Classical Cepheids as tracers of young Galactic and Magellanic stellar populations

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Introduction

★ Classical Cepheids are fundamental objects to estimate Galactic and extragalactic distances

Period-Luminosity relation

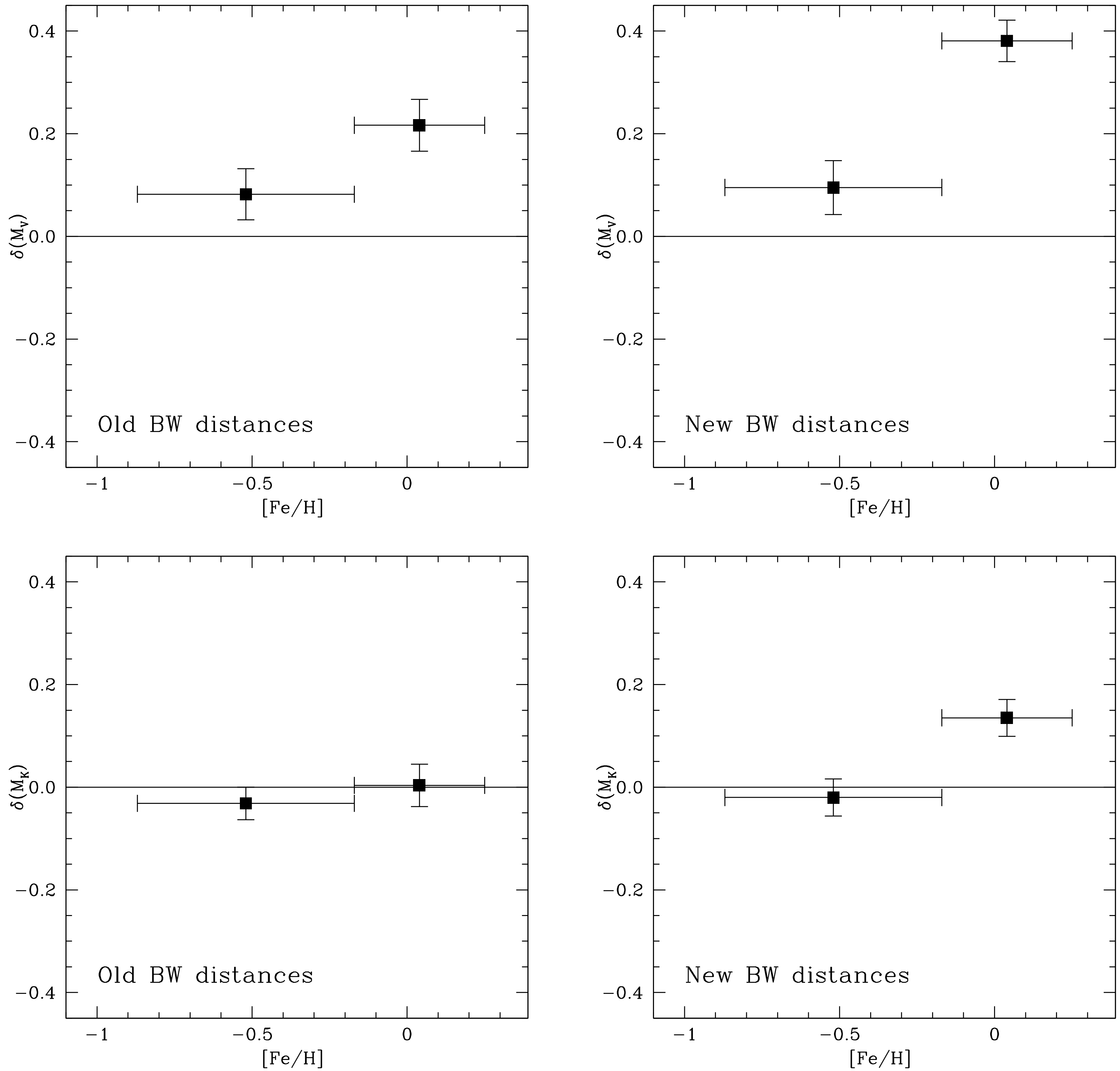
What is the influence of the chemical composition on the pulsation properties?

