

Lithium in the globular clusters ω Centauri & M4

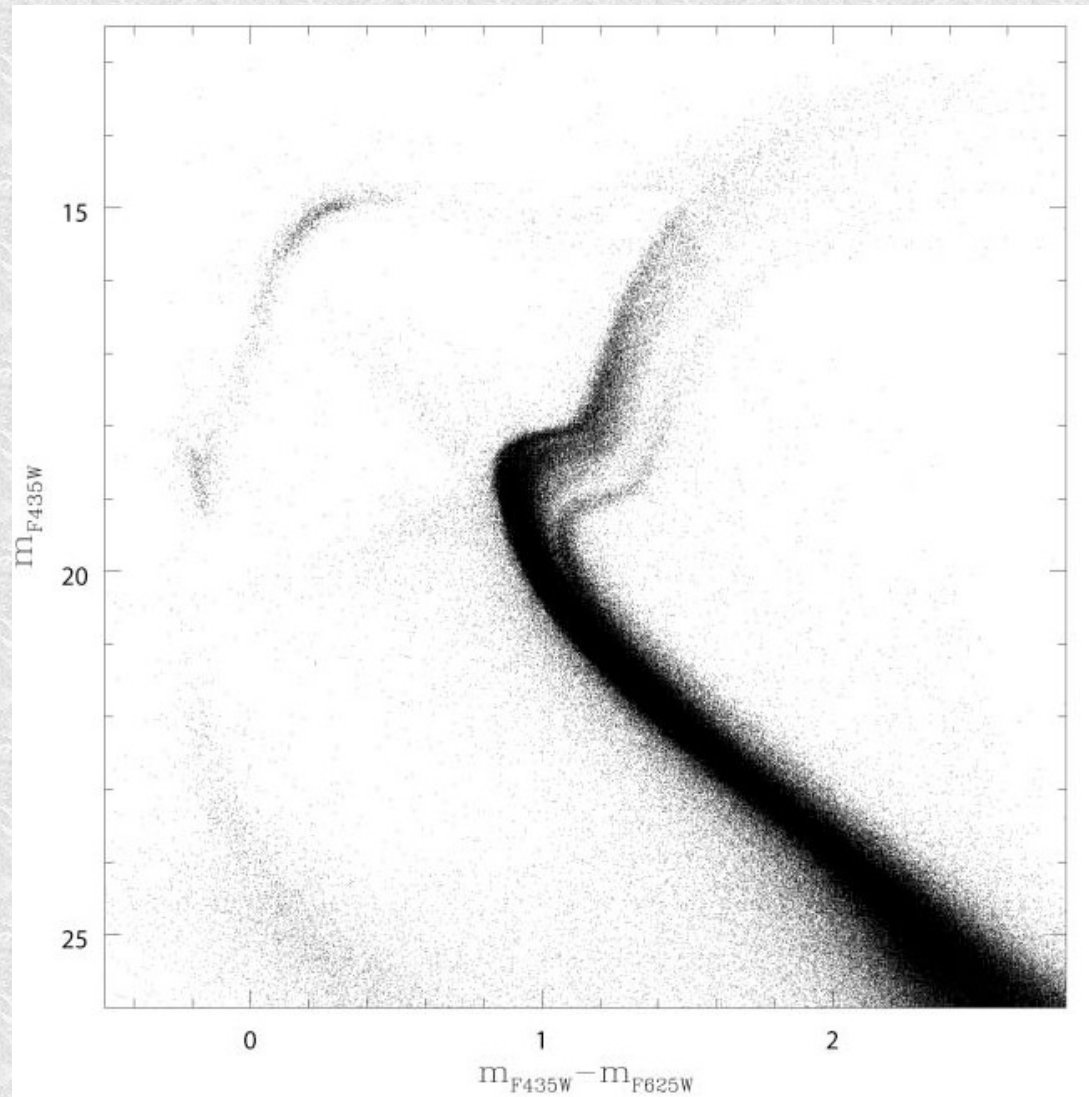
Lorenzo Monaco

ESO – European Southern Observatory / Santiago (Chile)
lmonaco@eso.org

Collaborators: P. Bonifacio, S. Villanova, L. Sbordone,
E. Caffau, H.-G. Ludwig, et al.

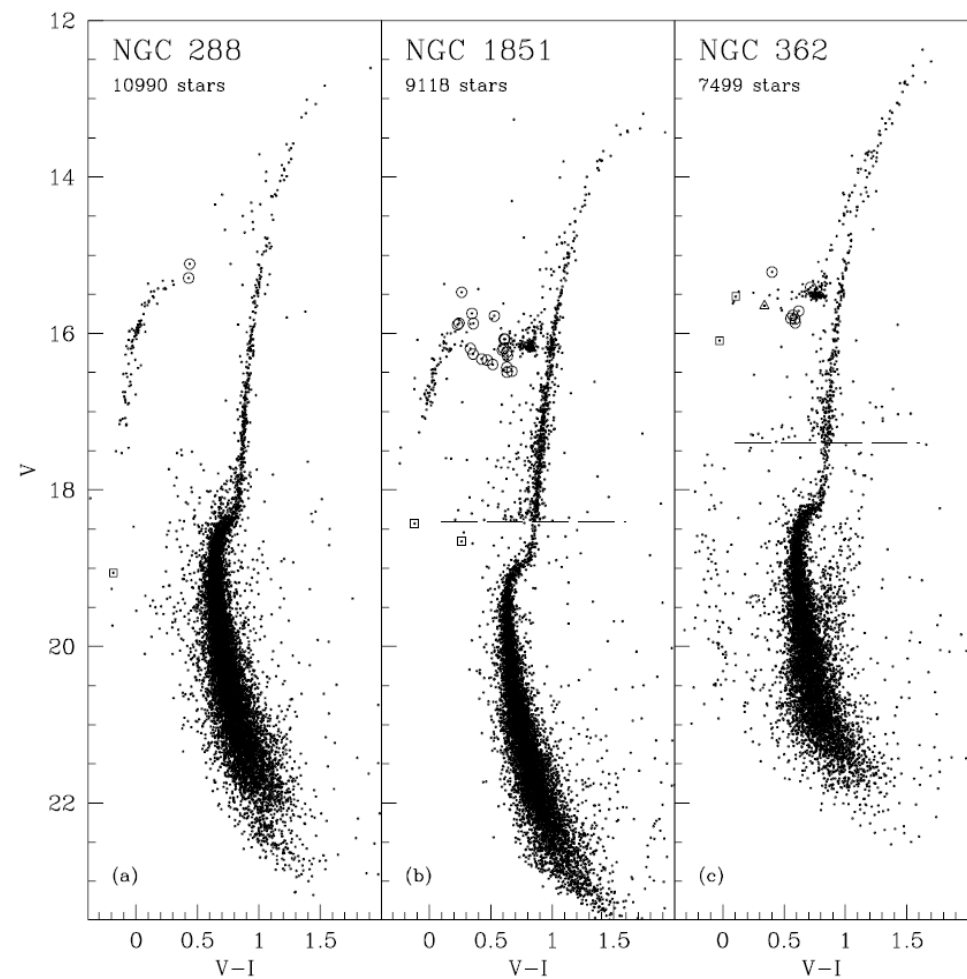
ω Centauri: GC or dSph?

ω Centauri is the most massive GC and is commonly considered as the remnant of an accreted dwarf galaxy

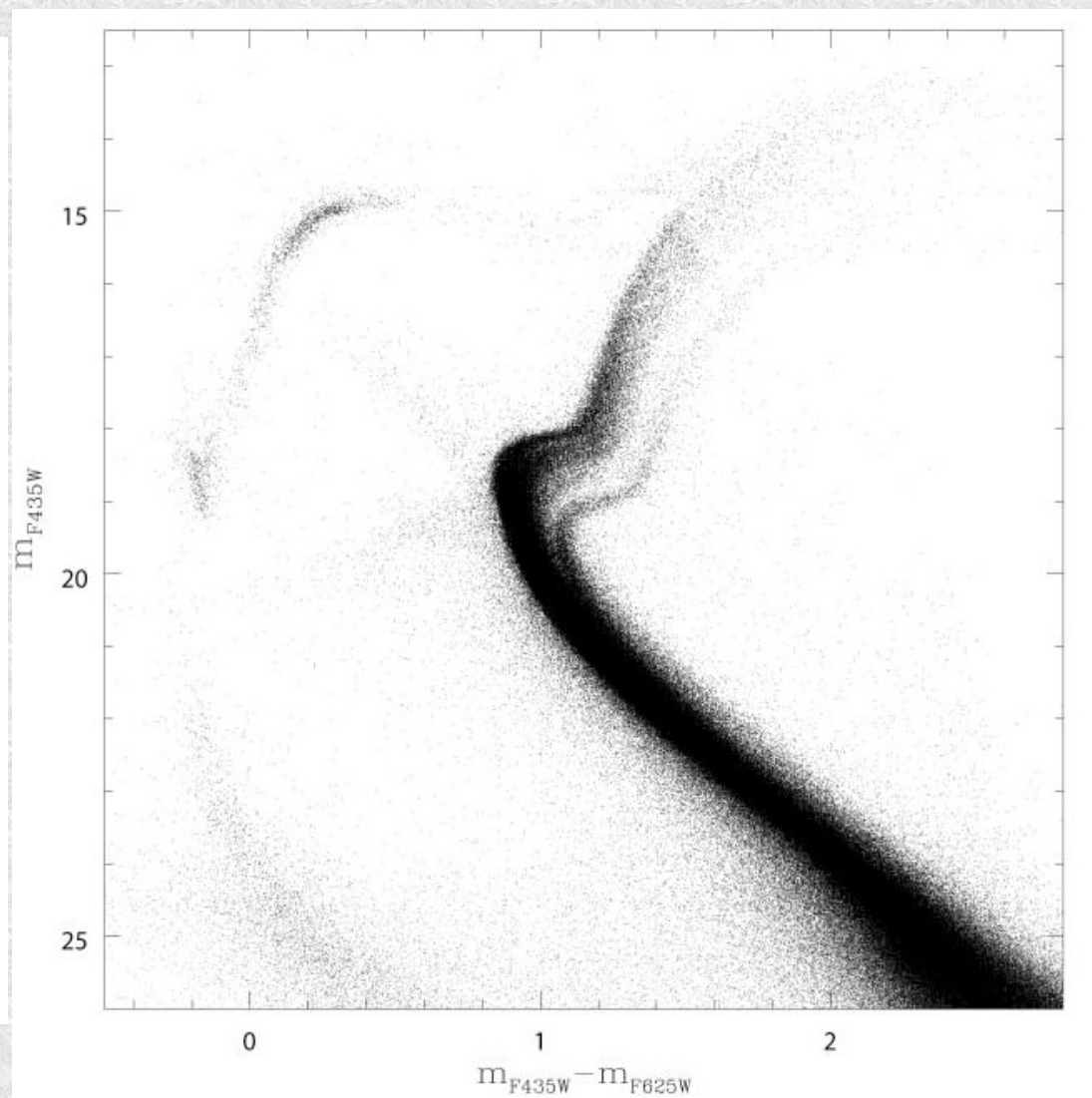


Villanova et al 2007

ω Centauri: GC or dSph?

