Effect of planetary period on planet detectability

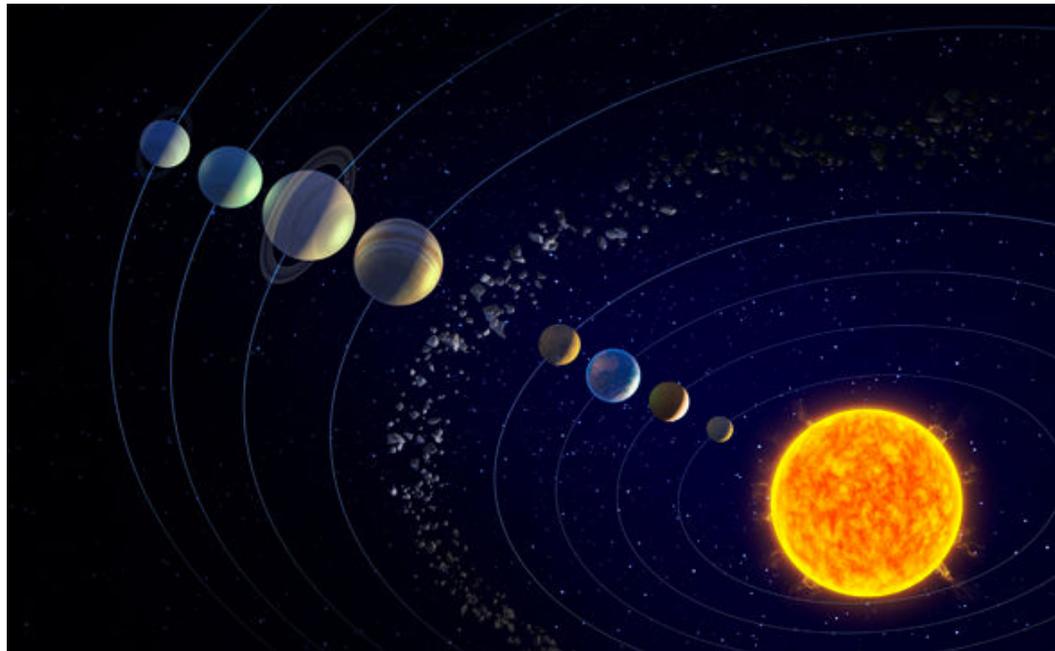## (RVs Group 1)

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Romina Petrucci – OAC Conicet, Argentina

Tsuguru Ryu – Sokendai NAOJ, Japan

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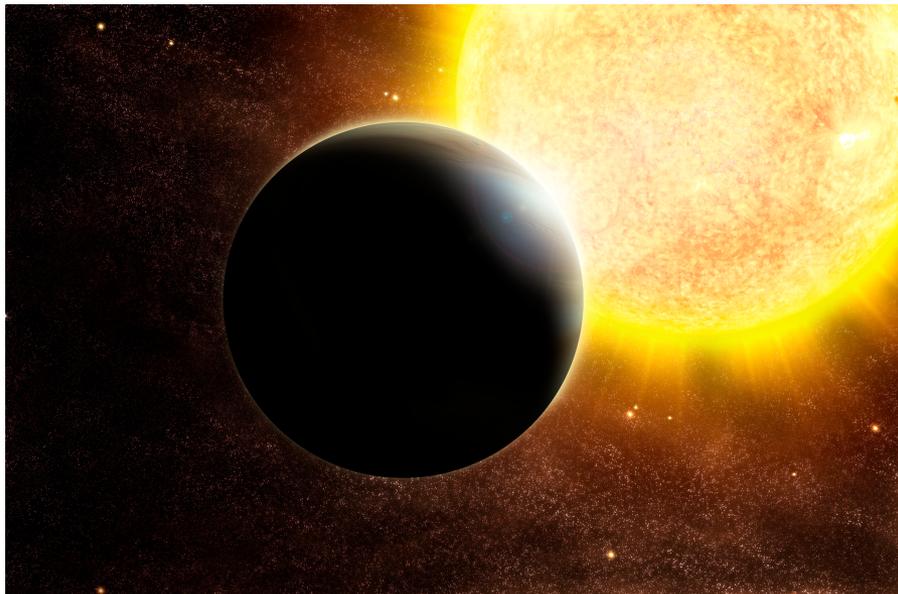
Project Goal

To investigate if it is easier to detect short or long period planets with the radial velocity technique

Hypothesis

Shorter-period planets may be easier to detect as:

