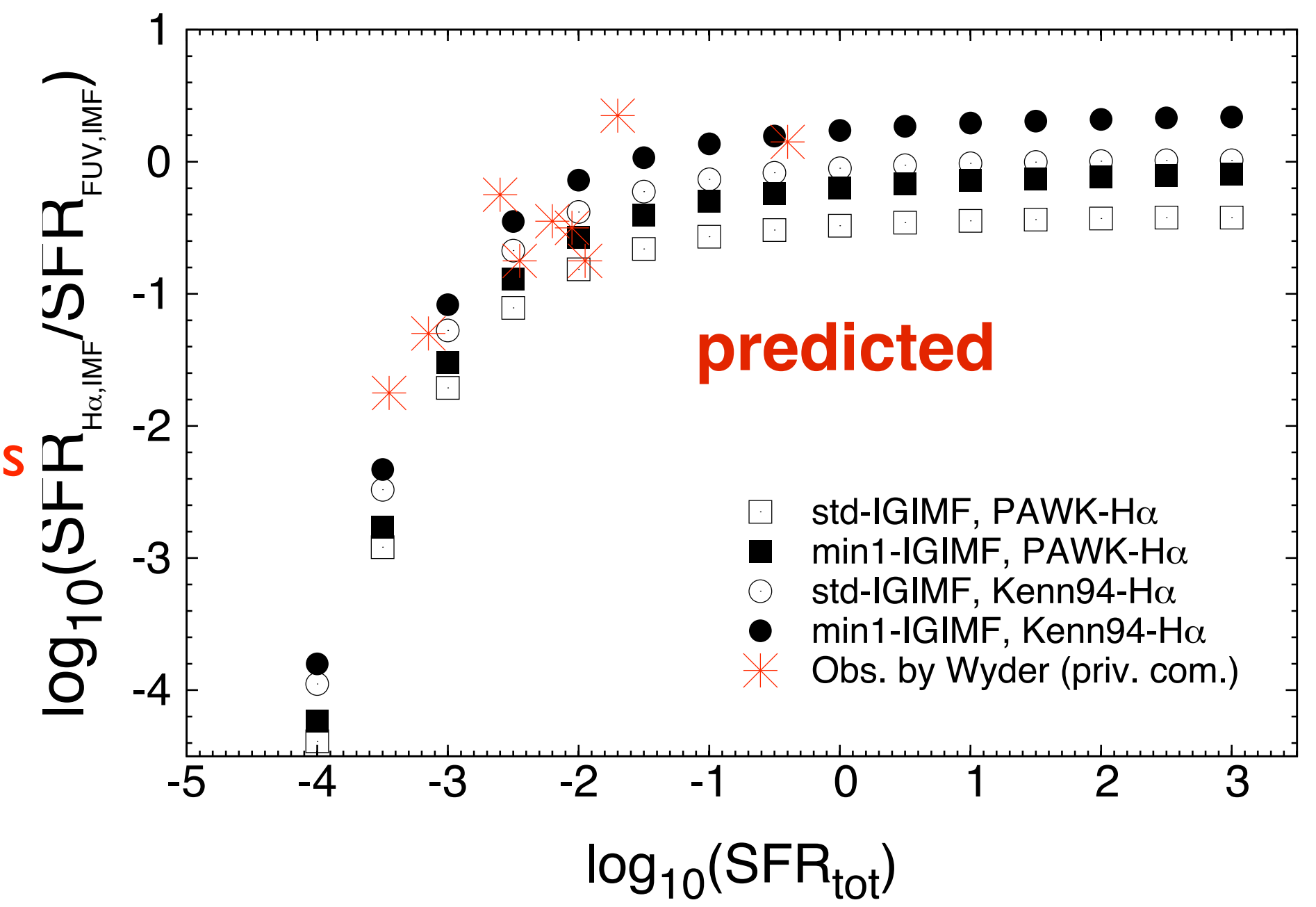
IGIMF - Successes

H α based SFR determination



