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Supplementary Figure 1: **Transits of the Kepler-107 planets.** Phase-folded transits of the four Kepler-107 planets with the best-fit model (red solid line) and residuals. For illustration purposes, data were binned in phase bins of 30, 45, 85, and 110 s for planets b, c, d, and e.
Supplementary Figure 2: Kepler light curve. Kepler long-cadence photometric measurements showing low-amplitude variations due to the rotational modulation of small photospheric active regions.
Supplementary Figure 3: **Weighted autocorrelation function of the Kepler light curve.** The peak at ~14 d might be the stellar rotation period.
Supplementary Figure 4: **Peakbagging fit for Kepler-107.** The power density spectrum centred on the region of excess power from solar-like oscillations is shown in grey, with a 1μHz smoothed version overlain in black. The best fitting model from the peakbagging is shown in red. The frequencies and angular degree of the individual modes are indicated by the coloured markers.
Supplementary Figure 5: **HARPS-N radial-velocity time series.** Radial velocities gathered with the HARPS-N high-accuracy and high-precision spectrograph at the Telescopio Nazionale Galileo (La Palma, Spain) as a function of time.
Supplementary Figure 6: **Generalized Lomb-Scargle periodograms of the radial-velocity and activity indicator time series measured by HARPS-N.** The panels show, from top to bottom, the periodograms of the RV time series, the spectral window centred at the highest peak at 13.8 d in the RV, the periodograms of the activity indexes $\log(R'_{HK})$, full-width at half maximum (FWHM) and bisector (BIS) of the averaged line profile. Vertical dashed lines indicate the orbital periods of Kepler-107b (green), c (red), d (pink), and e (blue). The horizontal dotted lines show the theoretical false alarm probabilities of 0.1% and 1%.
Supplementary Figure 7: **Generalized Lomb-Scargle periodograms of real and simulated radial-velocity time series.** The top panel shows the periodogram of the HARPS-N RV data (the same as in previous figure). The other panels display, from top to bottom, the averaged periodograms of simulated RVs at the real observation epochs by assuming three different values for the mass of Kepler-107b (see Methods): $M_{p,b} = M_{p,c} (9.4 M_\oplus)$, $M_{p,b} = 0.5 M_{p,c} (4.7 M_\oplus)$, and $M_{p,b} = 0.33 M_{p,c} (3.1 M_\oplus)$. These periodograms are less noisy than the real one (top panel) mainly because of the averaging effect. Vertical dashed lines indicate the orbital periods of Kepler-107b (green), c (red), d (pink), and e (blue).
Supplementary Figure 8: **Transit Timing Variations.** The panels show, from top to bottom, the variations of the mid-transit epochs of Kepler-107b, c, and e. Those of planet d could not be computed because of the very low signal-to-noise ratio of its individual transits. At the achieved precision, no significant trends are seen.
Supplementary Table 1: **Priors on the free parameters of the two radial-velocity models.**

| Parameter                        | 4 Keplerians + 1 Sinusoid                      | 4 Keplereians + Gaussian Process regression |
|----------------------------------|------------------------------------------------|---------------------------------------------|
| $P_b$ (d)                        | $\mathcal{N}(3.1800218, 2.9 \times 10^{-6})$ | $\mathcal{N}(3.1800218, 2.9 \times 10^{-6})$ |
| $T_{c,b} - 2,450,000 \text{ (BJD$_{TDB}$)}$ | $\mathcal{N}(5701.08414, 3.7 \times 10^{-4})$ | $\mathcal{N}(5701.08414, 3.7 \times 10^{-4})$ |
| $K_b$ (m/s)                      | $\mathcal{U}[0, +\infty]$                    | $\mathcal{U}[0, 10]$                        |
| $P_c$ (d)                        | $\mathcal{N}(5701.08414, 3.7 \times 10^{-4})$ | $\mathcal{N}(5701.08414, 3.7 \times 10^{-4})$ |
| $T_{c,c} - 2,450,000 \text{ (BJD$_{TDB}$)}$ | $\mathcal{N}(5697.01829, 7.9 \times 10^{-4})$ | $\mathcal{N}(5697.01829, 7.9 \times 10^{-4})$ |
| $K_c$ (m/s)                      | $\mathcal{U}[0, +\infty]$                    | $\mathcal{U}[0, 10]$                        |
| $P_d$ (d)                        | $\mathcal{N}(5697.01829, 7.9 \times 10^{-4})$ | $\mathcal{N}(5697.01829, 7.9 \times 10^{-4})$ |
