

Chemistry and Kinematics of NGC 2100

Lee R. Patrick

University of Edinburgh

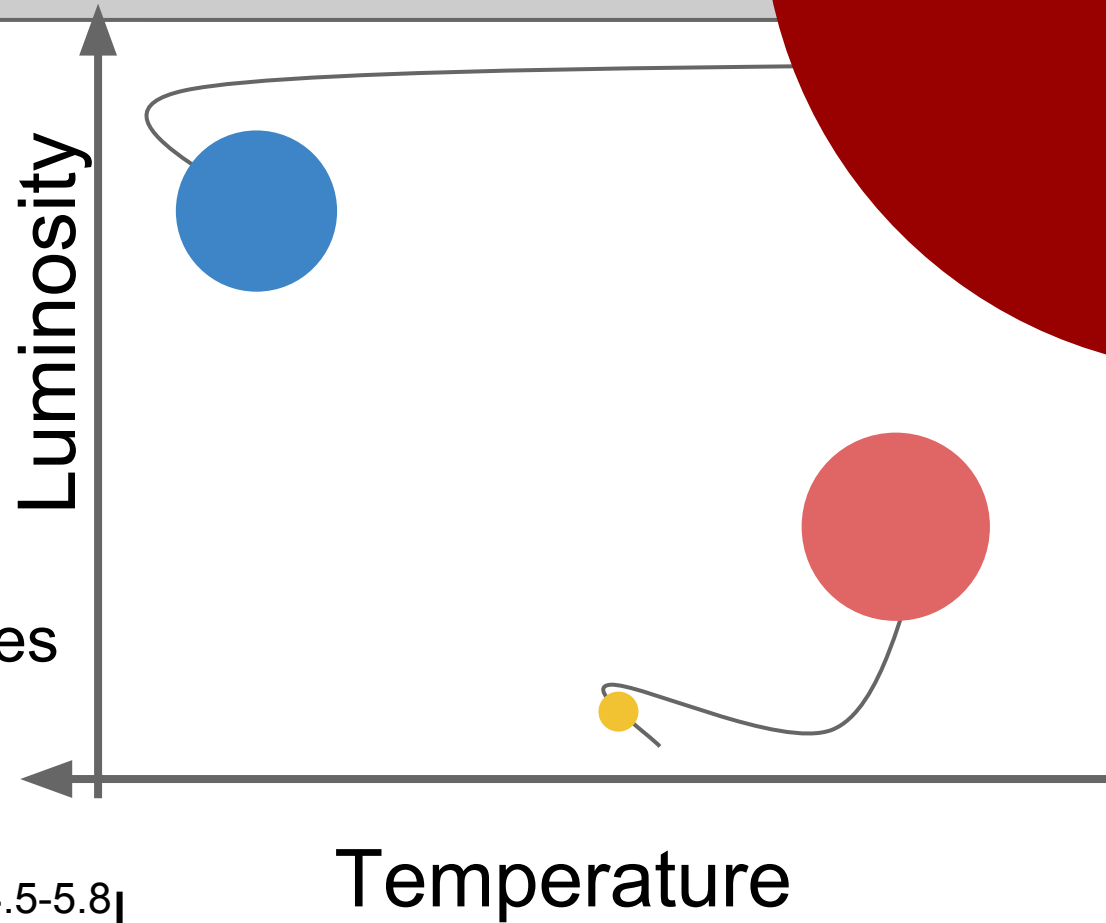
Collaborators: C. J. Evans, B. Davies,
R-P. Kudritzki, M. Bergemann, C. Lardo,
Z. Gazak, N. Bastian, B. Plez

Outline

- Intro.
 - What are RSGs?
 - Measuring metallicities with RSGs
- Young Massive Clusters
- Dynamical Mass and velocity dispersion
- NGC 2100 vs Perseus OB-1

