

Estimation of Transit Time Variations in CoRoT planetary systems

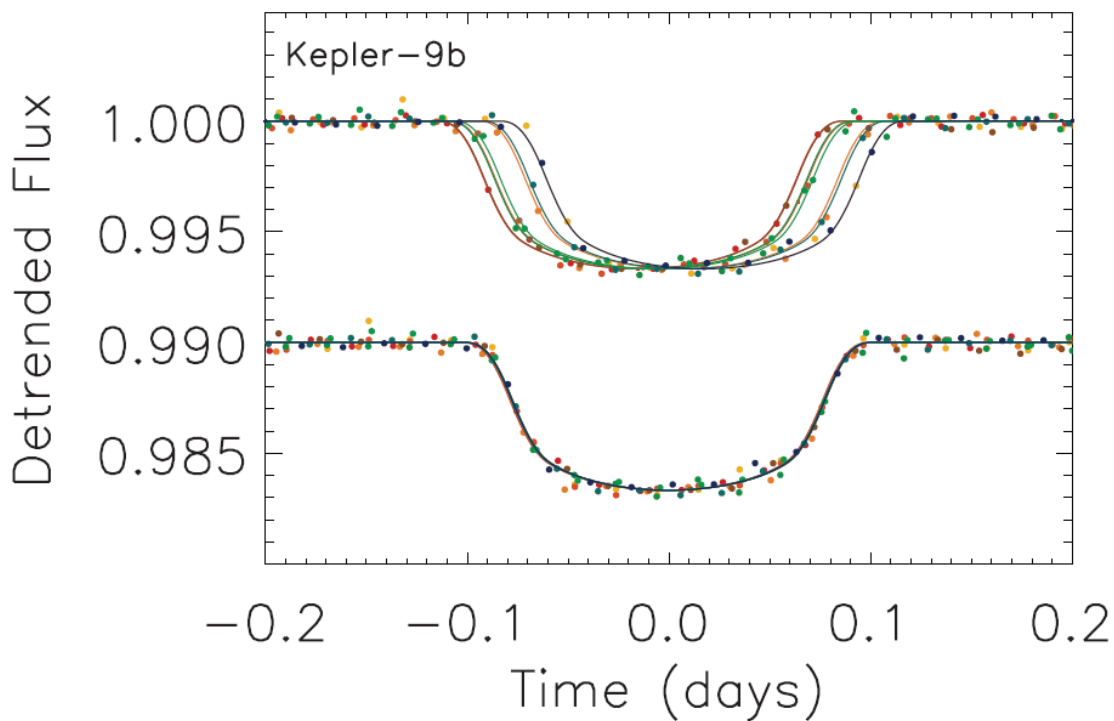
Judith Korth, Sascha Grziwa, Martin Pätzold

RIU-Planetenforschung an der Universität zu Köln

11th CoRoT Week

Time differences between transits:

TTV

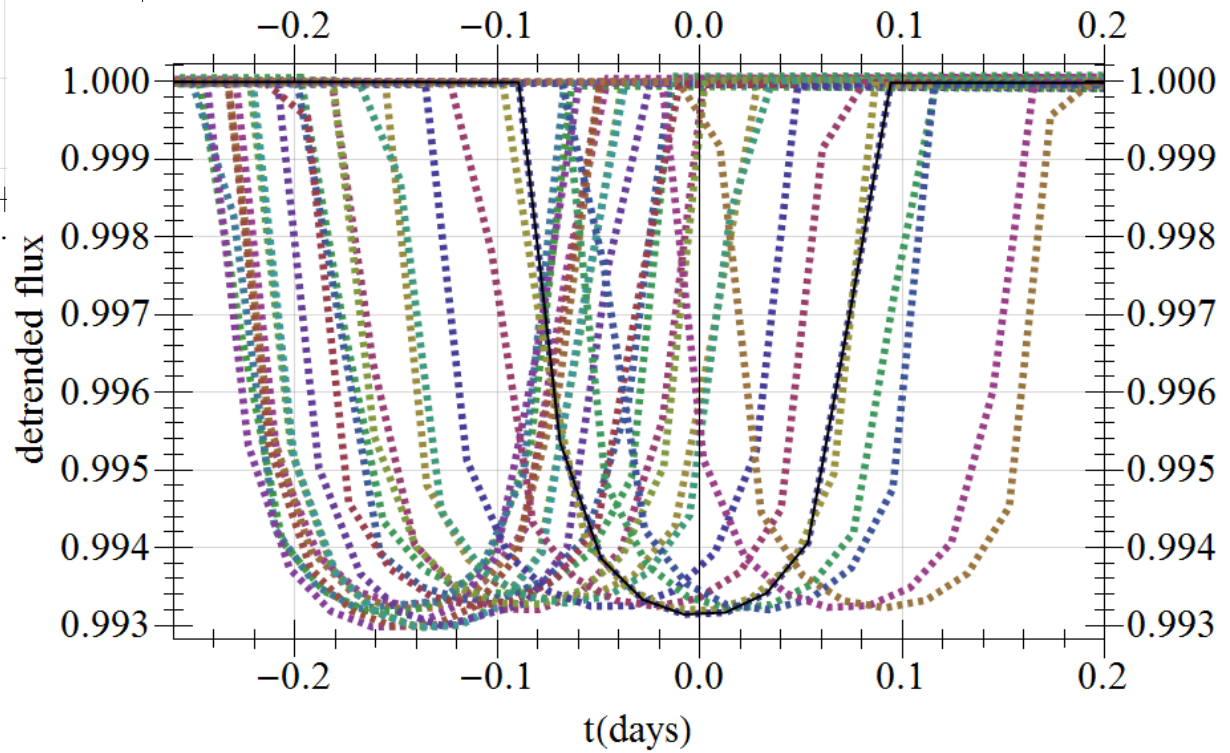
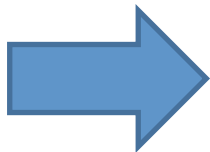
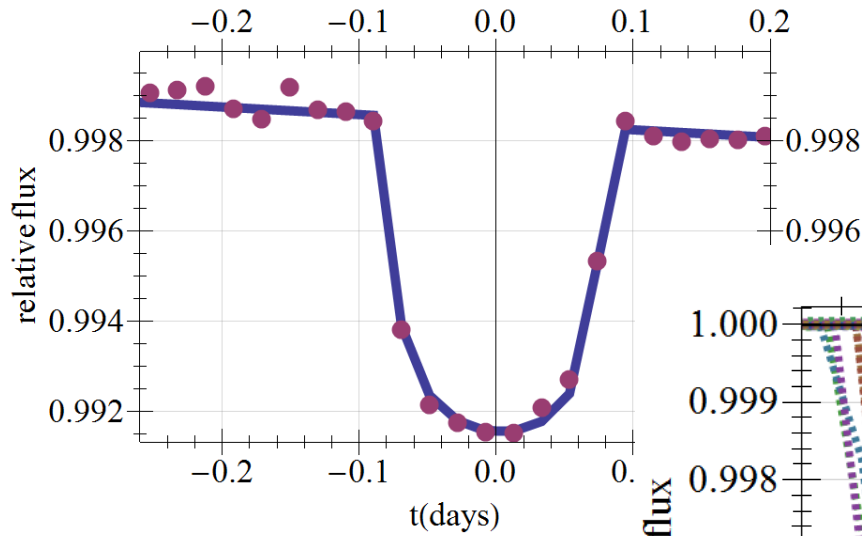


Time between successive transits is not constant

TTV: transit time shifts are due to gravitational interaction with other bodies in the stellar system

Estimation of TTV

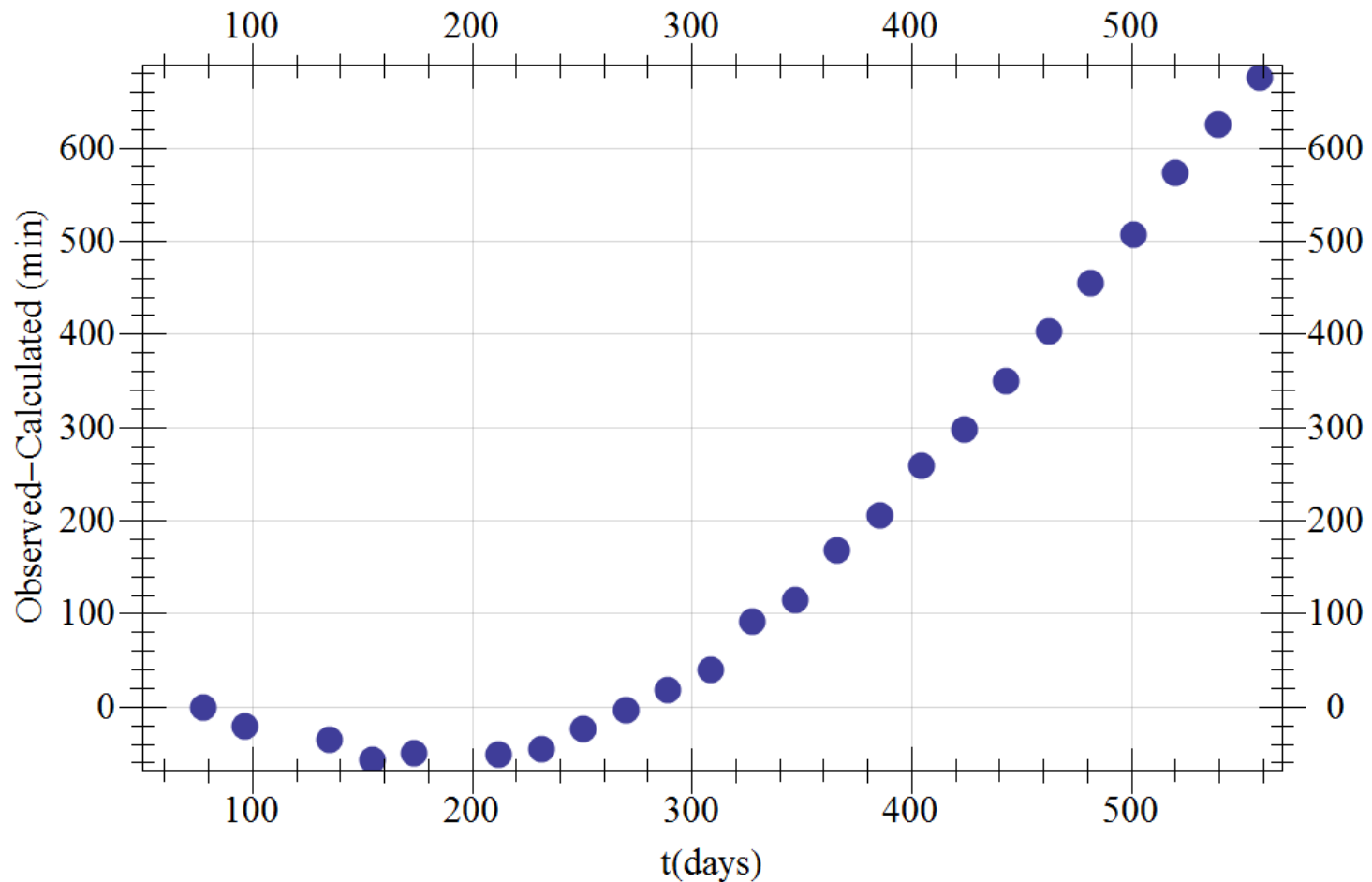
- precise computation of mid transit time