| $T_{c,d} - 2,450,000 \text{ (BJD$_{TDB}$)}$ | $\mathcal{N}(5702.9547 \pm 0.0060)$ | $\mathcal{N}(5702.9547 \pm 0.0060)$ |
| $K_e$ (m/s)                      | $\mathcal{U}[0, +\infty]$                    | $\mathcal{U}[0, 10]$                        |
| $P_e$ (d)                        | $\mathcal{N}(5702.9547 \pm 0.0060)$ | $\mathcal{N}(5702.9547 \pm 0.0060)$ |
| $T_{c,e} - 2,450,000 \text{ (BJD$_{TDB}$)}$ | $\mathcal{N}(5694.48550, 4.6 \times 10^{-4})$ | $\mathcal{N}(5694.48550, 4.6 \times 10^{-4})$ |
| $K_{e}$ (m/s)                    | $\mathcal{U}[0, +\infty]$                    | $\mathcal{U}[0, 10]$                        |
| $P_{sin}$ (d)                    | $\mathcal{U}(13.6, 14.6)$                    |                                            |
| $T_{0,sin} - 2,450,000 \text{ (BJD$_{TDB}$)}$ | $\mathcal{U}(0, +\infty)$                    |                                            |
| $K_{sin}$ (m/s)                  | $\mathcal{U}(0, +\infty)$                    |                                            |
| $h$ (m/s)                        | $\mathcal{U}[0, 10]$                          |                                            |
| $\theta$ (d)                     | $\mathcal{U}[12, 16]$                         |                                            |
| $w$ (d)                          | $\mathcal{U}[0, 1]$                           |                                            |
| $\lambda$ (d)                    | $\mathcal{U}[0, 1500]$                        |                                            |
| RV jitter (m/s)                   | $\mathcal{U}[0, +\infty]$                    | $\mathcal{U}[0, 10]$                        |
| $V_r$ (km/s)                     | $\mathcal{U}[0, +\infty]$                    | $\mathcal{U}[5500, 5750]$                  |

Notes:  
$\mathcal{N}(\mu, \sigma)$: normal distribution with mean $\mu$ and standard deviation $\sigma$  
$\mathcal{U}[a, b]$: uniform distribution between $a$ and $b$ values.
Supplementary Table 2: **Results of the radial-velocity modelling.** Error bars and upper limits refer to 1σ uncertainties.

| Parameter                        | 4 Keplerians + 1 Sinusoid | 4 Keplerians + Gaussian Process regression |
|----------------------------------|---------------------------|-------------------------------------------|
| $K_b$ (m/s)                      | $1.32 \pm 0.57$           | $1.39 \pm 0.50$                           |
| $K_c$ (m/s)                      | $3.06 \pm 0.57$           | $3.15 \pm 0.50$                           |
| $K_d$ (m/s)                      | $< 1.1$                   | $< 0.9$                                   |
| $K_e$ (m/s)                      | $1.95 \pm 0.82$           | $2.56 \pm 0.71$                           |
| $M_{p,b} (M_\oplus)$            | $3.51 \pm 1.52$           | $3.67 \pm 1.32$                           |
| $M_{p,c} (M_\oplus)$            | $9.39 \pm 1.77$           | $9.64 \pm 1.49$                           |
| $M_{p,d} (M_\oplus)$            | $< 3.8$                   | $< 3.1$                                   |
| $M_{p,e} (M_\oplus)$            | $8.6 \pm 3.6$             | $11.3 \pm 3.1$                            |
| $P_{in}$ (d)                     | $14.10^{+0.28}_{-0.30}$   |                                           |
| $T_{0,\sin}$ - 2,450,000 (BJD$_{TDB}$) | $6827.7 \pm 1.3$           |                                           |
| $K_{as}$ (m/s)                   | $2.41 \pm 0.70$           |                                           |
| $h$ (m/s)                        |                           | $1.77^{+1.35}_{-0.05}$                     |
| $\theta$ (d)                     |                           | $14.27^{+3.38}_{-3.40}$                    |
| $\omega$ (d)                     |                           | $0.61 \pm 0.26$                           |
| $\lambda$ (d)                    |                           | $867^{+296}_{-492}$                       |
| RV jitter (m/s)                  | $< 0.8$                   | $< 0.9$                                   |
| $V_r$ (m/s)                      | $5644.23 \pm 0.45$        | $5644.30^{+0.14}_{-0.06}$                  |
Supplementary Table 3: Stellar photospheric abundances relative to the Sun.

