Tested by Miriam Cortés Contreras, on September 21st 2017.

1 Summary

We compare the results in Rajpurohit et al. 2017, arXiv170806211R (hereafter Raj17) with the fit results obtained with VOSA.

- Effective temperatures

  Efective temperatures computed by VOSA are in agreement with those given by Rajpurohit et al. (2017) in the studied range from 3000 to 4000 K, with some dispersion towards higher values between 3100 and 3300 K. On average, temperatures provided by VOSA are systematically lower by less than 100 K and standard deviations are below 150 K for both BT-Settl and CIFIST models.

- Surface gravities, metallicities

  Metallicities and surface gravities provided by VOSA are not reliable due to the minor contribution of these parameters to the SED shape.

2 Sample and input parameters

- Rajpurohit et al. 2017
  - Parameter determination for 45 M dwarfs using spectral synthesis employing BT-Settl models and high-resolution spectra taken with APOGEE on the Sloan 2.5 m Telescope at Apache Point Observatory in the H band:
    * H band (1.51 – 1.7 μm)
    * R $\approx$ 22 500
  - Stellar properties:
    * Spectral types: M1.0 – M8.0 V
    * $3100 < T_{eff}\,[\mathrm{K}] < 3900$ (± 100 K)
    * $-0.50 <$ [Fe/H] $< +0.50$ with errors between 0.03 and 0.11.
    * $4 < \log g\,[\mathrm{cm\,s^{-2}}] < 5.5$ with errors between 0.2 and 0.5.
- SED building using VOSA
  - Photometric SED built using photometry from GALEX, Johnson, SDSS, APASS, Gaia, IPHAS, DENIS, UKIDSS, 2MASS, WISE and AKARI, retrieved from VO services.
  - Model fit using BT-Settl ($\log g : 4 - 5.5$; [Fe/H]: $-0.5 - 0.5$, $T_{eff} : 3000 - 4000$ K).
  - Model fit using BT-Settl CIFIST ($\log g : 4 - 5.5$; [M/H] $= 0$, $T_{eff} : 3000 - 4000$ K).

3 Parameters determination

We performed this analysis using BT-Settl models and used the more recent BT-Settl CIFIST models for comparison. Of the 45 M dwarfs of the analysis, only four had parallactic distances retrieved from VO services and another six had not enough photometric data for the fit.

3.1 Effective Temperatures

- BT-Settl (Fig. 1)

  Mean(T_{eff}(Raj17) $-$ T_{eff}(VOSA)) = 20.5 K; std = 111.4 K

- BT-Settl CIFIST (Fig. 2)

  Mean(T_{eff}(Raj17) $-$ T_{eff}(VOSA)) = 18.0 K; std = 110.6 K

Both models provide quite similar values for the effective temperatures and are overall consistent within the errorbars with those given in Rajpurojit et al. (2017).

3.2 Metallicity

- BT-Settl (Fig. 3)

  Mean(Metallicity(Raj17) - Metallicity(VOSA)) = -0.19; std= 0.41

No good determination of the metallicities using VOSA. On average, metallicities obtained using BT-Settl models differ with the values given by Rajpurohit et al. (2017) by more than 7σ.

3.3 Surface gravity

- BT-Settl (Fig. 4)

  Mean($\log g$(Raj17) $-$ $\log g$(VOSA)) = 0.36; std= 0.65

- BT-Settl CIFIST (Fig. 5)

  Mean($\log g$(Raj17) $-$ $\log g$(VOSA)) = 0.29; std = 0.56

The surface gravities given by VOSA strongly differ with those given by Rajpurohit et al. (2017) for near half of the analyzed sample. Hence, these values are not trustworthy.

