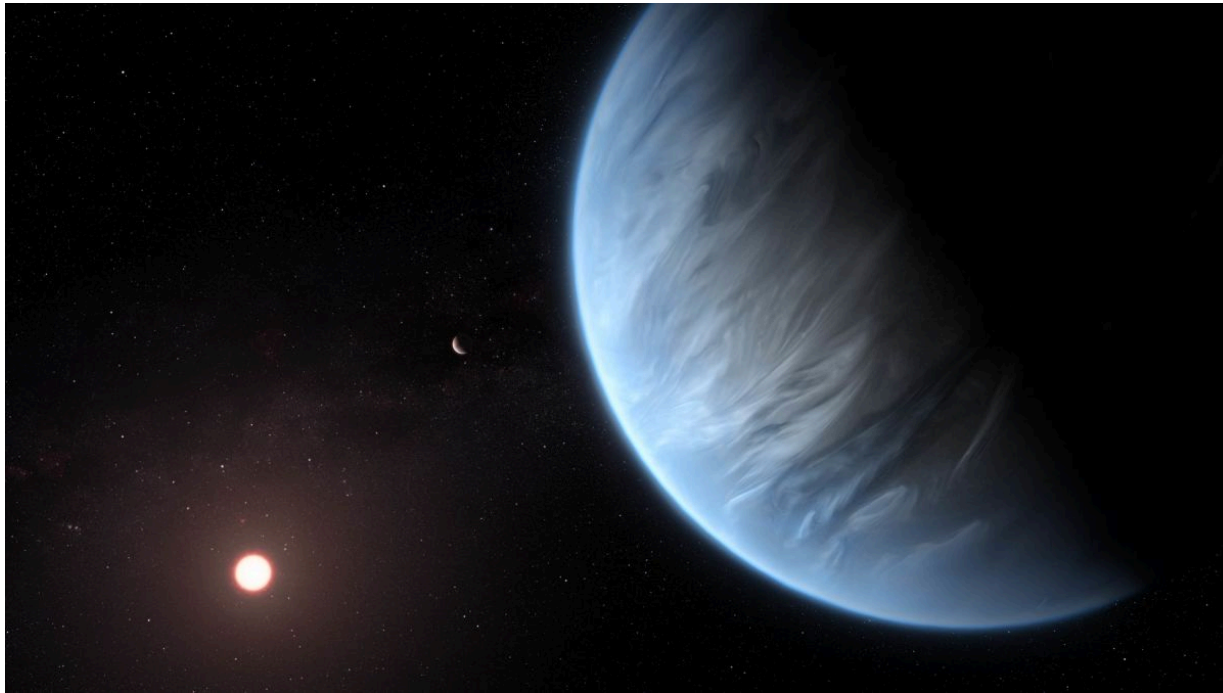


# Estimation of Stellar Parameter for Directly Imaged Exoplanets



**Swastik C**

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## Conversion from $[M/H]$ to $[Fe/H]$ :

$$[M/H] = \log_{10} \left( \frac{Z}{X} \right)_* - \log_{10} \left( \frac{Z}{X} \right)_{\odot}$$

$$X = 0.7381$$

Asplund et al 2009 :  $Y = 0.2485$

$$Z = 0.0134$$

From the above values we can obtain :

$$(Z/X)_* = ?$$

From Helium Enrichment Equation:

$$Y_* = Y_p + 2.25Z_*$$

$$Y_p = 0.23 \quad \text{Tantalo and Chiosi 2004}$$

$$Y_p = 0.248 \quad \text{Spergel et al 2007}$$

Now Substituting the all values in terms of  $Z_*$  :

$$X_* + Y_* + Z_* = 1$$

Thus we obtain :  $Z_*$

Now we have  $Z$  and  $\alpha$  from results.

Now we also have ....

$$[Fe/H] = \log_{10} \left[ \frac{(N_{Fe}/N_H)^*}{(N_{Fe}/N_H)_{\odot}} \right]$$

$$\frac{N_{Fe}}{N_H} = f_{Fe} \frac{Z/m_z(\alpha)}{X/m_H}$$

$f_{Fe}$  : No fraction of Iron with respect to all other element

$m_z(\alpha)$  is the average atomic mass of heavy elements weighted by the number of atoms.