| Element | [X/H]  | Abundance [dex] | Number of lines |
|---------|--------|-----------------|-----------------|
| NaI     | 0.400  | ± 0.070         | 3               |
| MgI     | 0.358  | ± 0.049         | 3               |
| AlI     | 0.389  | ± 0.014         | 2               |
| SiI     | 0.361  | ± 0.039         | 14              |
| CaI     | 0.313  | ± 0.031         | 12              |
| ScI     | 0.441  | ± 0.007         | 3               |
| ScII    | 0.425  | ± 0.093         | 6               |
| TiI     | 0.350  | ± 0.062         | 24              |
| TiII    | 0.359  | ± 0.051         | 6               |
| MnI     | 0.437  | ± 0.063         | 5               |
| CrI     | 0.352  | ± 0.047         | 21              |
| CrII    | 0.253  | ± 0.077         | 3               |
| VI      | 0.426  | ± 0.010         | 6               |
| CoI     | 0.452  | ± 0.028         | 8               |
| NiI     | 0.406  | ± 0.025         | 40              |
## Supplementary Table 4: Measurements of radial velocity and activity indexes.

| Time (BJD\textsubscript{UTC} - 2,450,000) | RV (m/s) | σRV (m/s) | FWHM (m/s) | BIS (m/s) | log(R\textsuperscript{'}\textsubscript{HK}) | σlog(R\textsuperscript{'}\textsubscript{HK}) |
|---------------------------------|--------|---------|-----------|---------|-----------------|------------------|
| 6829.641319                    | 5640.11 | 3.97    | 7796.31   | 24.90   | -4.994          | 0.080            |
| 6831.546838                    | 5639.56 | 3.26    | 7812.65   | 8.89    | -5.058          | 0.070            |
| 6832.592840                    | 5649.14 | 3.77    | 7803.99   | 6.29    | -5.046          | 0.086            |
| 6845.598973                    | 5640.18 | 3.01    | 7820.68   | 13.08   | -5.084          | 0.066            |
| 6846.641739                    | 5637.14 | 3.74    | 7819.36   | 7.02    | -5.037          | 0.076            |
| 6847.633230                    | 5643.25 | 6.30    | 7823.76   | -5.93   | -5.336          | 0.320            |
| 6849.586407                    | 5642.12 | 5.67    | 7824.36   | 3.06    | -5.085          | 0.154            |
| 6850.637493                    | 5639.78 | 5.61    | 7806.19   | 18.41   | -5.029          | 0.132            |
| 6851.632235                    | 5646.18 | 3.42    | 7809.08   | -3.65   | -5.078          | 0.078            |
| 6852.63376*                    | 5654.00 | 5.06    | 7797.71   | 5.36    | -5.036          | 0.128            |
| 6853.635316*                   | 5652.50 | 4.14    | 7812.85   | 12.61   | -4.955          | 0.078            |
| 6862.570003                    | 5646.30 | 4.13    | 7816.29   | 6.92    | -5.234          | 0.148            |
| 6863.531728                    | 5647.75 | 4.48    | 7837.46   | 19.71   | -5.111          | 0.124            |
| 6864.538823                    | 5647.43 | 3.19    | 7803.21   | 6.28    | -5.079          | 0.072            |
| 6866.541785                    | 5642.30 | 5.84    | 7815.92   | 14.80   | -5.266          | 0.241            |
| 7180.680532*                   | 5643.37 | 3.72    | 7799.86   | 17.13   | -5.060          | 0.083            |
| 7181.593700                    | 5650.47 | 5.40    | 7836.01   | -10.56  | -5.007          | 0.123            |
| 7182.557541                    | 5646.70 | 3.31    | 7814.09   | 5.08    | -5.194          | 0.098            |
| 7183.584880                    | 5635.22 | 4.96    | 7831.50   | 30.06   | -5.104          | 0.129            |
| 7185.572111                    | 5646.34 | 4.81    | 7799.70   | -2.05   | -5.070          | 0.123            |
| 7186.594367                    | 5640.02 | 3.18    | 7783.43   | 0.97    | -5.139          | 0.083            |