Estimation of TTV: 626 days

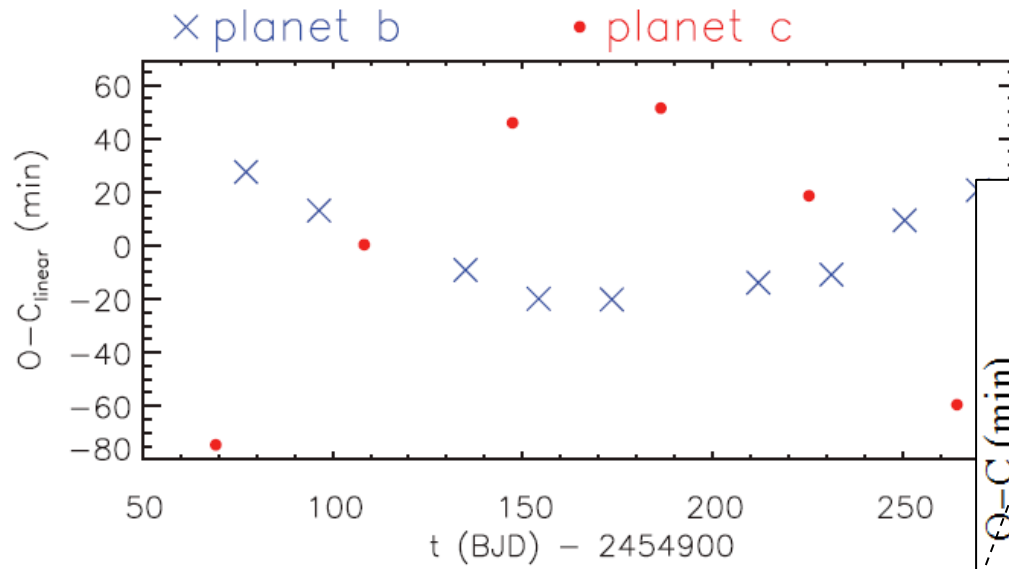
- TTV of Kepler 9b

Period:19.2533

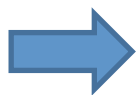
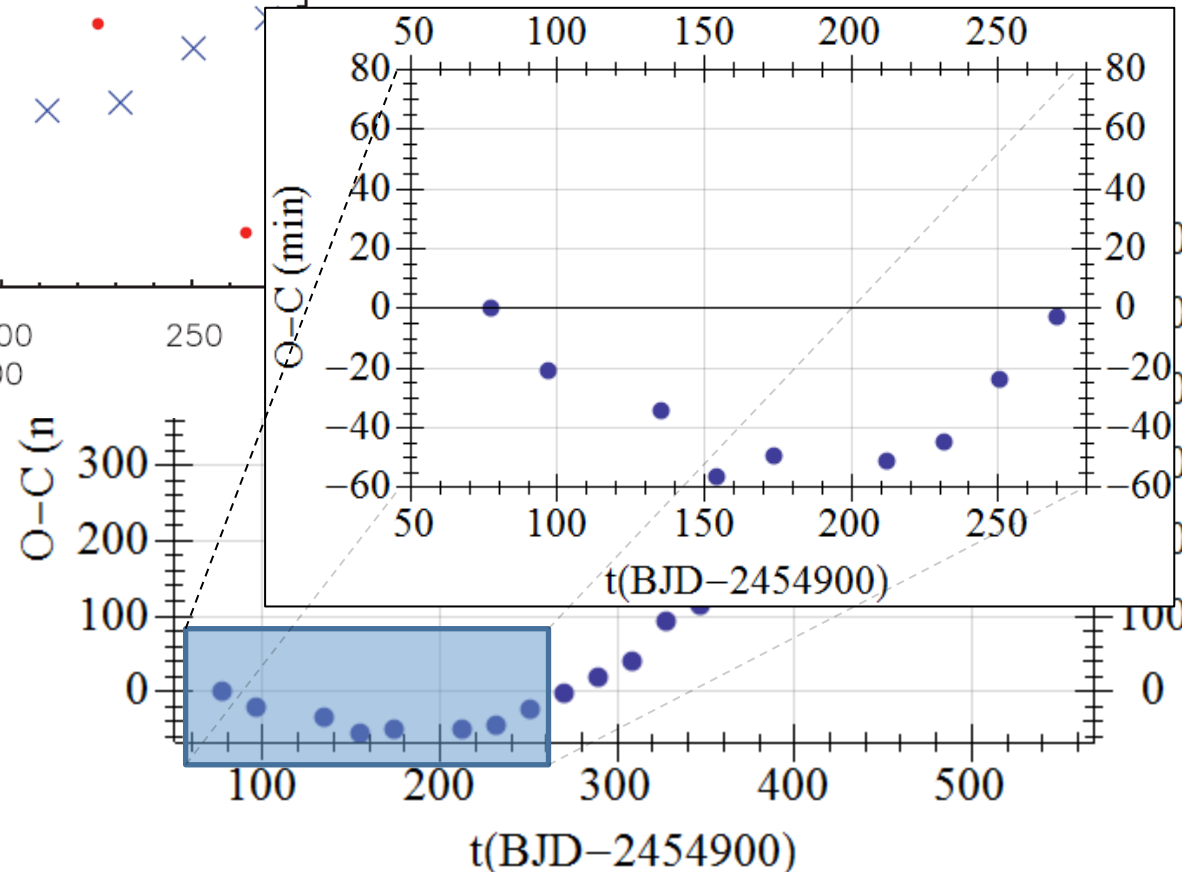


