ExoClock Project. II. A Large-scale Integrated Study with 180 Updated Exoplanet Ephemerides

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Abstract

The ExoClock project is an inclusive, integrated, and interactive platform that was developed to monitor the ephemerides of the Ariel targets to increase the mission efficiency. The project makes the best use of all available resources, i.e., observations from ground telescopes, midtime values from the literature, and finally, observations from space instruments. Currently, the ExoClock network includes 280 participants with telescopes capable of observing 85% of the currently known Ariel candidate targets. This work includes the results of ~1600 observations obtained up to 2020 December 31 from the ExoClock network. These data in combination with ~2350 midtime values collected from the literature are used to update the ephemerides of 180 planets. The analysis shows that 40% of the updated ephemerides will have an impact on future scheduling as either they have a significantly improved precision or they have revealed biases in the old ephemerides. With the new observations, the observing coverage and rate for half of the planets in the sample has been doubled or more. Finally, from a population perspective, we identify that the differences in the 2028 predictions between the old and the new ephemerides have an STD that is double what is expected from Gaussian uncertainties. These findings have implications for planning future observations, where we will need to account for drifts potentially greater than the prediction uncertainties. The updated ephemerides are open and accessible to the wider exoplanet community both from our Open Science Framework repository and our website.

Unified Astronomy Thesaurus concepts: Transit photometry (1709); Ephemerides (464); Exoplanets (498); Amateur astronomy (35)

1. Introduction

Follow-up observations of known transiting exoplanets are important to properly plan future observations with larger facilities in order to avoid wasting part of their observing time. While the transit times of near future events are predicted with relatively good accuracy, several factors prevent accurate predictions far into the future. First, the limited amount of available data for each planet introduces biases on the ephemeris estimation (e.g., Benneke et al. 2017; Mallonn et al. 2019b). Moreover, the precision of the predicted transit times is degrading with time due to the uncertainties of the initial ephemerides (e.g., Mallonn et al. 2019b). For example, planets that were recently discovered by TESS had initial ephemerides with very high uncertainties (e.g., Dragomir et al. 2020; Zellem et al. 2020). These ephemerides were only improved by follow-up observations and data from the extended TESS mission. Other issues that might result in biases in transit times include tidal orbital decays, gravitational interactions with other bodies, or apsidal precession (e.g., Agol et al. 2005; Maciejewski et al. 2016a; Bouma et al. 2019).

Future space missions aiming to characterize exoplanets require a good knowledge of transit times in order to increase the efficiency of the mission. The Ariel mission will spectroscopically observe the atmospheres of 1000 planets in order to investigate their nature. It will observe thousands of transits so it is crucial to improve the currently known ephemerides.

The importance and efficiency of using small-sized telescopes for observing transits has been highlighted in several works (e.g., Beck et al. 2019; Kabáth et al. 2019; Mallonn et al. 2019b; Zellem et al. 2020; Edwards et al. 2021; Kokori et al. 2021). In this regard, their contribution to planning observations for future space missions is of high significance. Since Ariel will observe a large number of planets, it is necessary to provide a list with verified ephemerides before the launch of the mission.

The best use of resources can be achieved through large-scale efforts that integrate data from various sources. These sources include data from the literature, data from telescopes of any size—even small ones—and, finally, data from space for the most challenging targets. ExoClock is such a project; it is an open, integrated platform that aims to monitor the ephemerides of the Ariel candidate targets. The nature, architecture, and organization of the project are described in detail in Kokori et al. (2021).

In Kokori et al. (2021) a first round of ephemerides updates was presented for 28 planets. The ExoClock project has been in operation since 2019 September and in the course of this effort it became clear that many planets have large scatter in the $O-C$ diagrams or they do not have many observations. Therefore, such targets require continuous monitoring and a longer time coverage of observations to decrease their current or predicted uncertainties.

In this work, we present the first large-scale update to the ephemerides of 180 planets. The refined ephemerides have been derived from a combination of midtimes from both ExoClock observations and literature data. The literature research includes a collection of the majority of midtimes from previous publications for all 180 planets. The results show that a considerable number of planets have midtimes derived from only a small number of past observations, in many cases from the discovery data alone. The absence of an adequate number of observations leads to increased uncertainties in the ephemerides. This highlights the importance of the continuous monitoring provided by ExoClock. Apart from its role to support the Ariel space mission, ExoClock aims to act as a community service with reliable ephemerides to be utilized for other exoplanet research purposes.

2. The ExoClock Network

At the time of this writing, the ExoClock network includes 280 participants (80% are amateur astronomers) and 300 telescopes with sizes ranging between 6 and 40 inches (80% are smaller than 17 inches). A full list of private observatories is outlined in Table 1. We calculate the signal-to-noise ratio (S/N) for each
planet–telescope combination based on Equation (1). If \( S/N \) is higher than 15, then the planet is flagged as accessible.

\[
S/N = aD \sqrt{10^{12 - R_{\text{mag}}/25} T_{\text{tr}} / \left( T_{\text{tr}} + \frac{1}{120} \right)}
\]

(1)

where \( a \) is a constant, \( D \) is the telescope aperture in inches, \( R_{\text{mag}} \) is the \( R \) magnitude of the star, \( T_{\text{tr}} \) is the transit depth in mmag, and \( T_{Dr} \) is the transit duration in minutes.

The factor \( a \) was estimated empirically based on observations acquired from the Holomos Astronomical station of the Aristotle University of Thessaloniki in Greece. The data were obtained with a 11 inch telescope, an ATIK11000 camera, and a Red (Cousins) filter. This can be considered as a representative example of a system capable of performing transit observations. Assuming that an observation starts one hour before the transit, ends one hour after the transit, has an exposure time of one minute, and has overheads of 30 s, the value of \( a \) is equal to 0.0125. In the course of the project, this factor is updated for each telescope based on the quality of the observations acquired.

Compared to Kokori et al. (2021), here we can take into account the updated number and the updated capabilities of the telescopes in our network—alongside the observability constraints (host star above 20\(^{\text{mag}}\), transit duration shorter than 6 hr)—and better estimate the capabilities of the network as a whole. Figure 1 shows the cumulative percentage of observable planets as a function of the telescope size. The large number and the global distribution of telescopes smaller than 17 inches ensures that the majority of our targets (75%) are observable with this type of equipment. The larger telescopes can contribute an additional 10\(%\), leading to a total of 85\% of observable planets from the list of currently known planets that are candidates for Ariel (Edwards et al. 2019). Given the limited time available to larger facilities, this kind of telescope distribution is proven to be very efficient for achieving a large-scale follow-up program.

3. Data Acquisition and Evaluation

3.1. ExoClock Data

As part of the ExoClock website\(^{48}\) we provide a personalized scheduler for each observer, a suggested protocol on how to acquire data, and the data analysis software\(^{49}\) to perform reduction and photometry. We refer the interested reader to Kokori et al. (2021) for more details. The most important aspects of the observing protocol include the use of the Red Cousins filter, the acquisition of data from one hour before the transit start until one hour after the transit end, and the regular check of the system clock to ensure accurate time-stamping of data. The above do not constitute requirements but only suggestions, as we welcome contributions of any kind. If the uploaded data do not include uncertainties, these are estimated with a moving standard deviation.

To ensure the high quality and homogeneity of observations, we perform light-curve modeling on the ExoClock website, using our dedicated exoplanet catalog for the planet parameters (the Exoplanet Characterization Catalog) and the open source Python package PyLightcurve\(^{50}\) (Tsiaras et al. 2016) for transit modeling. Again, we refer the interested reader to Kokori et al. (2021), while here we give a summary of the process. For every transit, we convert the time to BJD\(_{\text{TRP}}\); we then fix all the transit parameters with the exception of the planet-to-star radius ratio and the midtime, and also we calculate the limb-darkening coefficients using the ExoTETHyS\(^{51}\) (Morello et al. 2020) package for the specific photometric filter used. Finally, we fit the light curve with a transit model (exposure-integrated) together with a trend model (linear with airmass, linear with time, or quadratic with time based on the chi-squared of the residuals) using the nested sampling techniques as implemented in the Nestle package.\(^{52}\) After a first fit on the data, we scale the uncertainties to match the standard deviation of the residuals and re-fit. This way, we take into account any extra scatter in the observation and end up with a conservative estimate of the uncertainties in the final results.

In this work, we considered 180 planets that had at least two ExoClock observations submitted to the website before the end of 2020 and which met the required quality standards. We assess the quality of each light curve individually, based on three criteria, as listed below.

1. The fitted \( R_p/R_s \) should not differ by more than 3\( \sigma \) from the expected literature value. The only exceptions to this rule are planets that orbit stars with physical or projected companions (e.g., HAT-P-1b, K2-29b, WASP-77Ab, WASP-85Ab, XO2-Nb) or planets with grazing transits (e.g., WASP-45b, WASP-67b).

2. The autocorrelation and the Shapiro statistic for the normalized residuals should not differ by more than 3\( \sigma \) from the values for pure white noise at the same time. We estimated these limits as a function of the number of data points in a light curve from 100,000 simulated time series. The advantage of these metrics is that they are very sensitive to systematic noise and to outliers.

3. The fitted transit time should not have an uncertainty greater than 10 minutes and it should be in agreement with other observations on the same day or a few days apart (if such observations exist).

The total number of approved light curves for this data release is \( \sim \)1600, spanning the period from 2008 to 2020. For

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\(^{48}\) exoclock.space

\(^{49}\) github.com/ExoWorldsSpies/hops

\(^{50}\) github.com/ucl-exoplanets/pylightcurve

\(^{51}\) https://github.com/ucl-exoplanets/ExoTETHyS

\(^{52}\) github.com/kbarbary/nestle
the majority (∼60%) of the planets, the number of observations is lower than or equal to 10, indicating that more observations in the future are necessary. (For a discussion on the coverage achieved by our observations see Section 6.2.)

The overall precision achieved in the transit timing can be evaluated from Figure 2, where the majority of the observations (∼90%) deliver a precision better than three minutes. Additionally, Figure 3 shows the autocorrelation and the Shapiro diagnostics as a function of the light-curve length, together with the acceptable upper limit. Of these light curves, 7% fail the autocorrelation test mostly due to spot-crossing events or weather. However, these light curves pass the $R_p/R_s$ and the Shapiro test as these events do not cause strong residuals. These light curves will be flagged in the final data product to warn anyone who wishes to use them.

3.2. Literature Data

Approximately 2350 transit midtime values were collected from the literature for the 180 planets in our sample. While collecting the literature midtimes we:

1. included individual transit-time measurements and not ephemerides, with the exception of the discovery paper,
2. included transit-time measurements with uncertainties less than 10 minutes (similarly to the restriction for the ExoClock data),
3. did not include measurements that came from the Exoplanet Transit Database (ETD, Poddany et al. 2010) to avoid duplications, as we have started sharing data directly with the ETD collaboration (see Section 3.3) and these data will be directly linked to ExoClock, and
4. converted the reported time formats to BJD$_{TDB}$.

We need to note here that 35% of the planets in our sample have only one data point from the literature, related to the discovery of the planet. This statistic reveals a significant gap in the literature and highlights the need for a large-scale follow-up project like ExoClock.