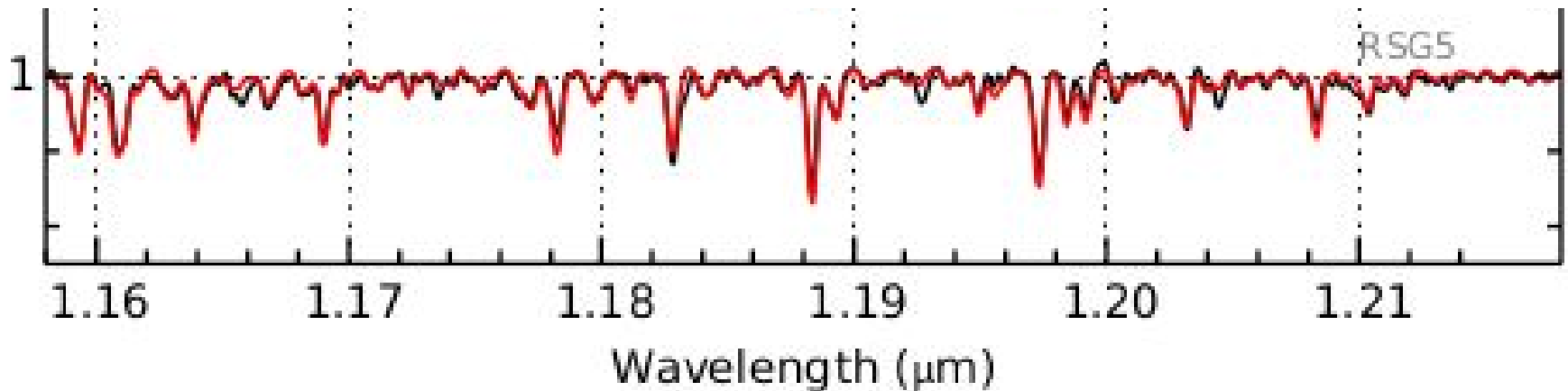
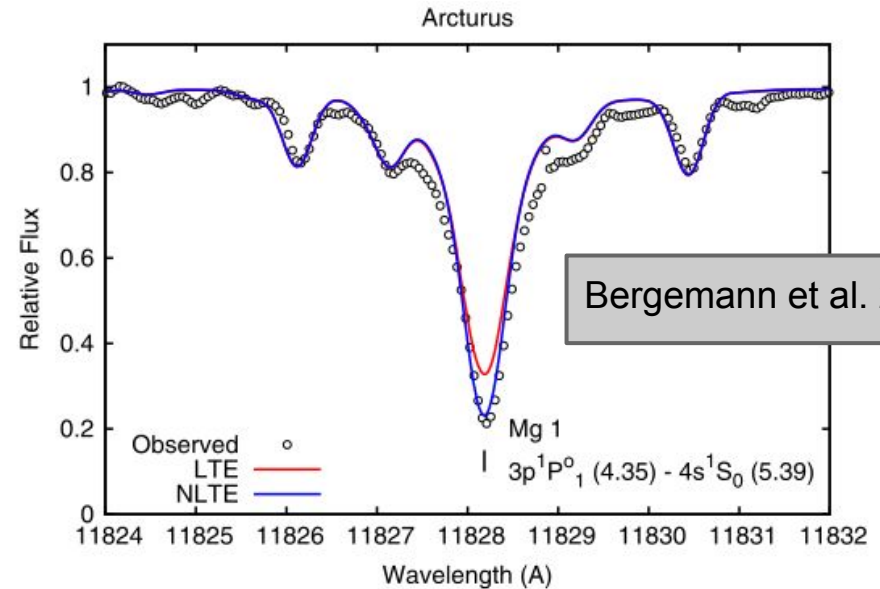
What are RSGs?