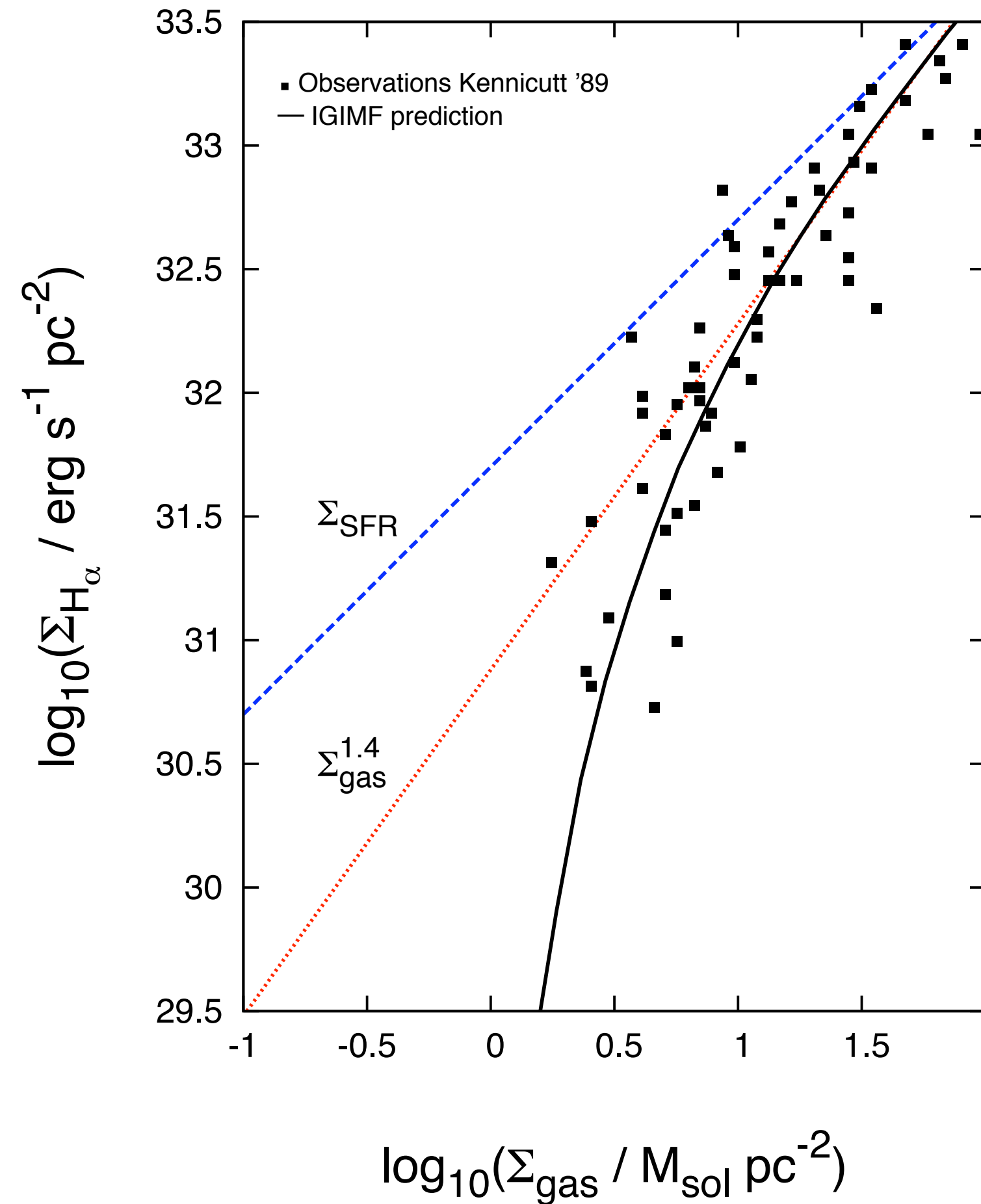
Pflamm-Altenburg, Weidner, Kroupa, 2007, ApJ, 671, 1550