3.3. ETD Data

In an effort to make the best use of all available resources, we would like to collaborate with other ground networks which have current or past observations of the Ariel candidate targets. At the moment the largest database of such observations is the Exoplanet Transit Database (ETD, Poddany et al. 2010) run by the Czech Astronomical Society since 2009, which provides more than 10,000 transit light curves for more than 350 exoplanet systems. In this study, we included 18 observations for three planets provided by the ETD network and midtimes from these were integrated with the ExoClock and the literature data.

In order to maintain homogeneity and reliability in our analysis, we only considered observations with a data quality index lower than three which were then processed on the ExoClock website using the same methodology and validation criteria as for the ExoClock data (Section 3.1).

Despite the low number of observations used in this analysis, we value the contribution of ETD and this is the first collaborative work between the two networks. Such collaborations are critical to avoid duplications and waste of resources. We aim to continue our collaboration and gradually integrate more data from ETD in future publications.

4. Results

4.1. Updated Ephemerides for 180 Planets

Here we present updated ephemerides for 180 of the total of 370 planets that are currently in the ExoClock target list. To determine these ephemerides, we combined all the available data. First, we updated the zero epoch to the weighted average of the available epochs, and then fitted a line on the epoch versus midtransit times data. To do so, we used the MCMC algorithm as implemented in the emcee package (Foreman-Mackey et al. 2013). After a first fit, we scaled up the uncertainties so that the mean uncertainty was equal to the STD of the $O − C$ residuals and in this way we incorporate any non-Gaussian noise. While, this step did not have a significant effect on the values of the zero-epoch midtransit and the period, it was important for their uncertainties. Without scaling, the uncertainties on the final ephemerides would have been largely underestimated, leading to reduced chi-squared values larger than 1. Table 2 in Appendix B provides all the new ephemerides and references to the literature values used.

Figure 4 shows the uncertainties in the 2028 predictions before and after the updates presented in this work ($\sigma_p$ and $\sigma_p'$, respectively). We note that all the new predictions have uncertainties lower than 10 minutes and an improvement has been achieved for 162 (90%) of them. There is a small number of planets (6) for which the prediction uncertainty has increased from ∼0.1 minute to ∼1–4 minutes. These planets were observed by Kepler/K2 but the individual midtime data were not reported in the literature, hence only the initial ephemerides were used. We plan to reanalyze and add the individual Kepler/K2 light curves in our database in our future data releases, solving the above issue. Moreover, Figure 5 shows the difference in the 2028 predictions between the new and the old ephemerides as a function of uncertainty, where 103 planets (57%) have drifts greater than their uncertainties.

4.2. Deviations from Linear Ephemerides

To assess the Gaussianity of the final $O − C$ diagrams we use the same methodology as for the individual light curves: by evaluating the autocorrelation and the Shapiro test.
From the autocorrelation test we find that three planets—WASP-12b, WASP-10b, and Qatar-2b—have a statistically significant \( O - C \) autocorrelation (>3\( \sigma \) deviation from Gaussian noise) that indicates a nonlinear ephemeris. WASP-12b is known to have a nonlinear ephemeris as its orbit is decaying (Maciejewski et al. 2016a; Turner et al. 2021), while for the other two planets more observations are required to verify the nonlinear nature of their ephemerides.

Additionally, the Shapiro test can help us identify high-frequency noise in \( O - C \) diagrams. We find five planets that deviate significantly from pure noise based on the Shapiro test: GJ1214b, HAT-P-32b, TrES-3b, WASP-43b, WASP-79b. For the planets mentioned above, an additional noise component should be taken into account when predicting future transit events, and we have indicated this in the Catalog of ExoClock Ephemerides (Section 5.2). As far as high-frequency noise is concerned, we find the most significant deviation (15 times higher than the 3\( \sigma \) limit) is for TrES-3b, a planet for which there are contradicting results in the literature regarding the presence of an additional planet or not (e.g., Mannaday et al. 2020).

5. Data Release B

The second data release of the ExoClock project includes two data products: the catalog of ExoClock observations and the catalog of ExoClock ephemerides. All data products and their descriptions can be found through the Open Science Framework (OSF) repository with doi:10.17605/OSF.IO/WNA5E.

5.1. Catalog of ExoClock Observations

The new catalog of ExoClock observations contains \( \sim \)1600 light curves analyzed in this work, which refer to 180 planets from the ExoClock target list. These observations were
conducted between 2008 and 2020, submitted to the ExoClock platform before the end of 2020, and validated according to the criteria described in Section 3.1. From the ∼1600 observations in this data set, 66% were obtained by amateur astronomers and the remaining 34% by professionals.

In the online repository, each observation is accompanied by:

1. metadata regarding the observer(s), the planet observed (link to ECC), the equipment used (telescope-camera-filter), the exposure time and the time and flux formats;
2. the raw light curve filtered for outliers, converted to BJDTDB, and flux formats and enhanced with the estimation for the uncertainties, the target altitude, and the airmass;
3. the fitting results, including the detrending method used and its parameters;
4. the detrended light curve, enhanced with the detrending model, the transit model, and the residuals; and
5. fitting diagnostics on the residuals (standard deviation, chi-squared, autocorrelation).

### 5.2. Catalog of ExoClock Ephemerides

The new catalog of ExoClock ephemerides contains the updated ephemerides for 180 planets from the ExoClock target list (see also Table 2 in Appendix B).

In the online repository, each observation is accompanied by:

1. the midtime values used to calculate the ephemeris,
2. references for the literature data used,
3. links to the ExoClock and ETD data used, and
4. flags concerning the detection of nonlinear ephemerides or high-frequency noise in the $O-C$ diagrams.

### 6. Discussion

#### 6.1. Ariel-focused Implications

Ariel will observe 75% of the transit duration before and after each transit to allow for the correction of instrumental systematics. For this reason, in Kokori et al. (2021) we defined that the aim of the ExoClock project is to deliver ephemerides that can predict the transit times for the end of 2028 with a precision higher than 1/12 of the transit duration (target uncertainty).

From the results presented in Section 4, three classes of planets can be distinguished:

1. class 1: 31 planets (17%) had initial ephemerides with prediction uncertainties greater than the target uncertainties,
2. class 2: 41 planets (24%) had initial ephemerides with prediction uncertainties lower than the target uncertainties, but the new ephemerides give predictions that deviate significantly from the initial ones (more than the target uncertainties), and
3. class 3: the remaining 108 planets (60%) had initial ephemerides with prediction uncertainties lower than the target uncertainties and the new ephemerides give predictions that do not deviate significantly from the initial ones.

In total, 40% of the ephemerides that have been updated in this work are important for the planning of Ariel observations. Despite the fact that the remaining 60% of the planets had reliable initial ephemerides, the majority of them still have a limited number of observations (see Section 6.2) and drifts might appear in the future. Therefore, continued monitoring is necessary.

#### 6.2. The Contribution from ExoClock

The overall contribution of the current work can be assessed by examining the distribution of the observations over the years for each planet. To do so, we used the following metrics:

1. mean observation rate: total number of data points divided by years since the first data point.
2. observing coverage: number of years with at least one data point divided by years since the first data point.

Figure 6 shows the mean observing rate versus the observing coverage for all 180 planets, while Figure 7 shows the distribution of planets over the two metrics. From both graphs, it is apparent that data collected as part of the ExoClock project have made a significant contribution to the follow-up of known planets, as the mean observing rate and the observing coverage have been doubled (or more) for 75% of the planets.

Certainly, there are planets that have an adequate number of observations over the years (observing coverage >0.8), such as Qatar-1b. These planets have very reliable ephemerides and
they can be considered saturated. The large number of observations available for these targets is due to the fact that follow-up observations were focused on a few specific targets. However, the saturated planets constitute a small fraction (10%) of the total sample, while half of the planets still have an observing coverage lower than 0.5 and, therefore, they might show a drift in the future. Therefore, apart from the few planets that have been observed over a long time period and that have precise ephemerides, all the remaining planets require continuous monitoring in order to increase their time coverage as well. In addition, to maximize the time coverage for all the planets, in the near future we plan to incorporate more data from ETD as well as the light curves from Kepler, K2, and TESS in our database.

6.3. General Implications for Follow-up Observations of Exoplanets

The large-scale approach to the ephemerides refinement followed in this work enables a general study of the behavior of the exoplanet ephemerides as a population. Here, we investigate the magnitude of the drifts between the predictions produced by the old and the new ephemerides (for the end of 2028) relative to their uncertainties.

One would expect that the drifts are drawn from a normal distribution with a standard deviation equal to the prediction uncertainty. However, as we can see in Figure 8 and also earlier in Figure 5, the detected drifts are systematically greater than the prediction uncertainties. More specifically, 68% of the detected drifts are within the ±2σ range rather than the expected ±1σ range. Previous studies had indicated a similar but weaker effect based on a smaller sample of planets (Mallonn et al. 2019b). This behavior implies that the old ephemerides were mostly underestimating the prediction uncertainties. To understand if this behavior is the result of biases in the calculation of the old ephemerides (most of which were calculated based on a small number of observations hence they could be biased more easily) or whether it is intrinsic to the follow-up strategy that is followed, it is necessary to repeat this type of evaluation regularly in the future.

7. Conclusions

The large-scale approach of this work is demonstrated to have significant implications for scheduling future observations for exoplanet characterization studies. The examination of past literature midtime values revealed that most planets lacked adequate observations while the focus of the studies was around a small number of planets. Observations provided by the ExoClock network doubled both the observing rate and coverage for half of the planets. Apart from the efficient organization of the project where all available resources are utilized under the same scope, the findings confirmed that continuous monitoring of exoplanet ephemerides is crucial for follow-up studies, because a considerable fraction of the planets studied here (40%) had highly uncertain or biased ephemerides. For this reason, we plan to continue monitoring those planets alongside other planets that have not yet been observed. A large number of observations (~600) for current and new targets has been submitted already to the ExoClock system and the results will be reported in a future study. All the results and the updated ephemerides are open to the wider exoplanet community to facilitate further research purposes in addition to Ariel.

This project has received funding from the European Research Council (ERC) under the European Union’s Horizon 2020 research and innovation program (grant agreement No. 758892, ExoAI) and from the UKSA/STFC grants ST/T001836/1, ST/V003380/1, and ST/W00254X/1. We acknowledge the support provided by the administrators, designers, and developers of the ETD project and of the Czech Astronomical Society both to the ExoClock project and also to the efforts of the whole amateur community through its 10+ years of operation.

This work has made use of observations made by the MicroObservatory which is maintained and operated as an educational service by the Center for Astrophysics, Harvard & Smithsonian as a project of NASA’s Universe of Learning, supported by NASA Award # NNX16AC65A.

This work has made use of observations made by the LCOGT network, as part of the LCOGT Global Sky Partners project “ORBYTS: Refining Exoplanet Ephemerides” (PI: B. Edwards).

B. Edwards is a Laureate of the Paris Region fellowship program supported by the Ile-de-France Region. This project has received funding under the framework program for research and Horizon 2020 innovation under the Marie Sklodowska-Curie grant agreement No. 945298.

L.V.M. is supported by ASI grant No. 2018.22.HH.O.

P. Pintr acknowledges the support by the project No. CZ.02.1.01/0.0/0.0/16_026/0008390.

A.P. and K.B. were responsible for automation of acquisition and processing of SUTO data and acknowledge grants: BK-225/Rau-11/2021, 02/140/SDU/10-22-02.

All the data products and their descriptions can found through the OSF repository with doi:10.17605/OSF.IO/WNASE.