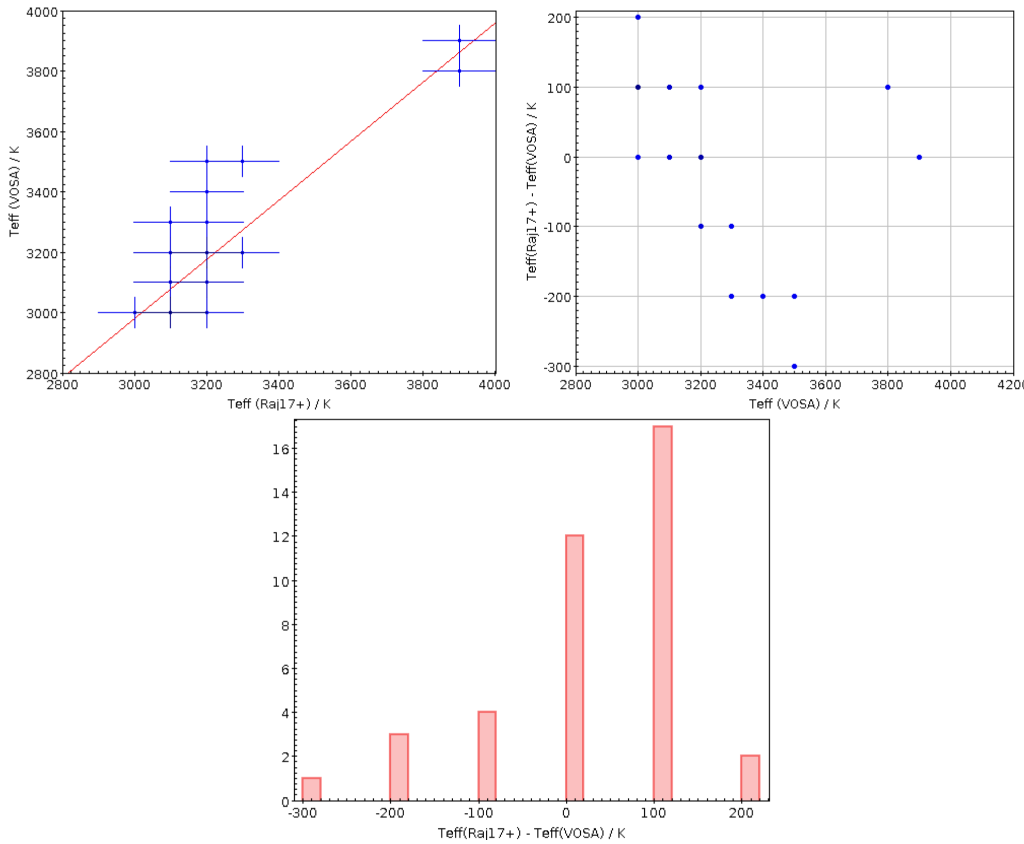

Figure 1: Effective temperatures using BT-Settl. Correlation coefficient $r = 0.85$.

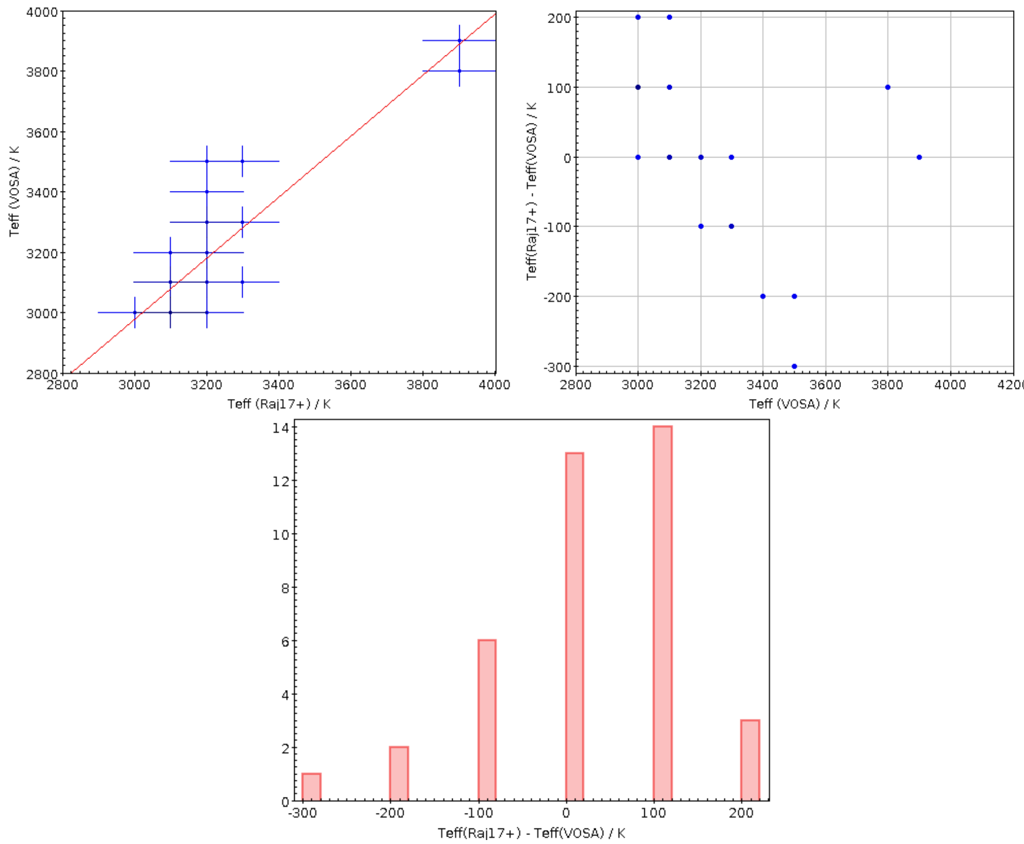

Figure 2: Effective temperatures using BT-Settl CIFIST. Correlation coefficient $r = 0.84$.