Estimation of TTV

Holman et al. 2010



My calculation

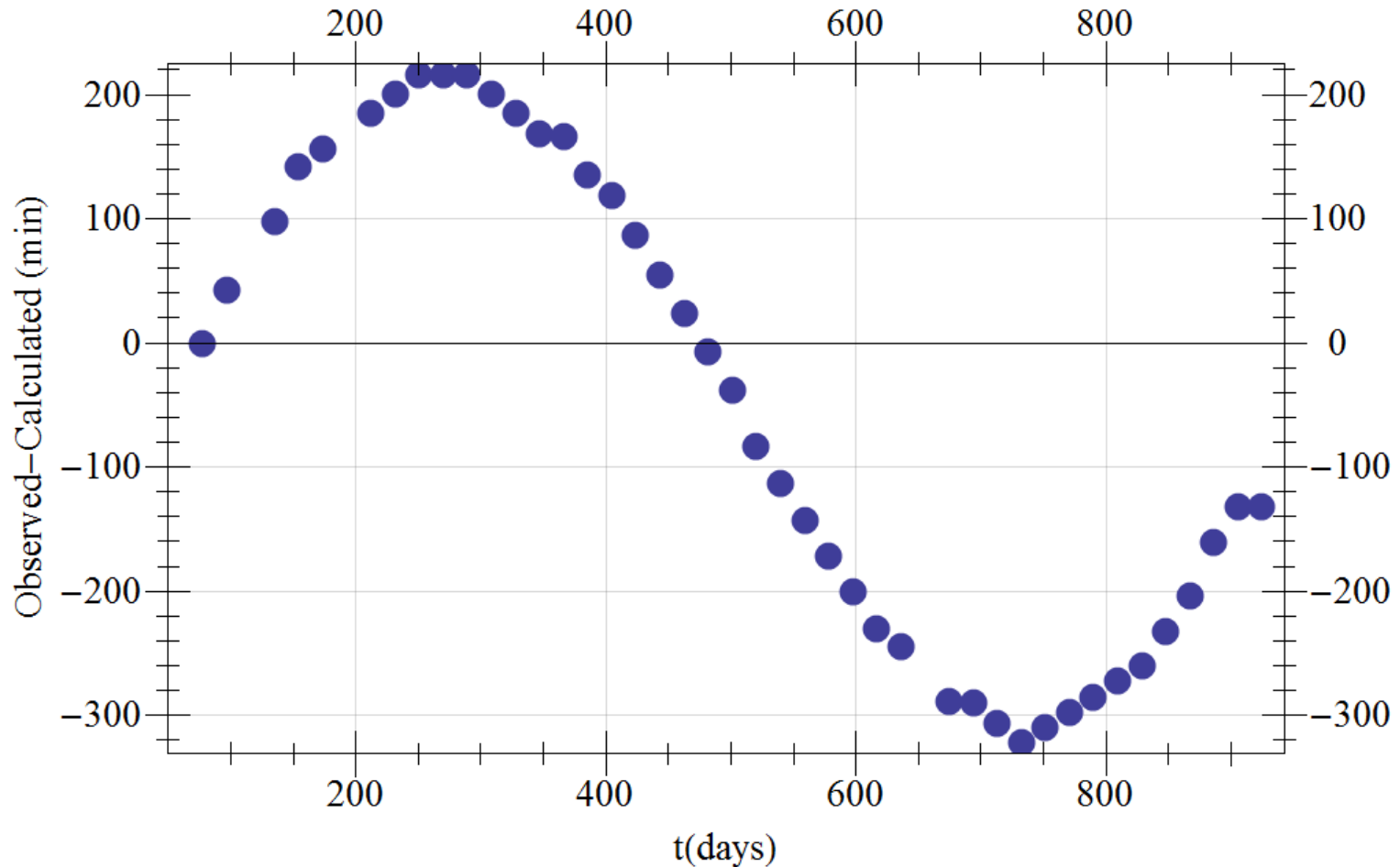


agreement with
published results

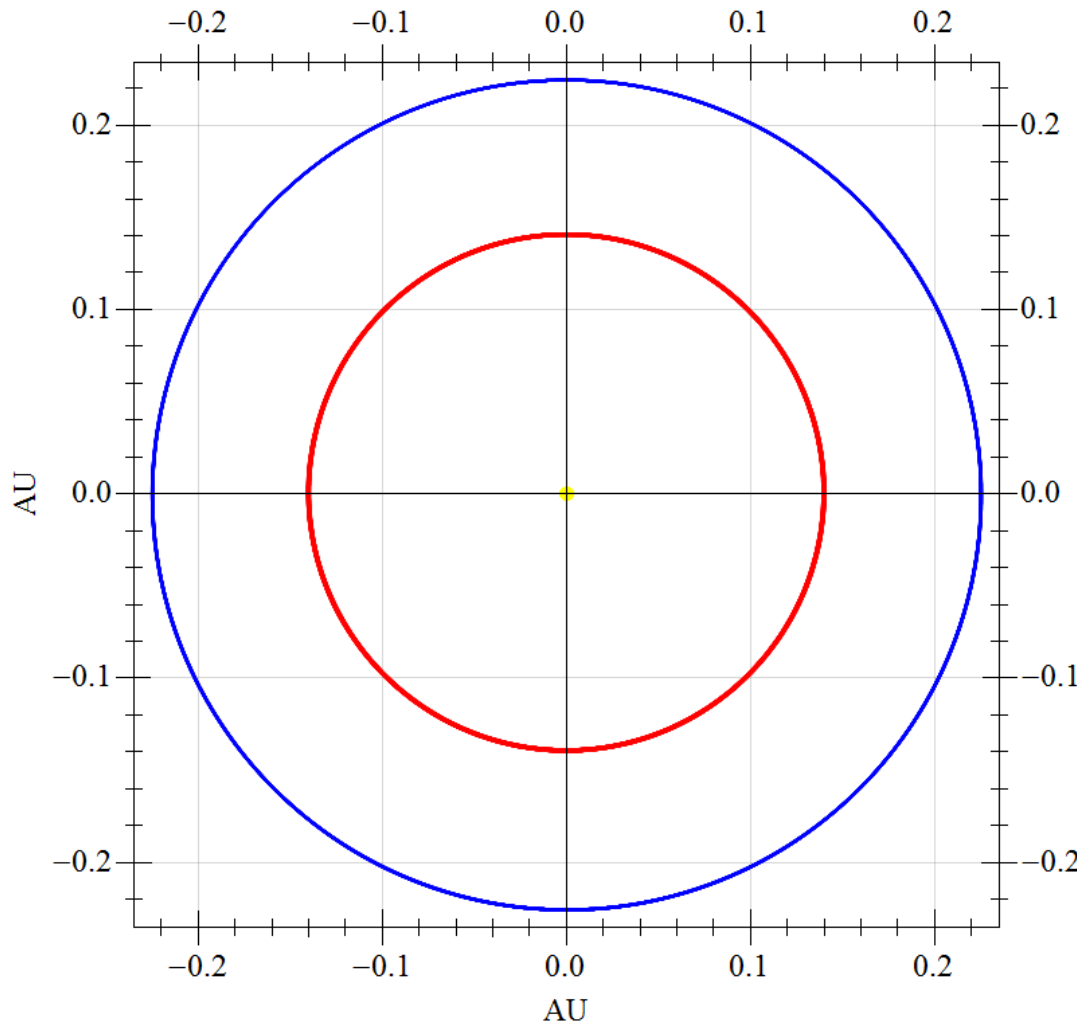
Estimation of TTV: 925 days

- TTV of Kepler 9b

Period:19.2579



Simulation for Kepler 9b and 9c orbits



Kepler 9b:

Mass: $0.252 \pm 0.013 M_J$
 Semimajor axis: 0.14 ± 0.001 AU
 Period: $19.2432 \pm 9.8e-05$ days

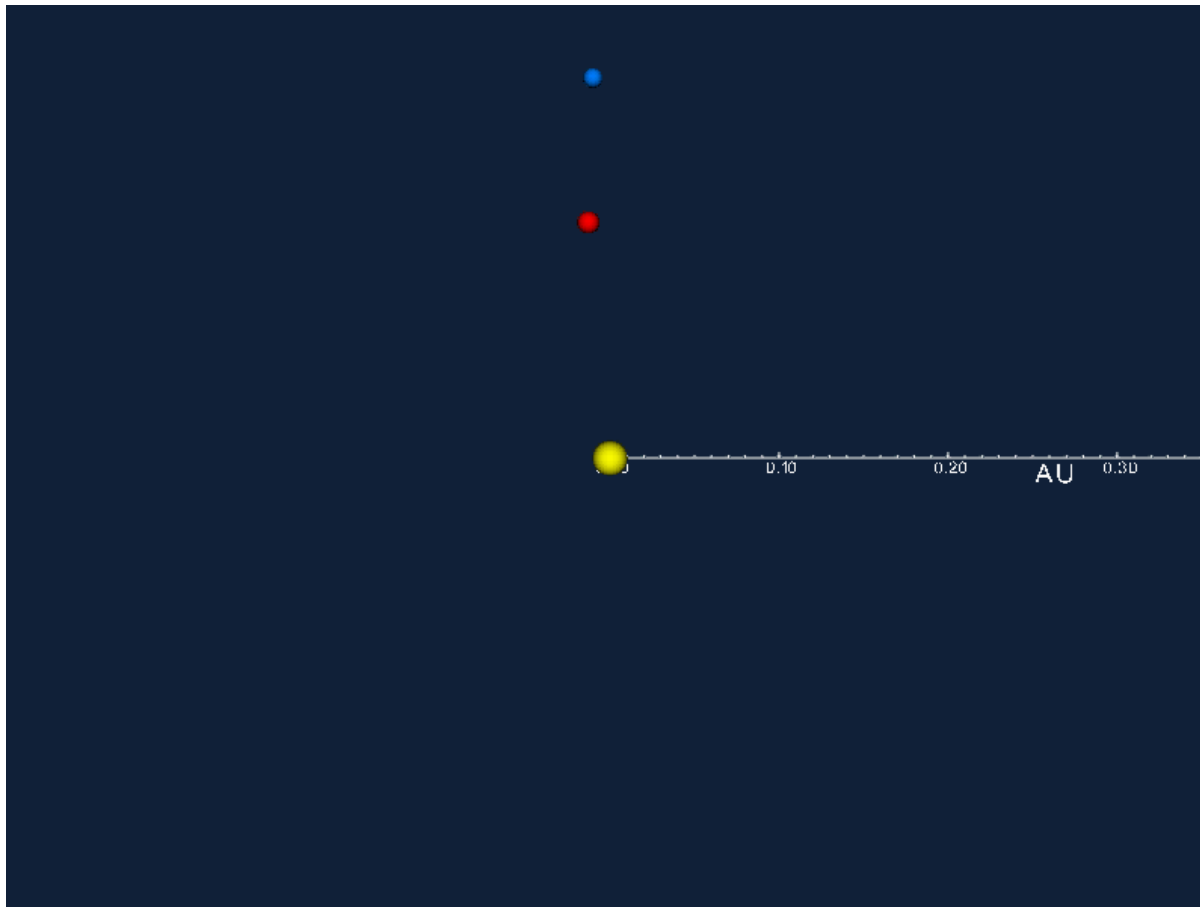
Kepler 9c:

Mass: $0.171 \pm 0.013 M_J$
 Semimajor axis: 0.225 ± 0.001 AU
 Period: 38.9086 ± 0.000738 days

Star:

Mass: $1 \pm 0.1 M_{\text{Sun}}$

Animation for Kepler 9b and 9c orbits



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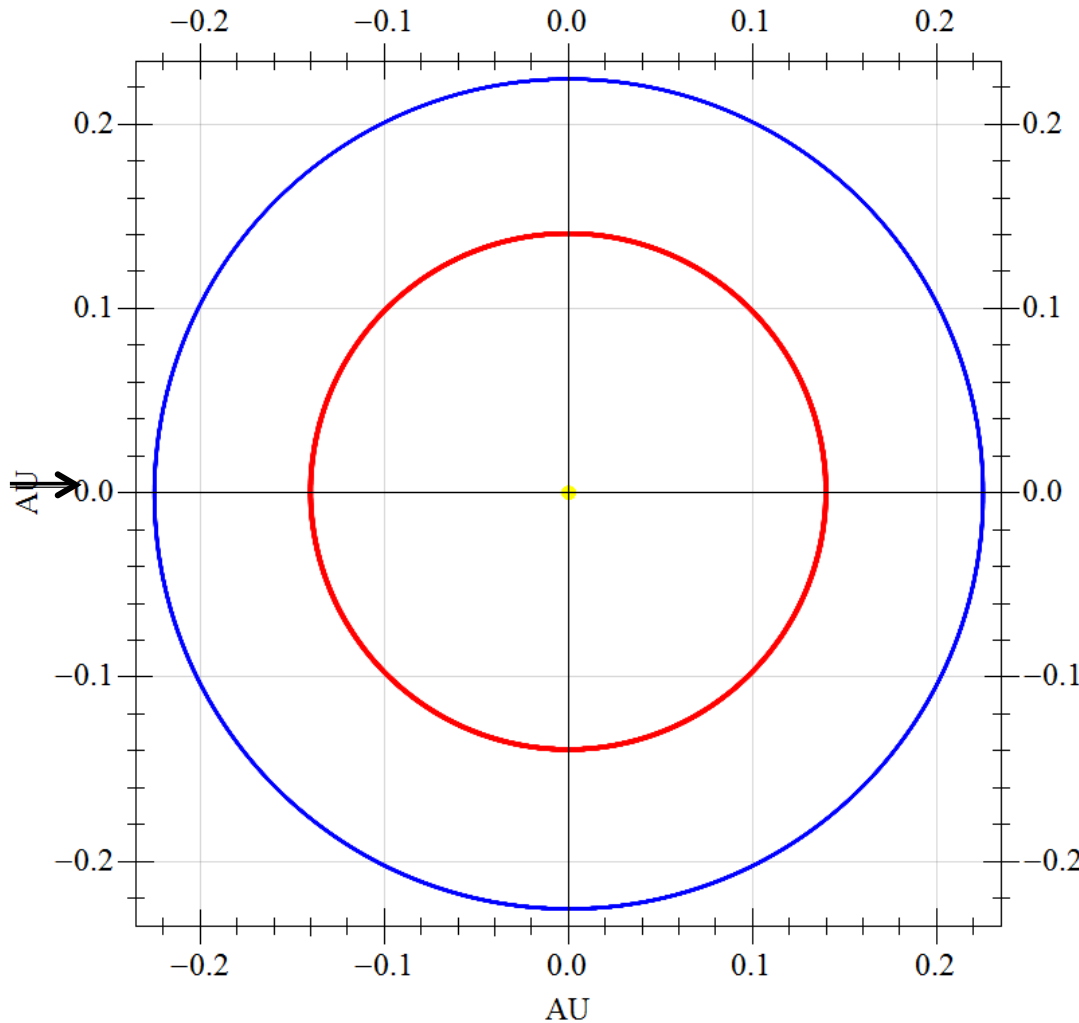
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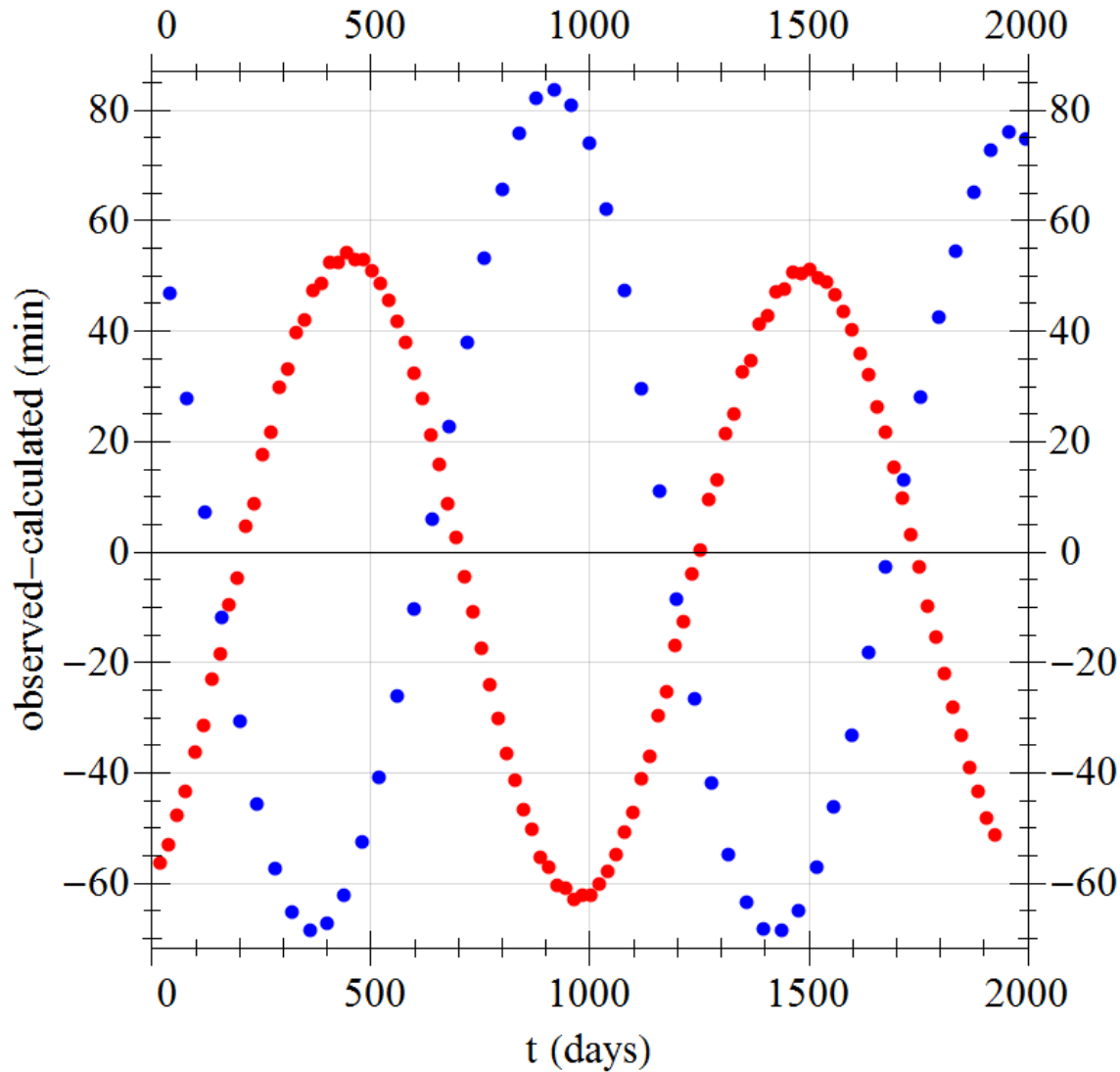
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TTV for Kepler 9b and 9c