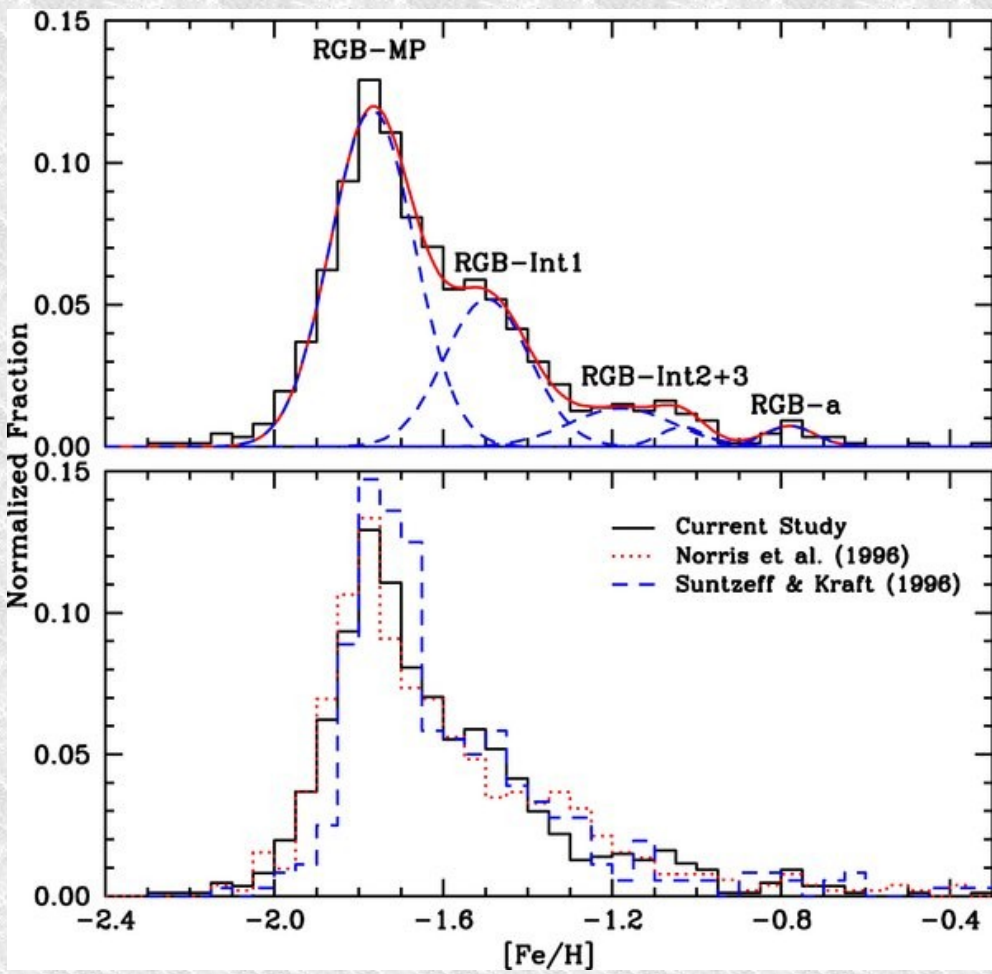


Bellazzini et al 2001

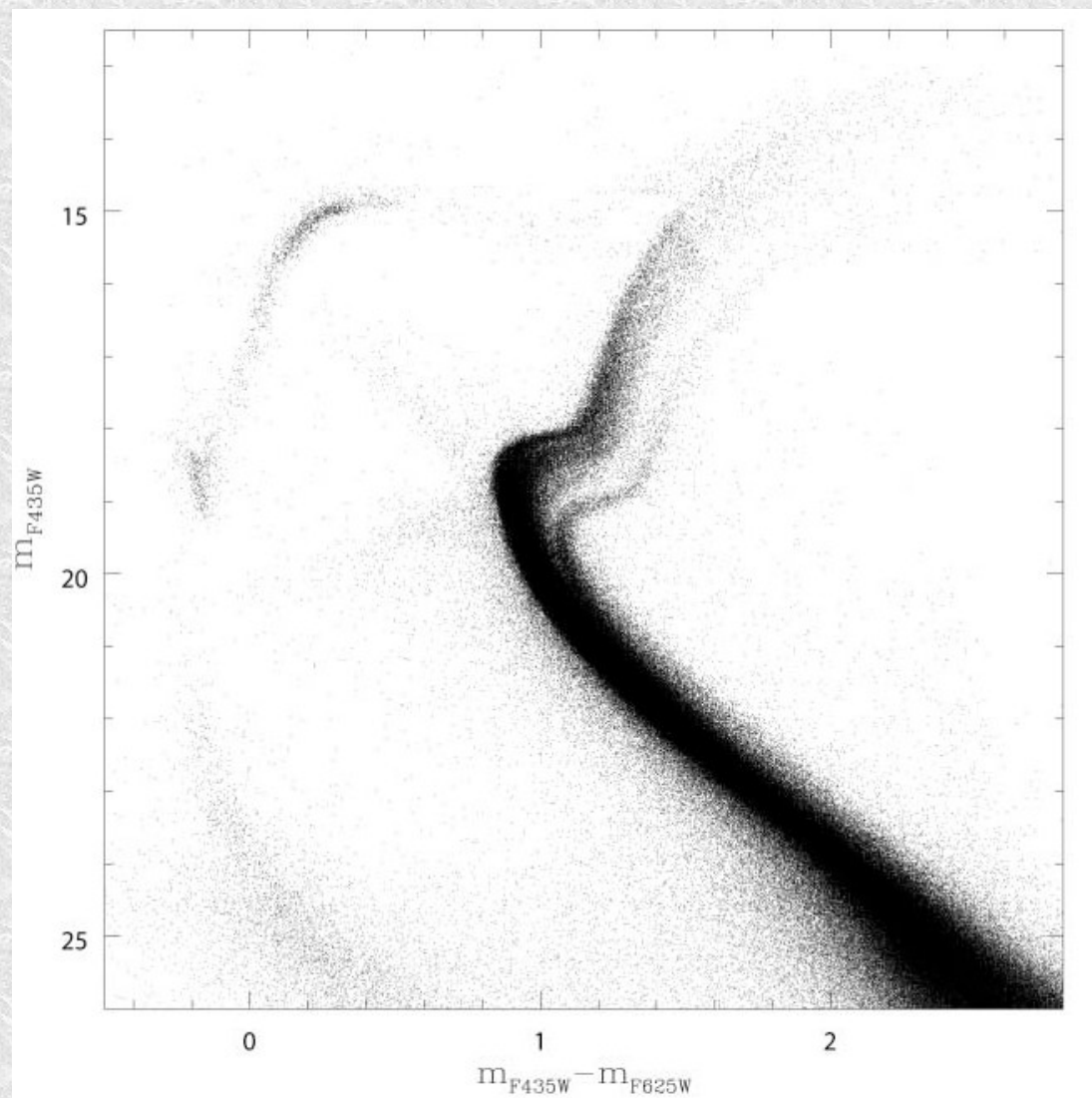


Villanova et al 2007

ω Centauri: GC or dSph?



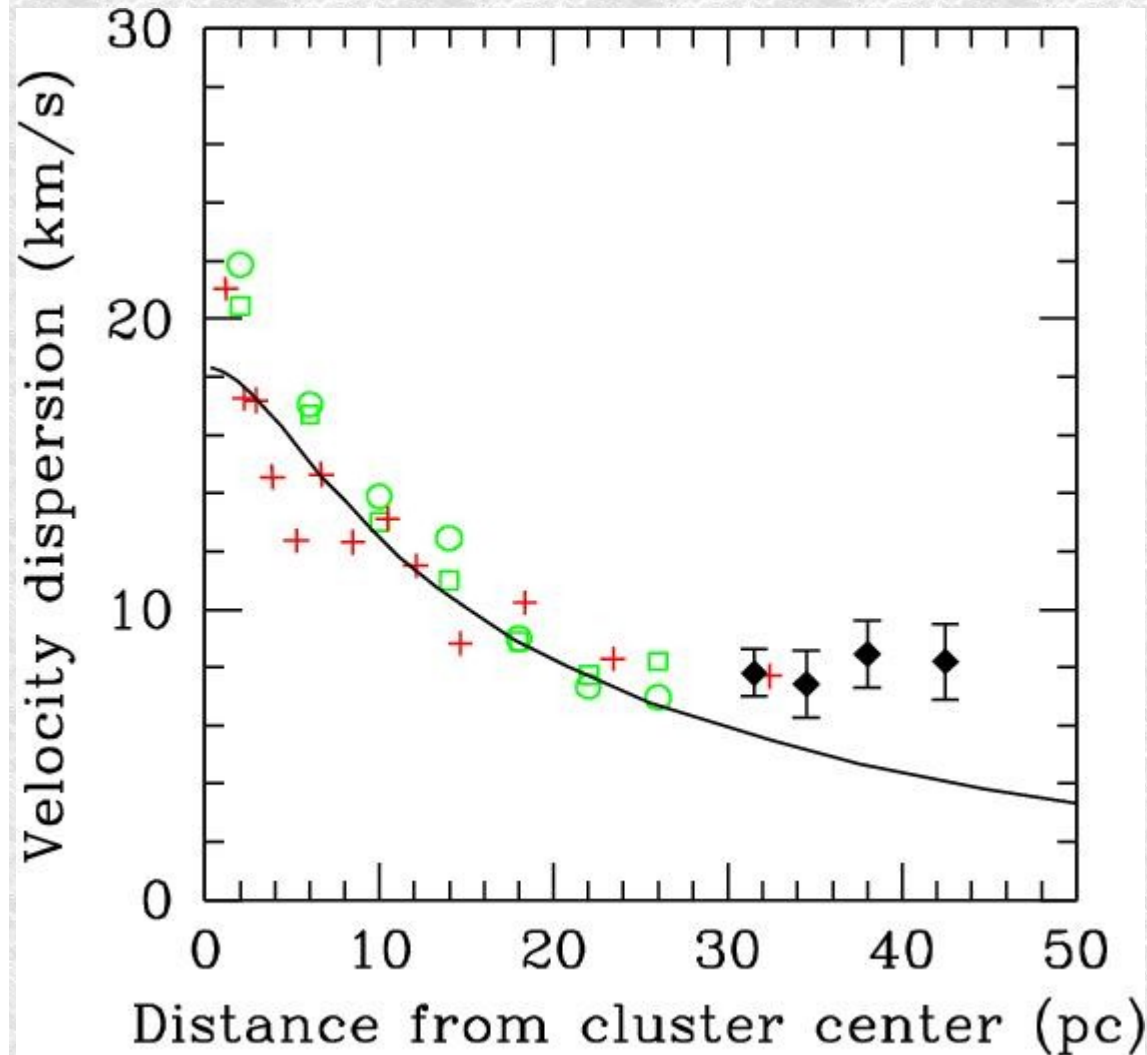
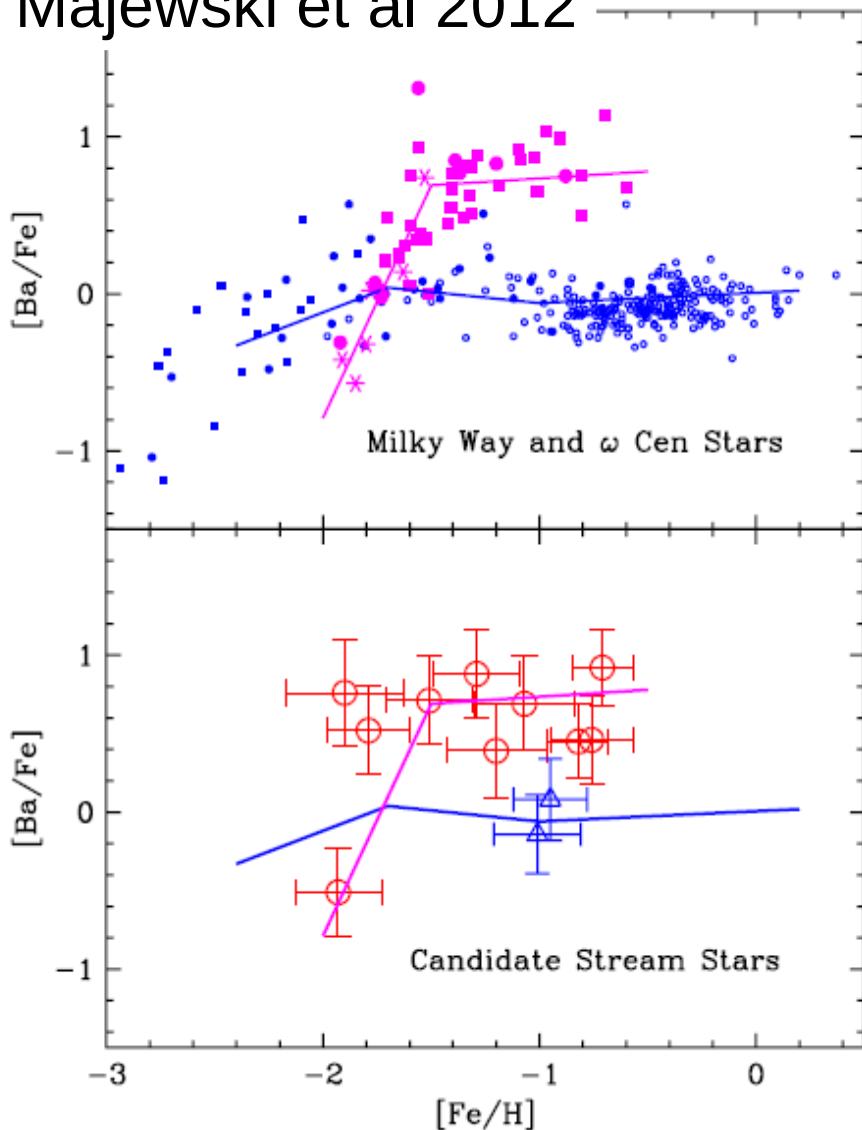
Johnson et al 2010



