INSTITUT FÜR ASTROPHYSIK GÖTTINGEN

On-sky Position Angles from Transit Timing

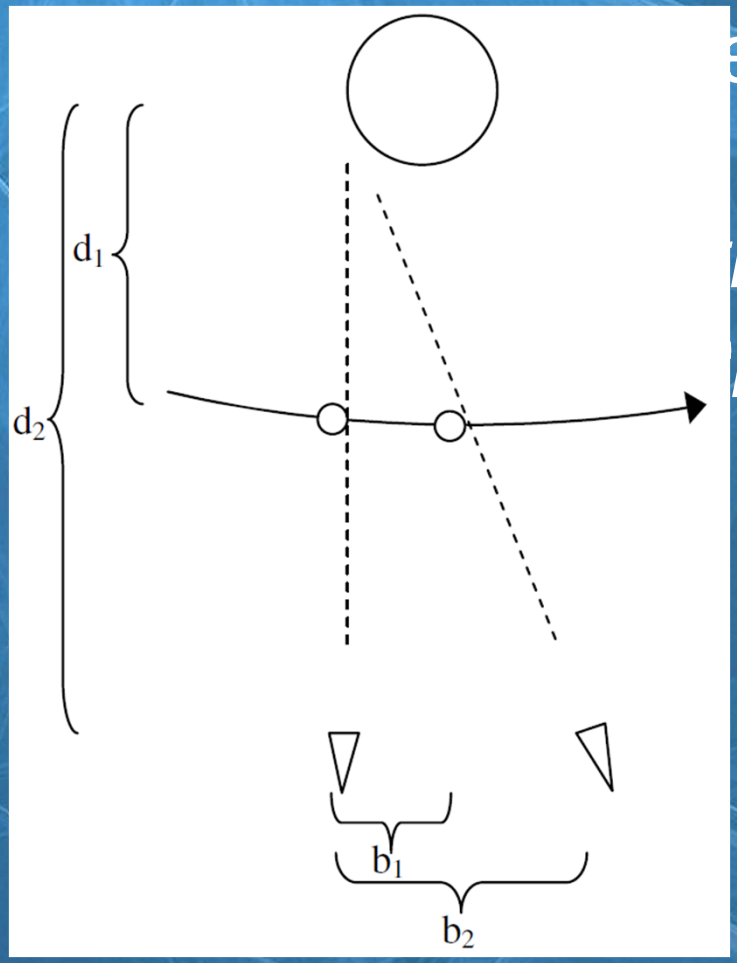
Aviv Ofir (IAG)

Introduction

- ew observable from
- *n from observing a*
  parate (AU-scale)
  - Expected delay:

$$\Delta t_{\text{expect}} = \frac{\boldsymbol{b}_1}{\boldsymbol{V}} = \frac{b_1}{2\pi d_1 / P} = P\frac{b_2}{2\pi d_2}$$

  - Parallactic delay



Non-Planar Geometry

- What if the orbital plain is tilted at angle l ?

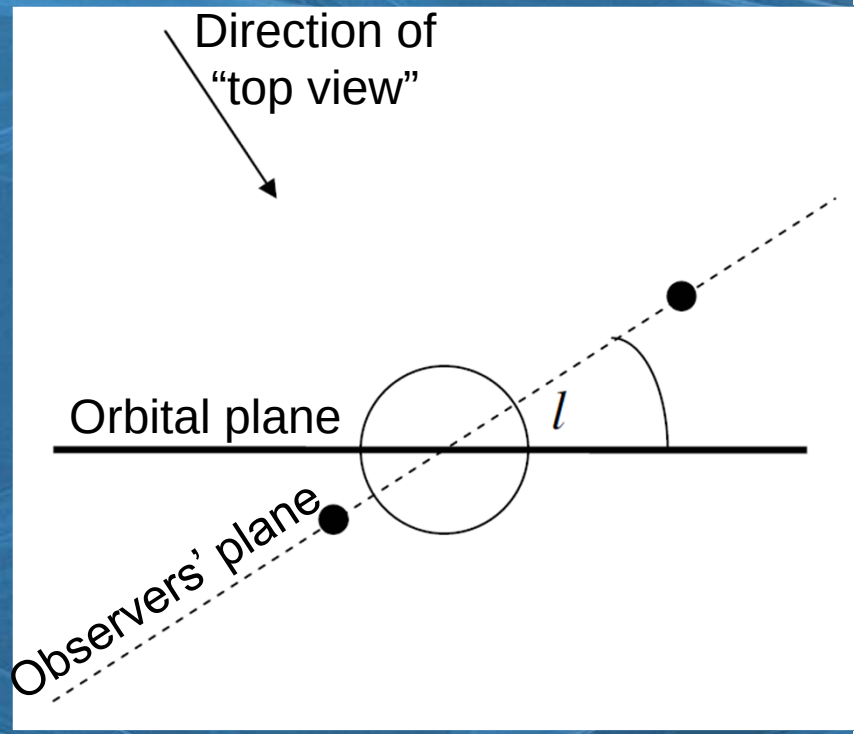
$$\Delta t_{\text{observe}} = \Delta t_{\text{expect}} \cos(l)$$

- What if there are *two* transiting planets?