- You can record many more full orbits
- Stronger RV signal for a given mass
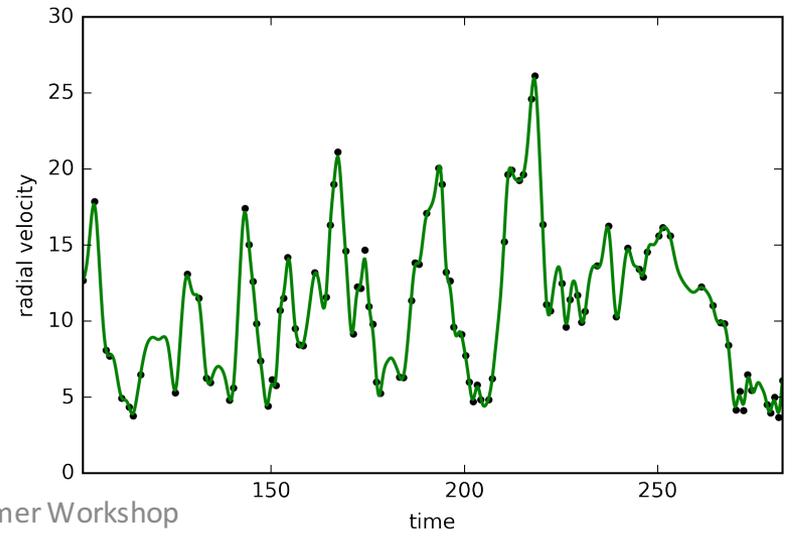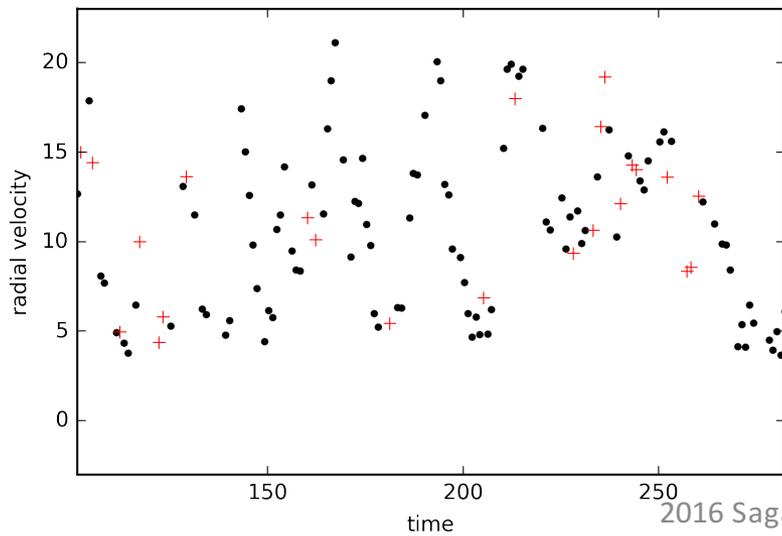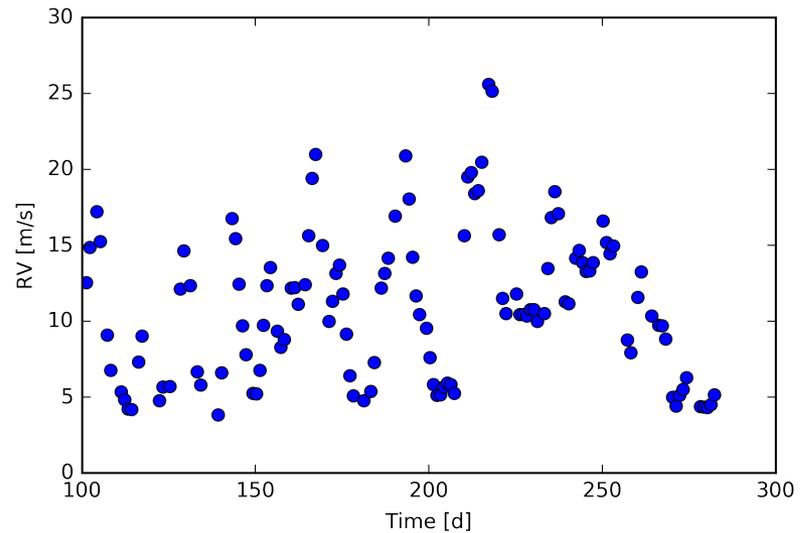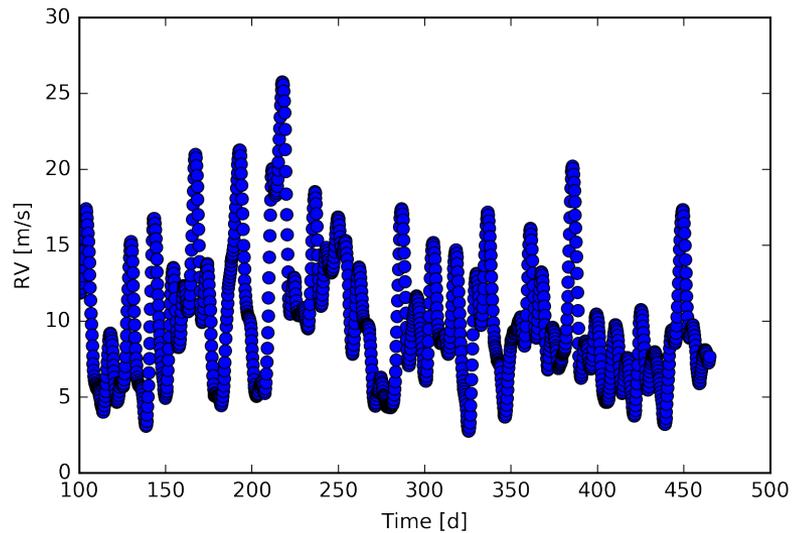- Higher probability for transit follow up