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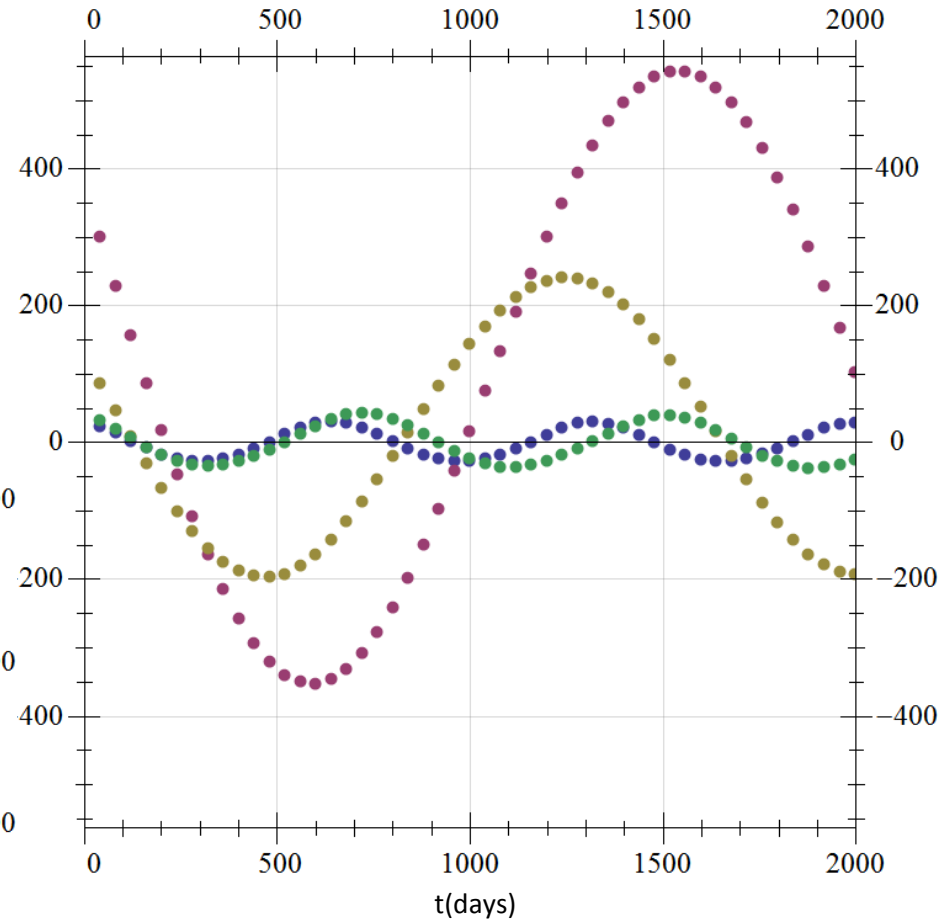
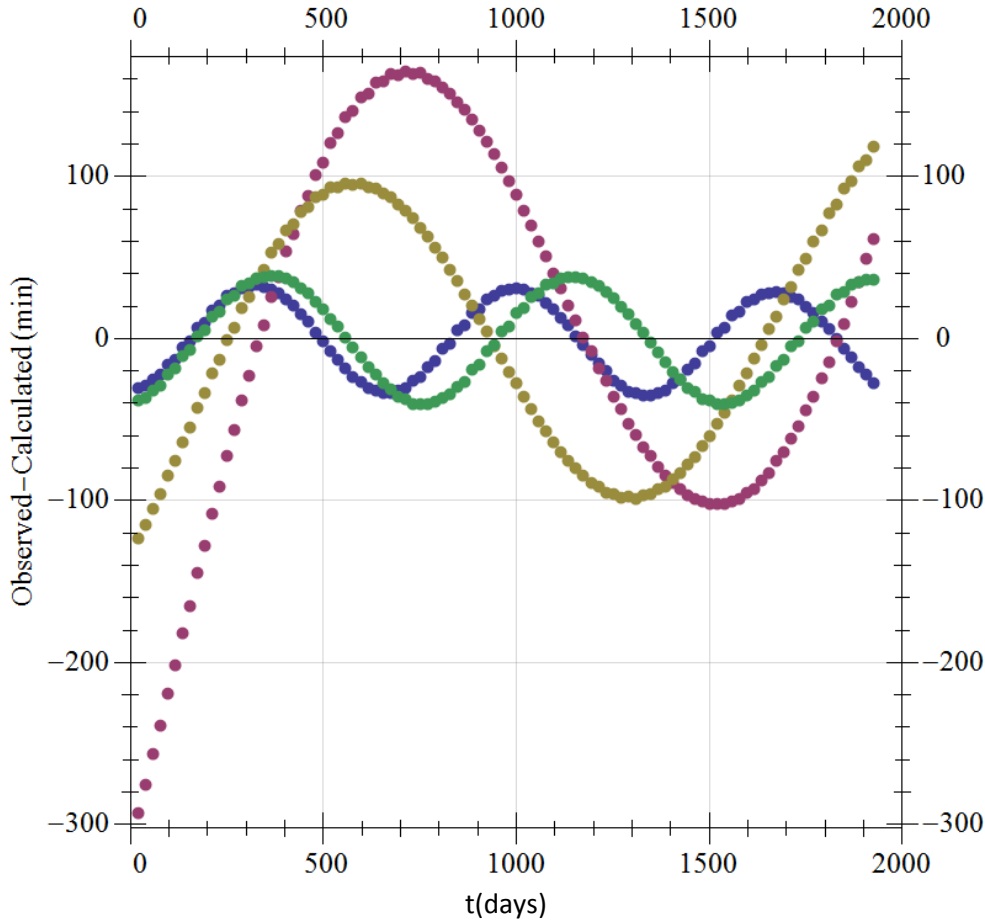
Mass: $1 \pm 0.1 M_{\text{Sun}}$

Orbitsimulation:TTV

9b: $0.14 + 0.001$ AU
 $0.14 - 0.001$ AU
 9c: $0.225 + 0.001$ AU
 $0.225 - 0.001$ AU

Kepler 9b

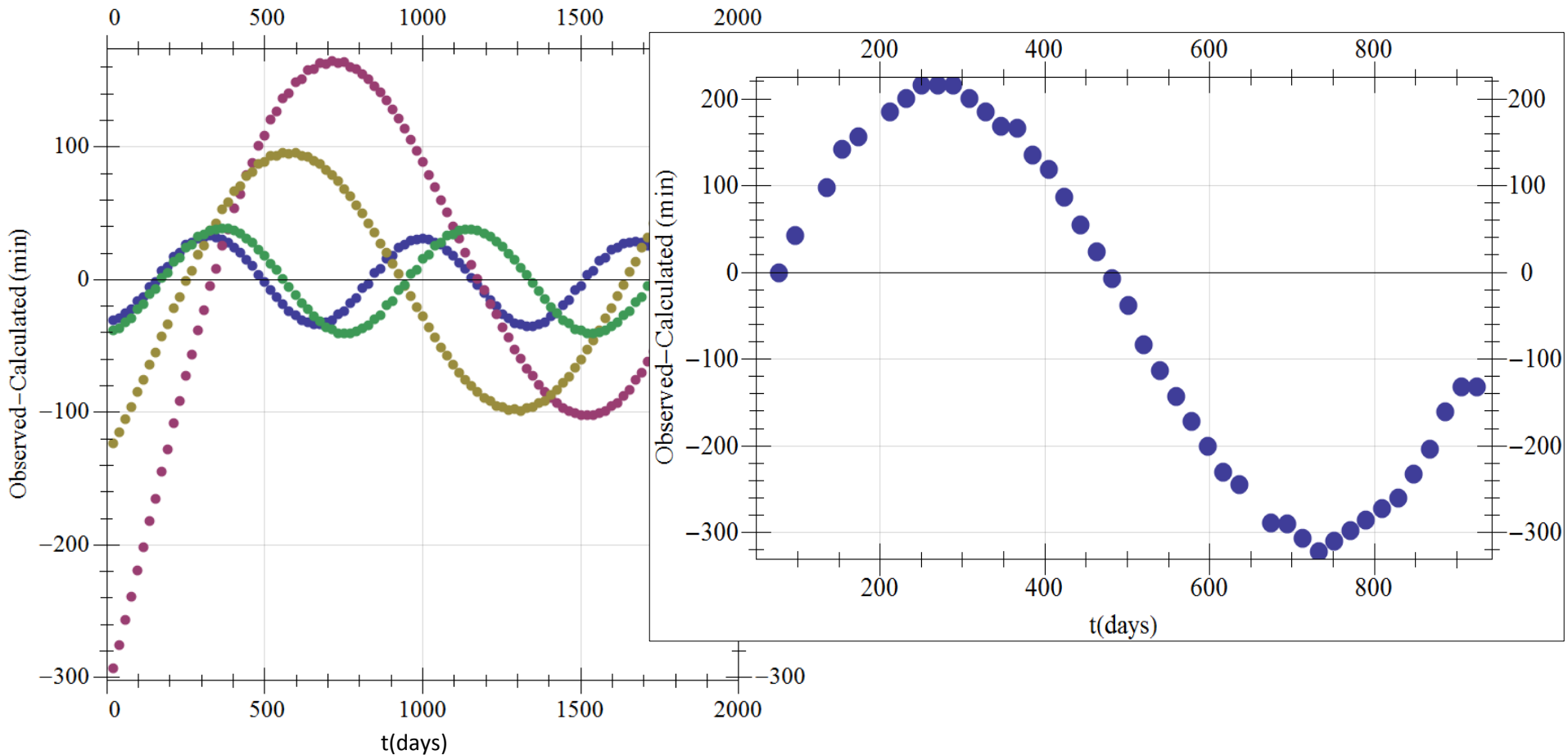
Kepler 9c



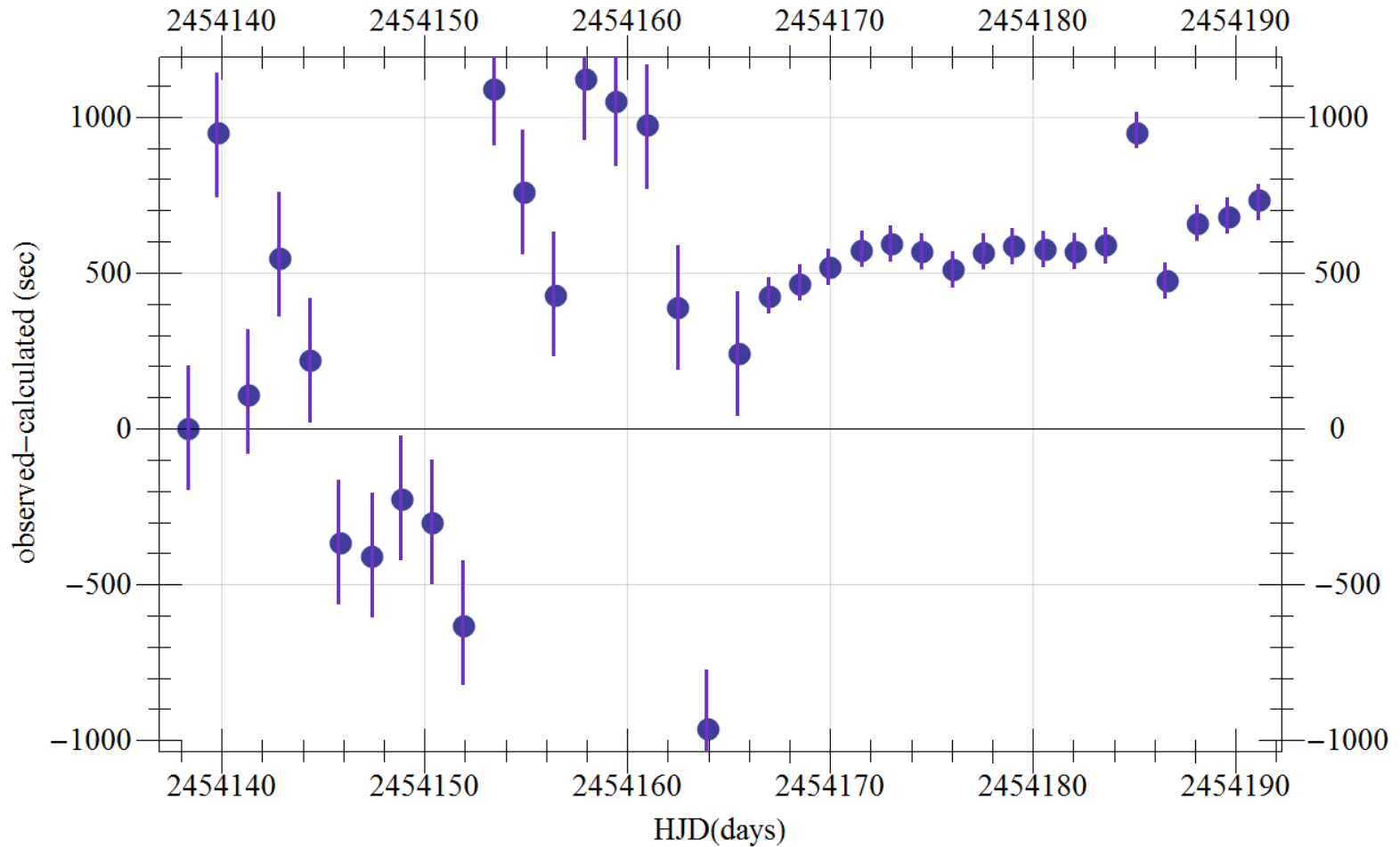
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Kepler 9b