Thus we can rewrite it by substituting:

$$[Fe/H] = \log_{10} \left[ \frac{f_{Fe}(\alpha) m_z(0)}{f_{Fe}(0) m_z(\alpha)} \left( \frac{Z}{X} \right)_* \left( \frac{X}{Y} \right)_{\odot} \right]$$

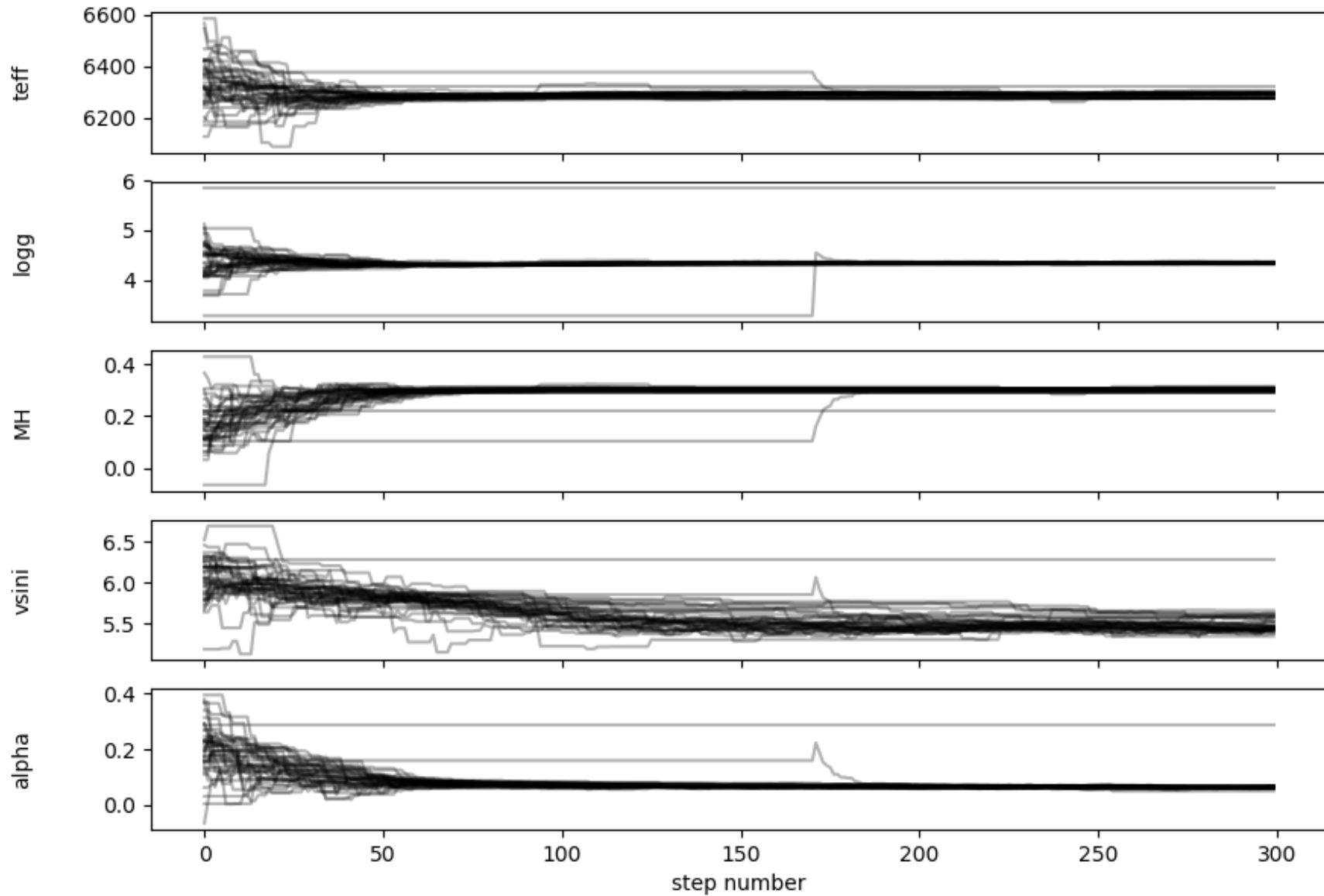
$$m_z(0) = 17.03 m_H$$

**Grevesse et al 1998**

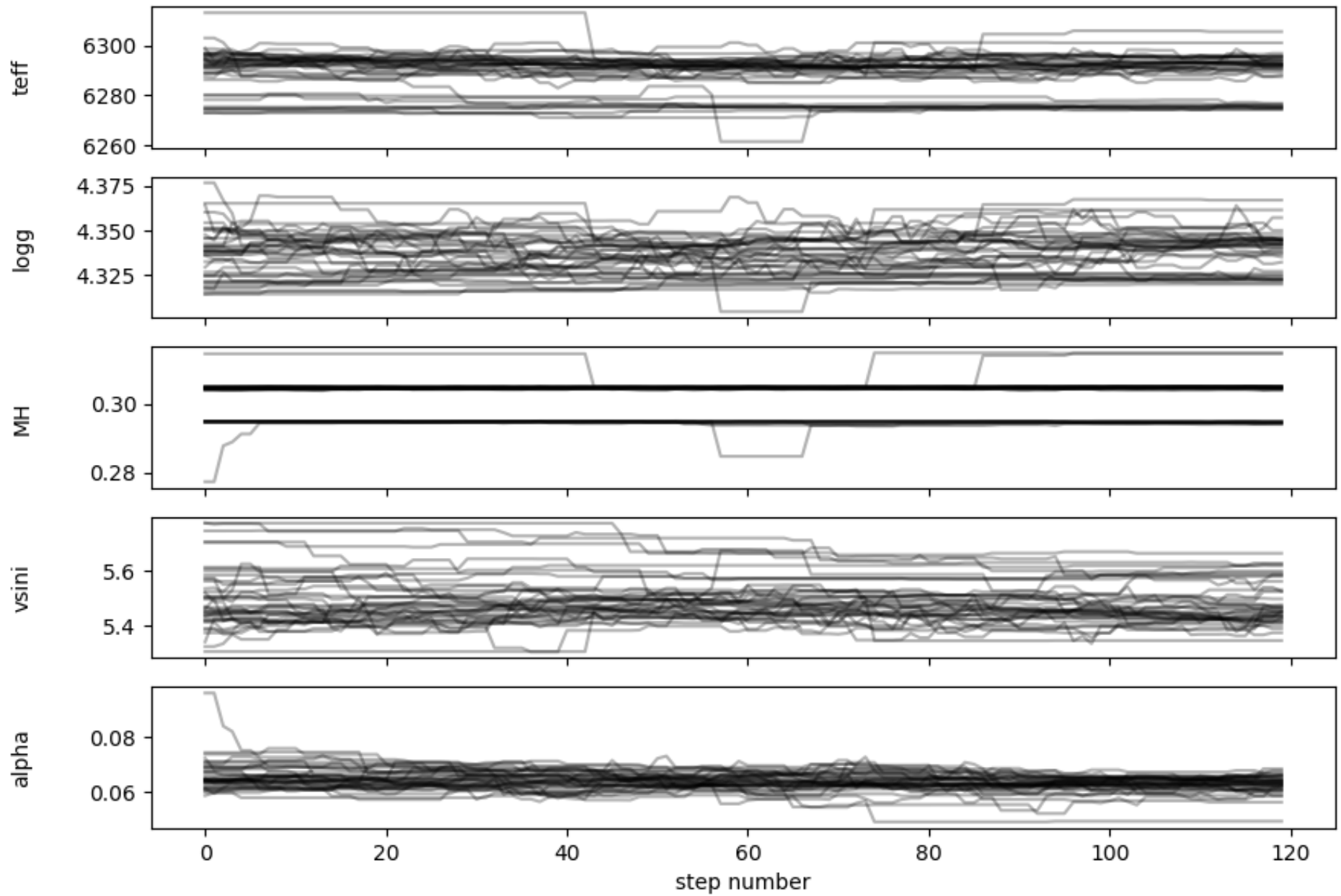
$$f_{Fe}(0) = 0.0235$$