Diverging H α -UV luminosities



Pflamm-Altenburg, Weidner, Kroupa, 2009, MNRAS, 395, 394

Kennicutt-Schmidt law

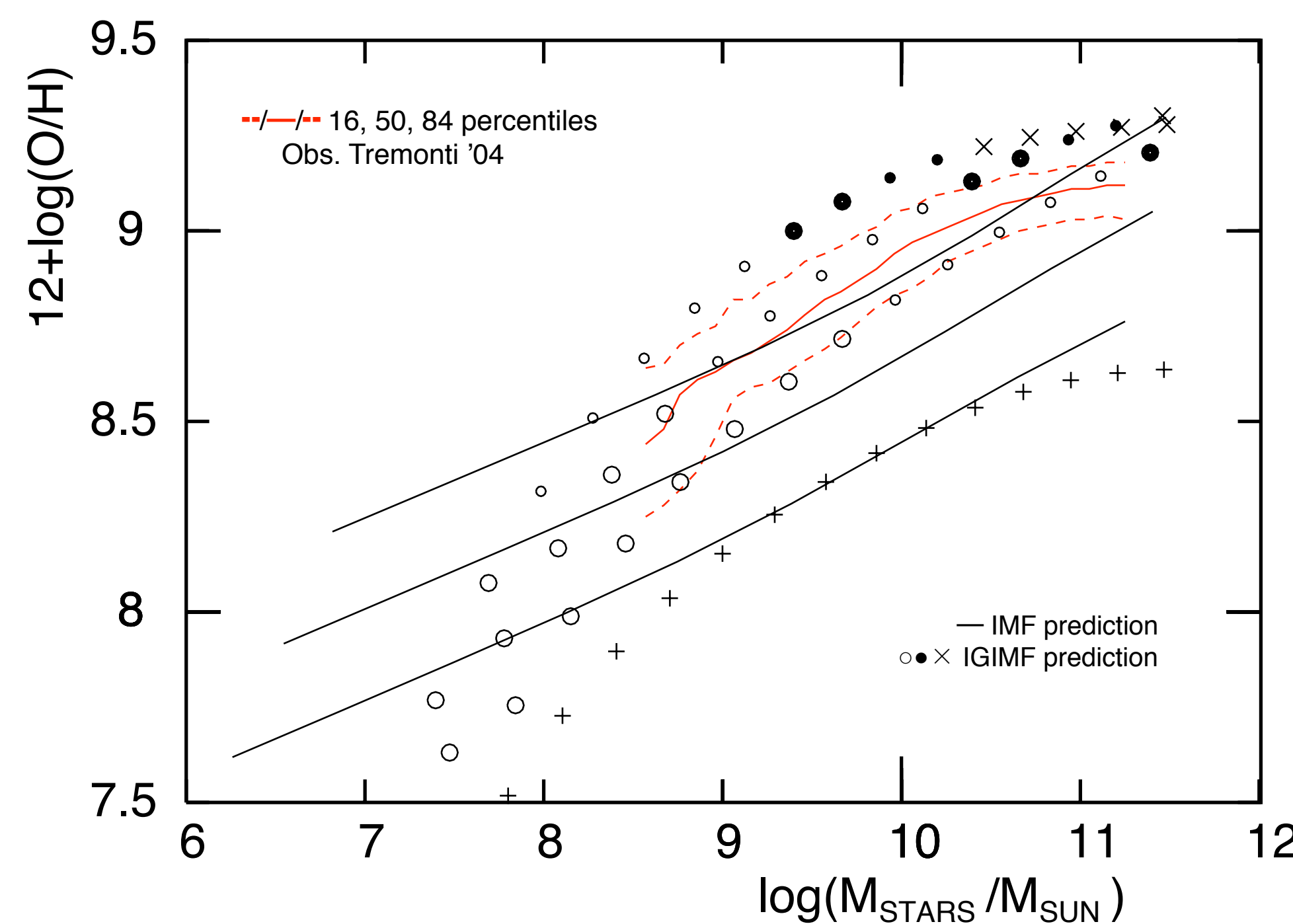


Pflamm-Altenburg, Kroupa, 2008, Nature, 455, 641

IGIMF - References

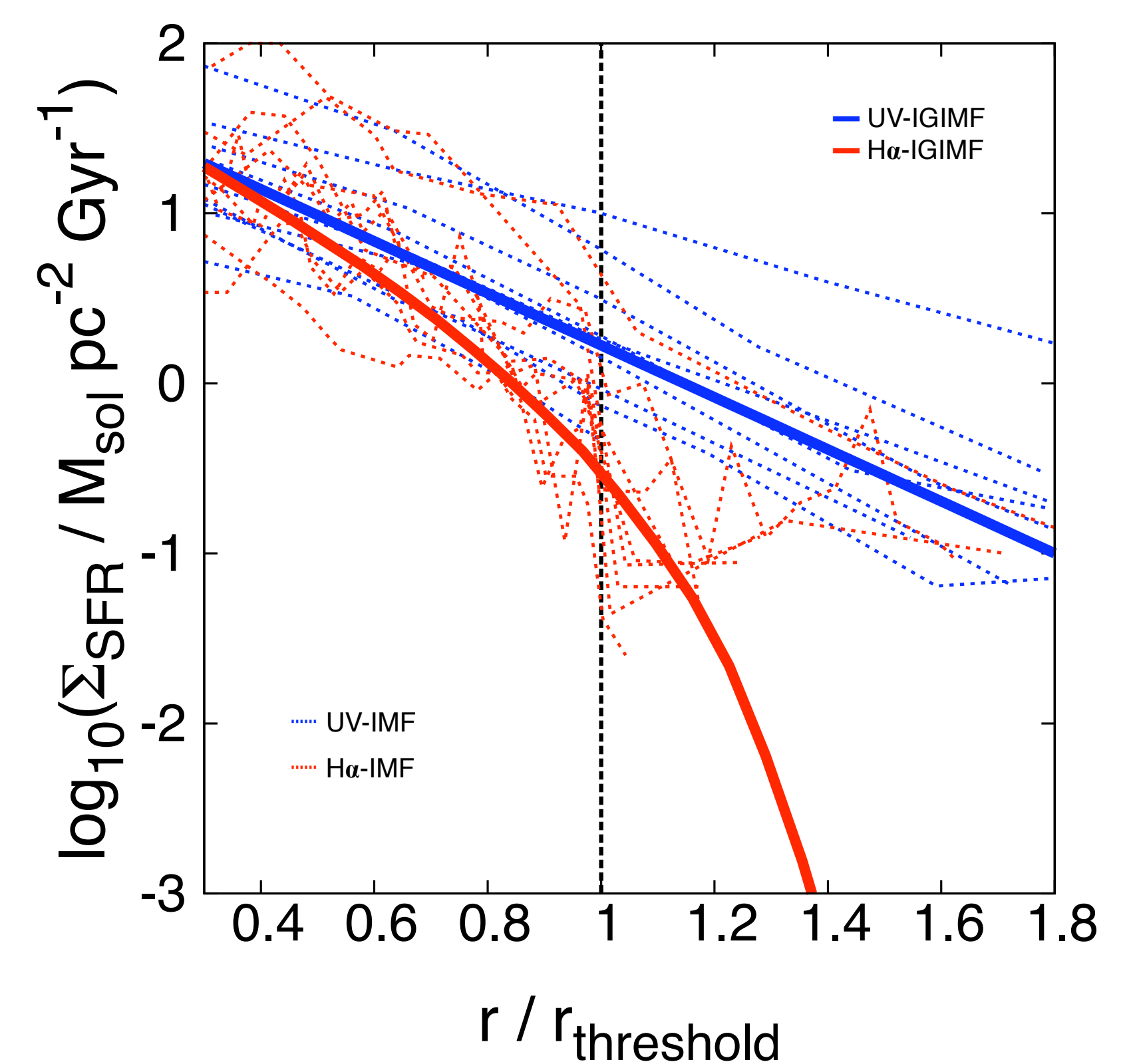
- Kroupa, P., Weidner, C., 2003, ApJ, 598, 1076 - *Galactic-Field Initial Mass Functions of Massive Stars*
- Weidner, C., Kroupa, P., 2004, MNRAS, 348, 187 - *Evidence for a fundamental stellar upper mass limit from clustered star formation*
- Weidner, C., Kroupa, P., Larsen, S.S., 2004, MNRAS, 350, 1503 - *Implications for the formation of star clusters from extragalactic star formation rates*
- Weidner, C., Kroupa, P., 2005, ApJ, 625, 754 - *The Variation of Integrated Star Initial Mass Functions among Galaxies*
- Weidner, C., Kroupa, P., 2006, MNRAS, 365, 1333 - *The maximum stellar mass, star-cluster formation and composite stellar populations*
- Köppen, J., Weidner, C., Kroupa, P., 2007, MNRAS, 375, 673 - *A possible origin of the mass-metallicity relation of galaxies*