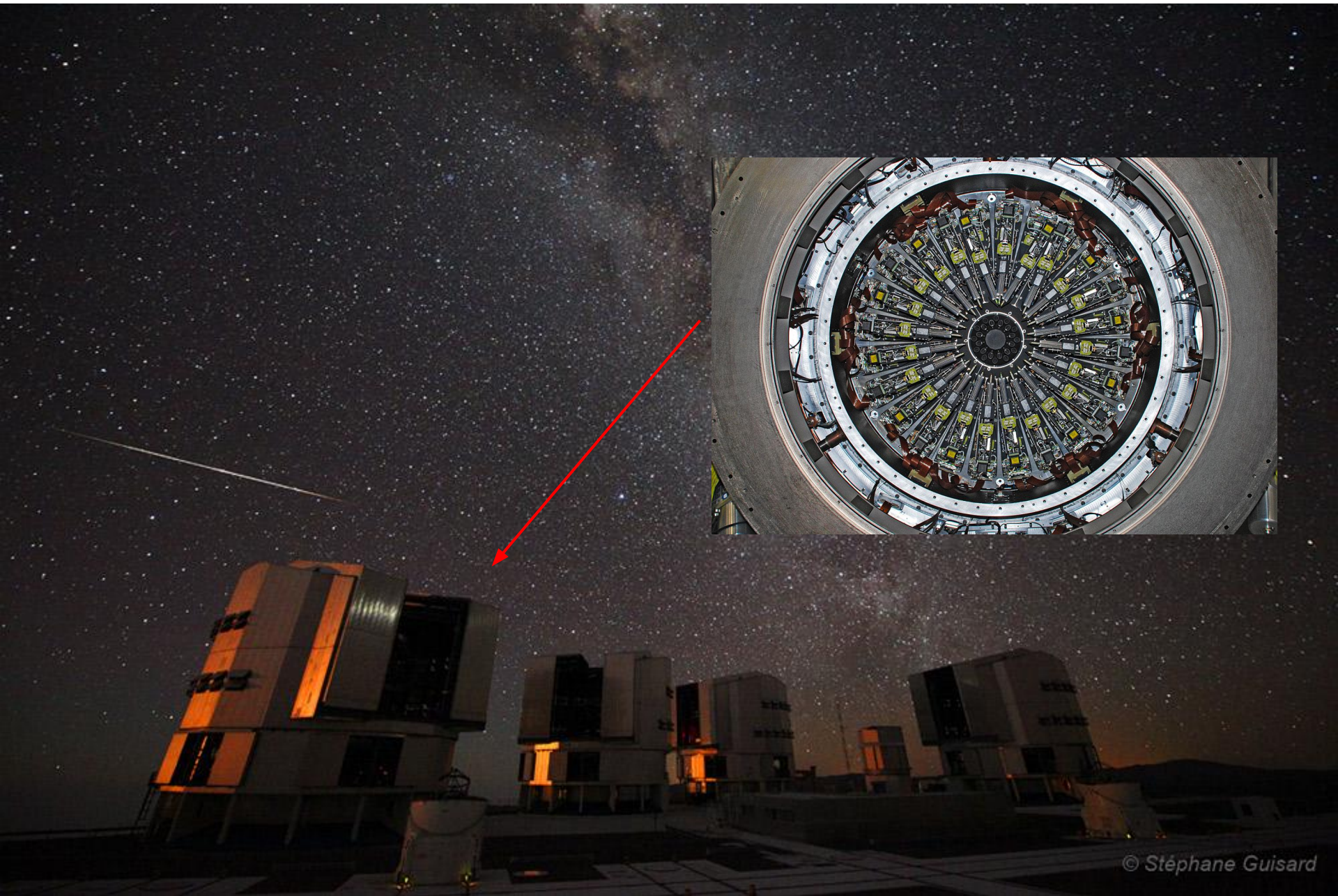
- Evolved massive stars
- SNe progenitors
- Extended atmospheres
= cool! $T_{\text{eff}} \sim 3900\text{K}$
- High luminosity $\sim 10^{4.5-5.8} L_{\odot}$
- Young $< 50\text{Myr}$



Abundances with RSGs

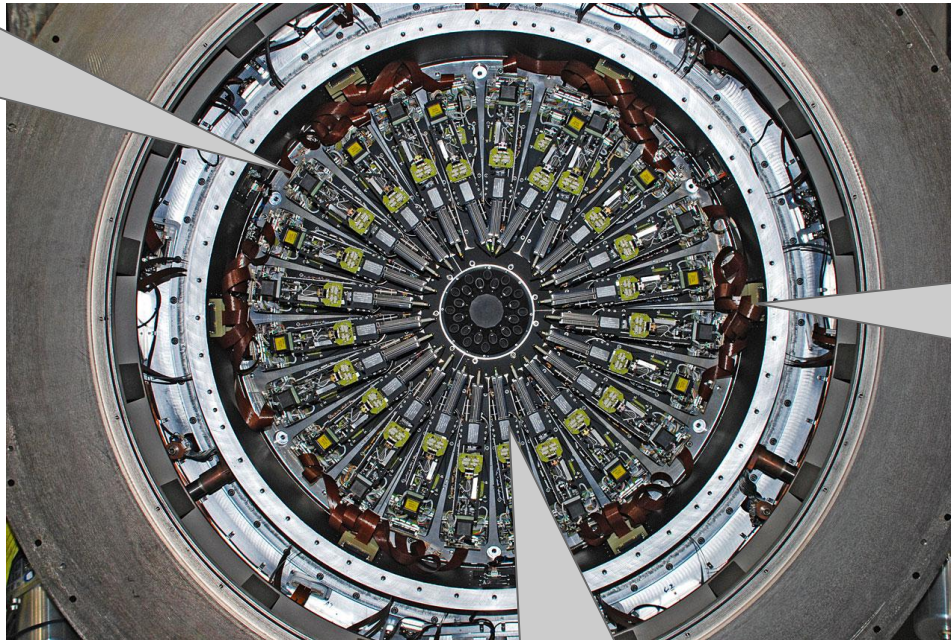
- J-band clean spectral window
- Elemental features: Fe I, Si I, Ti I and Mg I