Villanova et al 2007

ω Centauri: GC or dSph?

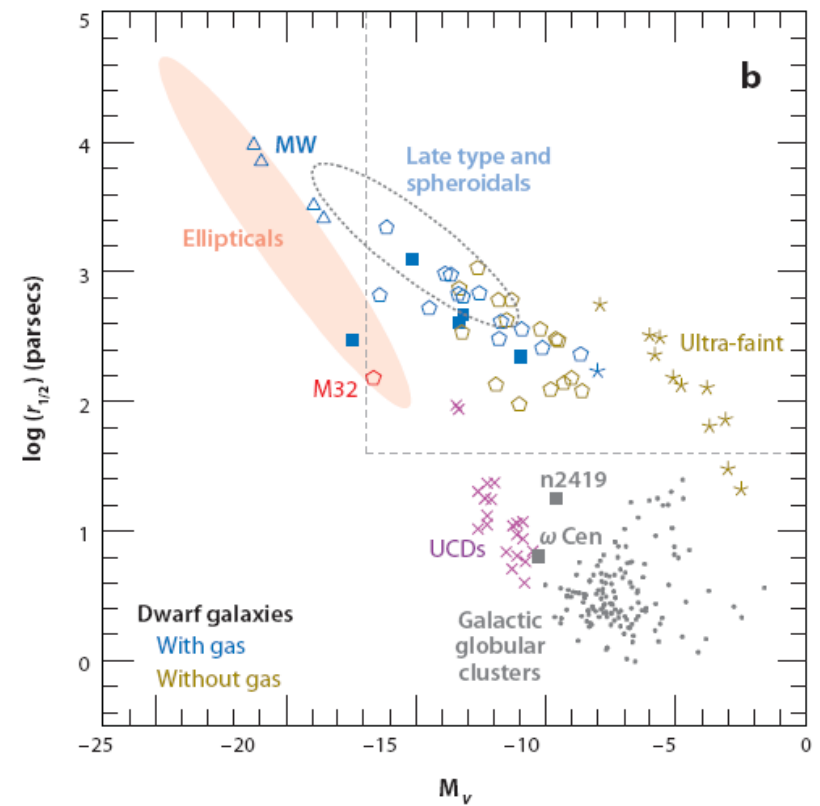
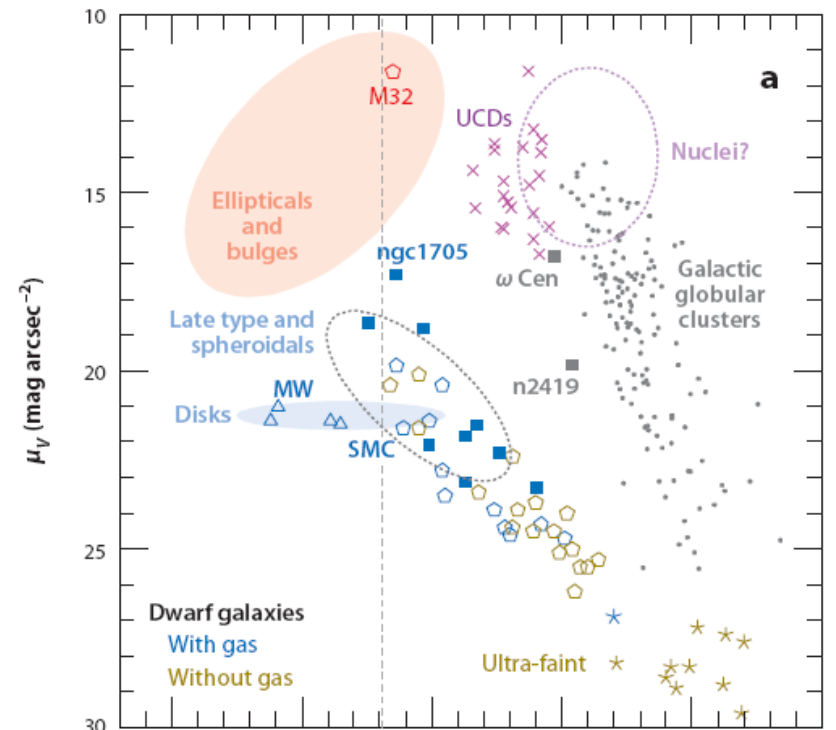
Majewski et al 2012



Scarpa et al 2003

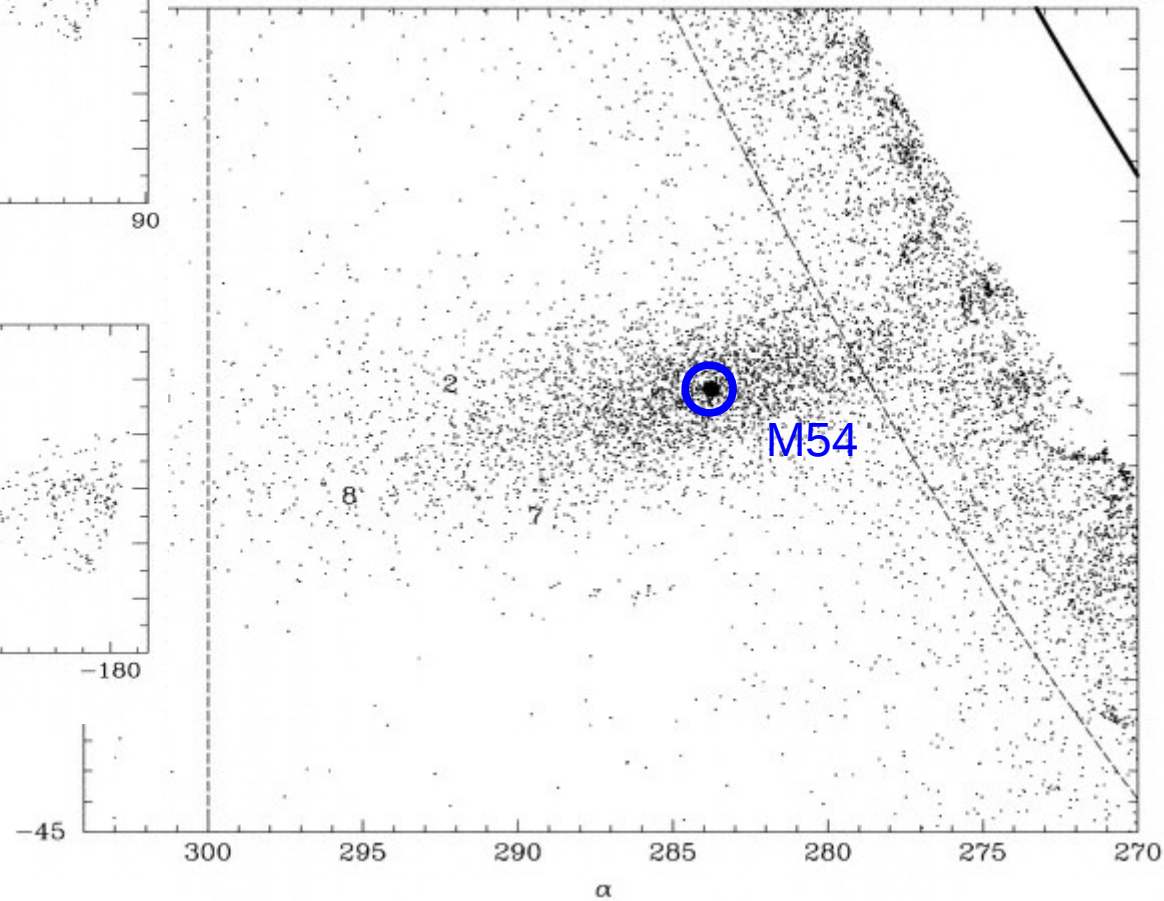
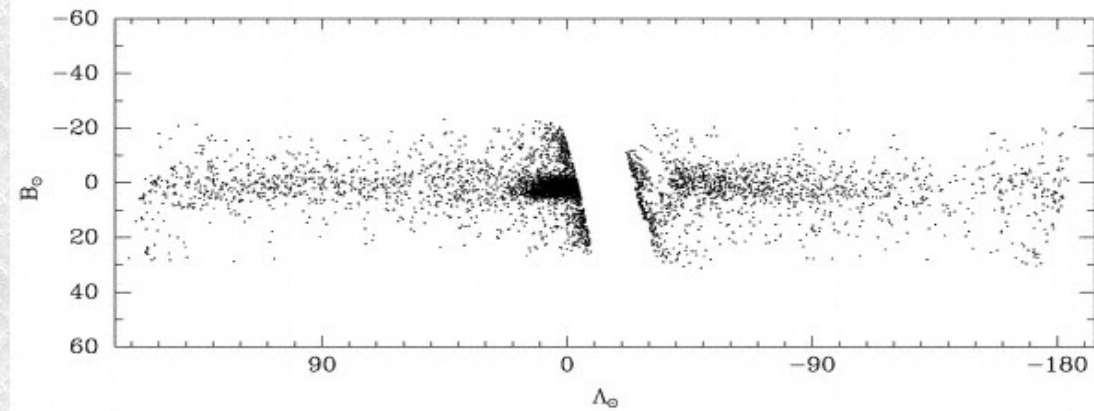
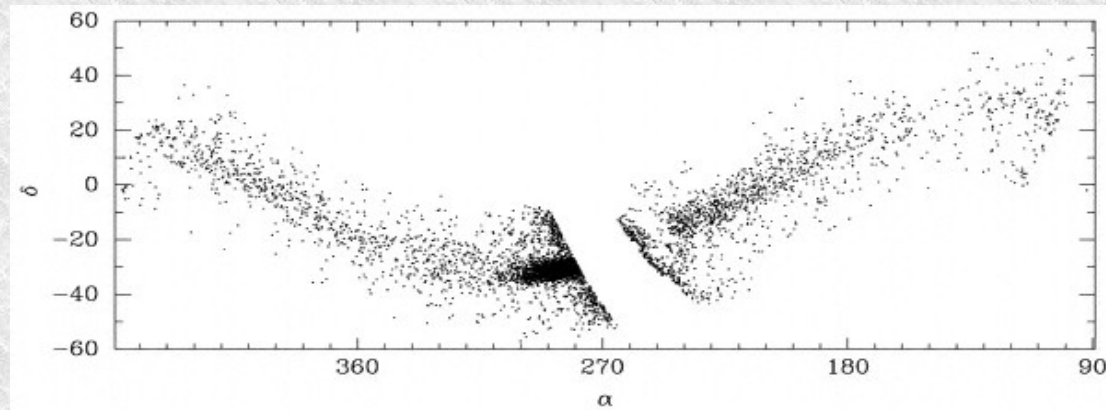
ω Centauri: GC or dSph?