Software: Django, PyLightcurve (Tsiaras et al. 2016), ExoTETHyS (Morello et al. 2020), Astropy (Astropy Collaboration et al. 2013), emcee (Foreman-Mackey et al. 2013), Matplotlib (Hunter 2007), Nestle, Numpy (Harris et al. 2020), SciPy (Virtanen et al. 2020).

Appendix A
List of Private Observatories

Appendix A includes Table 1, a complete list with the names of all observatories.
| Observer(s)                             | Observatory                                                                 |
|----------------------------------------|-----------------------------------------------------------------------------|
| Vikrant Kumar Agnihotri, Kuldip Vora   | Cepheid Observatory, Rawatbhata, India                                      |
| David Bennett                          | Rickford Observatory, UK                                                    |
| Paul Benni                             | Acton Sky Portal Observatory, Acton, MA, USA                                |
| Emmanuel Besson                        | Observatoire des Loges, Buffètes, France                                   |
| Leon Bewersdorff                       | Observatory Kipshoven, Germany                                              |
| Patrick Brandebourg                    | Observatoire du Guermont, Bretagne, France                                  |
| Stephen M. Brincat                     | Flarestar Observatory (MPC:171), San Gwann, Malta                          |
| Mauro Calò                             | Cavallino Observatory, Tuscany, Italy                                      |
| Roland Casali                          | Alto2000 Observatory, Italy                                                |
| Fran Campos                            | Puig d’Aguilés Observatory, Passatge Bosc, 1, 08759 Vallirana, Barcelona, |
|                                        | Catalonia, Spain                                                           |
| Martin Valentine Crow                  | Burnham Observatory, UK                                                    |
| Bruno Dauchet                          | Saint Véran Observatory, France                                            |
| Marc Deldem                            | Les Barres Observatory, Lamanon, France                                     |
| Dimitrios Deligeorgopoulos            | Artemis Observatory, Evrytania, Greece                                      |
| Nicolas Esseiva                        | Saint Martin Observatory, France                                           |
| Josep Guitaん                          | MAS MOIXA Observatory                                                      |
| Ferran Grau Horta                      | Observatori de Ca l’Ou, Sant Martí Sesgueioles, Spain                      |
| Francois Hurter                        | Altireo Observatory, Switzerland                                            |
| Adrian Jones                           | I64 Observatory, Maidenhead, UK                                            |
| Didier Laloum                          | Observatoire Privé du Mont (OPM) 40280 Saint-Pierre-du-Mont, France        |
| Massimiliano Mannucci                  | Telescopio Remoto Colacevich c/o Osservatorio Astronomico di Capodimonte   |
|                                        | di Napoli                                                                   |
| Antonio Marino, Andrea Tomacelli       | Telescopio Remoto Colacevich c/o Osservatorio Astronomico di Capodimonte   |
| Mike Miller                            | Georgetown Observatory, Georgetown, TX, USA                                 |
| Thomas Mollier                         | Tomastro Observatory, Italy                                                 |
| Nico Montigiani                        | Osservatorio Astronomico Margherita Hack, Firenze, Italy                    |
| Fabio Mortari                          | Hypatia Observatory, Italy                                                 |
| Nikolaos Paschalis                     | Nunki Observatory, Skiathos, Greece                                         |
| Valère Perroud                         | Observatoire de Duines, France                                              |
| Mark Phillips                          | Forthimage Observatory, UK                                                 |
| Jean-Bernard Pioppa                    | La Roque-Esclapon, France                                                 |
| Manfred Raetz                          | Privat Observatory Herges-Hallenberg, Germany                               |
| François Regembal                      | HRT Observatory, Spain                                                     |
| Keith Rickard                          | Putlands Observatory, UK                                                   |
| Mark Roberts, Dave Shave-Wall          | IMT3 Observatory, UK                                                       |
| Lionel Rousselot                      | Vierzon Observatory, France                                                |
| Xesco Rubia                            | Stupa Osservatori, Centelles, Catalonia, Spain                             |
| John Savage                           | Z42, Rushay Farm Observatory, Dorset, UK                                   |
| Danilo Sedita                          | Osservatorio Sedita Castrofilippo, Italy                                   |
| Nick Sioulas                           | NOAK Observatory L02, Greece                                               |
| Voňtěch Skolník                        | Broumov NM Observatory, Czech Republic                                     |
| Dimitris Stouraitis                    | Galileo Observatory, Greece                                                |
| Geoffrey Thurston                      | I67, Hartley Wintney, UK                                                   |
| Alberto Tomatis                        | Alto-Observatory, Italy                                                    |
| Bob Trevan                             | IMT3 Observatory, UK                                                       |
| Pierre Valeau                         | Observatoire de l’Aiguillon sur Mer, France                                |
| Bernhard Wenzel                        | Balcony Observatory Vienna, Austria                                        |
| David E. Wright                        | Yorick Observatory, UK                                                    |
Appendix B
Full List of Updated Ephemerides

Appendix B includes Table 2, a complete list with all ephemerides.