| 7188.656460                    | 5635.67 | 4.57    | 7782.68   | 2.48    | -4.955          | 0.092            |
| 7189.648563                    | 5638.90 | 7.85    | 7795.30   | -18.51  | -5.248          | 0.326            |
| 7190.663098                    | 5647.35 | 3.43    | 7799.31   | 5.55    | -5.060          | 0.080            |
| 7191.663534                    | 5642.24 | 3.32    | 7792.51   | 10.11   | -5.052          | 0.073            |
| 7192.660186                    | 5642.85 | 3.47    | 7809.78   | 12.46   | -5.233          | 0.117            |
| 7193.662207                    | 5640.42 | 3.09    | 7796.18   | 8.44    | -5.051          | 0.064            |
| 7195.654431                    | 5651.19 | 4.00    | 7815.44   | 15.26   | -5.192          | 0.124            |
| 7221.605328                    | 5642.08 | 2.91    | 7782.88   | 6.56    | -5.155          | 0.075            |
| 7222.541535                    | 5642.96 | 3.84    | 7780.88   | 17.27   | -5.089          | 0.100            |
| 7223.715037                    | 5634.17 | 9.55    | 7802.50   | 8.70    | -4.841          | 0.187            |
| 7227.604988                    | 5650.87 | 3.75    | 7791.80   | 1.63    | -5.013          | 0.078            |
| 7228.609294                    | 5648.84 | 5.40    | 7818.43   | 8.34    | -5.067          | 0.141            |
| 7230.660140                    | 5644.82 | 5.03    | 7818.98   | 7.37    | -5.057          | 0.136            |
| 7254.608600                    | 5657.08 | 5.64    | 7831.29   | 4.92    | -4.927          | 0.123            |
| 7256.614319                    | 5640.75 | 5.04    | 7799.96   | -0.71   | -4.984          | 0.107            |
| 7257.617068                    | 5644.00 | 6.71    | 7822.25   | 0.99    | -5.189          | 0.272            |

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| Time (BJD$_{UTC}$-2,450,000) | RV (m/s)  | σRV (m/s) | FWHM (m/s) | BIS (m/s) | log($R'_{HK}$) | σlog($R'_{HK}$) |
|-------------------------------|-----------|-----------|------------|-----------|----------------|----------------|
| 7267.552112                  | 5647.20   | 3.78      | 7815.64    | 13.86     | -5.131         | 0.101          |
| 7269.515188                  | 5653.99   | 3.99      | 7817.17    | -1.37     | -5.013         | 0.072          |
| 7270.498495                  | 5641.88   | 3.70      | 7804.91    | 13.73     | -5.033         | 0.059          |
| 7271.501443                  | 5641.57   | 3.12      | 7805.10    | 17.01     | -5.309         | 0.247          |
| 7272.540536                  | 5636.45   | 5.08      | 7798.88    | 12.80     | -5.049         | 0.074          |
| 7273.516979                  | 5647.84   | 3.59      | 7818.20    | -0.50     | -5.125         | 0.091          |
| 7301.493922                  | 5638.15   | 3.60      | 7808.70    | 15.82     | -5.028         | 0.137          |
| 7302.495732                  | 5631.49   | 5.92      | 7812.62    | 32.53     | -5.164         | 0.200          |
| 7498.703402                  | 5650.04   | 6.04      | 7804.65    | 24.01     | -4.905         | 0.091          |
| 7499.715106*                 | 5648.31   | 5.01      | 7771.64    | 23.71     | -5.449         | 0.235          |
| 7521.650229                  | 5642.85   | 4.35      | 7778.49    | 6.61      | -5.012         | 0.084          |
| 7522.698371                  | 5646.94   | 3.91      | 7795.96    | 27.16     | -5.089         | 0.161          |
| 7525.687954                  | 5644.80   | 5.77      | 7799.45    | 8.90      | -4.966         | 0.156          |
| 7526.688837                  | 5635.56   | 6.95      | 7799.03    | 13.43     | -4.961         | 0.105          |
| 7527.660506*                 | 5644.00   | 5.12      | 7784.03    | 8.00      | -5.262         | 0.182          |