Tolstoy et al. 2009

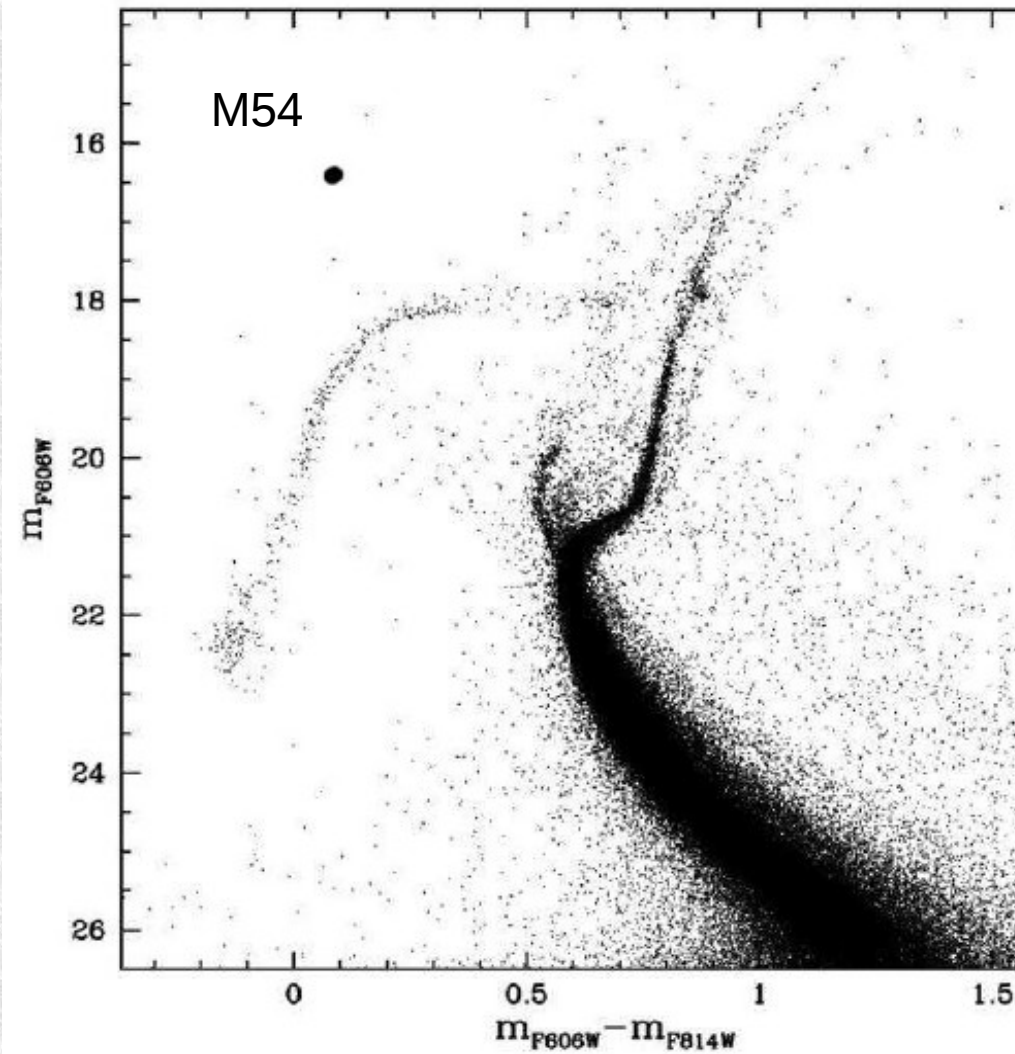


The Sgr dSph

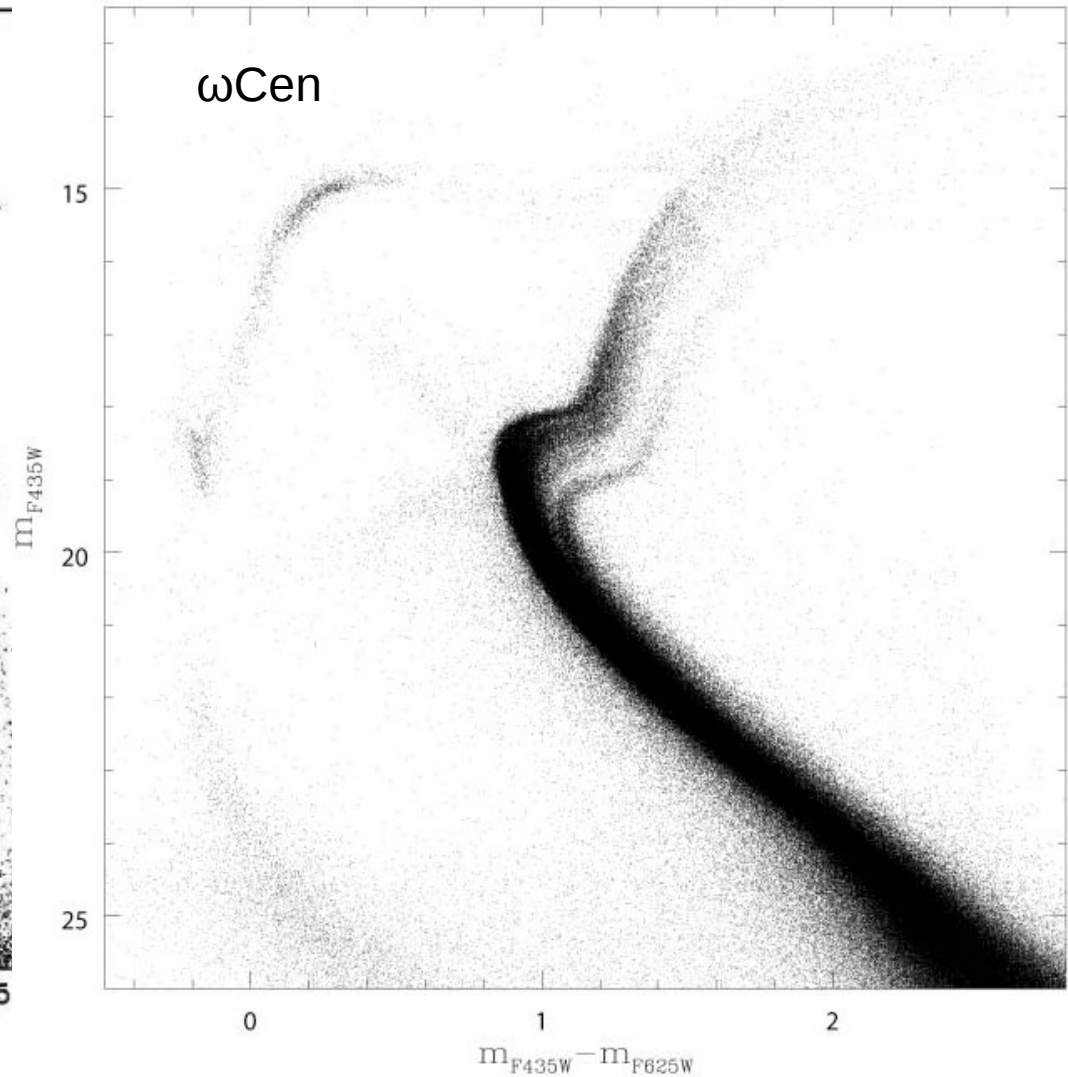
Majewski et al. 2003



M54 + Sgr Nucleus & ω Centauri



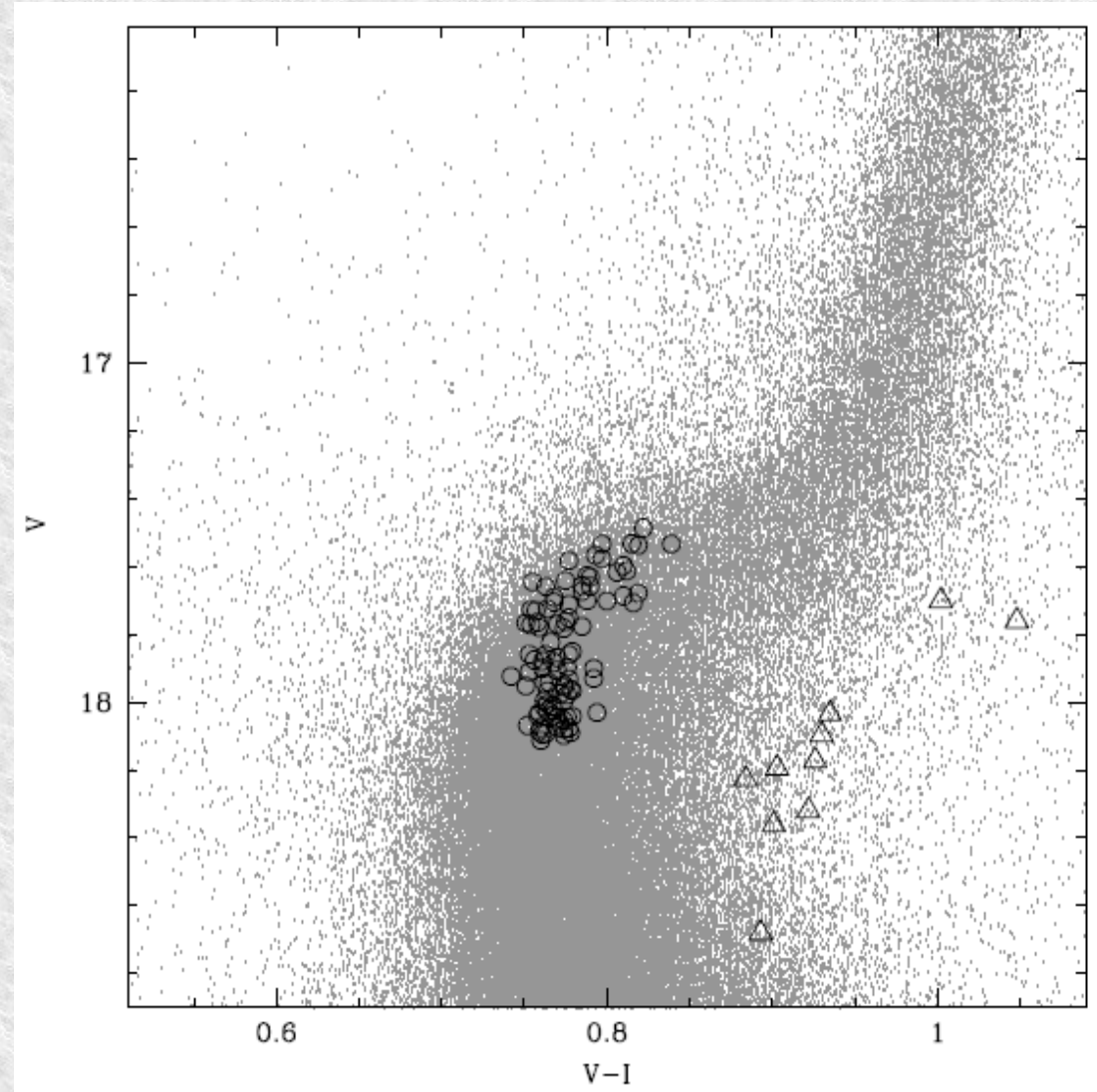
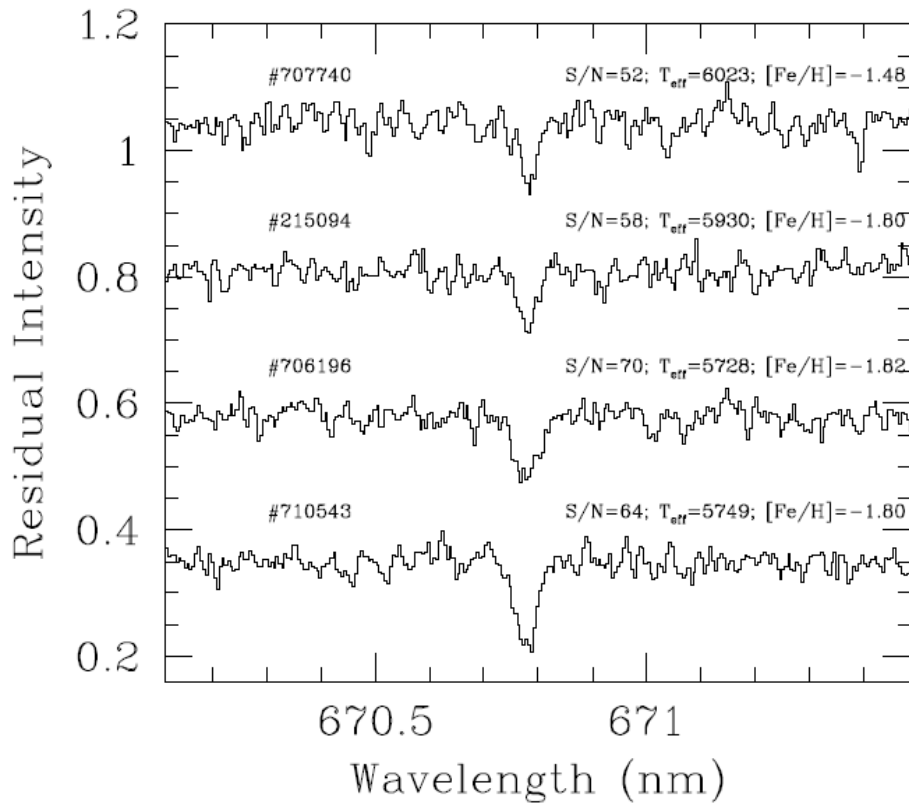
Siegel et al. 2007



Villanova et al 2007

The Lithium content of ω Cen

- FLAMES/VLT