Introduction

Dependence on metallicity

δM_V

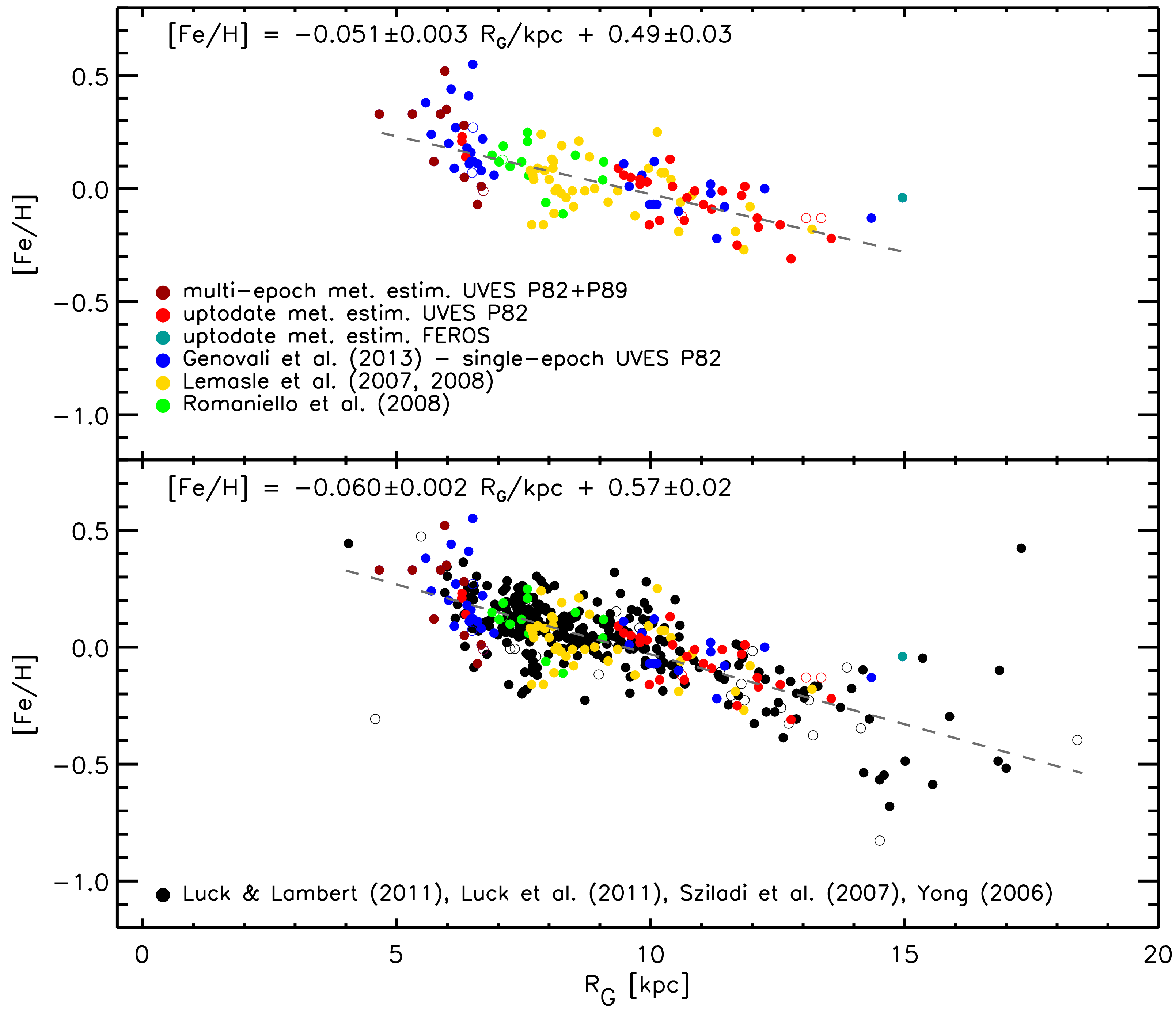
δM_K



Romaniello et al. (2008)

