

# Constraints on dust composition in the Magellanic Clouds from ultraviolet spectroscopy

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# QUESTIONS

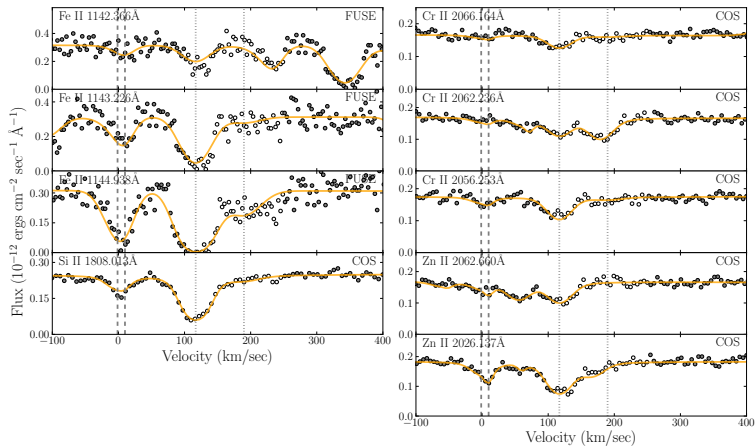
- ▶ What is the dust-to-gas ratio (D/G) in the LMC and SMC?
- ▶ How does D/G vary on small scales?
- ▶ Does silicon deplete in the Large and Small Magellanic Clouds (LMC and SMC)?
- ▶ Does zinc noticeably deplete at sub-solar metallicities?

# THE DATA SET

- ▶ Four elements - zinc (Zn), silicon (Si), chromium (Cr), iron (Fe)
- ▶ Eight sightlines through the Large Magellanic Cloud (LMC,  $Z \approx 0.5 Z_{\odot}$ )
- ▶ Eight sightlines through the Small Magellanic Cloud (SMC,  $Z \approx 0.2 Z_{\odot}$ )

# EXAMPLE SPECTRUM, WITH FIT

SK 9



# CONVENTIONS

- ▶ Column density

$$N(X) = \int_{s_0}^{s_1} n(X, s) ds$$

- ▶ Abundance

$$\epsilon(X) = \log_{10} \left( \frac{N(X)}{N(H)} \right)$$

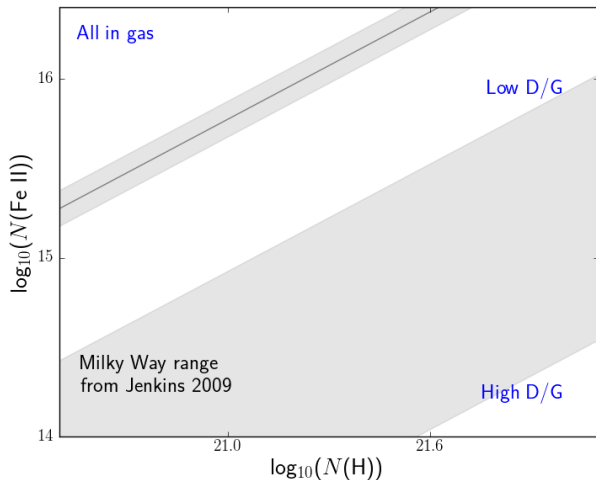
- ▶ Depletion

$$\delta(X) = \epsilon(X)_{\text{obs}} - \epsilon(X)_{\text{total}}$$

# INTERPRETING LOCAL GAS-PHASE COLUMN DENSITIES

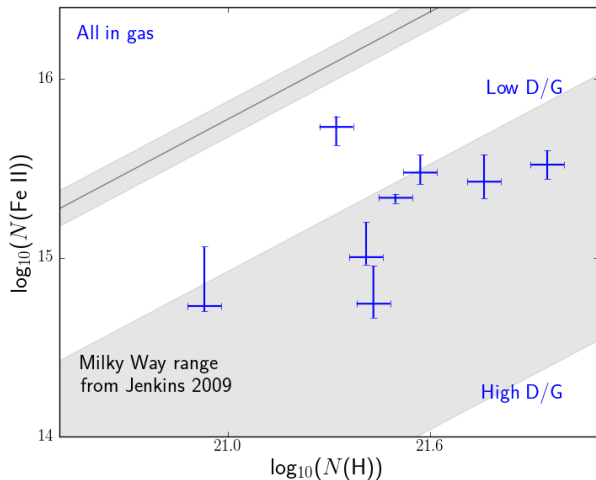
- ▶ Learn the range of the local dust compositions
- ▶ Find out what elements contribute to intrinsic scatter in  $D/G$
- ▶ Infer parameters of distributions with non-zero intrinsic width
- ▶ Problem: Sampling distribution for quantities of interest is not known