| Planet   | New $T_0$ (BJD$_{TDB}$) | New Period (days) | 1. References for literature data used | 2. Reference for the initial ephemeris | 3. Reference for the transit parameters used | 4. Reference for the stellar parameters used |
|----------|--------------------------|-------------------|----------------------------------------|----------------------------------------|--------------------------------------------|--------------------------------------------|
| CoRoT-2b| 2457347.04314 ± 0.00012  | 1.7429970 ± 0.0000011 | 1. Alonso et al. (2008a), Öztürk & Erdem (2019), Rauer et al. (2010) | 2. Bruno et al. (2016) | 3. Alonso et al. (2008a) | 4. Chavero et al. (2010) |
| GJ436b   | 2454873.01582 ± 0.00004  | 2.64389751 ± 0.0000012 | 1. Knutson et al. (2014), Cáceres et al. (2009), Turner et al. (2016), Shporer et al. (2009b), Gillon et al. (2007a), Southworth (2008), Deming et al. (2007), Ribas et al. (2008), Alonso et al. (2008b), Gillon et al. (2007b), Bean & Seifahrt (2008), Beaulieu et al. (2011) | 2. Lanotte et al. (2014) | 3. Knutson et al. (2011) | 4. Torres et al. (2008) |
| GJ1214b  | 2455881.579310 ± 0.00022 | 1.58040454 ± 0.0000004  | 1. Berta et al. (2011), Fraine et al. (2013), Cáceres et al. (2014), Harpsøe et al. (2013), Mallon et al. (2019a) | 2. Cáceres et al. (2014) | 3. Berta et al. (2012) | 4. Charbonneau et al. (2009) |
| HAT-P-1b | 2455801.77390 ± 0.00018  | 4.4652992 ± 0.0000004 | 1. Winn et al. (2007b), Johnson et al. (2008), Turner et al. (2016) | 2. Nikolov et al. (2014) | 3. Nikolov et al. (2014) | 4. Torres et al. (2008) |
| HAT-P-3b | 2455694.72623 ± 0.00008  | 2.89973826 ± 0.00000015 | 1. Torres et al. (2007), Chan et al. (2011), Gibson et al. (2010), Mancini et al. (2018), Nascimbeni et al. (2011a), Sada et al. (2012) | 2. Chan et al. (2011) | 4. Torres et al. (2008) |
| HAT-P-4b | 2454740.97205 ± 0.00020  | 3.0565233 ± 0.0000006 | 1. Kovács et al. (2007), Winn et al. (2011), Christiansen et al. (2011) | 2. Sada et al. (2012) | 3. Christiansen et al. (2011) | 4. Torres et al. (2008) |
| HAT-P-5b | 2455705.72567 ± 0.00024  | 2.7884735 ± 0.0000005 | 1. Turner et al. (2017), Bakos et al. (2007), Southworth et al. (2012b) | 2. Southworth et al. (2012b) | 3. Torres et al. (2008) | 4. Torres et al. (2008) |
| HAT-P-6b | 2455260.92994 ± 0.00021  | 3.8529962 ± 0.0000005 | 1. Noyes et al. (2008), Todorov et al. (2012) | 2. Noyes et al. (2008) | 3. Torres et al. (2008) | 4. Noyes et al. (2008) |
| HAT-P-7b | 2455174.8326 ± 0.0003 | 2.2047363 ± 0.0000007 | 1. Pál et al. (2008), Christiansen et al. (2010), Wong et al. (2016) | 2. Holczer et al. (2016) | 3. Wong et al. (2016) | 4. Pál et al. (2008) |
| HAT-P-8b | 2455945.0839 ± 0.0003 | 3.0763433 ± 0.0000007 | 1. Latham et al. (2009), Mancini et al. (2013c) | 2. Mancini et al. (2013c) | 3. Mancini et al. (2013c) | 4. Latham et al. (2009) |
| Planet     | New $T_0$ (BJD$_{TDB}$) | New Period (days) | 1. References for literature data used |
|-----------|--------------------------|-------------------|---------------------------------------|
| HAT-P-9b  | 2455473.14492 ± 0.00023  | 3.9228105 ± 0.0000008 | 1. Shporer et al. (2009a), Dittmann et al. (2012), Wang et al. (2019) |
|           |                          |                   | 2. Wang et al. (2019)                 |
|           |                          |                   | 3. Wang et al. (2019)                 |
|           |                          |                   | 4. Shporer et al. (2009a)             |
| HAT-P-11b | 2455109.335119 ± 0.000021 | 4.8878009 ± 0.0000003 | 1. Murgas et al. (2019), Tsiaras et al. (2018), Deming et al. (2011), Winn et al. (2010), Bakos et al. (2010), Sada et al. (2012) |
|           |                          |                   | 2. Holczer et al. (2016)              |
|           |                          |                   | 3. Bakos et al. (2010)                |
|           |                          |                   | 4. Bakos et al. (2010)                |
| HAT-P-12b | 2456716.53270 ± 0.000006 | 3.21305751 ± 0.00000017 | 1. Öztürk & Erdem (2019), Turner et al. (2017), Sada & Ramón-Fox (2016), Mallonn et al. (2015a), Lee et al. (2012), Sada et al. (2012), Line et al. (2013), Alexoudi et al. (2018), Hartman et al. (2009), Mancini et al. (2018), Hinse et al. (2015), Yan et al. (2020) |
|           |                          |                   | 2. Sada & Ramón-Fox (2016)            |
|           |                          |                   | 4. Hartman et al. (2009)              |
|           |                          |                   | 4. Hartman et al. (2009)              |
| HAT-P-13b | 2455456.49826 ± 0.000016 | 2.9162431 ± 0.00000006 | 1. Nascimbeni et al. (2011b), Sada & Ramón-Fox (2016), Fulton et al. (2011), Turner et al. (2016), Bakos et al. (2009), Pál et al. (2011), Southworth et al. (2012a), Sada & Ramón-Fox (2016) |
|           |                          |                   | 2. Sada & Ramón-Fox (2016)            |
|           |                          |                   | 4. Bakos et al. (2009)                |
|           |                          |                   | 4. Bakos et al. (2009)                |
| HAT-P-14b | 2455421.35484 ± 0.000022 | 4.6276623 ± 0.00000010 | 1. Torres et al. (2010), Nascimbeni et al. (2011a) |
|           |                          |                   | 2. Fukui et al. (2016)                |
|           |                          |                   | 4. Fukui et al. (2016)                |
|           |                          |                   | 4. Torres et al. (2010)               |
| HAT-P-16b | 2455968.64684 ± 0.000013 | 2.7759677 ± 0.00000003 | 1. Sada & Ramón-Fox (2016), Buchhave et al. (2010), Turner et al. (2016), Pearson et al. (2014), Ciceri et al. (2013) |
|           |                          |                   | 2. Sada & Ramón-Fox (2016)            |
|           |                          |                   | 4. Buchhave et al. (2010)             |
|           |                          |                   | 4. Buchhave et al. (2010)             |
| HAT-P-17b | 2456569.05972 ± 0.000005 | 10.3385346 ± 0.00000009 | 1. Tsiaras et al. (2018), Howard et al. (2012) |
|           |                          |                   | 2. Howard et al. (2012)               |
|           |                          |                   | 4. Howard et al. (2012)               |
|           |                          |                   | 4. Howard et al. (2012)               |
| HAT-P-18b | 2457276.25646 ± 0.000010 | 5.5080300 ± 0.00000008 | 1. Hartman et al. (2011b), Seeliger et al. (2015), Kirk et al. (2017) |
|           |                          |                   | 2. Seeliger et al. (2015)             |
|           |                          |                   | 4. Kirk et al. (2017)                 |
|           |                          |                   | 4. Hartman et al. (2011b)             |
| HAT-P-19b | 2456899.49658 ± 0.000010 | 4.0087842 ± 0.00000004 | 1. Hartman et al. (2011b), Seeliger et al. (2015), Mallonn et al. (2015b), Baştürk et al. (2020) |
|           |                          |                   | 2. Seeliger et al. (2015)             |
|           |                          |                   | 4. Hartman et al. (2011b)             |
|           |                          |                   | 4. Hartman et al. (2011b)             |
| HAT-P-20b | 2456705.48183 ± 0.000007 | 2.87531693 ± 0.00000024 | 1. Sun et al. (2017), Bakos et al. (2011), Granata et al. (2014), Esposito et al. (2017) |
|           |                          |                   | 2. Bakos et al. (2011)                |
|           |                          |                   | 3. Bakos et al. (2011)                |
|           |                          |                   | 4. Bakos et al. (2011)                |
| HAT-P-22b | 2456603.79429 ± 0.000014 | 3.2122330 ± 0.00000003 | 1. Turner et al. (2016), Bakos et al. (2011), Hinse et al. (2015) |
|           |                          |                   | 2. Bakos et al. (2011)                |
|           |                          |                   | 3. Bakos et al. (2011)                |
|           |                          |                   | 4. Bakos et al. (2011)                |
| Planet       | New $T_0$ (BJD$_{TDB}$) | New Period (days) | 1. References for literature data used | 2. Reference for the initial ephemeris | 3. Reference for the transit parameters used | 4. Reference for the stellar parameters used |
|-------------|--------------------------|-------------------|----------------------------------------|---------------------------------------|---------------------------------------------|---------------------------------------------|
| HAT-P-23b   | 2457575.19549 ± 0.00008  | 1.21288644 ± 0.00000008 | 1. Maciejewski et al. (2018), Sada & Ramón-Fox (2016), Bakos et al. (2011), Patra et al. (2020) | 2. Sada & Ramón-Fox (2016) | 3. Ciceri et al. (2015) | 4. Bakos et al. (2011) |
| HAT-P-24b   | 2455800.7899 ± 0.0003   | 3.3552460 ± 0.00000009 | 1. Kipping et al. (2010), Wang et al. (2013), Kjurkchieva et al. (2016) | 2. Kipping et al. (2010) | 3. Kipping et al. (2010) | 4. Kipping et al. (2010) |
| HAT-P-25b   | 2456590.49235 ± 0.00022 | 3.6528162 ± 0.00000008 | 1. Mallonn et al. (2019b), Wang et al. (2018b), Quinn et al. (2012) | 2. Mallonn et al. (2019b) | 3. Wang et al. (2018b) | 4. Quinn et al. (2012) |
| HAT-P-26b   | 2456892.59046 ± 0.00010 | 4.2345002 ± 0.00000007 | 1. von Essen et al. (2019), Hartman et al. (2011a), Tsiaras et al. (2018), Wakeford et al. (2017), Stevenson et al. (2016) | 2. Stevenson et al. (2016) | 3. Hartman et al. (2011a) | 4. Hartman et al. (2011a) |
| HAT-P-27b   | 2456638.93852 ± 0.00012 | 3.03957780 ± 0.00000025 | 1. Béky et al. (2011), Seeliger et al. (2015), Sada et al. (2012), Anderson et al. (2011a) | 2. Seeliger et al. (2015) | 3. Béky et al. (2011) | 4. Béky et al. (2011) |
| HAT-P-28b   | 2458124.34308 ± 0.00022 | 3.2572129 ± 0.00000006 | 1. Buchhave et al. (2011) | 2. Buchhave et al. (2011) | 3. Buchhave et al. (2011) | 4. Buchhave et al. (2011) |
| HAT-P-29b   | 2457240.8218 ± 0.0004  | 5.7233710 ± 0.00000024 | 1. Buchhave et al. (2011), Wang et al. (2018a) | 2. Mallonn et al. (2019b) | 4. Wang et al. (2018a) | 4. Buchhave et al. (2011) |
| HAT-P-30b   | 2455931.45837 ± 0.00018 | 2.8106016 ± 0.00000005 | 1. Maciejewski et al. (2016b), Johnson et al. (2011), Enoch et al. (2011a) | 2. Maciejewski et al. (2016b) | 4. Maciejewski et al. (2016b) | 4. Johnson et al. (2011) |
| HAT-P-32b   | 2456209.25393 ± 0.00005 | 2.15000825 ± 0.000000010 | 1. Tregloan-Reed et al. (2018), Hartman et al. (2011c), Gibson et al. (2013a), Zhao et al. (2014), Seeliger et al. (2014), Wang et al. (2019), Mallonn & Strassmeier (2016) | 2. Hartman et al. (2011c) | 3. Wang et al. (2019) | 4. Hartman et al. (2011c) |
| HAT-P-33b   | 2456601.47713 ± 0.00012 | 3.4744767 ± 0.00000003 | 1. Hartman et al. (2011c), Wang et al. (2017) | 2. Hartman et al. (2011c) | 3. Hartman et al. (2011c) | 4. Hartman et al. (2011c) |
| HAT-P-36b   | 2457334.53507 ± 0.00010 | 1.32734682 ± 0.000000012 | 1. Wang et al. (2019), Bakos et al. (2012) | 2. Mancini et al. (2015a) | 3. Wang et al. (2019) | 4. Bakos et al. (2012) |
| Planet  | New $T_0$ (BJD$_{TDB}$) | New Period (days) | References for literature data used                                                                 | References for the initial ephemeris | References for the transit parameters used | References for the stellar parameters used |
|---------|-------------------------|-------------------|------------------------------------------------------------------------------------------------------|-------------------------------------|------------------------------------------|------------------------------------------|
| HAT-P-37b | 2457754.21279 ± 0.00015 | 2.7974424 ± 0.0000004 | 1. Bakos et al. (2012), Maciejewski et al. (2016b), Turner et al. (2017)                             | 2. Maciejewski et al. (2016b)        | 4. Maciejewski et al. (2016b)             | 4. Bakos et al. (2012)                     |
| HAT-P-38b | 2457515.07748 ± 0.00011 | 4.6403288 ± 0.0000011 | 1. Bruno et al. (2018a), Mallonn et al. (2019b), Sato et al. (2012)                                 | 2. Mallonn et al. (2019b)            | 3. Sato et al. (2012)                     | 4. Sato et al. (2012)                     |
| HAT-P-40b | 2456414.9009 ± 0.0005   | 4.4572173 ± 0.0000017 | 1. Hartman et al. (2012)                                                                             | 2. Hartman et al. (2012)             | 3. Hartman et al. (2012)                  | 4. Hartman et al. (2012)                  |
| HAT-P-41b | 2458071.24389 ± 0.00012 | 2.6940497 ± 0.0000008 | 1. Hartman et al. (2012), Wakeford et al. (2020)                                                    | 2. Hartman et al. (2012)             | 4. Hartman et al. (2012)                  | 4. Hartman et al. (2012)                  |
| HAT-P-44b | 2457284.0768 ± 0.0004   | 4.3011900 ± 0.0000010 | 1. Hartman et al. (2014)                                                                             | 2. Mallonn et al. (2019b)            | 3. Hartman et al. (2014)                  | 4. Hartman et al. (2014)                  |
| HAT-P-49b | 2457077.8963 ± 0.0005   | 2.6915535 ± 0.0000012 | 1. Bieryla et al. (2014)                                                                            | 2. Bieryla et al. (2014)             | 3. Bieryla et al. (2014)                  | 4. Bieryla et al. (2014)                  |
| HAT-P-50b | 2456526.3049 ± 0.0003   | 3.1220018 ± 0.0000013 | 1. Hartman et al. (2015b)                                                                           | 2. Hartman et al. (2015b)            | 3. Hartman et al. (2015b)                 | 4. Hartman et al. (2015b)                 |
| HAT-P-51b | 2457868.67797 ± 0.00024 | 4.2180226 ± 0.0000009 | 1. Hartman et al. (2015b)                                                                           | 2. Hartman et al. (2015b)            | 3. Hartman et al. (2015b)                 | 4. Hartman et al. (2015b)                 |
| HAT-P-52b | 2456581.8074 ± 0.0004   | 2.7535973 ± 0.0000013 | 1. Hartman et al. (2015b)                                                                           | 2. Mallonn et al. (2019b)            | 3. Hartman et al. (2015b)                 | 4. Hartman et al. (2015b)                 |
| HAT-P-53b | 2457502.7149 ± 0.0003   | 1.9616248 ± 0.0000004 | 1. Hartman et al. (2015b)                                                                           | 2. Hartman et al. (2015b)            | 3. Hartman et al. (2015b)                 | 4. Hartman et al. (2015b)                 |
| HAT-P-54b | 2458419.62257 ± 0.00019 | 3.7998534 ± 0.0000008 | 1. Bakos et al. (2015)                                                                             | 2. Bakos et al. (2015)               | 3. Bakos et al. (2015)                    | 4. Bakos et al. (2015)                    |
| HAT-P-55b | 2457720.3595 ± 0.0003   | 3.5852329 ± 0.0000012 | 1. Juncker et al. (2015)                                                                            | 2. Juncker et al. (2015)             | 3. Juncker et al. (2015)                  | 4. Juncker et al. (2015)                  |
| HAT-P-56b | 2457700.6456 ± 0.0004   | 2.7908235 ± 0.0000009 | 1. Huang et al. (2015)                                                                             | 2. Huang et al. (2015)               | 3. Huang et al. (2015)                    | 4. Huang et al. (2015)                    |
| Planet      | New $T_0$ (BJD$_{TDB}$) | New Period (days) | 1. References for literature data used | 2. Reference for the initial ephemeris | 3. Reference for the transit parameters used | 4. Reference for the stellar parameters used |
|------------|-------------------------|-----------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| HAT-P-57b  | 2457159.6765 ± 0.0006   | 2.4652946 ± 0.0000007 | 1. Hartman et al. (2015c) | 2. Hartman et al. (2015c) | 4. Hartman et al. (2015c) | 4. Hartman et al. (2015c) |
| HAT-P-65b  | 2457149.2808 ± 0.0004   | 2.6054485 ± 0.0000009 | 1. Hartman et al. (2016) | 2. Hartman et al. (2016) | 4. Hartman et al. (2016) | 4. Hartman et al. (2016) |
| HATS-1b    | 2457901.9514 ± 0.0004   | 3.4464553 ± 0.0000008 | 1. Penev et al. (2013) | 2. Penev et al. (2013) | 3. Penev et al. (2013) | 4. Penev et al. (2013) |
| HATS-4b    | 2457086.8394 ± 0.0003   | 2.5167278 ± 0.0000005 | 1. Jordán et al. (2014) | 2. Jordán et al. (2014) | 4. Jordán et al. (2014) | 4. Jordán et al. (2014) |
| HATS-5b    | 2456392.8762 ± 0.0003   | 3.673390 ± 0.0000003 | 1. Zhou et al. (2014) | 2. Zhou et al. (2014) | 3. Zhou et al. (2014) | 4. Zhou et al. (2014) |
| HATS-6b    | 2456660.36771 ± 0.00013 | 3.3252722 ± 0.00000025 | 1. Hartman et al. (2015a) | 2. Hartman et al. (2015a) | 3. Hartman et al. (2015a) | 4. Hartman et al. (2015a) |
| HATS-13b   | 2456824.32250 ± 0.00023 | 3.0440546 ± 0.0000007 | 1. Mancini et al. (2015b) | 2. Mancini et al. (2015b) | 4. Mancini et al. (2015b) | 4. Mancini et al. (2015b) |
| HATS-22b   | 2457768.11264 ± 0.00023 | 4.7228189 ± 0.00000012 | 1. Bento et al. (2017) | 2. Bento et al. (2017) | 3. Bento et al. (2017) | 4. Bento et al. (2017) |
| HATS-24b   | 2458237.2874 ± 0.0005   | 1.3484963 ± 0.0000007 | 1. Bento et al. (2017) | 2. Bento et al. (2017) | 3. Bento et al. (2017) | 4. Bento et al. (2017) |