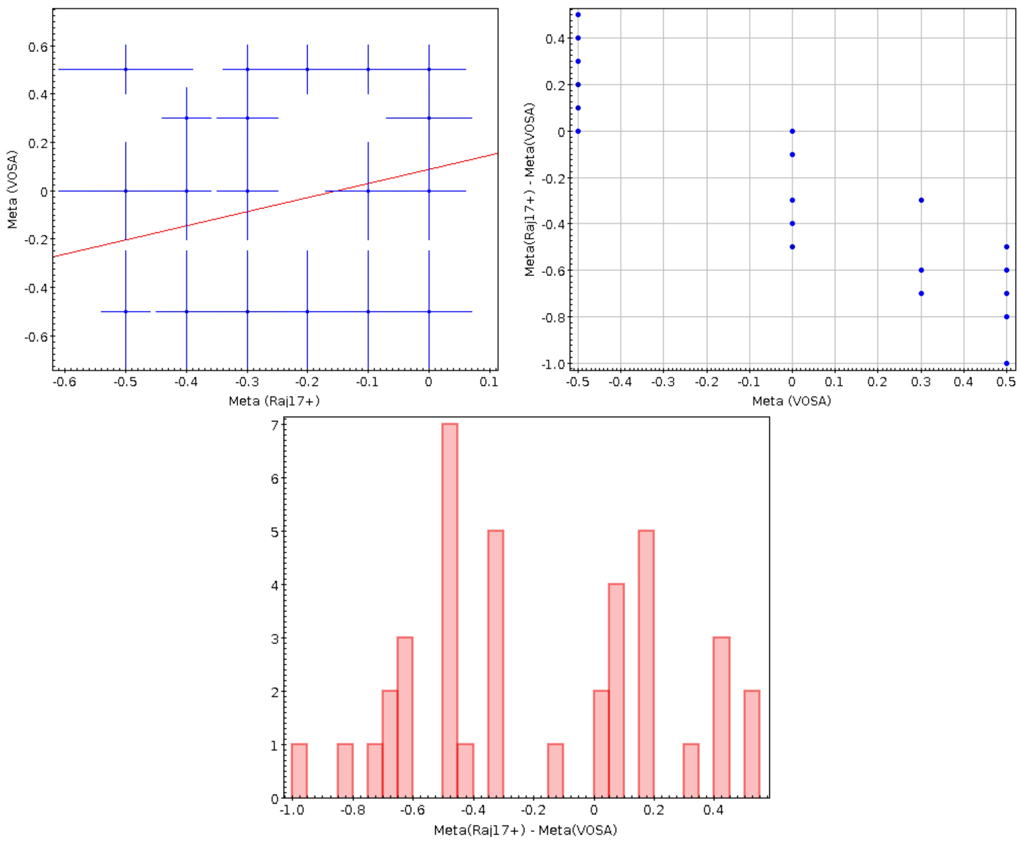

Figure 3: Metallicities using BT-Settl. Correlation coefficient $r = 0.25$.