- About 100 targets up to $V=18$
- Safe detection of the Li resonance doublet

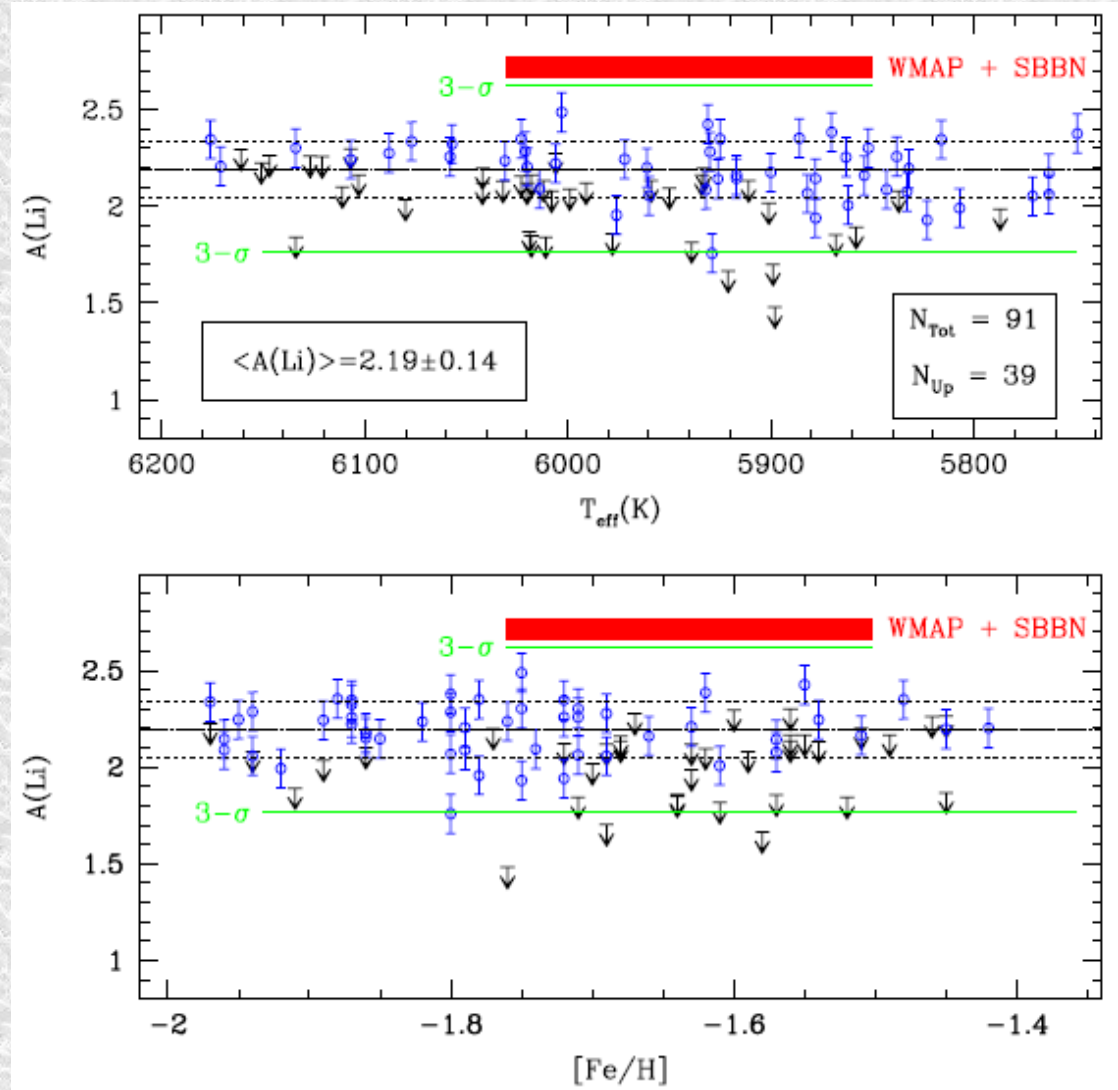


Monaco et al., 2010

The Lithium content of ω Cen

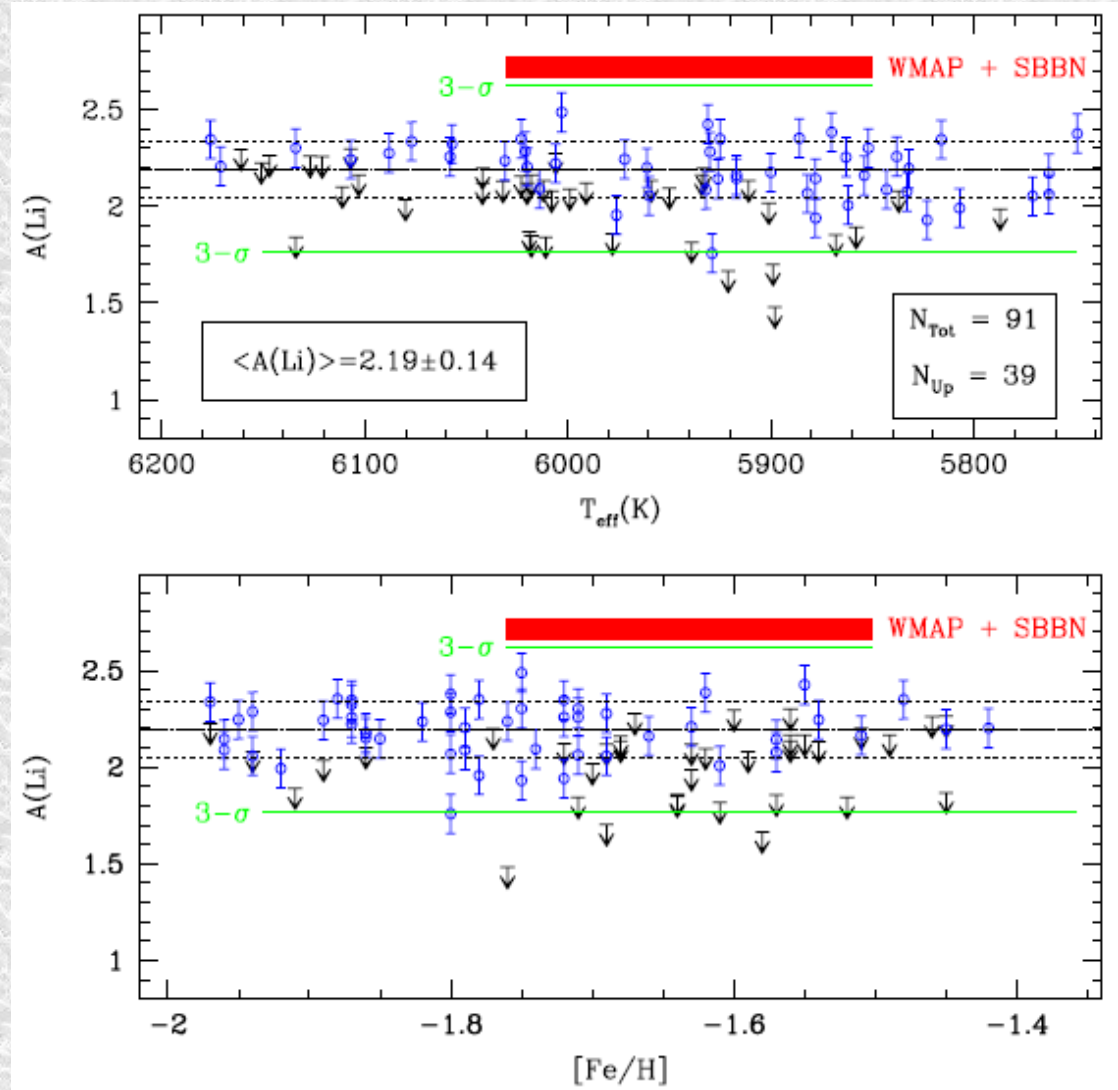
ω Cen stars have Li abundances close to the Spite plateau

The 1st (stellar) Lithium measure in an extra-galactic stellar system?