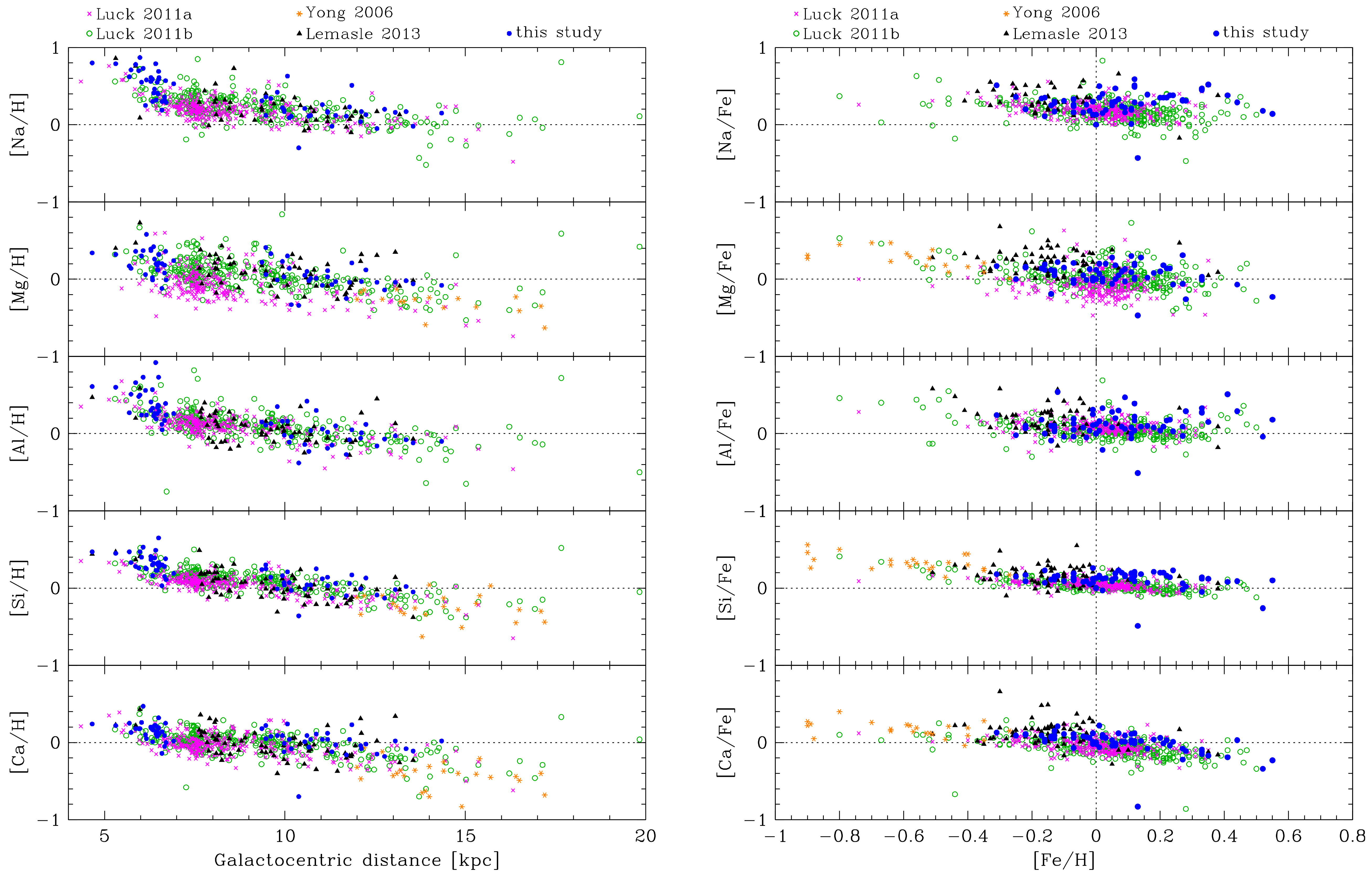
Introduction

Metallicity gradient

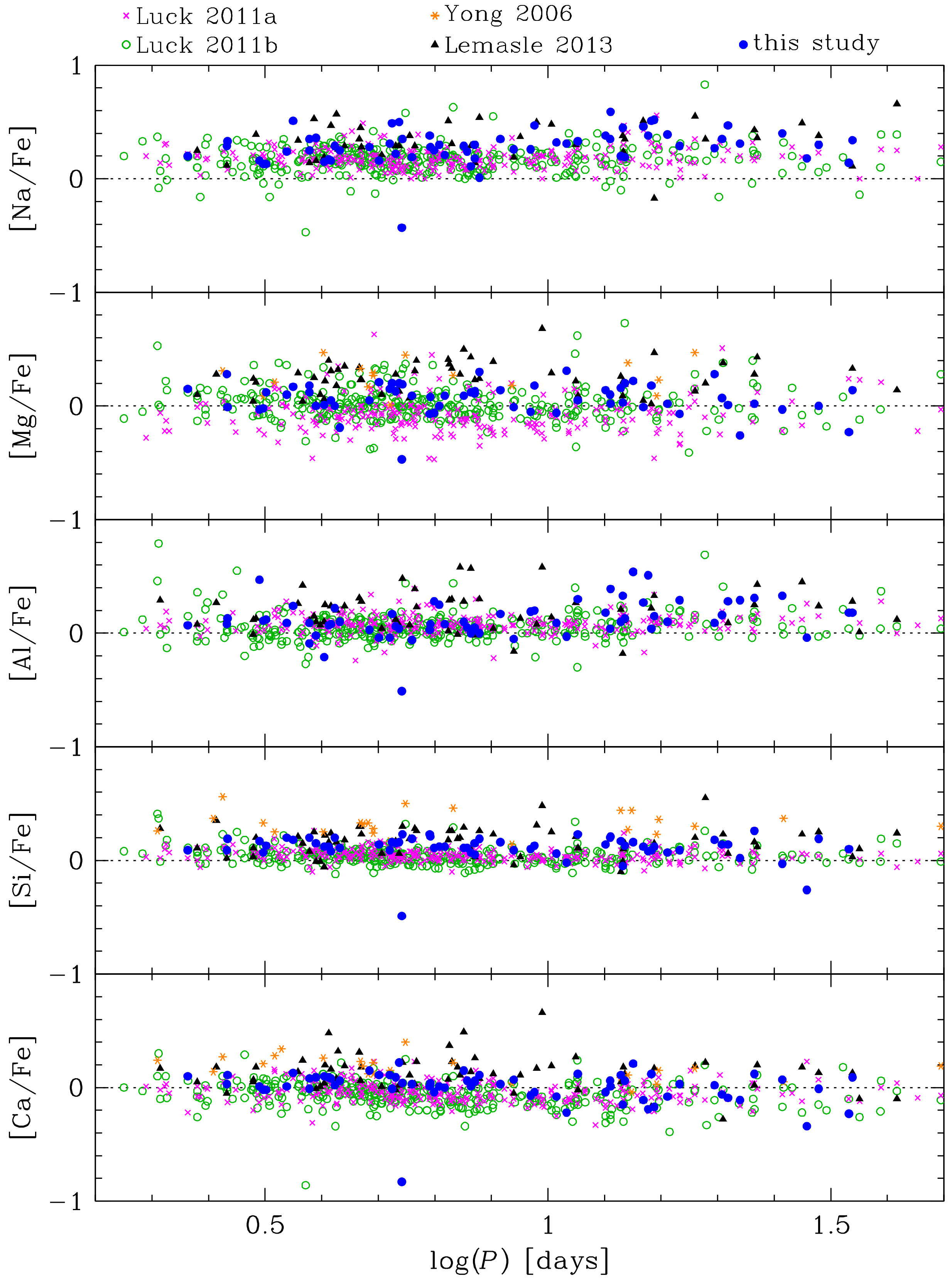


Genovali et al. (2014)

Introduction



Introduction



Introduction

★ Constraints on the chemical composition of extragalactic Cepheids are based on [O/H] nebular abundances of HII regions

★ Zero point:

Strong Oxygen and Hβ emission lines in extragalactic sources

X

Oxygen absorption lines in Galactic Cepheids

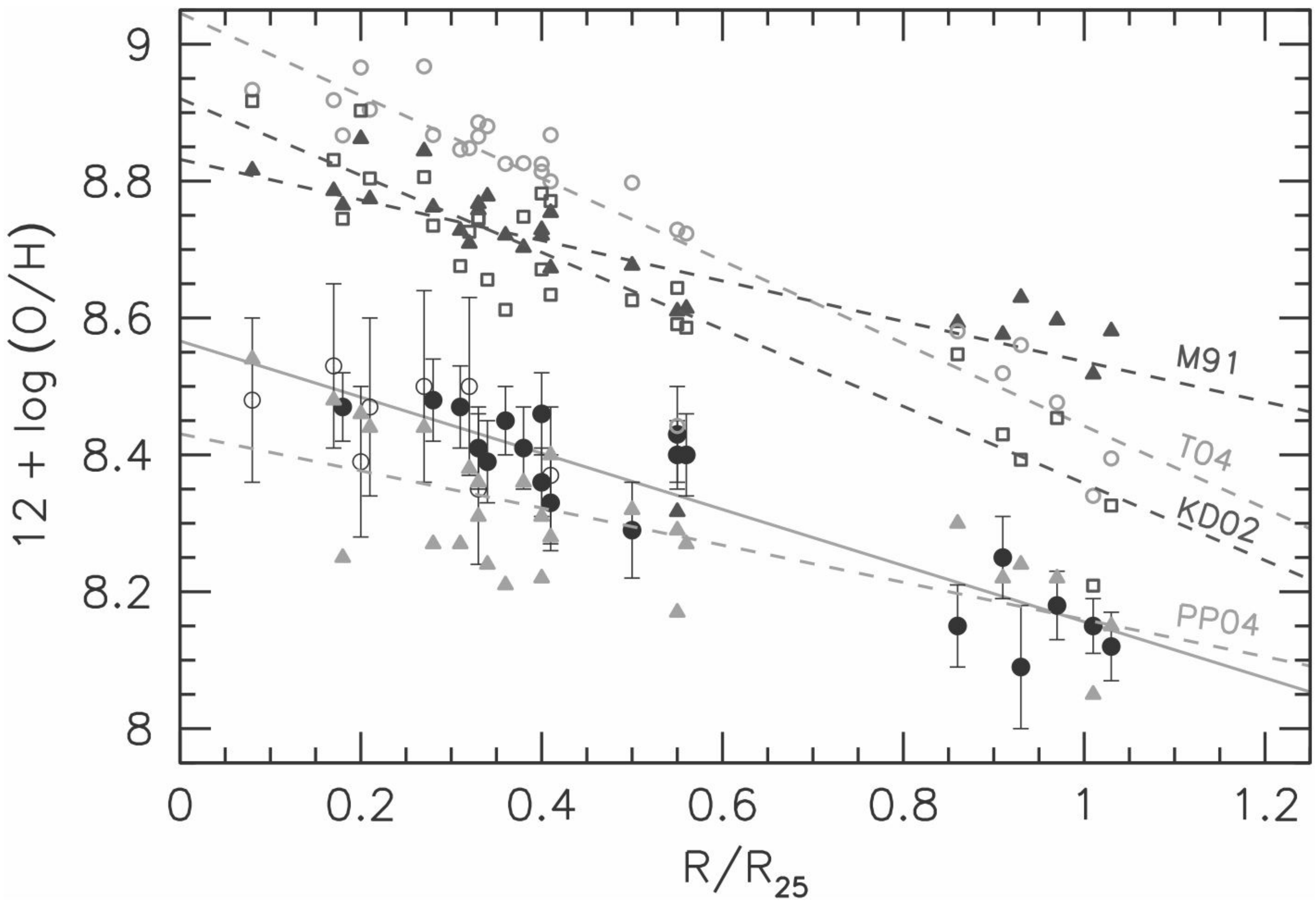
★ Slope:

Do [O/H] in extragalactic Cepheids scale with their metal content?

★ This study: O, Na, Mg, Al, Si, S, Ca, and Eu in the SMC and LMC

Introduction

Oxygen abundances from H II regions in NGC 300



Kudritzki et al. (2012)

Observations and Method

★ 22 stars of the Large Magellanic Cloud (LMC)

★ 14 stars of the Small Magellanic Cloud (SMC)

★ Spectra collected using UVES at VLT

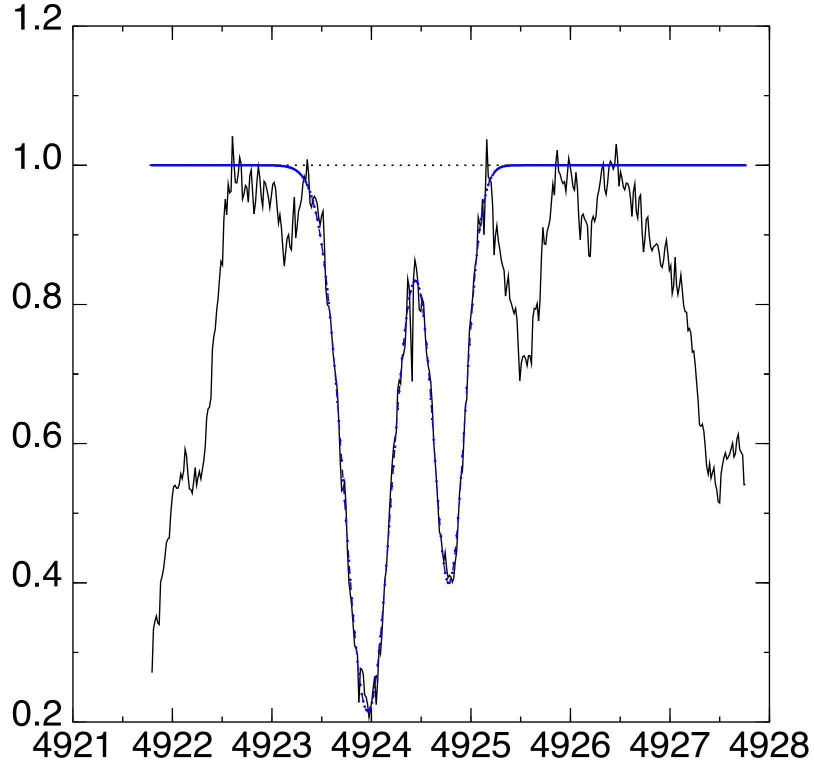
$R \sim 38000$ S/N $\gtrsim 50$ $\lambda\lambda$4800-6800 Å