- Pflamm-Altenburg, J., Weidner, C., Kroupa, P., 2007, ApJ, 671, 1558 - *Converting H α Luminosities into Star Formation Rates*
- Pflamm-Altenburg, J., Kroupa, P., 2008, Nature, 455, 641 - *Clustered star formation as a natural explanation for the H α cut-off in disk galaxies*
- Pflamm-Altenburg, J., Weidner, C., Kroupa, P., 2009, MNRAS, 395, 394 - *Diverging UV and H α fluxes of star-forming galaxies predicted by the IGIMF theory*
- Recchi, S., Calura, F., Kroupa, P., 2009, A&A, 499, 711 - *The chemical evolution of galaxies within the IGIMF theory: the [α /Fe] ratios.*
- Weidner, C., 2009, AIPC, 1111, 129 - *The Large Scale IMF - from local studies to large scale Star-formation*
- Weidner, C., Kroupa, P., Bonnell, I., 2009, MNRAS, submitted - *The implications of the most-massive star-star cluster mass relation on the physics of clustered star formation*

Mass-metallicity relation of galaxies



Köppen, Weidner, Kroupa, 2007, MNRAS, 375, 673

Radial SFR profile of galaxies



Pflamm-Altenburg, Kroupa, 2008, Nature, 455, 641