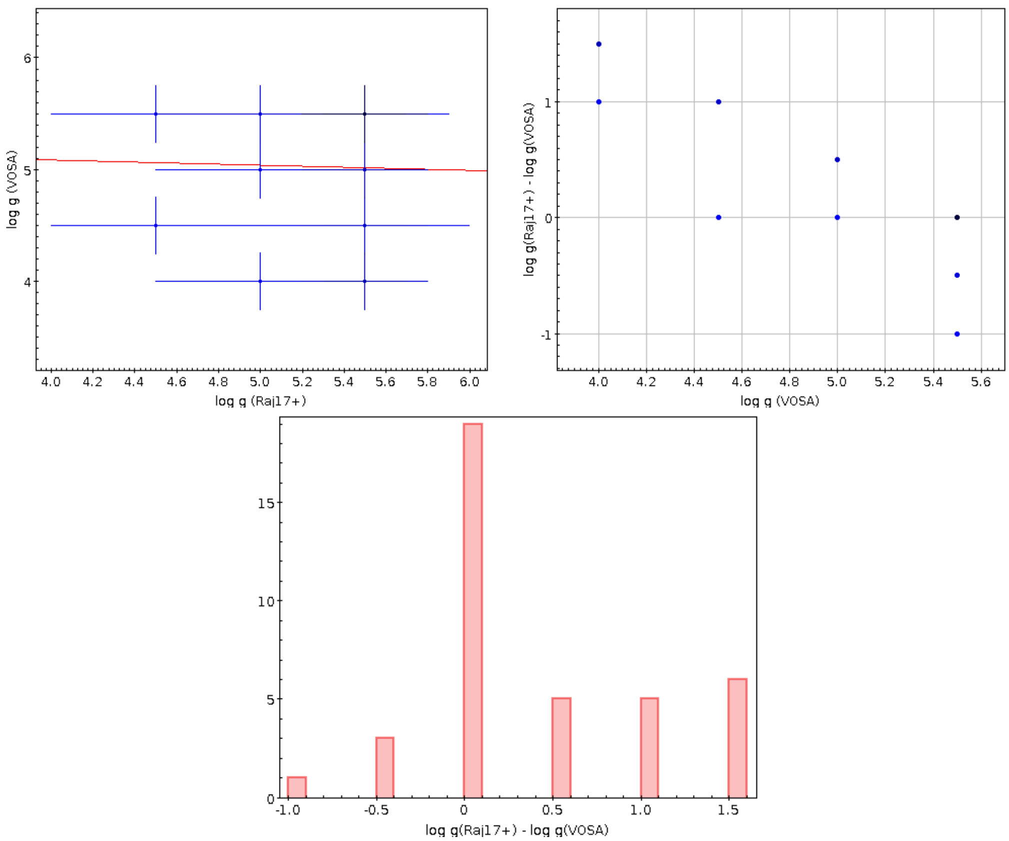

Figure 4: Surface gravities using BT-Settl. Correlation coefficient $r = -0.22$.

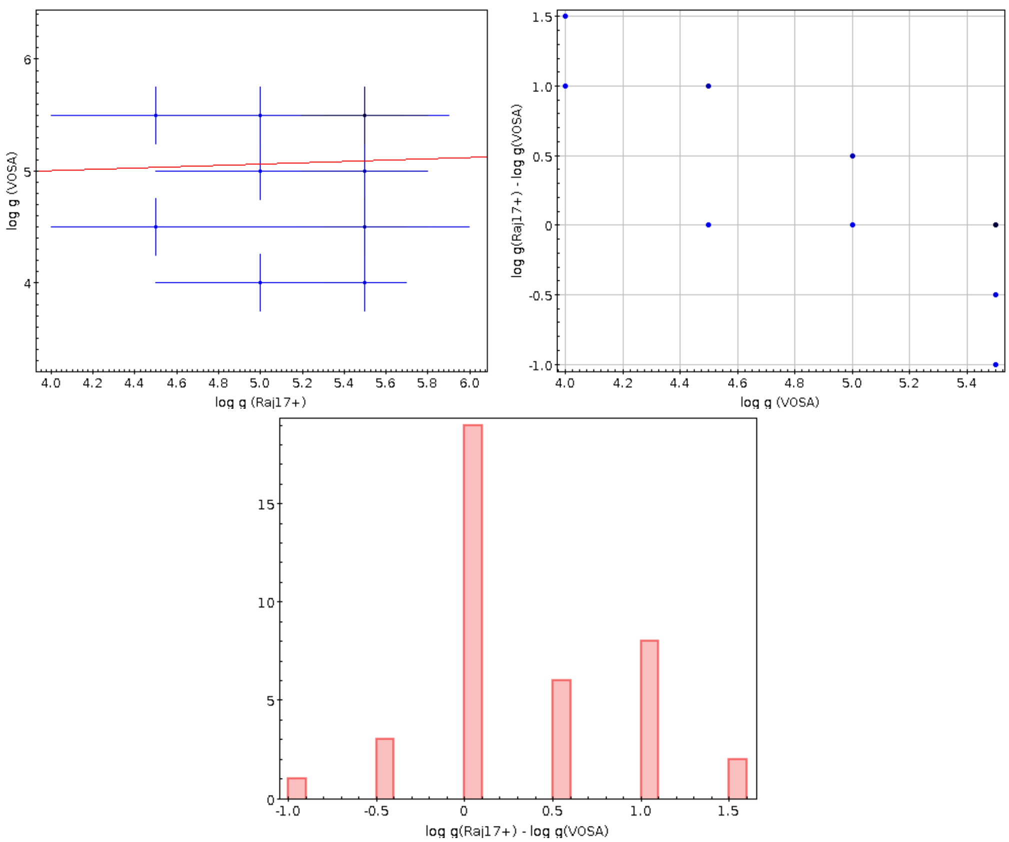

Figure 5: Surface gravities using BT-Settl CIFIST. Correlation coefficient $r = -0.29$.