★ Photospheric parameters derived from equivalent widths (EW) of Fe I and Fe II lines

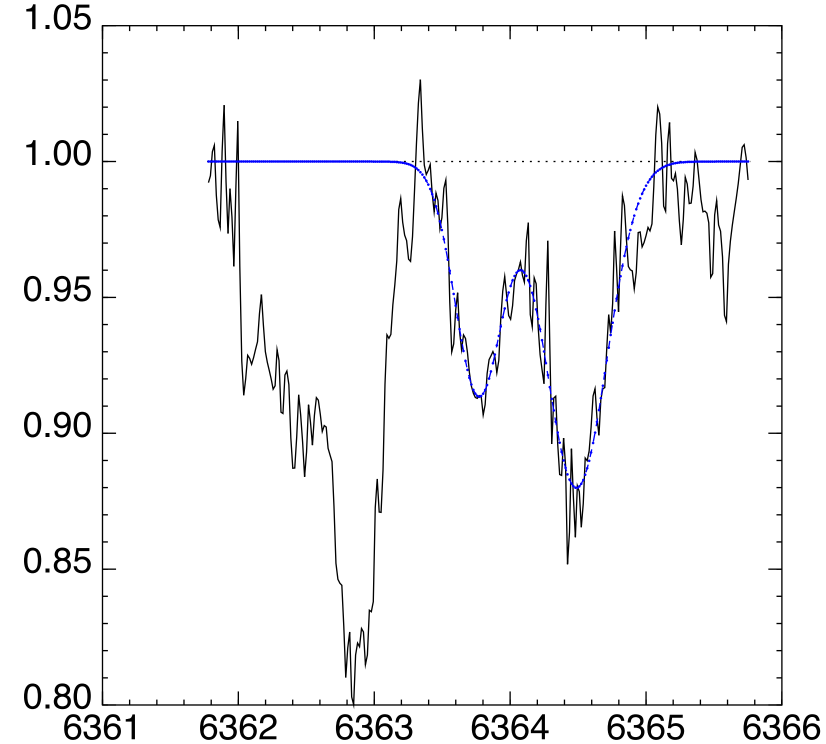
★ Abundances from the EWs of atomic lines