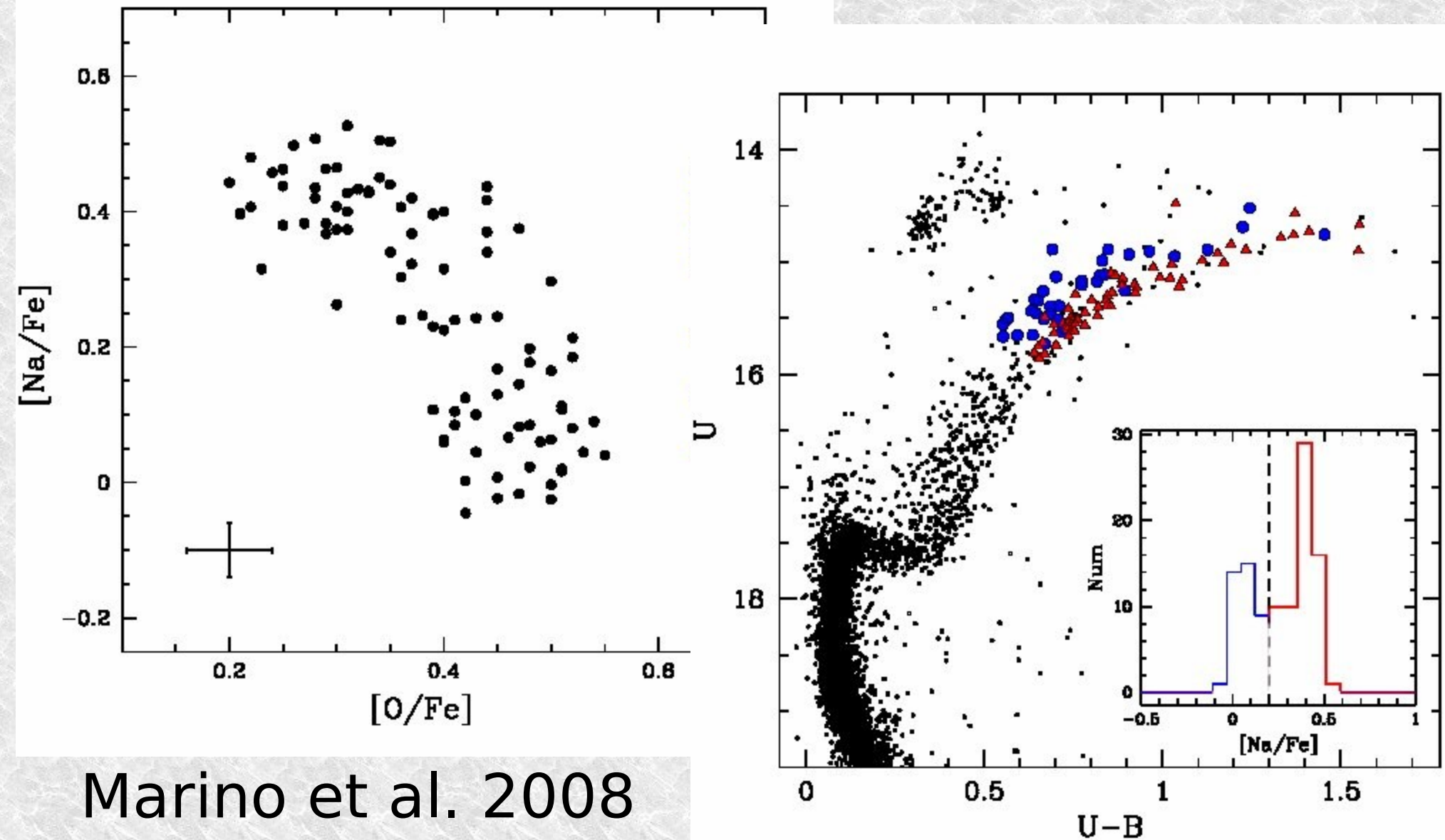
The Lithium content of ω Cen

- Issue for solutions of the cosmological Li problem through pre-processing of Galactic material through massive Pop III stars (Piau et al. 2006)



Li in Galactic globular clusters:
The case of M4

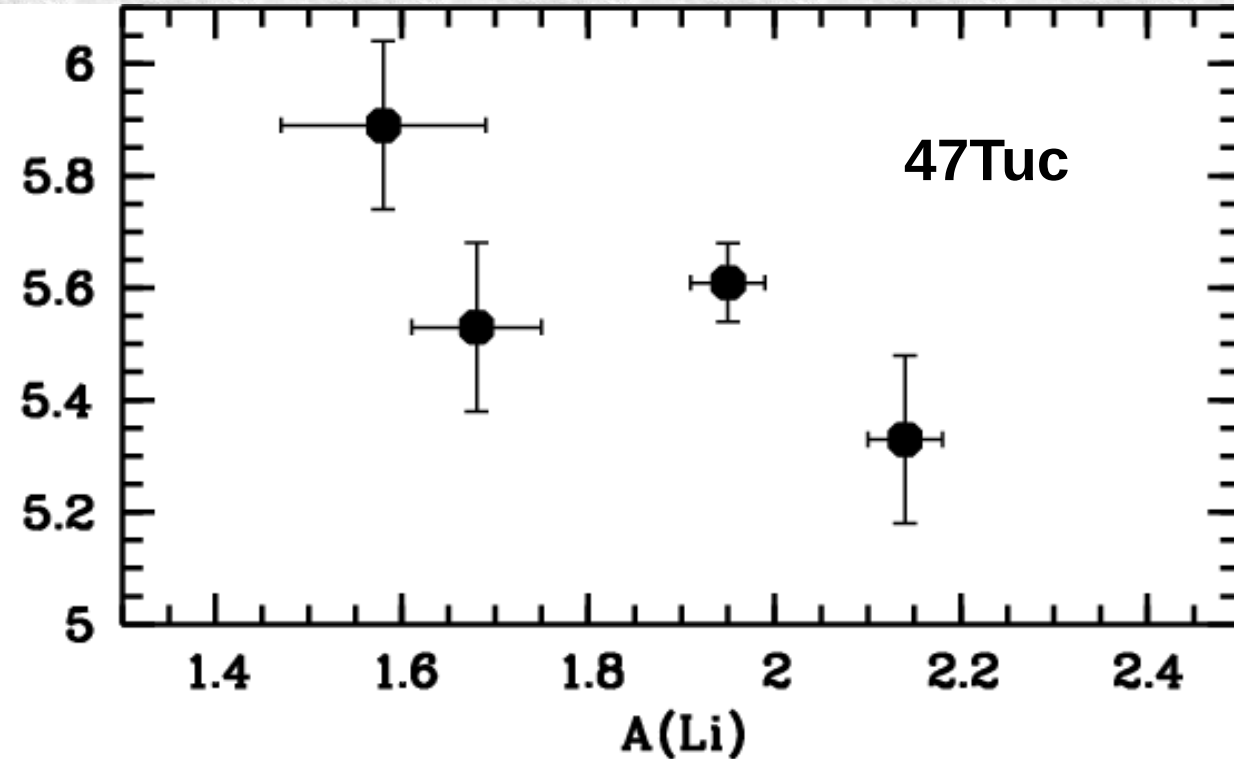
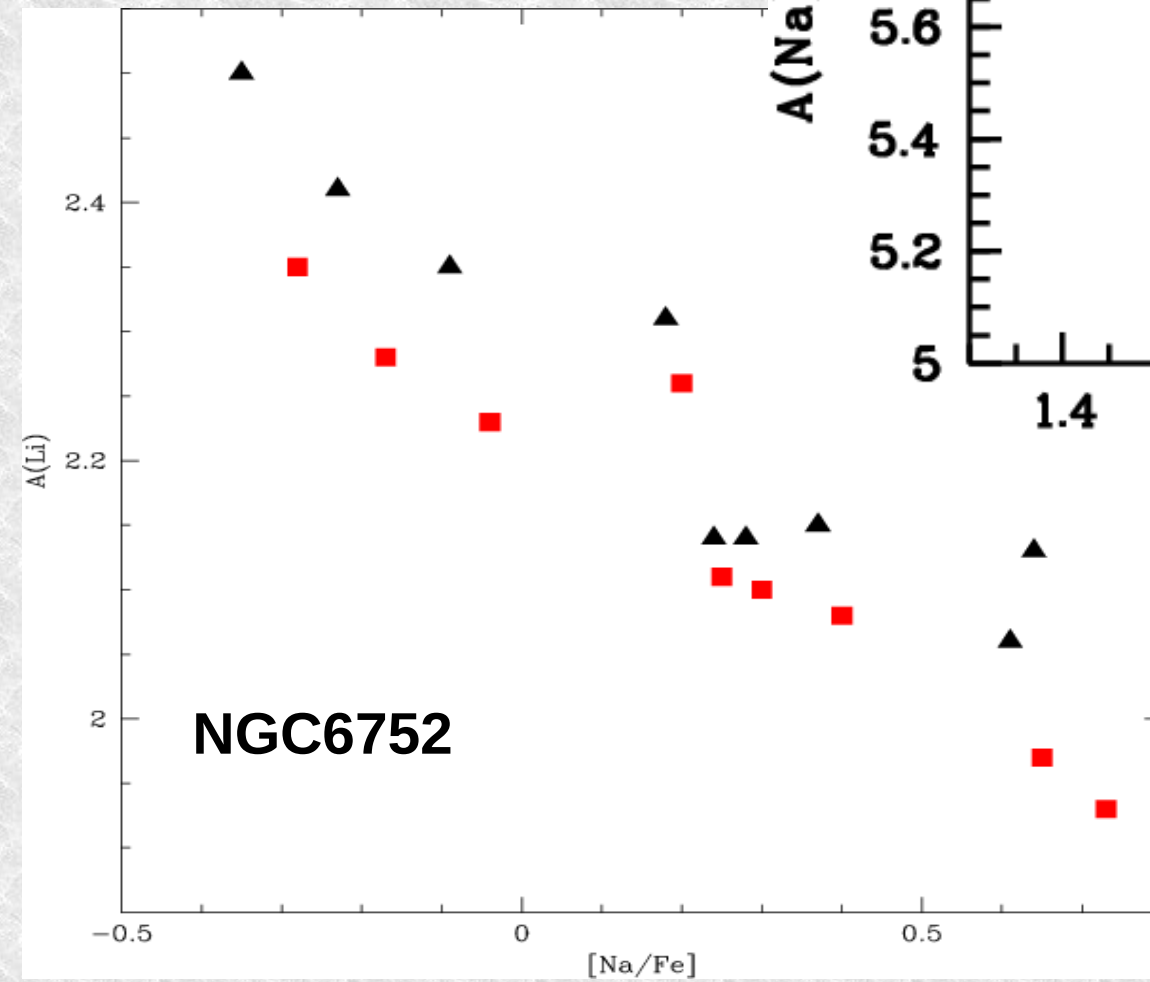
Na vs O in Galactic globular clusters: The case of M4