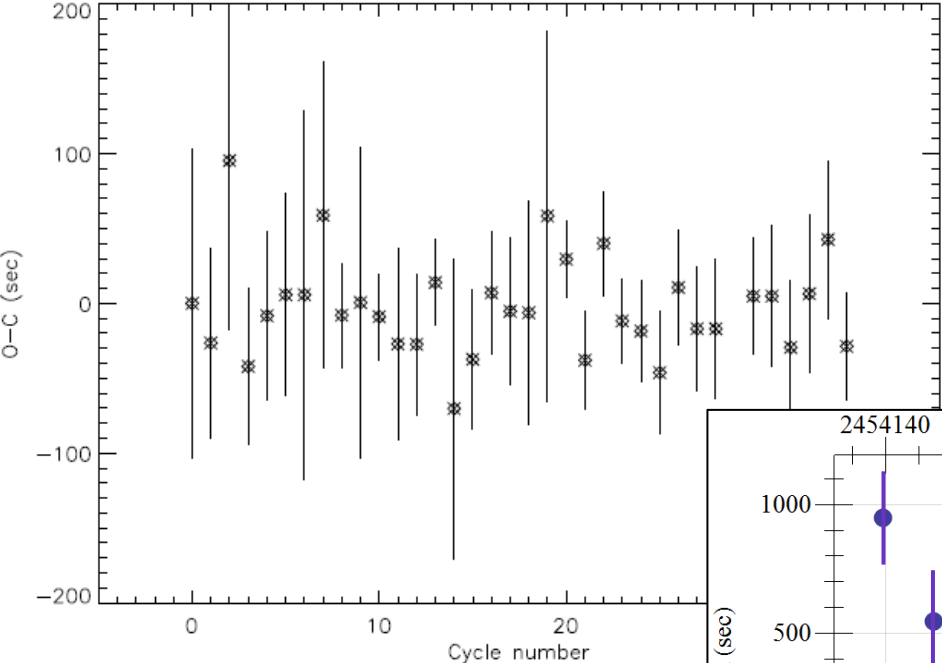


Application to Corot-1b

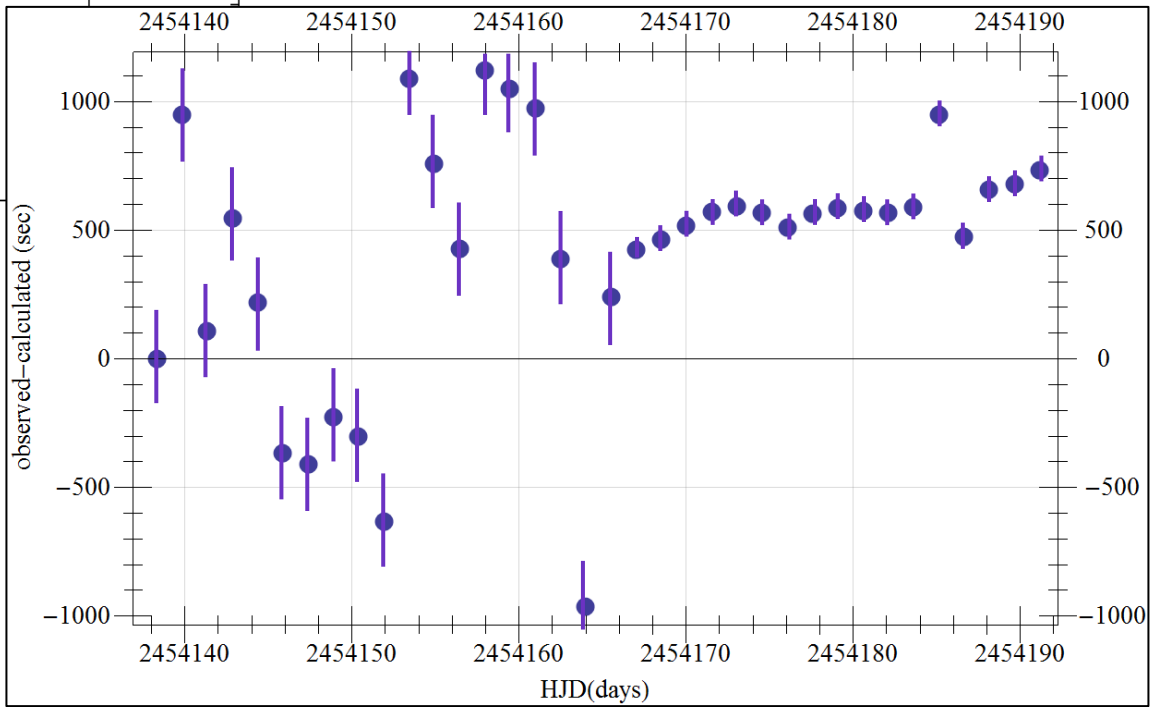


Application to Corot-1b

My calculation

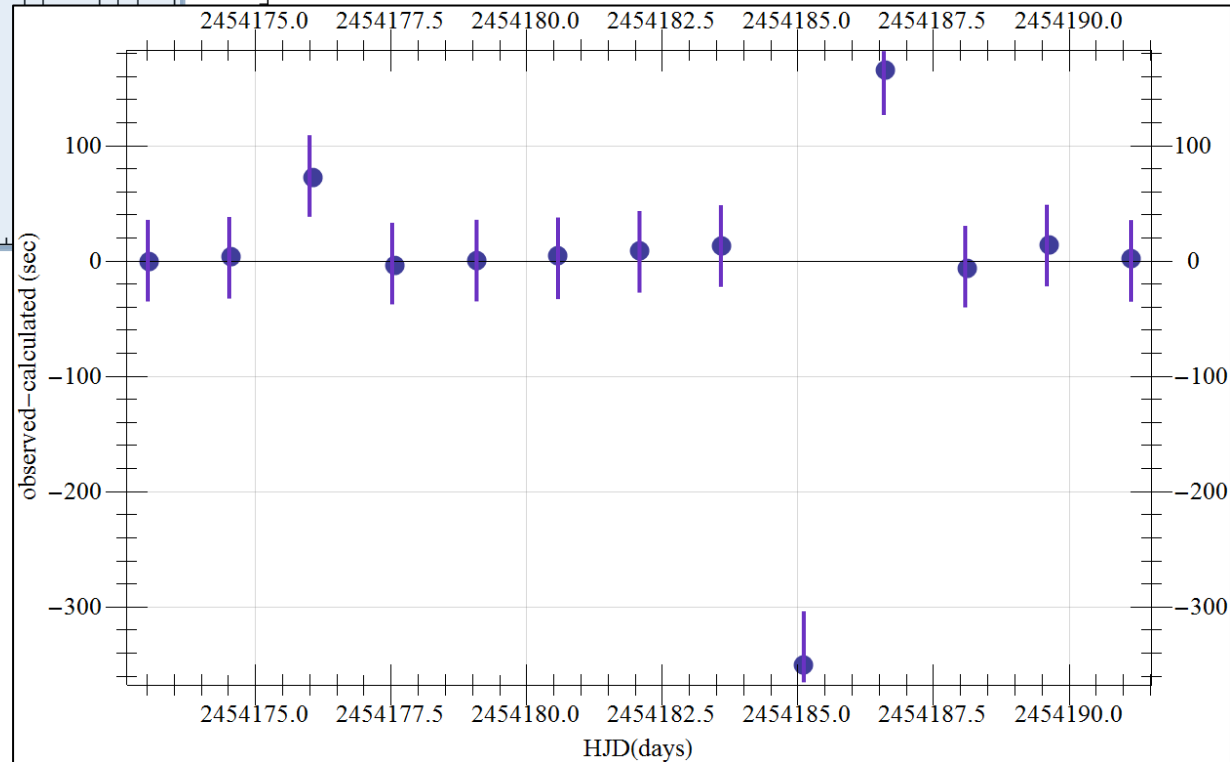
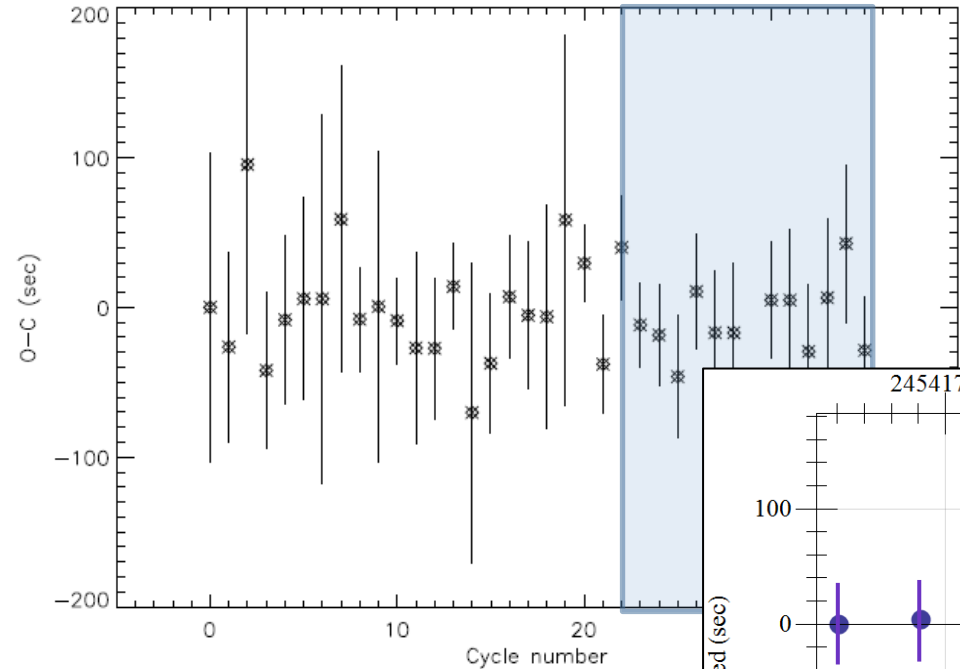