Observations and Method

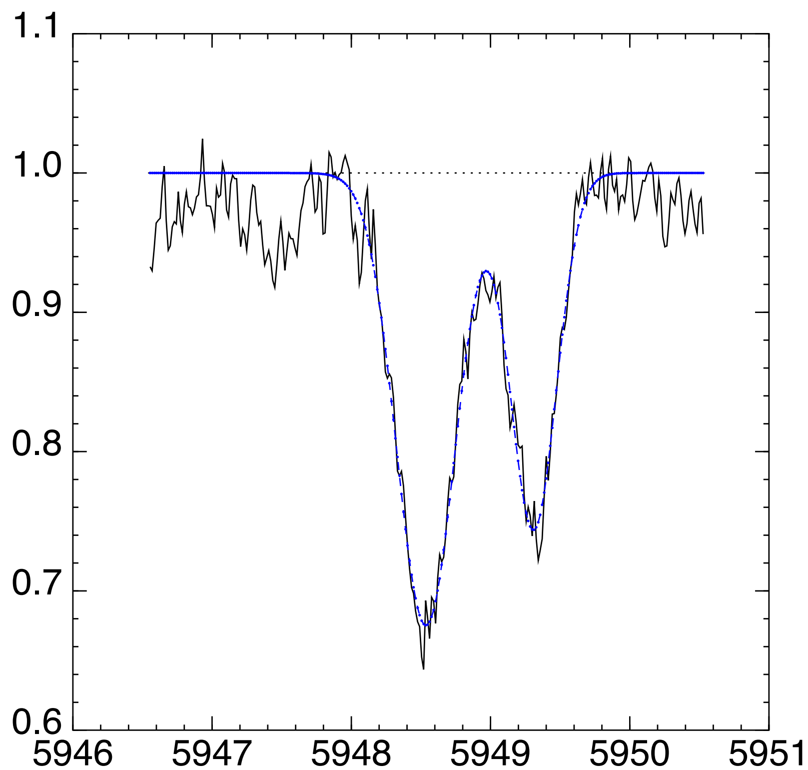
Fe I
λ4924.77 Å



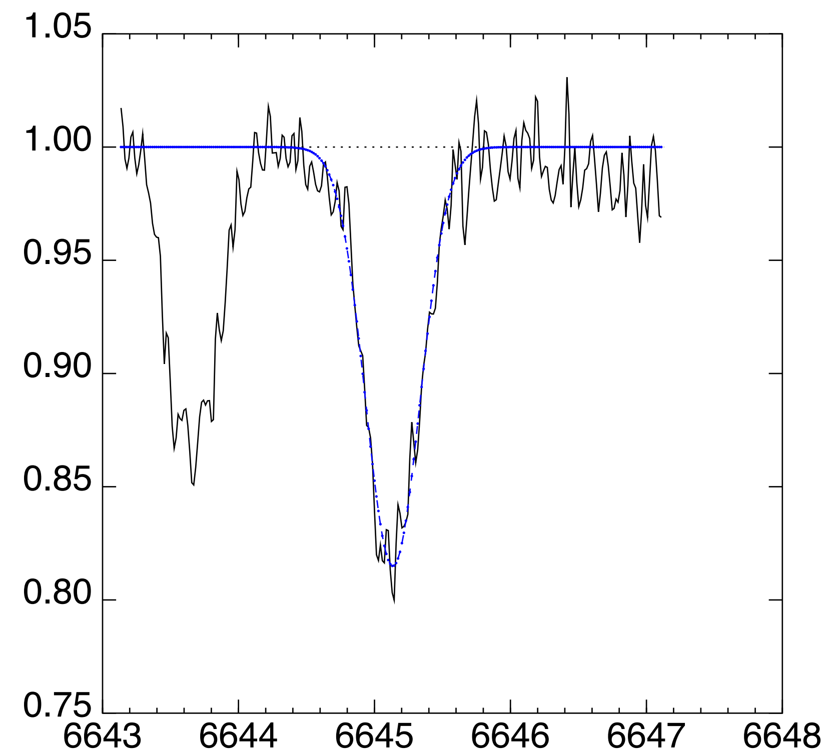
O I
λ6363.77 Å



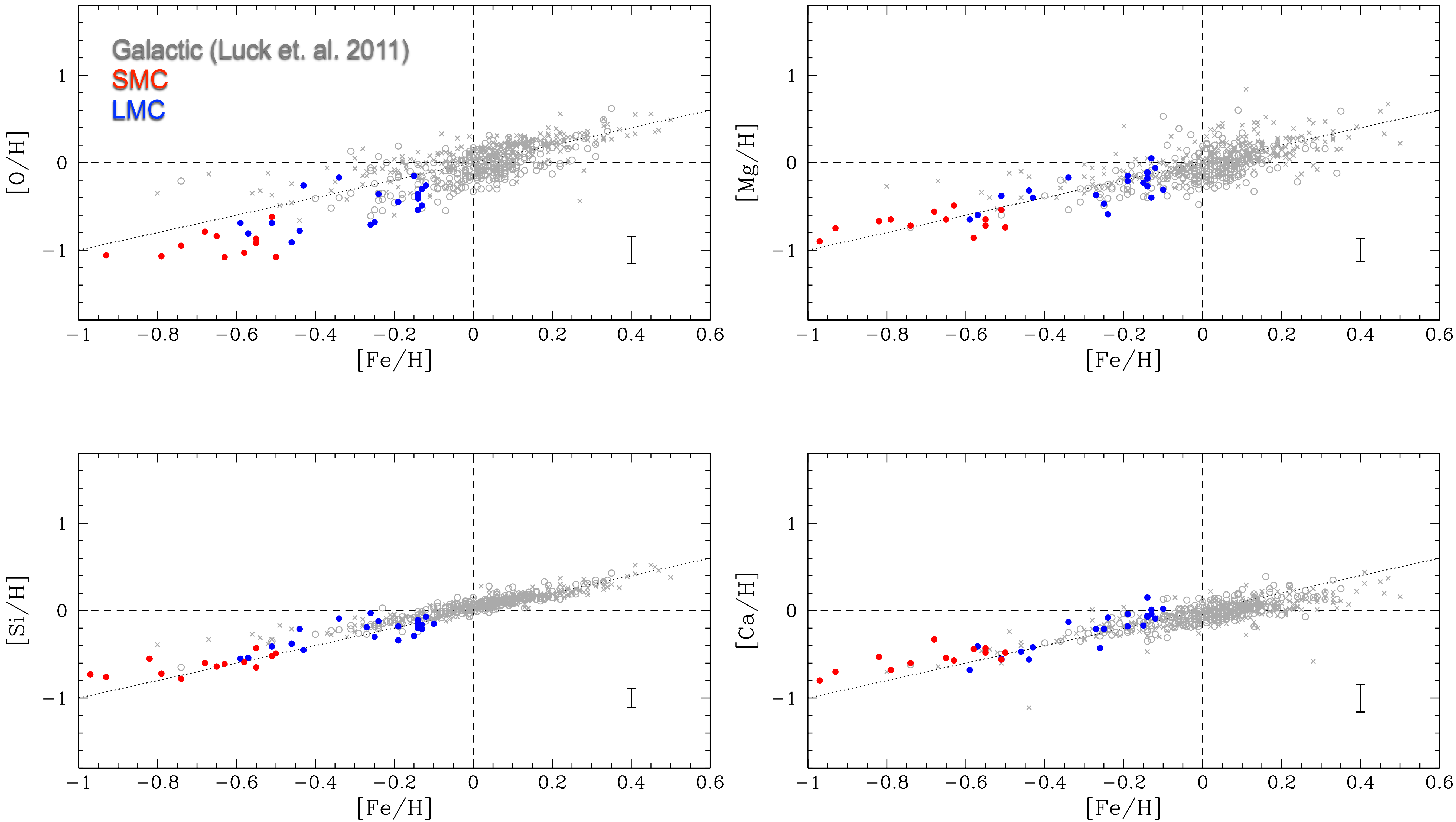