Why use KMOS?

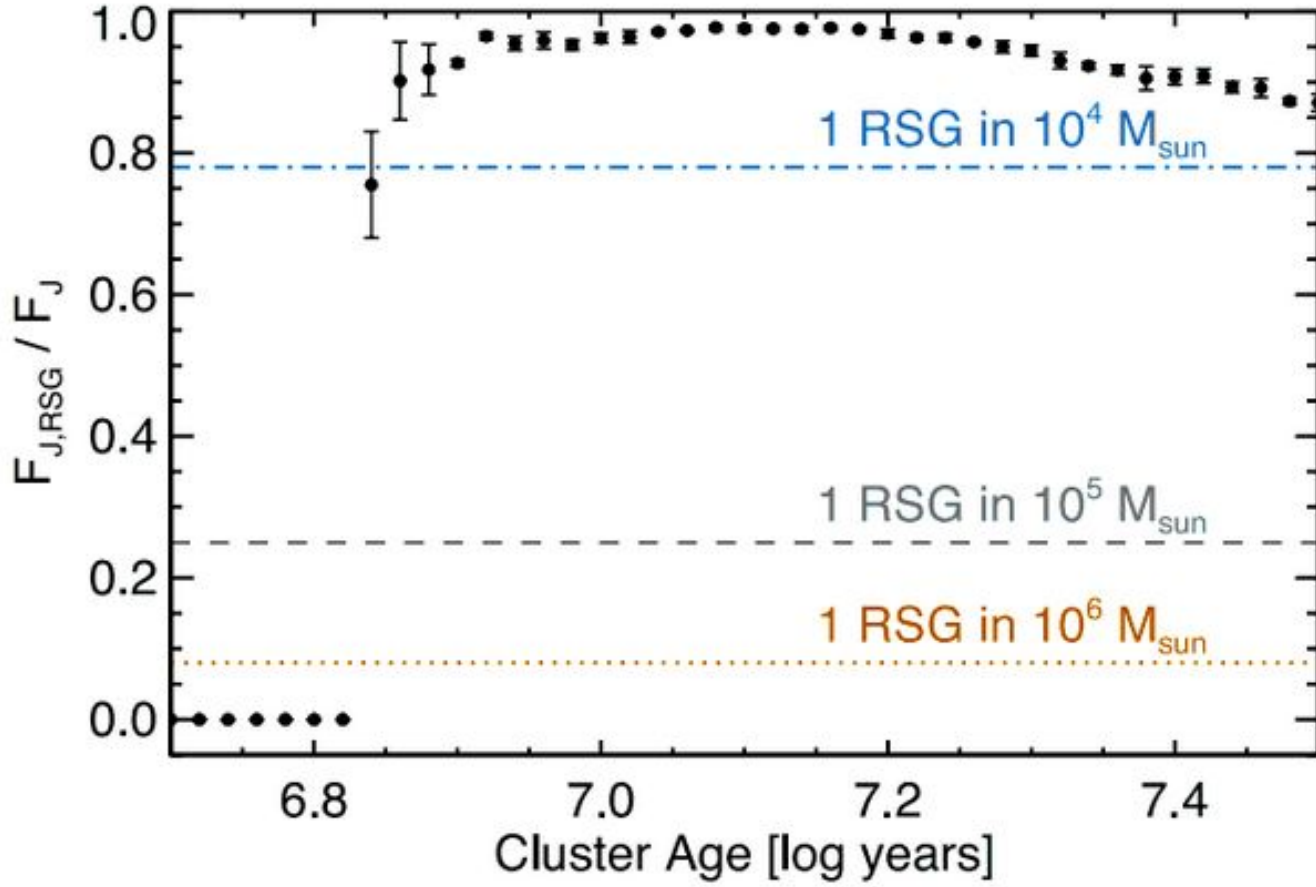
24 IFUs



1.0 - 1.36 μm

R~3000

Young Massive Clusters