| 7528.680232*                 | 5647.21   | 4.63      | 7789.27    | 23.25     | -5.118         | 0.157          |
| 7529.691289*                 | 5649.94   | 5.25      | 7792.05    | 33.71     | -4.968         | 0.134          |
| 7530.694093*                 | 5641.97   | 6.03      | 7822.29    | 25.68     | -5.242         | 0.202          |
| 7557.662814*                 | 5649.88   | 5.14      | 7802.55    | -7.13     | -4.955         | 0.146          |
| 7558.633191*                 | 5641.31   | 6.84      | 7794.55    | 41.52     | -5.019         | 0.157          |
| 7559.616508*                 | 5650.48   | 7.19      | 7802.48    | 7.84      | -5.103         | 0.245          |
| 7565.585627                  | 5644.46   | 8.22      | 7799.69    | 9.43      | -5.093         | 0.071          |
| 7566.606557                  | 5644.40   | 3.11      | 7785.22    | 1.69      | -5.085         | 0.131          |
| 7573.530542                  | 5647.73   | 4.91      | 7805.09    | 7.86      | -5.075         | 0.111          |
| 7573.551734                  | 5640.74   | 4.42      | 7774.72    | 23.15     | -4.964         | 0.064          |
| 7574.521167                  | 5638.21   | 3.49      | 7803.44    | 12.80     | -5.061         | 0.108          |
| 7574.541491                  | 5633.35   | 4.56      | 7787.33    | 14.86     | -5.080         | 0.104          |
| 7576.512913                  | 5645.31   | 4.33      | 7784.56    | 9.36      | -5.014         | 0.072          |
| 7576.533388                  | 5645.57   | 3.77      | 7793.50    | 9.41      | -6.314         | 3.430          |
| 7602.413100                  | 5644.28   | 7.23      | 7787.16    | 9.54      | -5.147         | 0.166          |
| 7602.433285                  | 5639.18   | 5.34      | 7809.63    | -3.55     | -5.290         | 0.140          |
| 7614.424583*                 | 5641.24   | 3.79      | 7795.82    | 7.68      | -5.100         | 0.088          |
| 7614.447303*                 | 5646.04   | 3.67      | 7811.11    | -12.32    | -5.032         | 0.116          |
| 7617.419103*                 | 5647.99   | 4.95      | 7785.28    | -20.50    | -4.968         | 0.107          |
| 7617.441696*                 | 5647.10   | 5.20      | 7770.38    | -36.37    | -5.158         | 0.170          |
| 7618.415801*                 | 5641.99   | 5.57      | 7775.99    | -64.62    | -5.148         | 0.244          |
| 7618.437109*                 | 5637.68   | 7.67      | 7814.93    | -16.78    | -5.062         | 0.076          |
| 7619.391064*                 | 5635.79   | 3.50      | 7804.13    | -17.10    | -5.113         | 0.085          |

Continued on next page
| Time (BJD_{UTC}-2,450,000) | RV (m/s) | σRV (m/s) | FWHM (m/s) | BIS (m/s) | log(R'_{HK}) | σlog(R'_{HK}) |
|-----------------------------|---------|-----------|------------|-----------|--------------|--------------|
| 7619.413876*                | 5640.07 | 3.47      | 7788.45    | -0.28     | -5.117       | 0.109        |
| 7651.362036*                | 5652.12 | 4.11      | 7811.95    | 7.79      | -4.985       | 0.070        |
| 7651.382707*                | 5649.98 | 3.65      | 7783.03    | 1.69      | -5.246       | 0.120        |
| 7652.360994                 | 5649.98 | 3.59      | 7808.77    | 6.72      | -4.996       | 0.061        |
| 7652.382047                 | 5650.90 | 3.40      | 7794.89    | 9.01      | -5.092       | 0.184        |
| 7653.365426                 | 5640.99 | 6.26      | 7803.50    | 12.56     | -4.977       | 0.151        |
| 7653.386397                 | 5649.11 | 6.68      | 7796.38    | 16.06     | -5.111       | 0.120        |
| 7654.364440                 | 5644.77 | 4.48      | 7791.02    | -2.01     | -5.321       | 0.226        |