Cszmadia et al. 2010

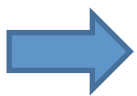


Application to Corot-1b

My calculation

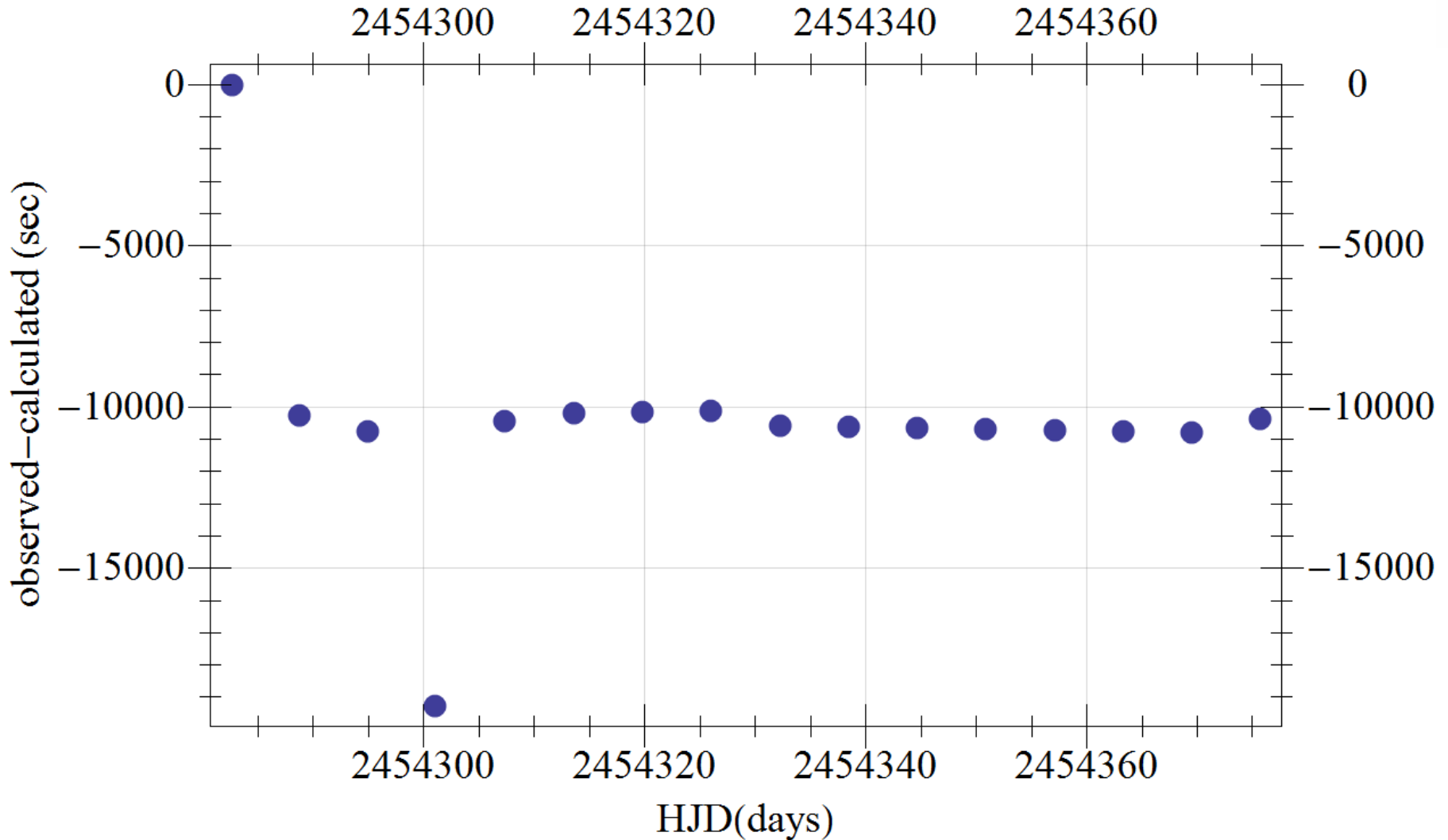


Csizmadia et al. 2010

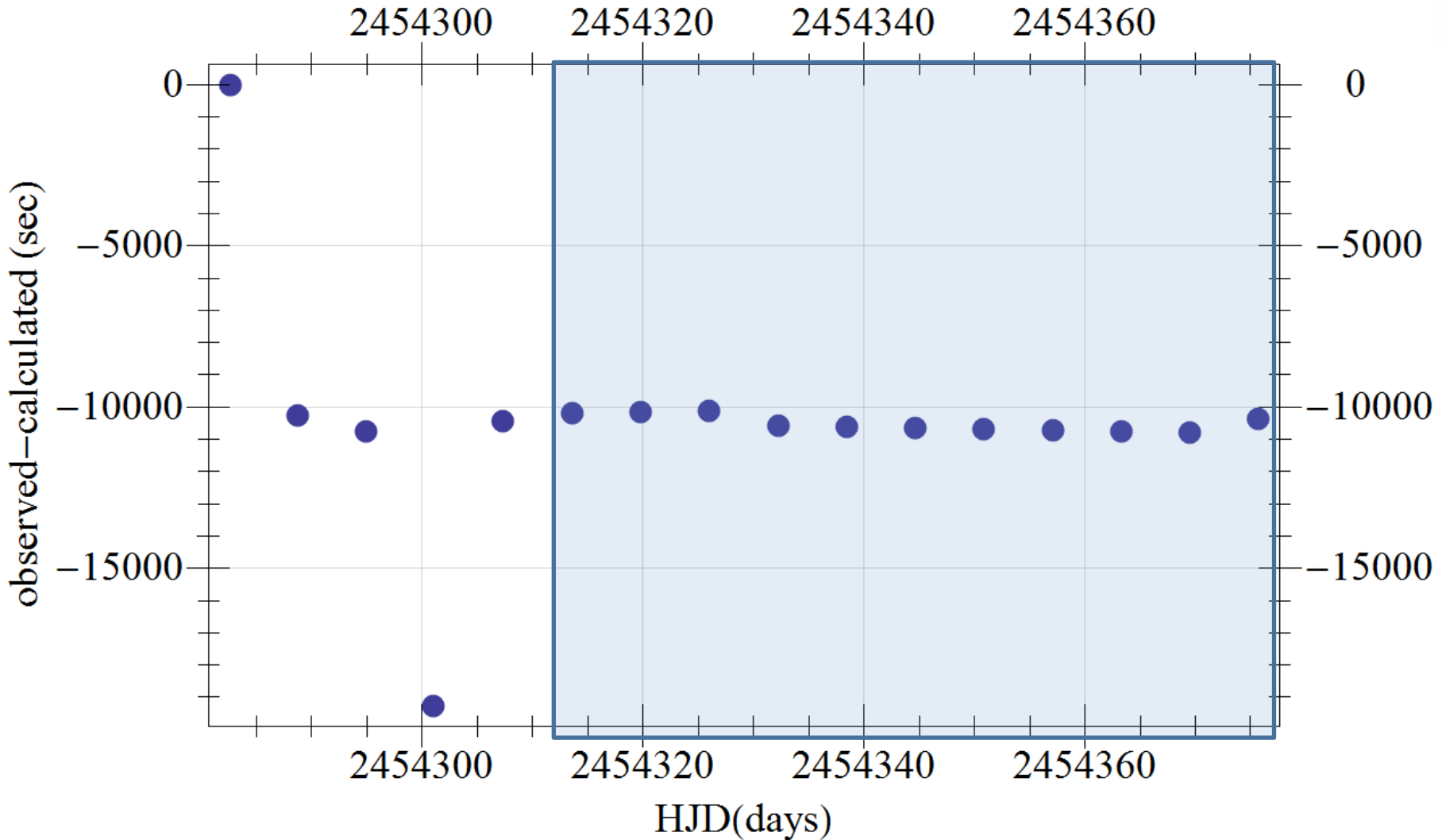


agreement with
published results

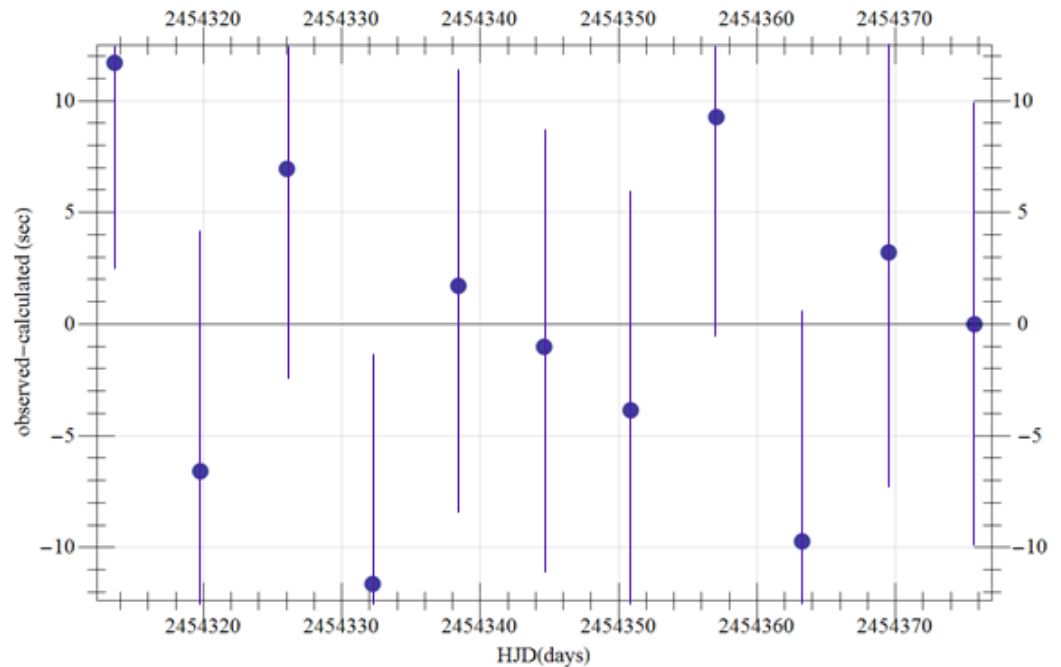
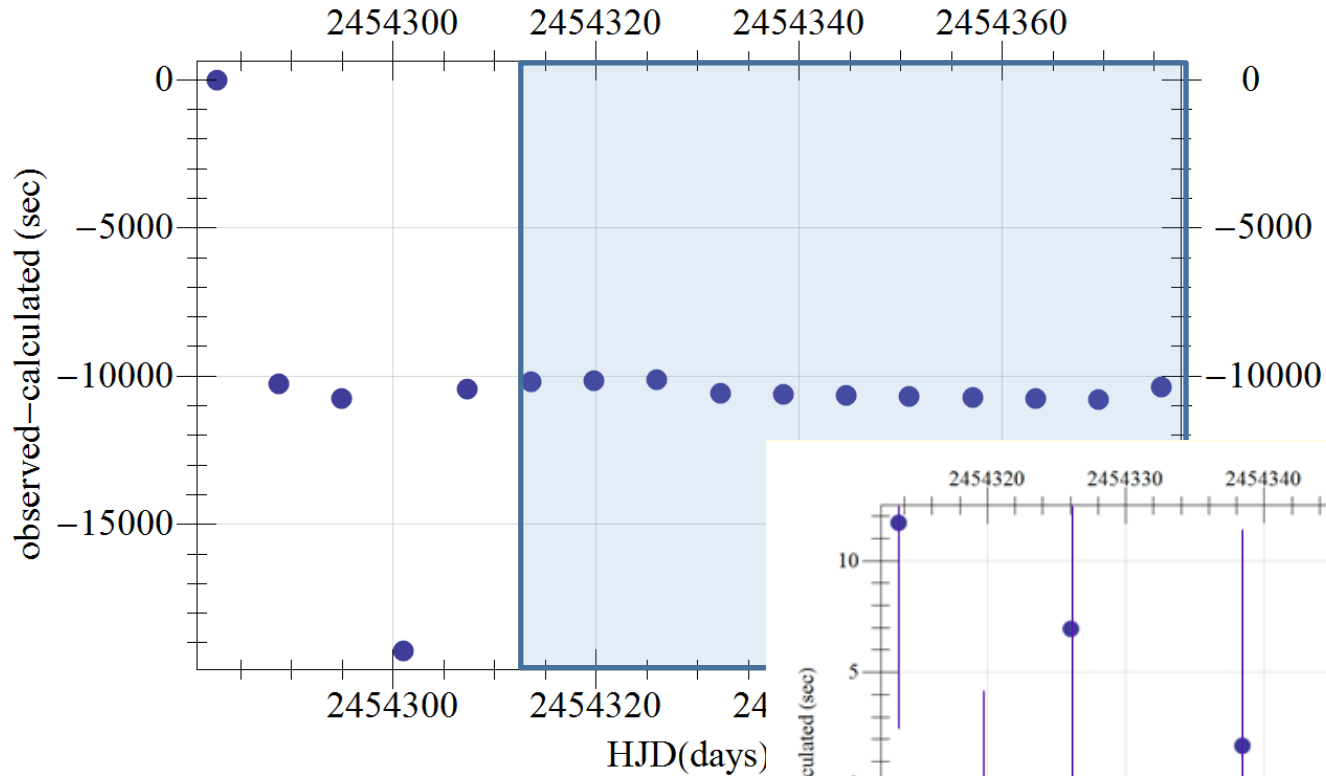
Application to Corot-8b



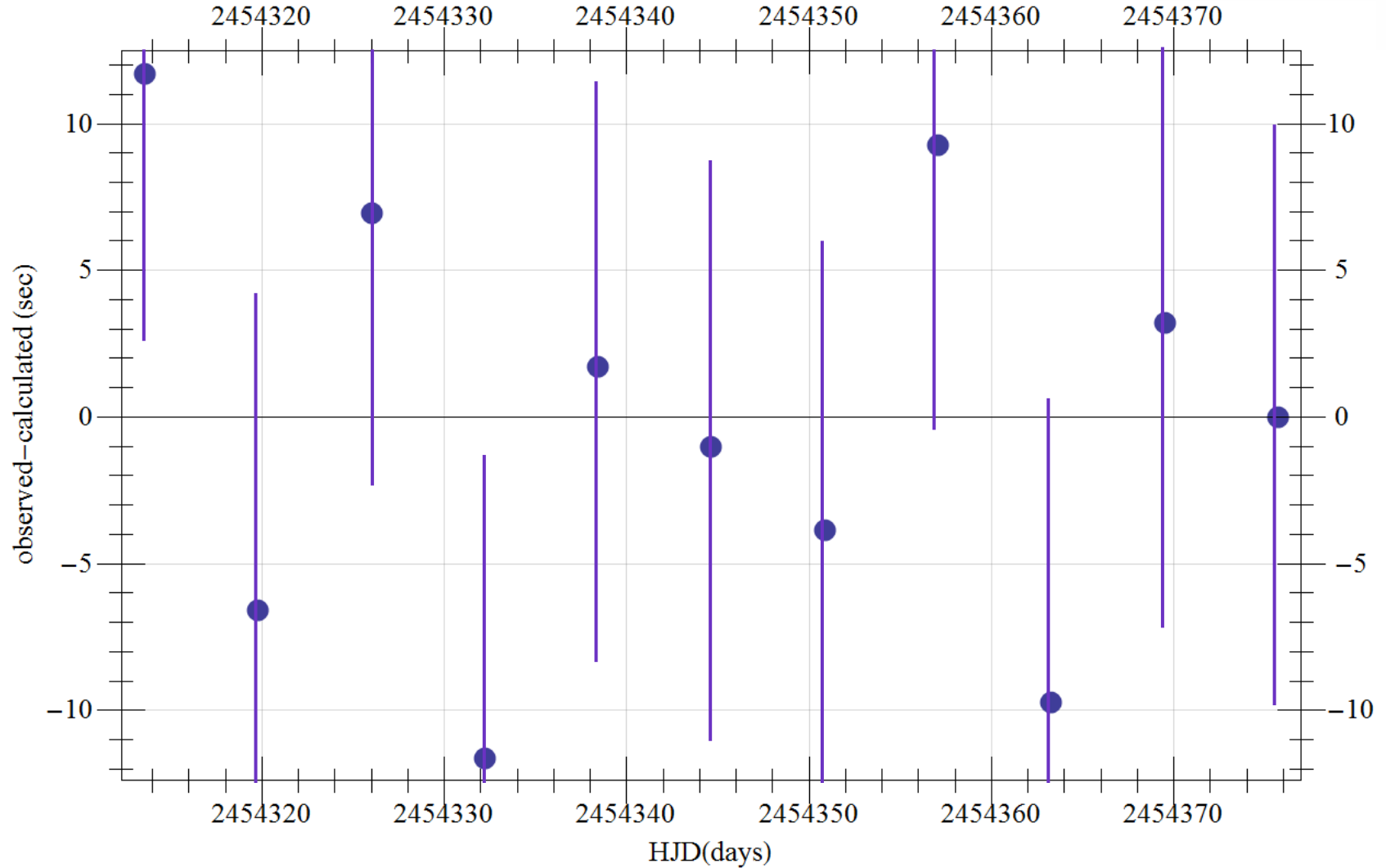
Application to Corot-8b



Application to Corot-8b



Application to Corot-8b



Conclusion

- An exact calculation of the mid transit time is required for the precise estimation of TTV
- The temporal resolution of the light curve limits the precision of the TTV
- The temporal resolution of the Kepler light curve is sufficient to estimate TTV
- It is possible to estimate TTV in the high resolved part of the Corot light curve