Marino et al. 2008

Li vs Na in Galactic globular clusters

Bonifacio et al. 2007



Pasquini et al. 2005

Li vs Na in Galactic globular clusters

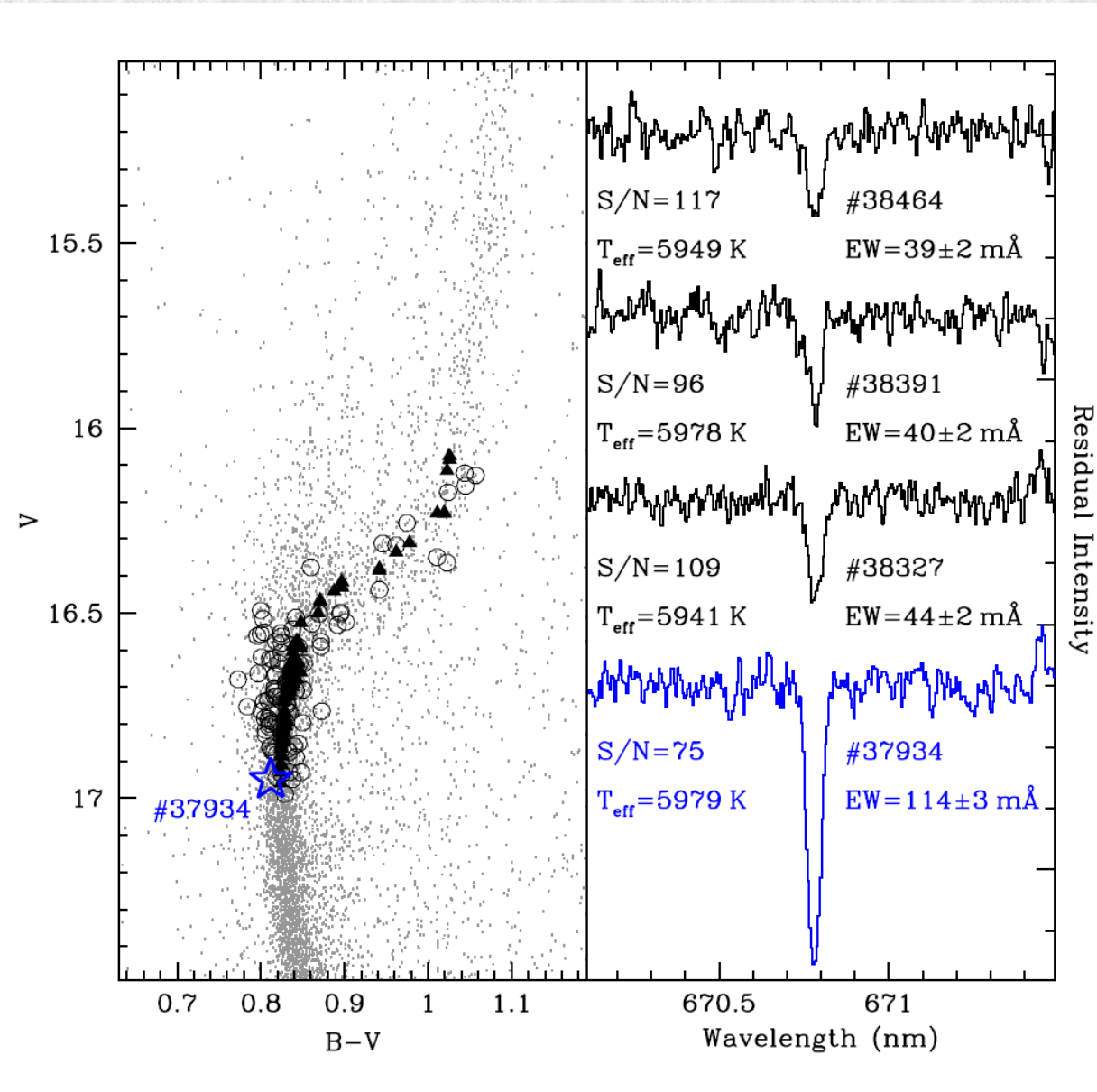
Possible polluters of the gas from which the second generation of stars formed in GCs:

- Fast rotating massive stars (**FRMS**)
 - **destruction** of the original Li content
- Massive **AGB** stars
 - may have an important **lithium yield**
- **Li production tend to erase the Na vs Li anti-correlation**

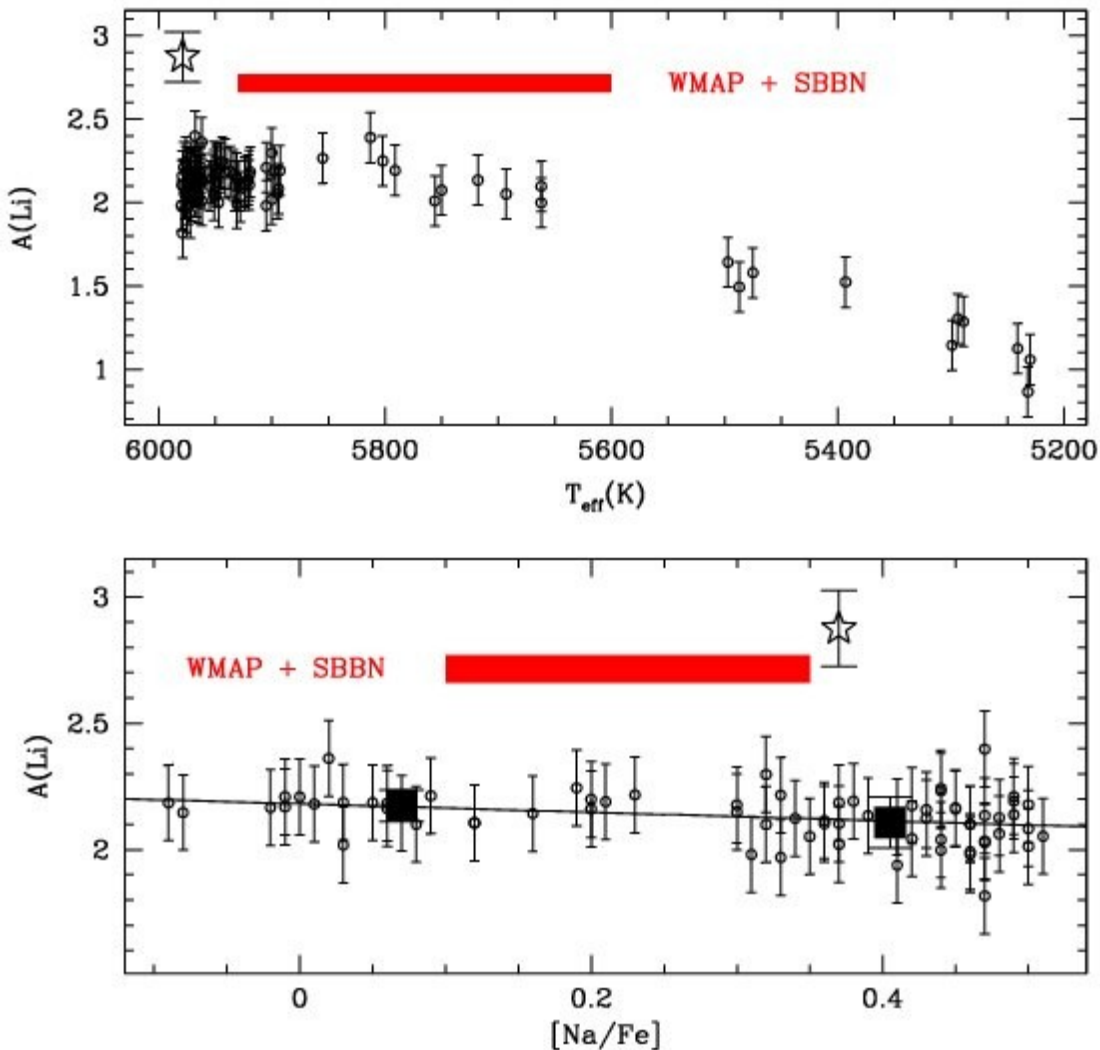
Li in Galactic globular clusters: The case of M4

- Search for a Na vs Li anti-correlation
- P85 – FLAMES/VLT
- About 90 targets up to $V=17$
- Safe detection of the Li resonance doublet

Monaco et al. 2012



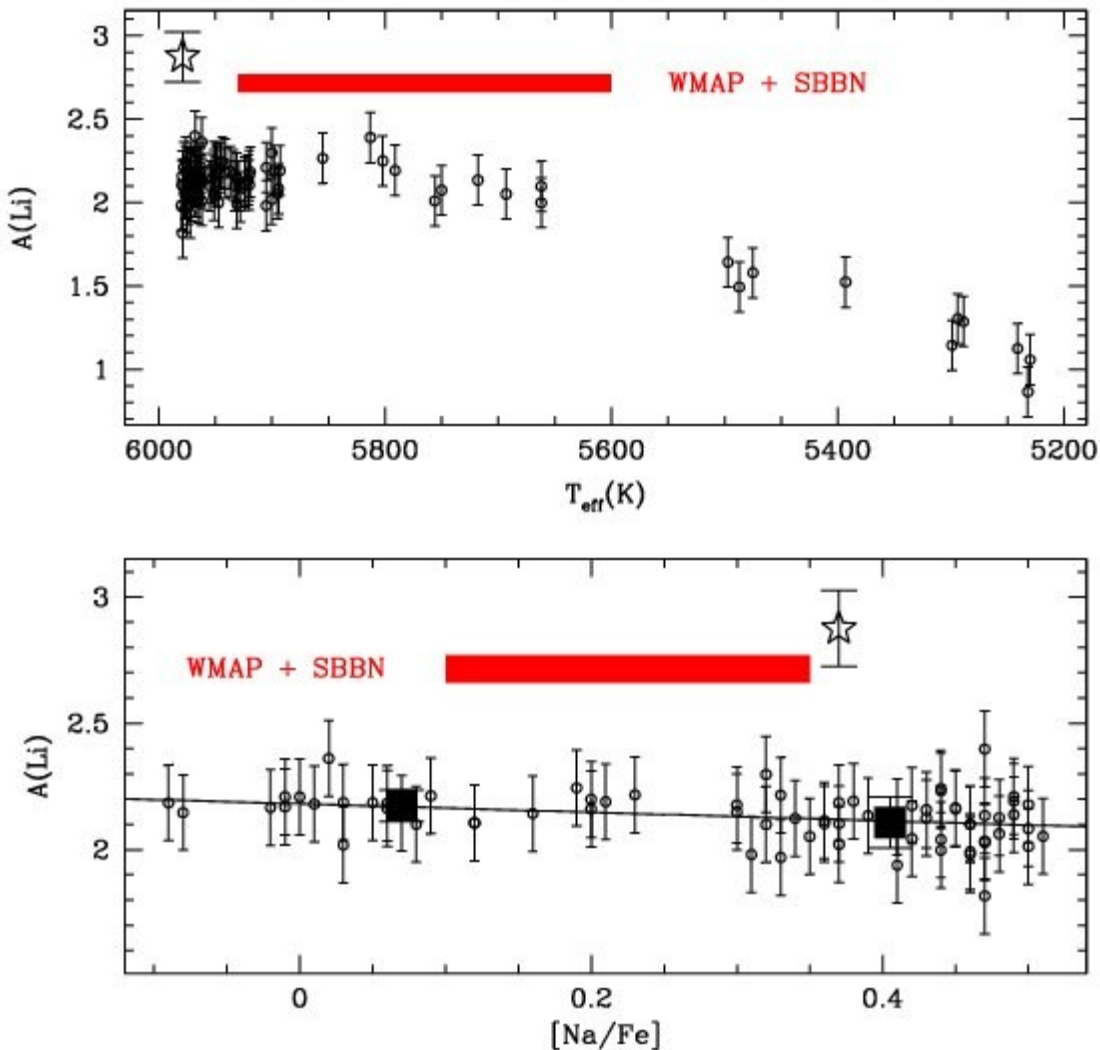
A Li-rich dwarfs in the Globular Cluster M4



- We detected a dwarf in M4 having a **Li content compatible with the cosmological value**
- Is it really the **primordial Li** or is it a case of **pollution**?