Si I
λ5948.54 Å



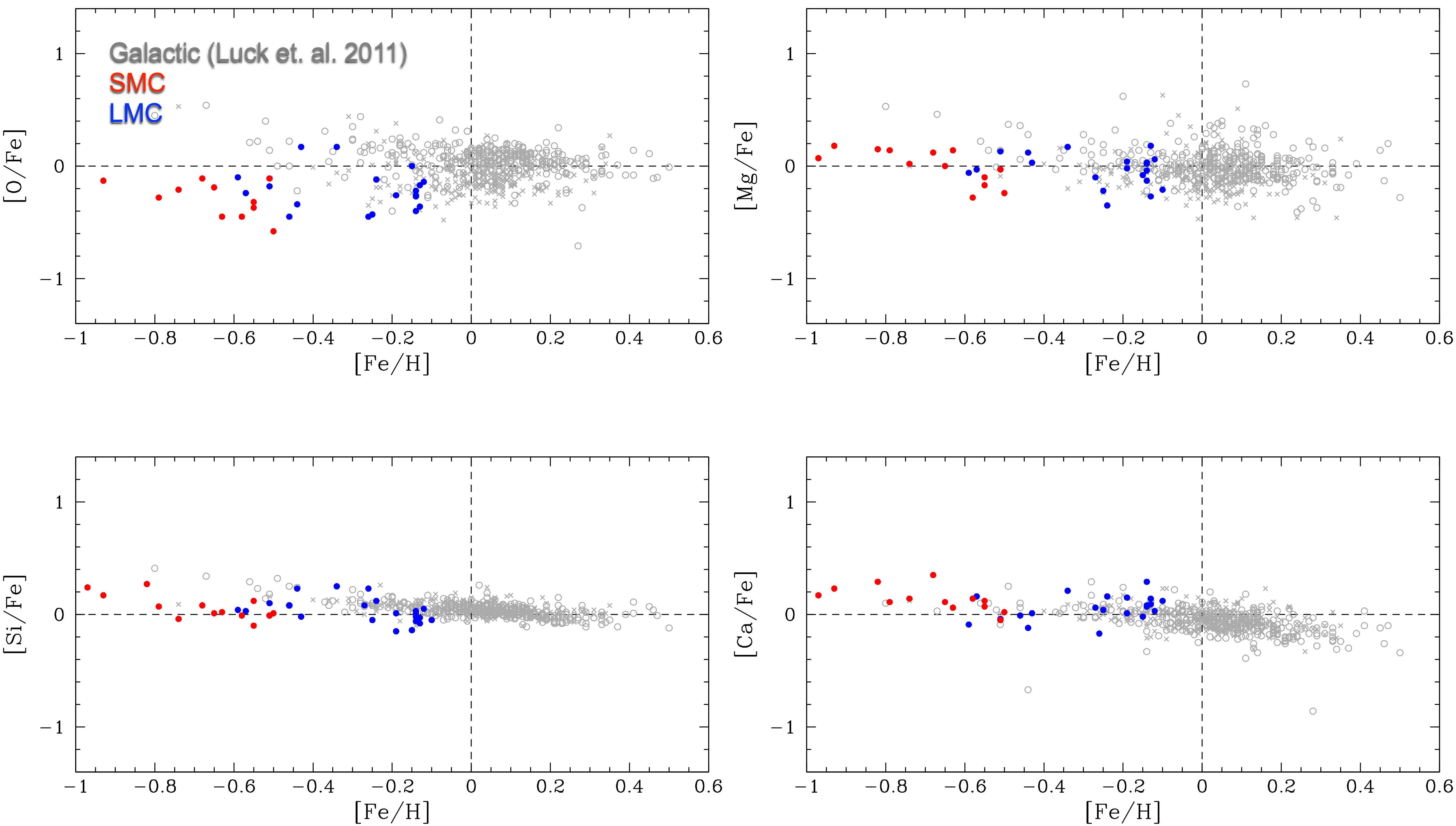
Eu II
λ6645.13 Å



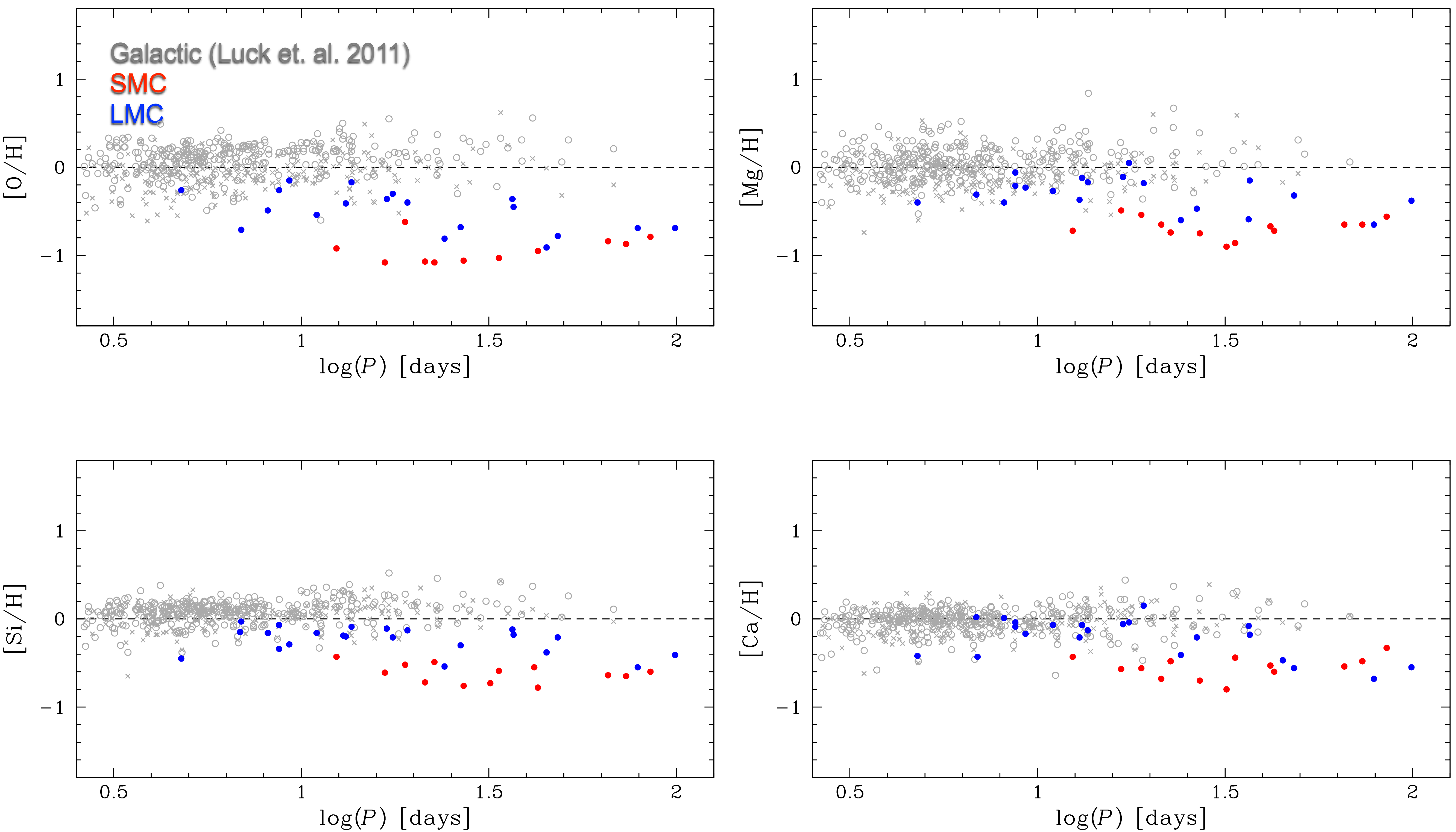
First results: [alpha/H] vs. [Fe/H]