| HATS-29b   | 2457851.8034 ± 0.0005   | 4.6058791 ± 0.0000024 | 1. Espinoza et al. (2016) | 2. Espinoza et al. (2016) | 3. Espinoza et al. (2016) | 4. Espinoza et al. (2016) |
| HATS-30b   | 2457912.20039 ± 0.00026 | 3.1743516 ± 0.0000007 | 1. Espinoza et al. (2016) | 2. Espinoza et al. (2016) | 3. Espinoza et al. (2016) | 4. Espinoza et al. (2016) |
| HATS-33b   | 2458090.7093 ± 0.0005   | 2.5495627 ± 0.0000011 | 1. de Val-Borro et al. (2016) | 2. de Val-Borro et al. (2016) | 4. de Val-Borro et al. (2016) | 4. de Val-Borro et al. (2016) |
| HATS-35b   | 2457899.5875 ± 0.0003   | 1.8210014 ± 0.0000006 | 1. de Val-Borro et al. (2016) | 2. de Val-Borro et al. (2016) | 3. de Val-Borro et al. (2016) | 4. de Val-Borro et al. (2016) |
| Planet     | New $T_0$ (BJD$_{TDB}$) | New Period (days) | 1. References for literature data used | 2. Reference for the initial ephemeris | 3. Reference for the transit parameters used | 4. Reference for the stellar parameters used |
|-----------|-------------------------|-------------------|----------------------------------------|---------------------------------------|-----------------------------------------------|-----------------------------------------------|
| HATS-43b  | 2458039.86444 ± 0.00022 | 4.3888499 ± 0.0000014 | 1. Brahm et al. (2018) | 2. Brahm et al. (2018) | 3. Brahm et al. (2018) | 4. Brahm et al. (2018) |
| HD189733b | 2454403.67711 ± 0.000025 | 2.21857519 ± 0.00000014 | 1. Hrudková et al. (2010), Agol et al. (2010), Baluev et al. (2015) | 2. Agol et al. (2010) | 3. Morello et al. (2014) | 4. Torres et al. (2008) |
| HD209458b | 2455015.49844 ± 0.00012 | 3.5247499 ± 0.0000003 | 1. Miller-Ricci et al. (2008), Deming et al. (2013) | 2. Knutson et al. (2007) | 3. Torres et al. (2008) | 4. Torres et al. (2008) |
| K2-25b    | 2457620.11054 ± 0.00008 | 3.4845627 ± 0.0000009 | 1. Kain et al. (2020), Mann et al. (2016) | 2. Mann et al. (2016) | 3. Mann et al. (2016) | 4. Mann et al. (2016) |
| K2-29b    | 2458508.0943 ± 0.0003   | 3.2588315 ± 0.0000009 | 1. Santerne et al. (2016) | 2. Santerne et al. (2016) | 4. Santerne et al. (2016) | 4. Santerne et al. (2016) |
| K2-30b    | 2457395.78391 ± 0.00013 | 4.0984791 ± 0.0000007 | 1. Johnson et al. (2016) | 2. Johnson et al. (2016) | 3. Johnson et al. (2016) | 4. Johnson et al. (2016) |
| K2-237b   | 2457861.43410 ± 0.00013 | 2.1805330 ± 0.0000007 | 1. Edwards et al. (2021), Soto et al. (2018) | 2. Soto et al. (2018) | 3. Soto et al. (2018) | 4. Soto et al. (2018) |
| K2- 260b  | 2457836.49912 ± 0.00010 | 2.6266974 ± 0.0000017 | 1. Johnson et al. (2018) | 2. Johnson et al. (2018) | 3. Johnson et al. (2018) | 4. Johnson et al. (2018) |
| KELT-1b   | 2456981.90516 ± 0.00014 | 1.21749399 ± 0.00000016 | 1. Beatty et al. (2019, 2020), Siverd et al. (2012), Beatty et al. (2014, 2017), Maciejewski et al. (2018) | 2. Beatty et al. (2019) | 3. Beatty et al. (2019) | 4. Siverd et al. (2012) |
| KELT-3b   | 2456666.8880 ± 0.0004   | 2.7033878 ± 0.00000010 | 1. Pepper et al. (2013) | 2. Mallon et al. (2019b) | 3. Pepper et al. (2013) | 4. Pepper et al. (2013) |
| KELT-7b   | 2458343.40408 ± 0.00010 | 2.7347657 ± 0.0000004 | 1. Bieryla et al. (2015), Pluriel et al. (2020), Garhart et al. (2020) | 2. Bieryla et al. (2015) | 3. Bieryla et al. (2015) | 4. Bieryla et al. (2015) |
| KELT-15b  | 2458564.05392 ± 0.00020 | 3.329475 ± 0.0000004 | 1. Edwards et al. (2021), Rodriguez et al. (2016) | 2. Rodriguez et al. (2016) | 3. Rodriguez et al. (2016) | 4. Rodriguez et al. (2016) |
| KELT-16b  | 2458136.78366 ± 0.00011 | 0.96899328 ± 0.00000019 | 1. Oberst et al. (2017), Maciejewski et al. (2018), Patra et al. (2020) | 2. Oberst et al. (2017) | 3. Oberst et al. (2017) | 4. Oberst et al. (2017) |
| Planet          | New $T_0$ (BJD$_{TDB}$) | New Period (days) | 1. References for literature data used | 2. Reference for the initial ephemeris | 3. Reference for the transit parameters used | 4. Reference for the stellar parameters used |
|-----------------|--------------------------|------------------|----------------------------------------|----------------------------------------|-------------------------------------------|---------------------------------------------|
| KELT-18b        | 2457838.3101 ± 0.0004    | 2.8717023 ± 0.0000019 | 1. McLeod et al. (2017) | 2. McLeod et al. (2017) | 3. McLeod et al. (2017) | 4. McLeod et al. (2017) |
| Kepler-6b       | 2455006.24253 ± 0.00008  | 3.2346990 ± 0.0000009 | 1. Dunham et al. (2010), Kipping & Bakos (2011a) | 2. Holczer et al. (2016) | 3. Esteves et al. (2015) | 4. Dunham et al. (2010) |
| Kepler-12b      | 2455004.009119 ± 0.000020 | 4.379654 ± 0.0000011 | 1. Fortney et al. (2011) | 2. Holczer et al. (2016) | 3. Esteves et al. (2015) | 4. Fortney et al. (2011) |
| Kepler-447b     | 2454970.26082 ± 0.00011  | 7.794303 ± 0.0000003 | 1. Holczer et al. (2016) | 2. Holczer et al. (2016) | 3. Lillo-Box et al. (2015) | 4. Lillo-Box et al. (2015) |
| Kepler-854b     | 2454966.985381 ± 0.000010 | 2.1446334 ± 0.0000007 | 1. Morton et al. (2016) | 2. Gajdoš et al. (2019) | 3. Morton et al. (2016) | 4. Morton et al. (2016) |
| KPS-1b          | 2458678.90907 ± 0.00026  | 1.7063241 ± 0.00000015 | 1. Burdanov et al. (2018) | 2. Burdanov et al. (2018) | 3. Burdanov et al. (2018) | 4. Burdanov et al. (2018) |
| Qatar-1b        | 2457026.47712 ± 0.00005  | 1.42002461 ± 0.00000007 | 1. von Essen et al. (2013), Püsküllü et al. (2017), Alsubai et al. (2011), Covino et al. (2013), Maciejewski et al. (2015), Collins et al. (2017) | 2. Collins et al. (2017) | 3. Collins et al. (2017) | 4. Alsubai et al. (2011) |
| Qatar-2b        | 2457173.98591 ± 0.00003  | 1.33711716 ± 0.00000012 | 1. Dai et al. (2017), Mancini et al. (2014a), Bryan et al. (2012) | 2. Močnik et al. (2017b) | 3. Močnik et al. (2017b) | 4. Bryan et al. (2012) |
| Qatar-4b        | 2458767.93317 ± 0.00014  | 1.8053646 ± 0.00000006 | 1. Alsubai et al. (2017), Mallonn et al. (2019b) | 2. Mallonn et al. (2019b) | 3. Alsubai et al. (2017) | 4. Alsubai et al. (2017) |
| Qatar-5b        | 2457489.36120 ± 0.00017  | 2.8793002 ± 0.00000010 | 1. Alsubai et al. (2017), Mallonn et al. (2019b) | 2. Mallonn et al. (2019b) | 3. Alsubai et al. (2017) | 4. Alsubai et al. (2017) |
| TrES-1b         | 2454110.97865 ± 0.00006  | 3.03007008 ± 0.000000010 | 1. Alonso et al. (2004), Charbonneau et al. (2005), Cubillos et al. (2013), Winn et al. (2007a), Narita et al. (2007), Raetz et al. (2009a), Rabus et al. (2009) | 2. Sada et al. (2012) | 3. Torres et al. (2008) | 4. Torres et al. (2008) |
| TrES-2b         | 2455148.47118 ± 0.00003  | 2.4706373 ± 0.000000009 | 1. Oztürk & Erdem (2019), Christiansen et al. (2011), O’Donovan et al. (2006), Turner et al. (2016), Raetz et al. (2009b, 2014), Holman et al. (2007), Mislis et al. (2010), Kipping & Bakos (2011b) | 2. Holczer et al. (2016) | 3. Esteves et al. (2015) | 4. Torres et al. (2008) |
| Planet   | New $T_0$ (BJD$_{TDB}$) | New Period (days) | References for literature data used |
|----------|-------------------------|-------------------|-----------------------------------|
| TrES-3b  | 2457536.279521 ± 0.000018 | 1.30618639 ± 0.00000003 | 1. O’Donovan et al. (2007), Sozzetti et al. (2009), Gibson et al. (2009), Colón et al. (2010), Christiansen et al. (2011), Turner et al. (2013), Kundurthy et al. (2013), Stefansson et al. (2017), Fiskalü et al. (2017), Mannay et al. (2020), Parviainen et al. (2016) |
|          |                         |                   | 2. Reference for the initial ephemeris |
|          |                         |                   | 3. Reference for the transit parameters used |
|          |                         |                   | 4. Reference for the stellar parameters used |
| TrES-4b  | 2455364.6085 ± 0.00003  | 3.5559266 ± 0.00000008 | 1. Mandushev et al. (2007), Sozzetti et al. (2009), Chan et al. (2011) |
|          |                         |                   | 2. Sozzetti et al. (2015) |
|          |                         |                   | 3. Sozzetti et al. (2015) |
|          |                         |                   | 4. Torres et al. (2008) |
| TrES-5b  | 2456833.6008 ± 0.00006  | 1.48224718 ± 0.00000009 | 1. Mandushev et al. (2011), Mislis et al. (2015), Sokov et al. (2018) |
|          |                         |                   | 2. Maciejewski et al. (2016b) |
|          |                         |                   | 3. Maciejewski et al. (2016b) |
|          |                         |                   | 4. Mandushev et al. (2011) |
| WASP-1b  | 2455215.32701 ± 0.00015 | 2.51994713 ± 0.00000026 | 1. Shporer et al. (2007), Collier Cameron et al. (2007), Turner et al. (2016), Charbonneau et al. (2007), Simpson et al. (2011a), Albrecht et al. (2011), Granata et al. (2014) |
|          |                         |                   | 2. Maciejewski et al. (2014) |
|          |                         |                   | 3. Maciejewski et al. (2014) |
|          |                         |                   | 4. Torres et al. (2008) |
| WASP-2b  | 2455097.75755 ± 0.00007 | 2.15222231 ± 0.00000015 | 1. Charbonneau et al. (2007), Southworth et al. (2010), Becker et al. (2013), Addison et al. (2019) |
|          |                         |                   | 2. Sada et al. (2012) |
|          |                         |                   | 3. Southworth et al. (2010) |
|          |                         |                   | 4. Torres et al. (2008) |
| WASP-3b  | 2455554.83317 ± 0.00007 | 1.84683511 ± 0.00000013 | 1. Nascimbeni et al. (2013), Pollacco et al. (2008), Christiansen et al. (2011), Gibson et al. (2008), Tripathi et al. (2010), Sada et al. (2012), Maciejewski et al. (2010, 2013b), Montalto et al. (2012), Eibe et al. (2012), Baluеv et al. (2019) |
|          |                         |                   | 2. Christiansen et al. (2011) |
|          |                         |                   | 3. Christiansen et al. (2011) |
|          |                         |                   | 4. Pollacco et al. (2008) |
| WASP-4b  | 2455880.79492 ± 0.00003 | 1.33823144 ± 0.00000003 | 1. Wilson et al. (2008), Winn et al. (2009a), Southworth et al. (2009a, 2019), Sanchis-Ojeda et al. (2011), Hoyer et al. (2013), Gillon et al. (2009b), Dragomir et al. (2011), Huitson et al. (2017) |
|          |                         |                   | 2. Southworth et al. (2019) |
|          |                         |                   | 3. Bouma et al. (2019) |
|          |                         |                   | 4. Wilson et al. (2008) |
| WASP-5b  | 2455017.22682 ± 0.00007 | 1.62843033 ± 0.00000011 | 1. Anderson et al. (2008), Southworth et al. (2009b), Fukui et al. (2011), Gillon et al. (2009b), Triaud et al. (2010), Hoyer et al. (2012), Dragomir et al. (2011), Moyano et al. (2017) |
|          |                         |                   | 2. Hoyer et al. (2012) |
|          |                         |                   | 3. Fukui et al. (2011) |
|          |                         |                   | 4. Anderson et al. (2008) |
| WASP-6b  | 2455591.28967 ± 0.00007 | 3.36100207 ± 0.00000021 | 1. Bouma et al. (2019), Kammer et al. (2015), Nikolov et al. (2015), Tregloan-Reed et al. (2015), Dragomir et al. (2011), Gillon et al. (2009a), Baluev et al. (2019) |
|          |                         |                   | 2. Tregloan-Reed et al. (2015) |
|          |                         |                   | 3. Gillon et al. (2009a) |
|          |                         |                   | 4. Gillon et al. (2009a) |
| Planet   | New $T_\circ$ (BJD$_{TDB}$) | New Period (days) | References for literature data used |
|----------|-----------------------------|-------------------|-------------------------------------|
| WASP-10b | 2455638.24761 ± 0.00004     | 3.09272826 ± 0.00000010 | 1. Barros et al. (2013), Dittmann et al. (2010), Christian et al. (2009), Maciejewski et al. (2011a, 2011c), Krejčová & Budaj (2010), Sada & Ramón-Fox (2016) 2. Sada & Ramón-Fox (2016) 3. Johnson et al. (2009b) 4. Christian et al. (2009) |
| WASP-11b | 2456200.28683 ± 0.00009     | 3.7224790 ± 0.00000003 | 1. West et al. (2009a), Wang et al. (2014), Sada et al. (2012), Mancini et al. (2015a) 2. Mancini et al. (2015a) 3. Wang et al. (2014) 4. West et al. (2009a) |
| WASP-12b | 2456594.68160 ± 0.00004     | 1.09141964 ± 0.00000004 | 1. Öztürk & Erdem (2019), Maciejewski et al. (2011b, 2013a, 2016a, 2018), Collins et al. (2017), Hebb et al. (2009), Haswell et al. (2012), Sing et al. (2013), Chan et al. (2011), Stevenson et al. (2014), Kreidberg et al. (2015), Patra et al. (2017), Yee et al. (2020) 2. Collins et al. (2017) 3. Collins et al. (2017) 4. Hebb et al. (2009) |
| WASP-14b | 2455643.79792 ± 0.00011     | 2.24376628 ± 0.000000024 | 1. Joshi et al. (2009), Johnson et al. (2009a), Blecic et al. (2013), Raetz et al. (2015), Wong et al. (2015) 2. Wong et al. (2015) 3. Wong et al. (2015) 4. Joshi et al. (2009) |
| WASP-15b | 2455890.4286 ± 0.0003       | 3.7520987 ± 0.00000016  | 1. West et al. (2009b), Southworth et al. (2013) 2. Southworth et al. (2013) 3. Southworth et al. (2013) 4. West et al. (2009b) |
| WASP-16b | 2455732.07584 ± 0.00022     | 3.1186037 ± 0.00000007  | 1. Southworth et al. (2013), Lister et al. (2009) 2. Southworth et al. (2013) 3. Southworth et al. (2013) 4. Lister et al. (2009) |
| WASP-18b | 2455562.11007 ± 0.00007     | 0.94145254 ± 0.00000008 | 1. Maxted et al. (2013b), Wilkins et al. (2017), Hellier et al. (2009) 2. Triaud et al. (2010) 3. Shporer et al. (2019) 4. Hellier et al. (2009) |
| WASP-19b | 2456688.273095 ± 0.000023   | 0.788839195 ± 0.000000019 | 1. Hebb et al. (2010), Tregloan-Reed et al. (2013), Lendl et al. (2013), Mancini et al. (2013a), Huitson et al. (2013), Sedaghati et al. (2015), Espinoza et al. (2019), Bean et al. (2013), Petrucci et al. (2020) 2. Wong et al. (2016) 3. Wong et al. (2016) 4. Hebb et al. (2010) |
| WASP-20b | 2456367.3093 ± 0.0004       | 4.8996461 ± 0.00000016  | 1. Anderson et al. (2015a) 2. Anderson et al. (2015a) 3. Evans et al. (2016) 4. Anderson et al. (2015a) |
| WASP-21b | 2457660.73516 ± 0.00016     | 4.3225038 ± 0.00000008  | 1. Bouchy et al. (2010), Seeliger et al. (2015), Ciceri et al. (2013), Chen et al. (2020), Alderson et al. (2020) 2. Seeliger et al. (2015) 3. Bouchy et al. (2010) 4. Bouchy et al. (2010) |
| Planet   | New $T_0$ (BJD\textsubscript{TDB}) | New Period (days) | 1. References for literature data used | 2. Reference for the initial ephemeris | 3. Reference for the transit parameters used | 4. Reference for the stellar parameters used |
|----------|-----------------------------------|------------------|---------------------------------------|----------------------------------------|------------------------------------------|------------------------------------------|
| WASP-23b | 2456333.00703 ± 0.00008           | 2.9442732 ± 0.0000022 | 1. Triaud et al. (2011), Nikolov et al. (2013) | 2. Triaud et al. (2011) | 3. Triaud et al. (2011) | 4. Triaud et al. (2011) |
| WASP-24b | 2455402.12744 ± 0.00015           | 2.3412202 ± 0.0000003 | 1. Street et al. (2010), Turner et al. (2017) | 2. Southworth et al. (2014) | 3. Southworth et al. (2014) | 4. Street et al. (2010) |
| WASP-25b | 2456396.9176 ± 0.00004            | 3.7648334 ± 0.0000009 | 1. Enoch et al. (2011b) | 2. Southworth et al. (2014) | 3. Southworth et al. (2014) | 4. Enoch et al. (2011b) |
| WASP-26b | 2456631.49797 ± 0.00023           | 2.7565963 ± 0.0000006 | 1. Smalley et al. (2010), Southworth et al. (2014) | 2. Southworth et al. (2014) | 3. Southworth et al. (2014) | 4. Smalley et al. (2010) |
| WASP-28b | 2457683.40894 ± 0.00003           | 3.4088353 ± 0.0000003 | 1. Močnik et al. (2020), Anderson et al. (2015a), Maciejewski et al. (2016b), Petrucci et al. (2015) | 2. Maciejewski et al. (2016b) | 3. Maciejewski et al. (2016b) | 4. Anderson et al. (2015a) |
| WASP-29b | 2456347.98683 ± 0.00014           | 3.9227124 ± 0.0000004 | 1. Hellier et al. (2010), Dragomir et al. (2011), Gibson et al. (2013b) | 2. Hellier et al. (2010) | 3. Gibson et al. (2013b) | 4. Hellier et al. (2010) |
| WASP-31b | 2456183.80208 ± 0.00020           | 3.4058841 ± 0.0000008 | 1. Sing et al. (2015), Anderson et al. (2011b), Dragomir et al. (2011) | 2. Anderson et al. (2011b) | 3. Anderson et al. (2011b) | 4. Anderson et al. (2011b) |
| WASP-32b | 2456893.71806 ± 0.00017           | 2.7186631 ± 0.0000004 | 1. Sada et al. (2012), Maxted et al. (2010), Sun et al. (2015) | 2. Sada et al. (2012) | 3. Maxted et al. (2010) | 4. Maxted et al. (2010) |
| WASP-35b | 2455932.99920 ± 0.00015           | 3.1615699 ± 0.0000004 | 1. Enoch et al. (2011a) | 2. Enoch et al. (2011a) | 3. Enoch et al. (2011a) | 4. Enoch et al. (2011a) |
| WASP-36b | 2456526.07935 ± 0.00006           | 1.5373654 ± 0.00000011 | 1. Mancini et al. (2016b), Turner et al. (2016), Smith et al. (2012), Wong et al. (2020) | 2. Mancini et al. (2016b) | 3. Mancini et al. (2016b) | 4. Smith et al. (2012) |
| WASP-37b | 2457524.4596 ± 0.0003             | 3.5774793 ± 0.0000008 | 1. Mallonn et al. (2019b), Simpson et al. (2011b) | 2. Mallonn et al. (2019b) | 3. Simpson et al. (2011b) | 4. Simpson et al. (2011b) |
| WASP-43b | 2456047.051715 ± 0.000022         | 0.81347414 ± 0.00000003 | 1. Hellier et al. (2011), Hoyer et al. (2016), Gillon et al. (2012), Murgas et al. (2014), Chen et al. (2014), Jiang et al. (2016), Esposito et al. (2017), Sun et al. (2018) | 2. Hoyer et al. (2016) | 3. Hoyer et al. (2016) | 4. Hellier et al. (2011) |
### Table 2 (Continued)