Gazak et al. 2013

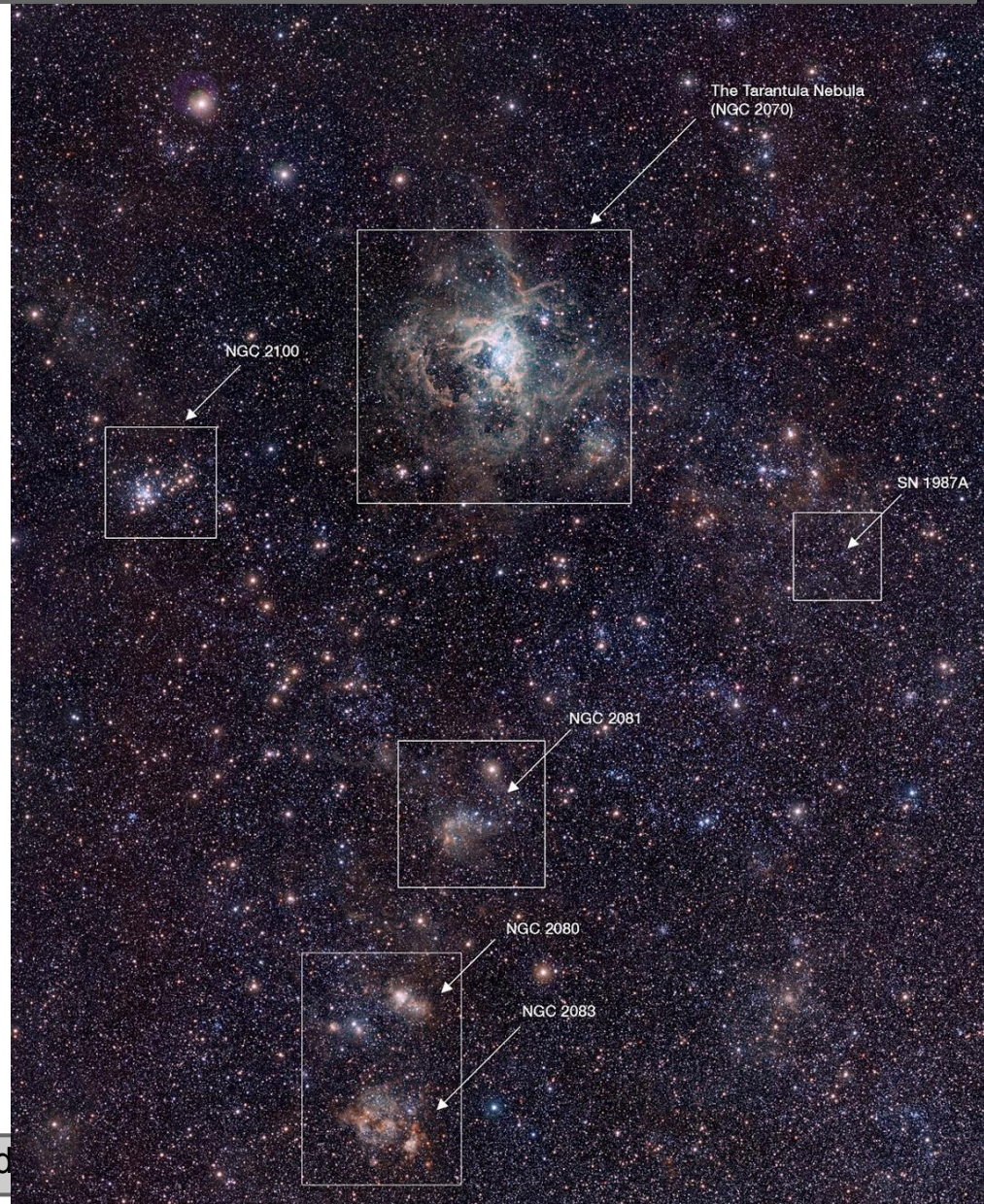
NGC 2100

- Not in isolation!