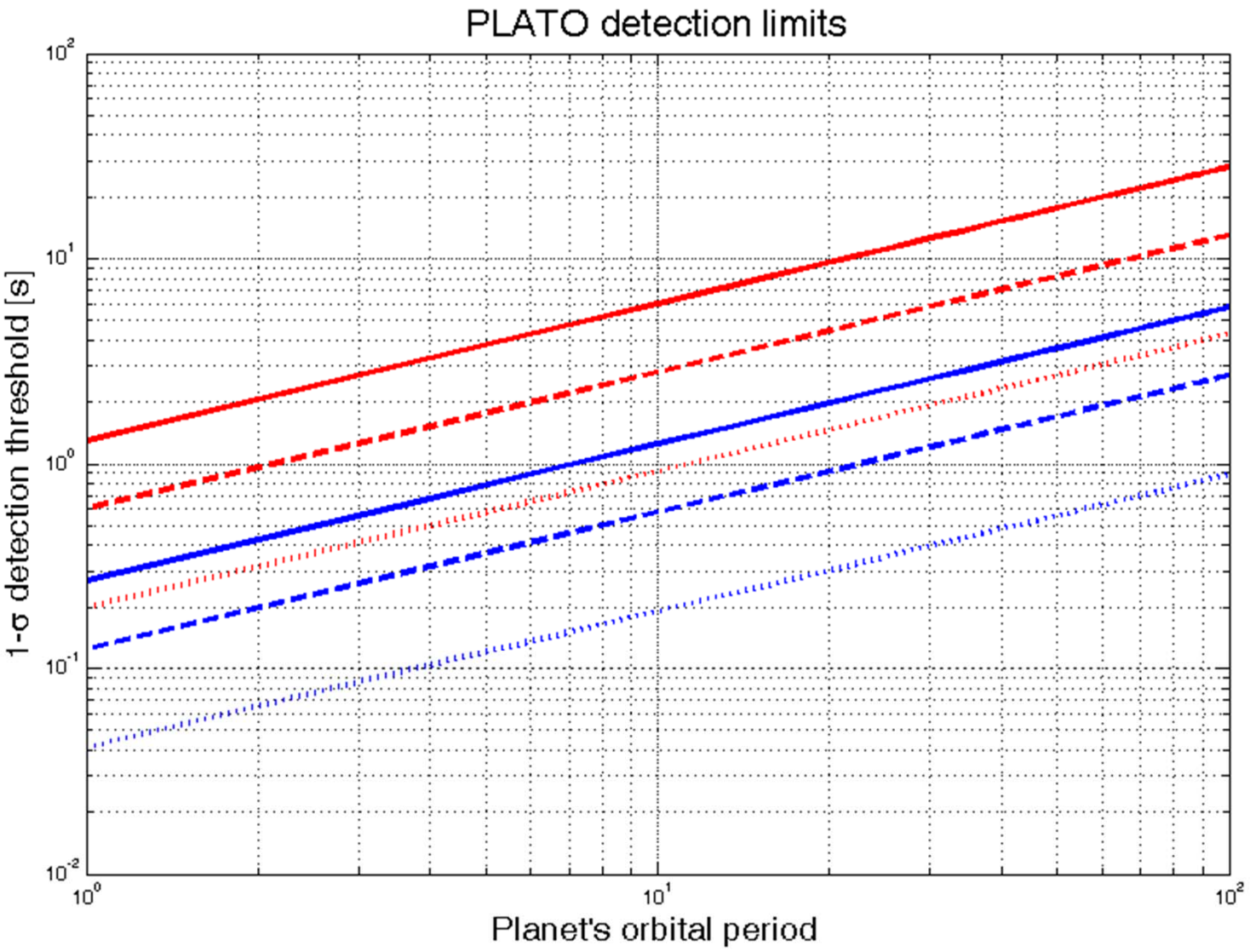
$$\cos(l_1) \quad \Delta t_1 \; P_1 \; b_{2,2}$$
$$\cos(l_2) \quad \Delta t_2 \; P_2 \; b_{2,1}$$

- Is this observable?

$$\Delta t_{\text{expect}} = 13.0685 \begin{bmatrix} P \\ d \end{bmatrix} \begin{bmatrix} b_2 \\ AU \end{bmatrix} \begin{bmatrix} d_2 \\ pc \end{bmatrix}^{-1} \; [s]$$



And for PLATO?



Some uses for the new observable

- Partial-plane direct imaging techniques.
- Variation of cos(*I*) may allow inferring the existence of non-transiting planets.
- Connection with stellar companions
- …

Conclusions

- A fundamentally new observable from transit photometry.
- Some already-known planets may allow to measure cos(*I*) in the near team.
- PLATO will allow to measure cos(*I*) in large scale.

Thank you.