| 7654.385528                 | 5646.10 | 4.99      | 7791.52    | -3.24     | -5.124       | 0.178        |
| 7655.403210                 | 5646.98 | 5.81      | 7786.50    | 16.71     | -5.268       | 0.339        |
| 7655.425003                 | 5642.61 | 7.34      | 7795.17    | 24.01     | -5.045       | 0.081        |
| 7656.357283                 | 5650.08 | 3.71      | 7767.62    | 4.63      | -5.208       | 0.131        |
| 7656.378463                 | 5649.12 | 3.92      | 7808.16    | -30.68    | -4.924       | 0.147        |
| 7658.395272                 | 5634.23 | 7.73      | 7794.18    | 14.02     | -5.079       | 0.217        |
| 7658.415573                 | 5632.06 | 7.95      | 7775.04    | -3.57     | -5.136       | 0.141        |
| 7659.433207                 | 5636.31 | 4.74      | 7798.11    | -5.26     | -5.044       | 0.122        |
| 7659.454318                 | 5632.62 | 5.13      | 7772.62    | -4.62     | -5.186       | 0.090        |
| 7661.374576                 | 5642.01 | 3.19      | 7790.73    | 10.60     | -5.039       | 0.065        |
| 7661.395478                 | 5640.21 | 3.19      | 7790.11    | 5.15      | -5.176       | 0.089        |
| 7669.359450                 | 5645.77 | 3.27      | 7793.04    | -0.61     | -5.400       | 0.160        |
| 7669.379947                 | 5644.30 | 3.44      | 7767.81    | -0.68     | -5.190       | 0.197        |
| 7670.382276                 | 5645.13 | 5.63      | 7807.98    | 9.98      | -5.114       | 0.150        |
| 7670.403398                 | 5635.47 | 5.21      | 7769.91    | 5.61      | -4.935       | 0.069        |
| 7671.353842                 | 5647.08 | 3.87      | 7778.44    | 5.99      | -5.163       | 0.094        |
| 7671.374605                 | 5649.73 | 3.38      | 7795.49    | 12.10     | -5.121       | 0.090        |
| 7672.357559                 | 5648.41 | 3.44      | 7760.09    | 3.41      | -4.991       | 0.071        |
| 7672.378241                 | 5643.34 | 3.53      | 7771.20    | 0.38      | -5.073       | 0.089        |
| 7673.359389                 | 5643.28 | 4.03      | 7797.50    | 8.51      | -5.264       | 0.133        |
| 7673.380719                 | 5641.43 | 3.91      | 7802.90    | 21.48     | -5.052       | 0.090        |
| 7699.345433                 | 5649.22 | 4.34      | 7750.61    | -15.18    | -5.018       | 0.143        |
| 7706.370203                 | 5652.20 | 6.33      | 7790.39    | 10.95     | -5.000       | 0.130        |
| 7721.345665                 | 5641.33 | 5.95      | 7780.78    | 10.85     | -5.062       | 0.099        |
| 7727.324829                 | 5640.16 | 3.99      | 7813.98    | 12.55     | -4.976       | 0.123        |
| 7728.330556                 | 5646.56 | 5.57      | 7793.96    | -4.52     | -4.949       | 0.111        |
| 7729.315081                 | 5636.67 | 5.75      | 7820.37    | -0.95     | -5.113       | 0.175        |
| 7861.716662                 | 5650.46 | 6.27      | 7803.22    | -14.40    | -5.088       | 0.130        |
| 7863.730901                 | 5643.20 | 5.73      | 7814.61    | 6.50      | -5.075       | 0.082        |
| 7864.667902                 | 5632.46 | 3.98      | 7807.42    | 19.87     | -5.195       | 0.272        |

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| Time (BJD\textsubscript{UTC}-2,450,000) | RV (m/s) | σRV (m/s) | FWHM (m/s) | BIS (m/s) | log(R\textsubscript{HK}’) | σlog(R\textsubscript{HK}’) |
|--------------------------------------|----------|-----------|------------|-----------|-----------------|-----------------|
| 7865.685104                         | 5631.66  | 7.97      | 7856.53    | 6.00      | -4.777          | 0.160           |

Notes:
*: observations corrected for moonlight contamination.