First results: [alpha/Fe] vs. [Fe/H]



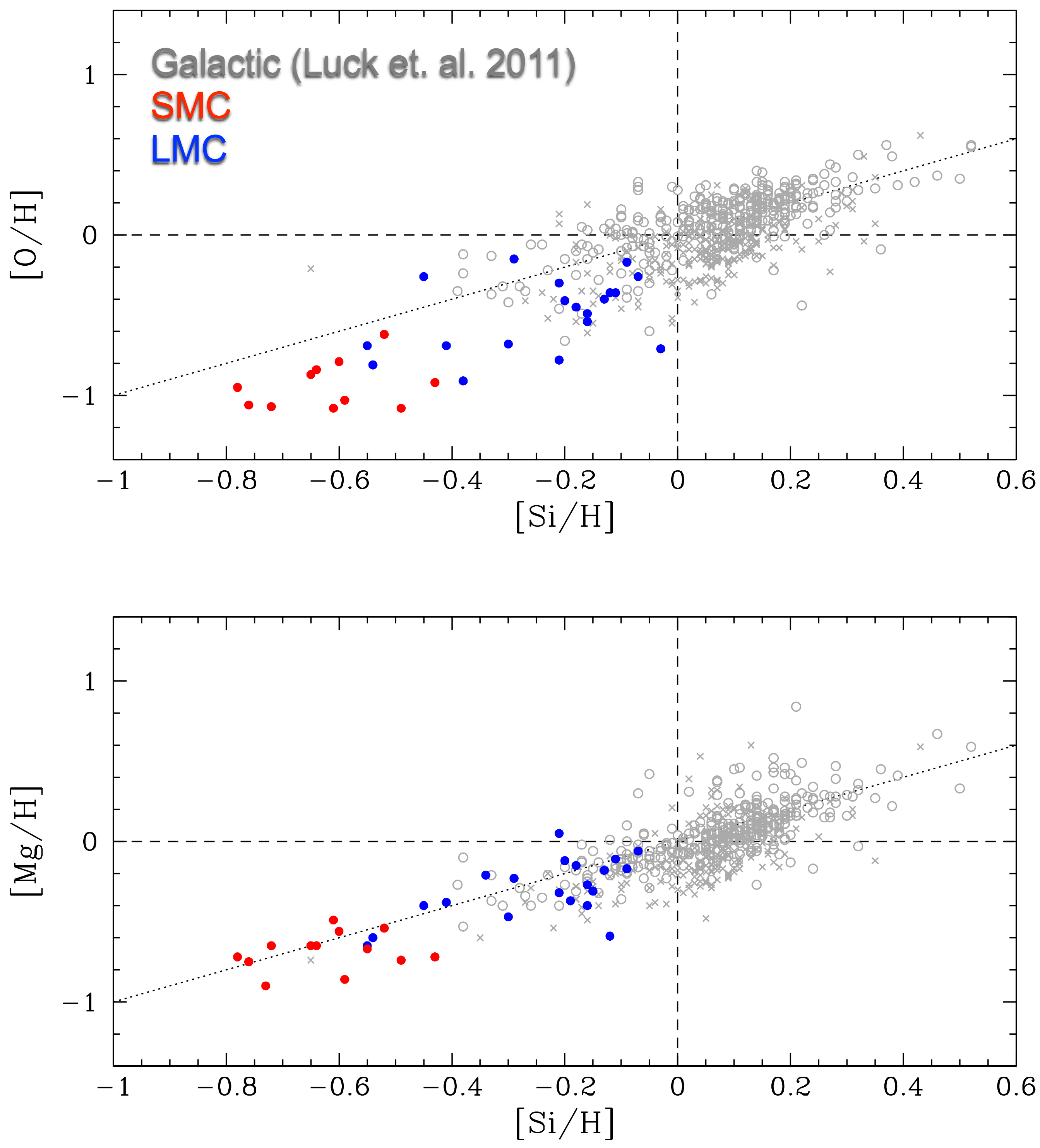
First results: [alpha/H] vs. log(P)



First results: Hydrostatic vs. Explosive elements

Hydrostatic burning phases:
O, Mg, Na, Al, Cu

SN explosion event:
Si, Ca, Ti



Summary

- ★ Oxygen abundances do scale with the metal content of extragalactic Cepheids, but we found a zero-point difference
- ★ Decreasing [alpha/H] with increasing pulsation period
- ★ Hydrostatic vs. explosive elements: negative ratios in the Magellanic Clouds
- ★ E-ELT: higher magnitudes, larger distances