| Planet | New $T_0$ (BJD$_{TDB}$) | New Period (days) | References for literature data used | Reference for the initial ephemeris | Reference for the transit parameters used | Reference for the stellar parameters used |
|--------|-------------------------|-------------------|-------------------------------------|-------------------------------------|----------------------------------------|----------------------------------------|
| WASP-44b | 2456006.39613 ± 0.00009 | 2.4238107 ± 0.000003 | 1. Anderson et al. (2012), Turner et al. (2016), Mancini et al. (2013b), Moyano et al. (2017), Addison et al. (2019) | 2. Anderson et al. (2012) | 3. Anderson et al. (2012) | 4. Anderson et al. (2012) |
| WASP-45b | 2458254.7392 ± 0.0003 | 3.1260777 ± 0.0000008 | 1. Addison et al. (2019), Anderson et al. (2012), Edwards et al. (2021) | 2. Ciceri et al. (2016) | 3. Ciceri et al. (2016) | 4. Anderson et al. (2012) |
| WASP-46b | 2456842.71410 ± 0.00017 | 1.43037222 ± 0.00000023 | 1. Anderson et al. (2012), Petrucci et al. (2018), Moyano et al. (2017) | 2. Ciceri et al. (2016) | 3. Ciceri et al. (2016) | 4. Anderson et al. (2012) |
| WASP-47b | 2456354.9460 ± 0.0003 | 4.1591496 ± 0.0000010 | 1. Hellier et al. (2012) | 2. Vanderburg et al. (2017) | 3. Vanderburg et al. (2017) | 4. Hellier et al. (2012) |
| WASP-48b | 2456176.98991 ± 0.00012 | 2.1436364 ± 0.0000003 | 1. Clark et al. (2018), Murgas et al. (2017), Turner et al. (2016), Enoch et al. (2011a), Ciceri et al. (2015) | 2. Ciceri et al. (2015) | 3. Ciceri et al. (2015) | 4. Enoch et al. (2011a) |
| WASP-49b | 2456198.14045 ± 0.00014 | 2.7817366 ± 0.0000005 | 1. Lendl et al. (2012, 2016) | 2. Wytenbach et al. (2017) | 3. Wytenbach et al. (2017) | 4. Lendl et al. (2012) |
| WASP-50b | 2457701.39451 ± 0.00023 | 1.9550928 ± 0.0000003 | 1. Gillon et al. (2011) | 2. Tregloan-Reed & Southworth (2013) | 3. Gillon et al. (2011) | 4. Gillon et al. (2011) |
| WASP-52b | 2456770.05972 ± 0.00004 | 1.74978119 ± 0.00000010 | 1. Öztürk & Erdem (2019), Bruno et al. (2018b), Chen et al. (2017), Louden et al. (2017), Mancini et al. (2017), Kirk et al. (2016), Hébrard et al. (2013), Baluev et al. (2015, 2019), Zellem et al. (2020) | 2. Öztürk & Erdem (2019) | 3. Hébrard et al. (2013) | 4. Hébrard et al. (2013) |
| WASP-53b | 2456284.48161 ± 0.00015 | 3.3098436 ± 0.0000005 | 1. Triaud et al. (2017) | 2. Triaud et al. (2017) | 3. Triaud et al. (2017) | 4. Triaud et al. (2017) |
| WASP-55b | 2456720.37845 ± 0.00010 | 4.4656299 ± 0.0000008 | 1. Southworth et al. (2016) | 2. Southworth et al. (2016) | 3. Southworth et al. (2016) | 4. Hellier et al. (2012) |
| WASP-56b | 2455841.60939 ± 0.00023 | 4.6170654 ± 0.0000021 | 1. Faedi et al. (2013) | 2. Faedi et al. (2013) | 3. Faedi et al. (2013) | 4. Faedi et al. (2013) |
Table 2 (Continued)