Monaco et al. 2012

A Li-rich dwarfs in the Globular Cluster M4

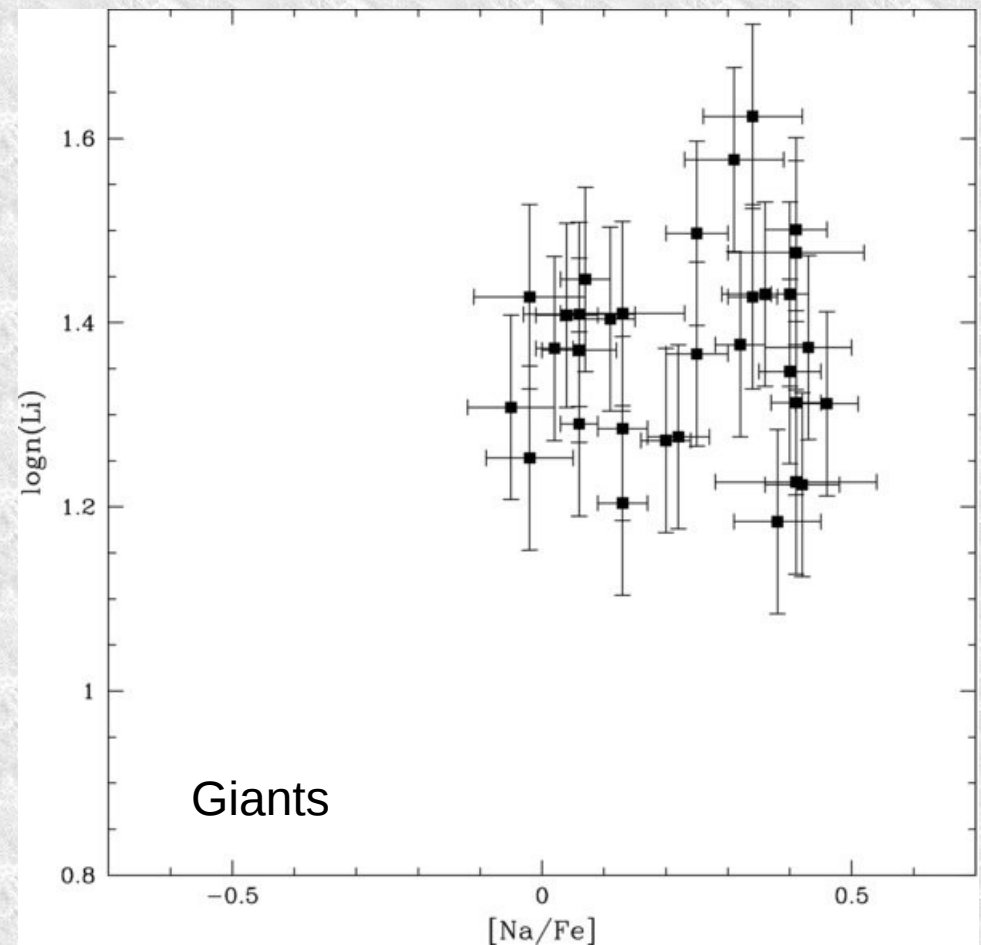
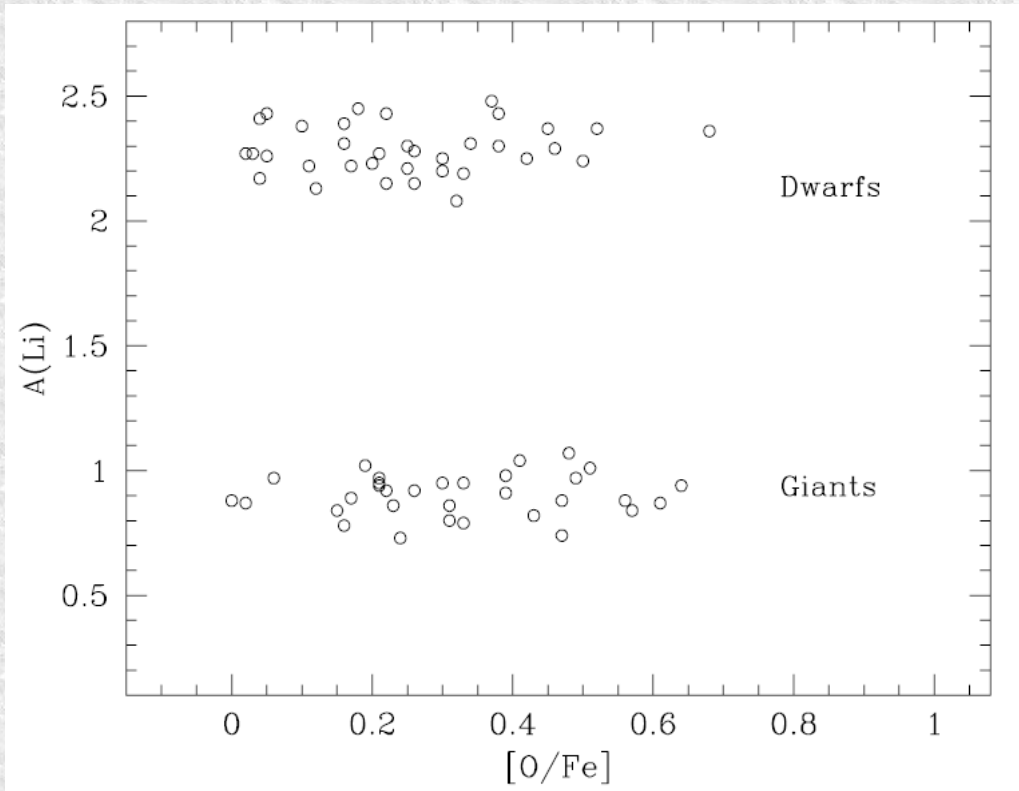


- The shallow slope of the $A(\text{Li})$ vs $A(\text{Na})$ anti-correlation suggests **Li production in place**
- **#37394** has a high Na content: it is a **2nd generation star**

Monaco et al. 2012

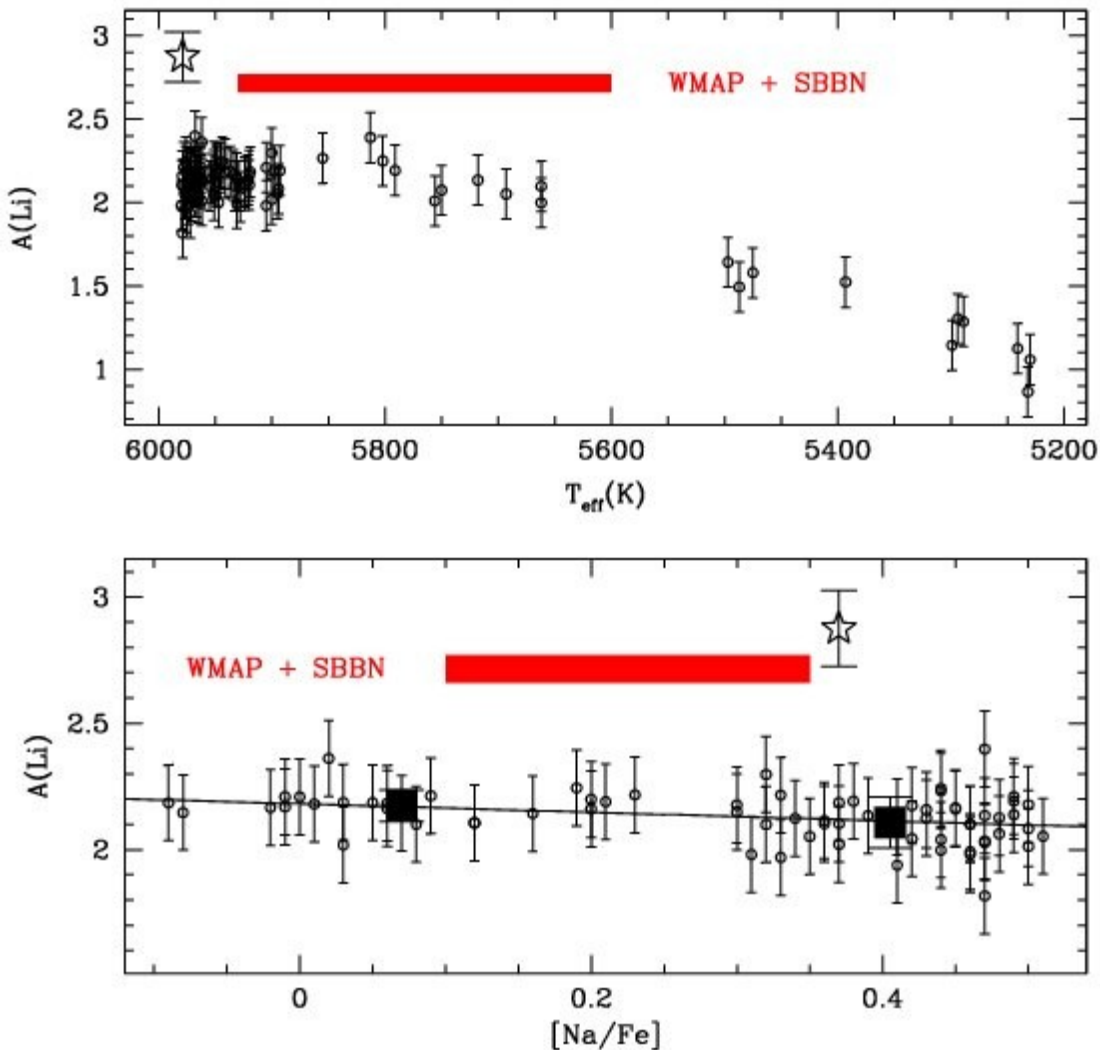
Li – O – Na in M4 giants and dwarfs

Mucciarelli et al. 2011



D'orazi & Marino, 2010

A Li-rich dwarfs in the Globular Cluster M4



Where can pollution come from?

- Pollution from a now evolved companion which produced Li?
- Pollution from massive AGB stars?
- Primordial scenario cannot be discarded

Monaco et al. 2012