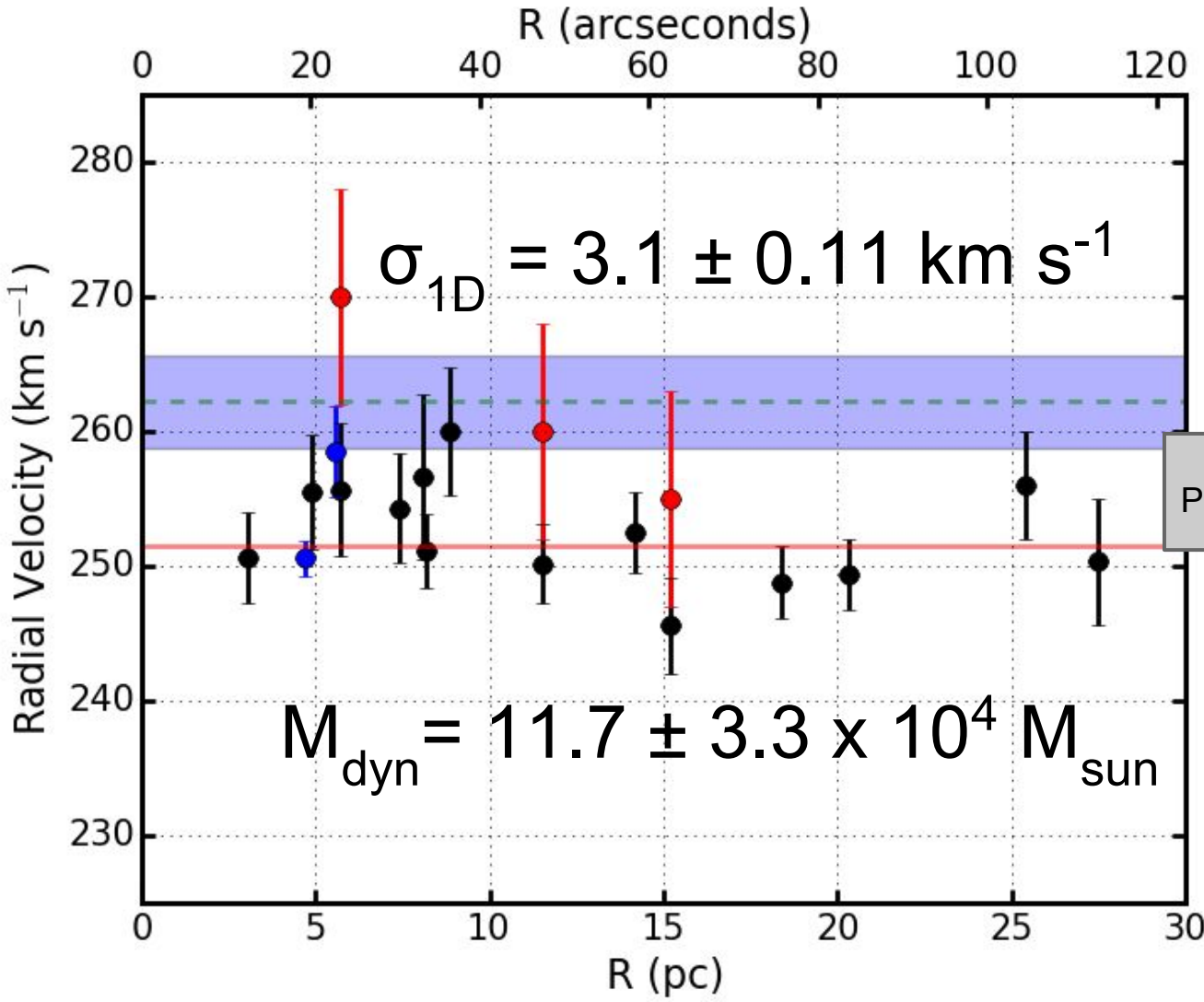
$$M_{\text{phot}} = 4.6 \times 10^4 M_{\text{sun}}$$

~20 Myr

McLaughlin & van der
Marel 2005



Dynamical Properties



Patrick et al. in prep

Dynamical Vs. Photometric Mass

- Discrepancy between the two measurements:

$$M_{\text{phot}} = 2.3 \pm 1.0 \times 10^4 M_{\text{sun}}$$

Vs.

$$M_{\text{dyn}} = 11.7 \pm 3.3 \times 10^4 M_{\text{sun}}$$

Dynamical Vs. Photometric Mass

- Discrepancy between the two measurements:
 - Binaries
 - Out of Virial Equilibrium
 - What else ...