$$\begin{array}{l} f_{Fe}(\alpha) \\ m_z(\alpha) \end{array} \longrightarrow \text{Ferguson et al. 2005.}$$

# GJ504: MCMC Run : Walkers 40 ,Iter 300



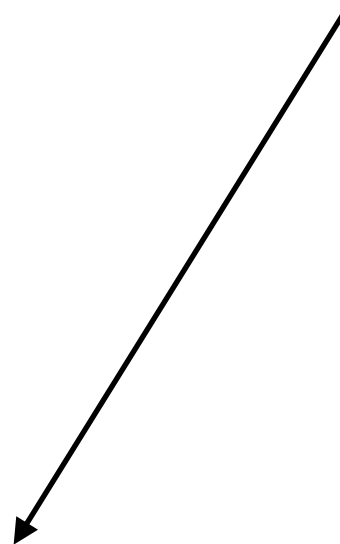
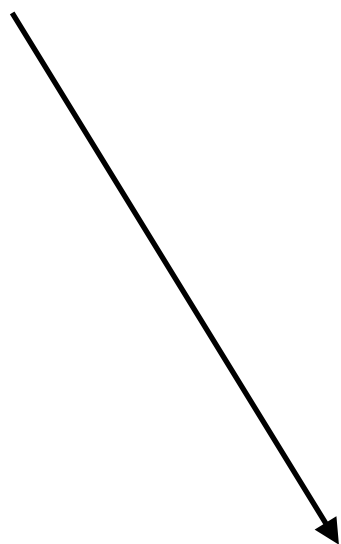
# DATA POINTS AFTER BURNS:





$$[M/H] = 0.30$$

$$\alpha = 0.06$$



$$[Fe/H] = 0.258$$

Veiling:

GQ LUP

CT CHA

PDS 70

ROSS 458

All the above stars are late K type or early M  
type stars