| Planet       | New $T_0$ (BJD$_{TDB}$) | New Period (days) | 1. References for literature data used | 2. Reference for the initial ephemeris | 3. Reference for the transit parameters used | 4. Reference for the stellar parameters used |
|--------------|--------------------------|-------------------|---------------------------------------|---------------------------------------|---------------------------------------------|---------------------------------------------|
| WASP-57b     | 2456433.28630 ± 0.00010  | 2.8389180 ± 0.0000006 | 1. Southworth et al. (2015a)          | 2. Southworth et al. (2015a)           | 3. Southworth et al. (2015a)                | 4. Faedi et al. (2013)                          |
| WASP-58b     | 2457692.5406 ± 0.0004    | 5.0172137 ± 0.0000016 | 1. Hébrard et al. (2013)              | 2. Mallonn et al. (2019b)             | 3. Hébrard et al. (2013)                    | 4. Hébrard et al. (2013)                          |
| WASP-60b     | 2458902.6003 ± 0.0006    | 4.305007 ± 0.000003   | 1. Hébrard et al. (2013)              | 2. Hébrard et al. (2013)              | 3. Hébrard et al. (2013)                    | 4. Hébrard et al. (2013)                          |
| WASP-61b     | 2456152.5714 ± 0.00023   | 3.8558980 ± 0.0000010 | 1. Brown et al. (2017), Hellier et al. (2012) | 2. Hellier et al. (2012)              | 3. Hellier et al. (2012)                    | 4. Hellier et al. (2012)                          |
| WASP-62b     | 2458427.55327 ± 0.00004  | 4.4119395 ± 0.0000004 | 1. Hellier et al. (2012), Brown et al. (2017), Skaf et al. (2020) | 2. Hellier et al. (2012)              | 3. Hellier et al. (2012)                    | 4. Hellier et al. (2012)                          |
| WASP-64b     | 2456444.76501 ± 0.00012  | 1.57329025 ± 0.00000015 | 1. Kozłowski et al. (2017), Gillon et al. (2013) | 2. Gillon et al. (2013)              | 3. Gillon et al. (2013)                    | 4. Gillon et al. (2013)                          |
| WASP-65b     | 2456912.75129 ± 0.00019  | 2.3114217 ± 0.00000004 | 1. Gómez Maqueo Chew et al. (2013)    | 2. Gómez Maqueo Chew et al. (2013)    | 3. Gómez Maqueo Chew et al. (2013)          | 4. Gómez Maqueo Chew et al. (2013)              |
| WASP-67b     | 2456618.05370 ± 0.00008  | 4.6144166 ± 0.00000004 | 1. Hellier et al. (2012), Mancini et al. (2014b), Bruno et al. (2018a) | 2. Hellier et al. (2012)              | 3. Hellier et al. (2012)                    | 4. Hellier et al. (2012)                          |
| WASP-69b     | 2457176.17789 ± 0.00017  | 3.8681390 ± 0.00000006 | 1. Anderson et al. (2014), Murgas et al. (2020), Tsiaras et al. (2018) | 2. Anderson et al. (2014)              | 3. Anderson et al. (2014)                    | 4. Anderson et al. (2014)                          |
| WASP-70Ab    | 2456319.4479 ± 0.0004    | 3.7130169 ± 0.00000012 | 1. Anderson et al. (2014)              | 2. Anderson et al. (2014)              | 3. Anderson et al. (2014)                    | 4. Anderson et al. (2014)                          |
| WASP-74b     | 2457205.93774 ± 0.00010  | 2.1377516 ± 0.00000006 | 1. Hellier et al. (2015), Mancini et al. (2019) | 2. Hellier et al. (2015)              | 3. Hellier et al. (2015)                    | 4. Hellier et al. (2015)                          |
| WASP-75b     | 2457340.3450 ± 0.0003    | 2.4841987 ± 0.00000006 | 1. Gómez Maqueo Chew et al. (2013)    | 2. Gómez Maqueo Chew et al. (2013)    | 3. Gómez Maqueo Chew et al. (2013)          | 4. Gómez Maqueo Chew et al. (2013)              |
| WASP-76b     | 2457273.4191 ± 0.0005    | 1.8098806 ± 0.00000007 | 1. West et al. (2016)                 | 2. West et al. (2016)                 | 3. West et al. (2016)                        | 4. West et al. (2016)                            |
## Table 2