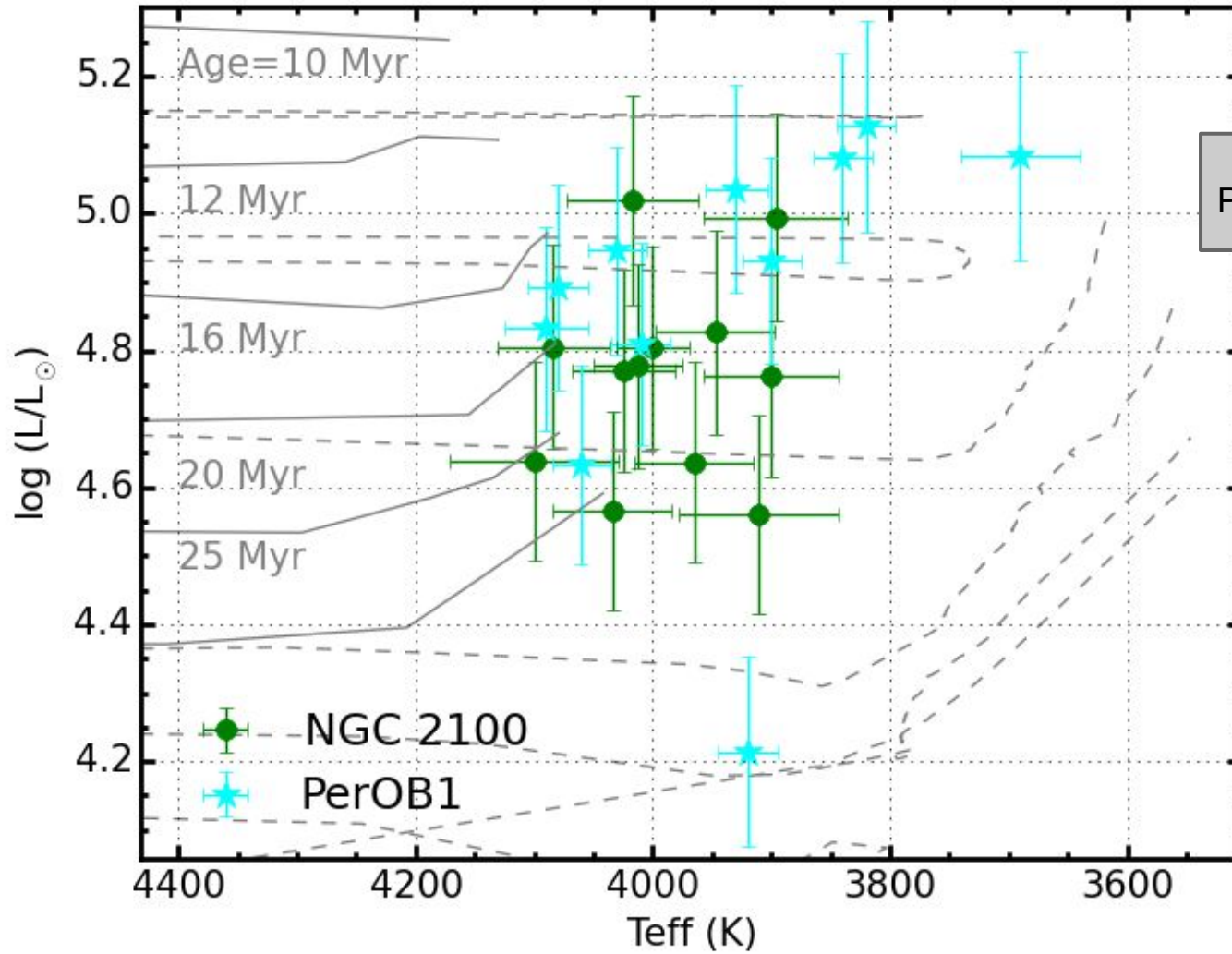


NGC 2100 and Per OB-1

- h and χ Persei double cluster
- Similar mass and age to NGC2100
- Gazak et al. 2014 study RSGs using same method