# INTERPRETING SMALL NUMBERS OF LOCAL GAS-PHASE COLUMN DENSITIES



$$\log_{10}(N(X)) = \delta(X) + \log_{10}(N(H)) + \epsilon(X)_{\text{SMC}}$$

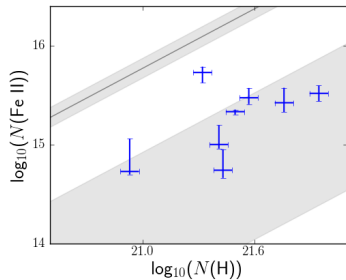
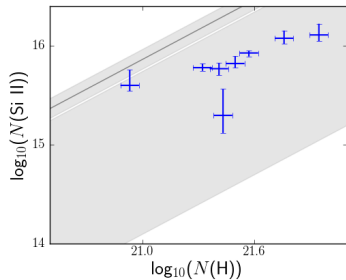
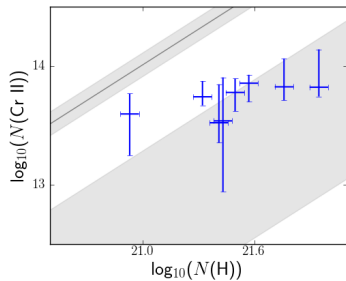
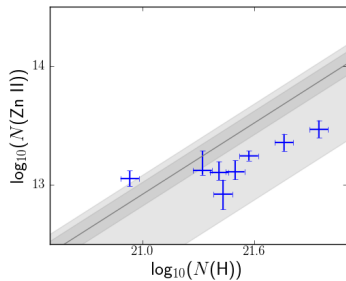
# INTERPRETING SMALL NUMBERS OF LOCAL GAS-PHASE COLUMN DENSITIES



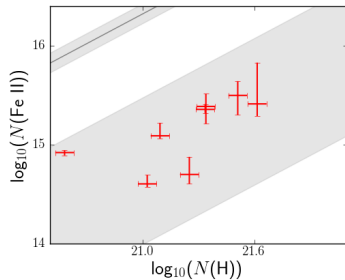
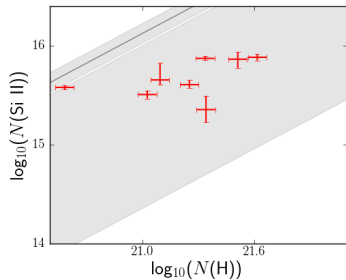
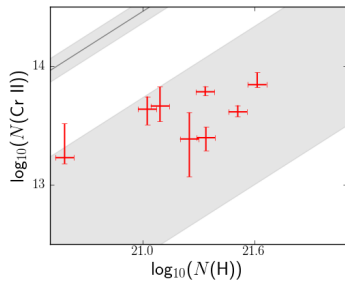
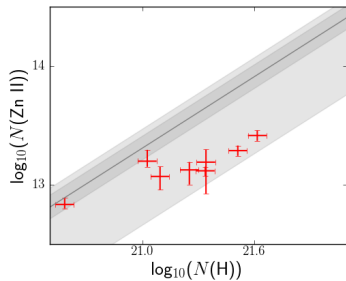
$$\log_{10}(N(X)) = \delta(X) + \log_{10}(N(H)) + \epsilon(X)_{\text{SMC}}$$



# THE SMC



# THE LMC



# CONCLUSIONS

- ▶ Observations consistent with a D/G that scales linearly or superlinearly with metallicity
- ▶ Zinc and silicon depletion seen in both Magellanic Clouds
- ▶ Larger sample, more elements needed for better constraints on D/G