(Continued)

| Planet      | New $T_0$ (BJDTDB) | New Period (days) | 1. References for literature data used | 2. Reference for the initial ephemeris | 3. Reference for the transit parameters used | 4. Reference for the stellar parameters used |
|-------------|--------------------|-------------------|---------------------------------------|---------------------------------------|---------------------------------------------|---------------------------------------------|
| WASP-77Ab   | 2456663.34757 ± 0.00012 | 1.36002922 ± 0.00000013 | 1. Maxted et al. (2013a), Turner et al. (2016), Cortés-Zuleta et al. (2020) | 2. Maxted et al. (2013a) | 3. Maxted et al. (2013a) | 4. Maxted et al. (2013a) |
| WASP-78b    | 2456922.0975 ± 0.0003 | 2.1751852 ± 0.0000005 | 1. Brown et al. (2017), Smalley et al. (2012), Wong et al. (2020) | 2. Smalley et al. (2012) | 3. Smalley et al. (2012) | 4. Smalley et al. (2012) |
| WASP-79b    | 2458200.47327 ± 0.000018 | 3.6623925 ± 0.00000021 | 1. Skaf et al. (2020), Smalley et al. (2012) | 2. Smalley et al. (2012) | 3. Smalley et al. (2012) | 4. Smalley et al. (2012) |
| WASP-80b    | 2456671.49615 ± 0.00004 | 3.06785271 ± 0.00000019 | 1. Triaud et al. (2013), Mancini et al. (2014c), Fukui et al. (2014), Turner et al. (2017), Kirk et al. (2018) | 2. Triaud et al. (2015) | 3. Triaud et al. (2015) | 4. Triaud et al. (2013) |
| WASP-81b    | 2456969.77318 ± 0.000020 | 2.7164835 ± 0.0000004 | 1. Triaud et al. (2017) | 2. Triaud et al. (2017) | 3. Triaud et al. (2017) | 4. Triaud et al. (2017) |
| WASP-83b    | 2457121.9961 ± 0.0003 | 4.9712917 ± 0.00000012 | 1. Hellier et al. (2015), Edwards et al. (2021) | 2. Hellier et al. (2015) | 3. Hellier et al. (2015) | 4. Hellier et al. (2015) |
| WASP-84b    | 2456422.48255 ± 0.00014 | 8.523499 ± 0.0000004 | 1. Anderson et al. (2014, 2015b) | 2. Anderson et al. (2014) | 3. Anderson et al. (2014) | 4. Anderson et al. (2014) |
| WASP-85Ab   | 2456847.472867 ± 0.000010 | 2.6556765 ± 0.0000004 | 1. Stefansson et al. (2017); Brown et al. (2014) | 2. Močnik et al. (2016b) | 3. Brown et al. (2014) | 4. Brown et al. (2014) |
| WASP-88b    | 2458005.5181 ± 0.0006 | 4.9540021 ± 0.00000022 | 1. Delrez et al. (2014) | 2. Delrez et al. (2014) | 3. Delrez et al. (2014) | 4. Delrez et al. (2014) |
| WASP-89b    | 2456398.33771 ± 0.00012 | 3.3564182 ± 0.0000005 | 1. Hellier et al. (2015) | 2. Hellier et al. (2015) | 3. Hellier et al. (2015) | 4. Hellier et al. (2015) |
| WASP-90b    | 2457003.1520 ± 0.0004 | 3.9162624 ± 0.00000013 | 1. West et al. (2016) | 2. West et al. (2016) | 3. West et al. (2016) | 4. West et al. (2016) |
| WASP-92b    | 2457627.3719 ± 0.0003 | 2.1746733 ± 0.0000006 | 1. Hay et al. (2016) | 2. Hay et al. (2016) | 3. Hay et al. (2016) | 4. Hay et al. (2016) |
| Planet     | New $T_0$ (BJD$_{TDB}$) | New Period (days) | 1. References for literature data used | 2. Reference for the initial ephemeris | 3. Reference for the transit parameters used | 4. Reference for the stellar parameters used |
|------------|-------------------------|-------------------|----------------------------------------|--------------------------------------|---------------------------------------------|---------------------------------------------|
| WASP-93b   | 2457492.2860 ± 0.0003    | 2.7325358 ± 0.00000007 | 1. Hay et al. (2016)                | 2. Hay et al. (2016)                | 3. Hay et al. (2016)                | 4. Hay et al. (2016)                |
| WASP-95b   | 2456607.17355 ± 0.00023   | 2.1846688 ± 0.00000006 | 1. Hellier et al. (2014)            | 2. Hellier et al. (2014)            | 3. Hellier et al. (2014)            | 4. Hellier et al. (2014)            |
| WASP-96b   | 2457128.07797 ± 0.00022   | 3.4252565 ± 0.00000008 | 1. Nikolov et al. (2018), Hellier et al. (2014) | 2. Hellier et al. (2014)            | 3. Hellier et al. (2014)            | 4. Hellier et al. (2014)            |
| WASP-97b   | 2457186.45400 ± 0.00015   | 2.0727600 ± 0.00000003 | 1. Hellier et al. (2014)            | 2. Hellier et al. (2014)            | 3. Hellier et al. (2014)            | 4. Hellier et al. (2014)            |
| WASP-98b   | 2456840.00365 ± 0.00008   | 2.9626415 ± 0.00000004 | 1. Hellier et al. (2014), Mancini et al. (2016a), Kozłowski et al. (2017) | 2. Hellier et al. (2014)            | 3. Mancini et al. (2016a)            | 4. Hellier et al. (2014)            |
| WASP-100b  | 2458500.55730 ± 0.00012   | 2.8493830 ± 0.00000021 | 1. Hellier et al. (2014), Wong et al. (2020) | 2. Hellier et al. (2014)            | 3. Hellier et al. (2014)            | 4. Hellier et al. (2014)            |
| WASP-101b  | 2456297.36537 ± 0.00019   | 3.5857072 ± 0.00000012 | 1. Hellier et al. (2014)            | 2. Hellier et al. (2014)            | 3. Hellier et al. (2014)            | 4. Hellier et al. (2014)            |
| WASP-103b  | 2457132.47094 ± 0.00004   | 0.9255454 ± 0.00000008 | 1. Delrez et al. (2018), Gillon et al. (2014), Turner et al. (2017), Southworth et al. (2015b), Maciejewski et al. (2018), Lendl et al. (2017), Patra et al. (2020) | 2. Southworth et al. (2015b)        | 3. Southworth & Evans (2016)         | 4. Gillon et al. (2014)             |
| WASP-104b  | 2457048.59061 ± 0.00016   | 1.7554060 ± 0.00000003 | 1. Smith et al. (2014)              | 2. Smith et al. (2014)              | 3. Smith et al. (2014)              | 4. Smith et al. (2014)              |
| WASP-107b  | 2456680.3346 ± 0.00003    | 5.721488 ± 0.00000003 | 1. Anderson et al. (2017)           | 2. Mońnik et al. (2017a)            | 3. Mońnik et al. (2017a)            | 4. Anderson et al. (2017)           |
| WASP-113b  | 2457201.64037 ± 0.00004   | 4.542170 ± 0.00000003 | 1. Barros et al. (2016)             | 2. Barros et al. (2016)             | 3. Barros et al. (2016)             | 4. Barros et al. (2016)             |
| WASP-114b  | 2457242.33222 ± 0.00020   | 1.5487752 ± 0.00000003 | 1. Barros et al. (2016), Patra et al. (2020) | 2. Barros et al. (2016)             | 3. Barros et al. (2016)             | 4. Barros et al. (2016)             |
Table 2
(Continued)

| Planet  | New $T_0$ (BJD$_{TDB}$) | New Period (days) | 1. References for literature data used | 2. Reference for the initial ephemeris | 3. Reference for the transit parameters used | 4. Reference for the stellar parameters used |
|---------|-------------------------|-------------------|----------------------------------------|----------------------------------------|----------------------------------------|----------------------------------------|
| WASP-119b | 2458924.8626 ± 0.0004 | 2.4998045 ± 0.0000017 | 1. Maciejewski (2020) | 2. Maxted et al. (2016) | 3. Maxted et al. (2016) | 4. Maxted et al. (2016) |
| WASP-121b | 2457404.48798 ± 0.00006 | 1.27492477 ± 0.00000012 | 1. Tsiaras et al. (2018), Delrez et al. (2016), Evans et al. (2018), Bourrier et al. (2020) | 2. Delrez et al. (2016) | 3. Delrez et al. (2016) | 3. Delrez et al. (2016) |
| WASP-124b | 2457173.60811 ± 0.00012 | 3.3726492 ± 0.0000008 | 1. Maxted et al. (2016) | 2. Maxted et al. (2016) | 3. Maxted et al. (2016) | 4. Maxted et al. (2016) |
| WASP-126b | 2457758.5601 ± 0.0006 | 3.2887885 ± 0.00000018 | 1. Maxted et al. (2016) | 2. Maxted et al. (2016) | 3. Maxted et al. (2016) | 4. Maxted et al. (2016) |
| WASP-132b | 2457732.5679 ± 0.0003 | 7.1335135 ± 0.00000018 | 1. Hellier et al. (2017) | 2. Hellier et al. (2017) | 3. Hellier et al. (2017) | 4. Hellier et al. (2017) |
| WASP-133b | 2457262.80855 ± 0.00019 | 2.1764231 ± 0.00000008 | 1. Maxted et al. (2016) | 2. Maxted et al. (2016) | 3. Maxted et al. (2016) | 4. Maxted et al. (2016) |
| WASP-135b | 2458606.9117 ± 0.0003 | 1.4013788 ± 0.00000004 | 1. Spake et al. (2016) | 2. Spake et al. (2016) | 3. Spake et al. (2016) | 4. Spake et al. (2016) |
| WASP-140b | 2457205.26576 ± 0.00022 | 2.2359838 ± 0.00000007 | 1. Hellier et al. (2017) | 2. Hellier et al. (2017) | 3. Hellier et al. (2017) | 4. Hellier et al. (2017) |
| WASP-153b | 2458018.1510 ± 0.0007 | 3.3326099 ± 0.00000020 | 1. Demangeon et al. (2018) | 2. Demangeon et al. (2018) | 3. Demangeon et al. (2018) | 4. Demangeon et al. (2018) |
| WASP-157b | 2457265.70719 ± 0.00009 | 3.951605 ± 0.0000003 | 1. Močnik et al. (2016a) | 2. Močnik et al. (2016a) | 3. Močnik et al. (2016a) | 4. Močnik et al. (2016a) |
| WASP-164b | 2457747.6583 ± 0.0003 | 1.7771363 ± 0.00000006 | 1. Lendl et al. (2019) | 2. Lendl et al. (2019) | 3. Lendl et al. (2019) | 4. Lendl et al. (2019) |
| WASP-167b | 2456717.82564 ± 0.00019 | 2.0219570 ± 0.00000007 | 1. Temple et al. (2017) | 2. Temple et al. (2017) | 3. Temple et al. (2017) | 4. Temple et al. (2017) |
Table 2 (Continued)

| Planet     | New $T_0$ (BJD(TDB)) | New Period (days) | 1. References for literature data used |
|------------|----------------------|-------------------|----------------------------------------|
| XO-1b      | 2455385.51978 ± 0.00005 | 3.94150500 ± 0.00000018 | 1. Holman et al. (2006), Burke et al. (2010), Wilson et al. (2006), Raetz et al. (2009a), McCullough et al. (2006), Cáceres et al. (2009), Deming et al. (2013), Southworth et al. (2018) |
|            |                      |                   | 2. Reference for the initial ephemeris |
|            |                      |                   | 3. Reference for the transit parameters used |
|            |                      |                   | 4. Reference for the stellar parameters used |
| XO-2Nb     | 2456923.17711 ± 0.00015 | 2.61585978 ± 0.00000019 | 1. Burke et al. (2007) |
|            |                      |                   | 2. Damasso et al. (2015) |
|            |                      |                   | 3. Damasso et al. (2015) |
|            |                      |                   | 4. Torres et al. (2008) |
| XO-3b      | 2455024.34346 ± 0.00013 | 3.1915250 ± 0.0000003 | 1. Johns-Knall et al. (2008), Turner et al. (2017), Garal et al. (2017), Winn et al. (2008, 2009b), Hébrard et al. (2008) |
|            |                      |                   | 2. Wong et al. (2014) |
|            |                      |                   | 3. Wong et al. (2014) |
|            |                      |                   | 4. Johns-Knall et al. (2008) |
| XO-4b      | 2455682.20389 ± 0.00023 | 4.1250679 ± 0.0000006 | 1. McCullough et al. (2008), Narita et al. (2010), Todorov et al. (2012), Villanueva et al. (2016) |
|            |                      |                   | 2. Narita et al. (2010) |
|            |                      |                   | 3. Narita et al. (2010) |
|            |                      |                   | 4. McCullough et al. (2008) |
| XO-5b      | 2455469.7912 ± 0.00003 | 4.1877562 ± 0.0000006 | 1. Pál et al. (2009), Burke et al. (2008) |
|            |                      |                   | 2. Smith (2015) |
|            |                      |                   | 3. Smith (2015) |
|            |                      |                   | 4. Burke et al. (2008) |
| XO-6b      | 2458843.93943 ± 0.00012 | 3.7649939 ± 0.0000013 | Crouzet et al. (2017), Ridden-Harper et al. (2020) |
|            |                      |                   | Crouzet et al. (2017) |
|            |                      |                   | Crouzet et al. (2017) |

**Note.** The actual values used can be found in the Data Release B.

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