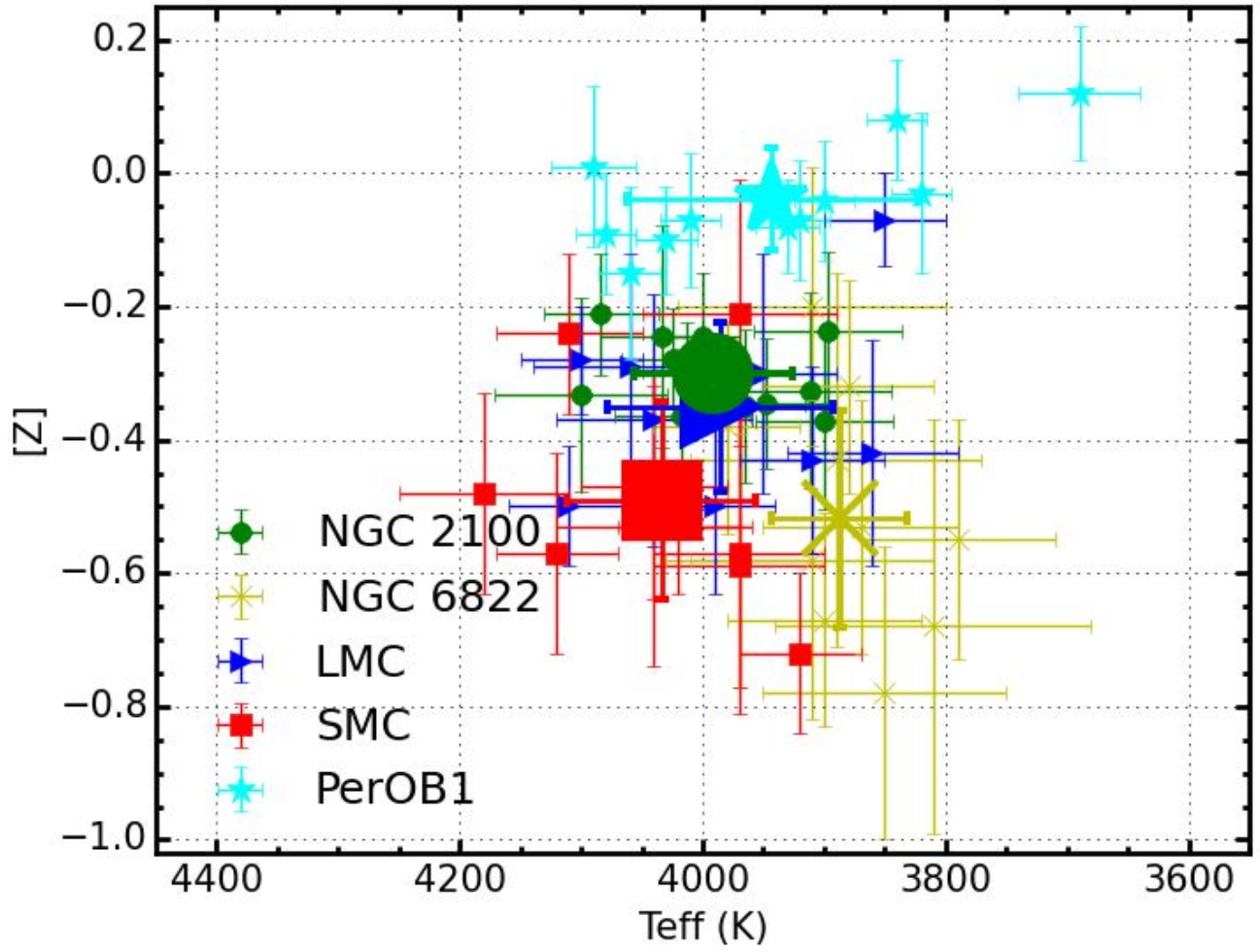


NGC 2100 and Per OB-1



Patrick et al. in prep

Temperature-metallicity Dependence



Patrick et al. 2015

Conclusions

- RSGs and SSCs metallicities in external galaxies
- Why a discrepancy between the mass measurements?
- How can stellar evolution account for no temperature-metallicity variation of RSGs?

Future Work: E-ELT era

- 30m telescopes measures metallicities at 10's of Mpc