Methodology

For a given planet (period and semi-amplitude):

- Model random stellar RV signals + inject planet

- Move 20% into a validation set

- Train GP on remaining 80%

- Run MCMC on training set

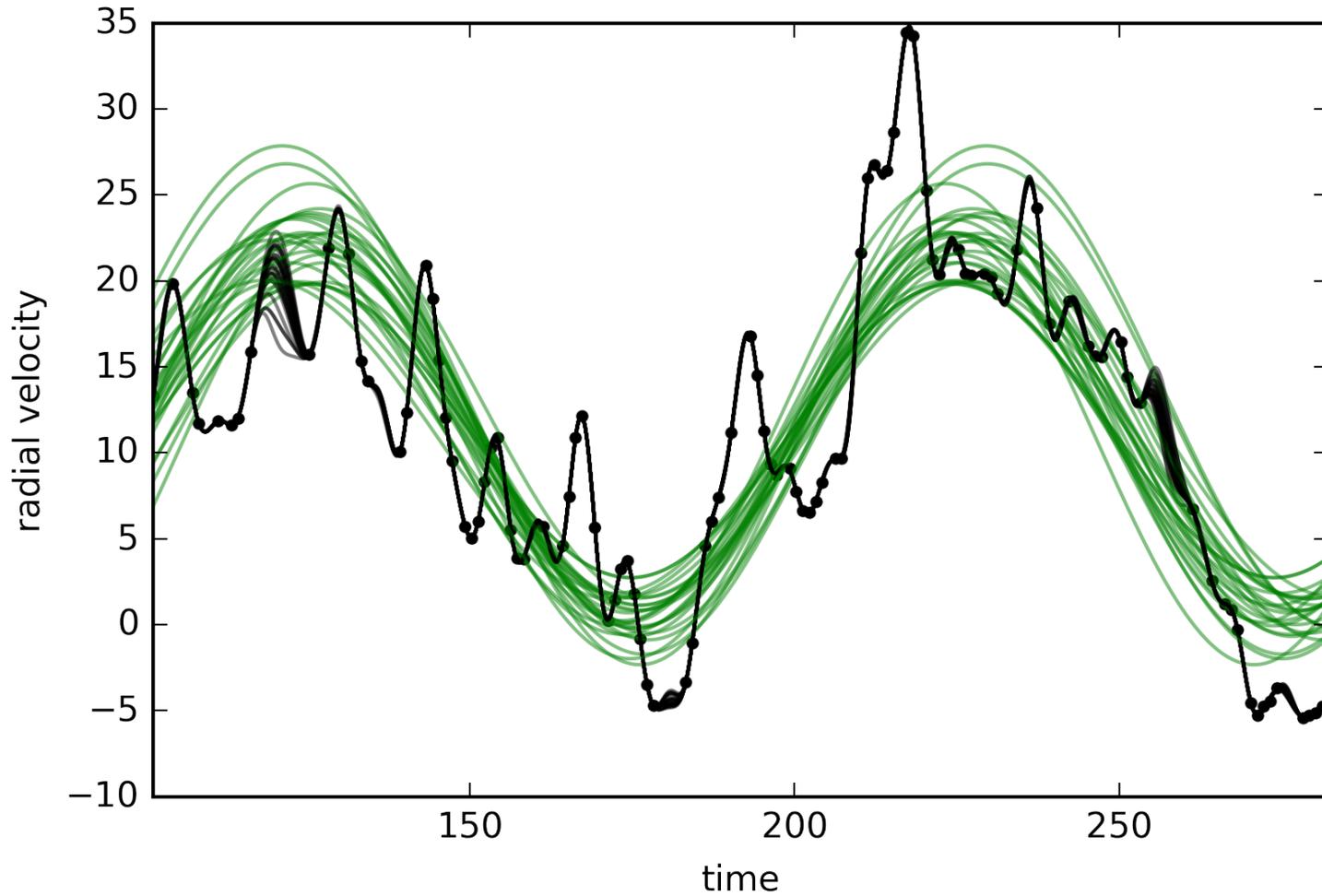- Fit RV + planet with GP

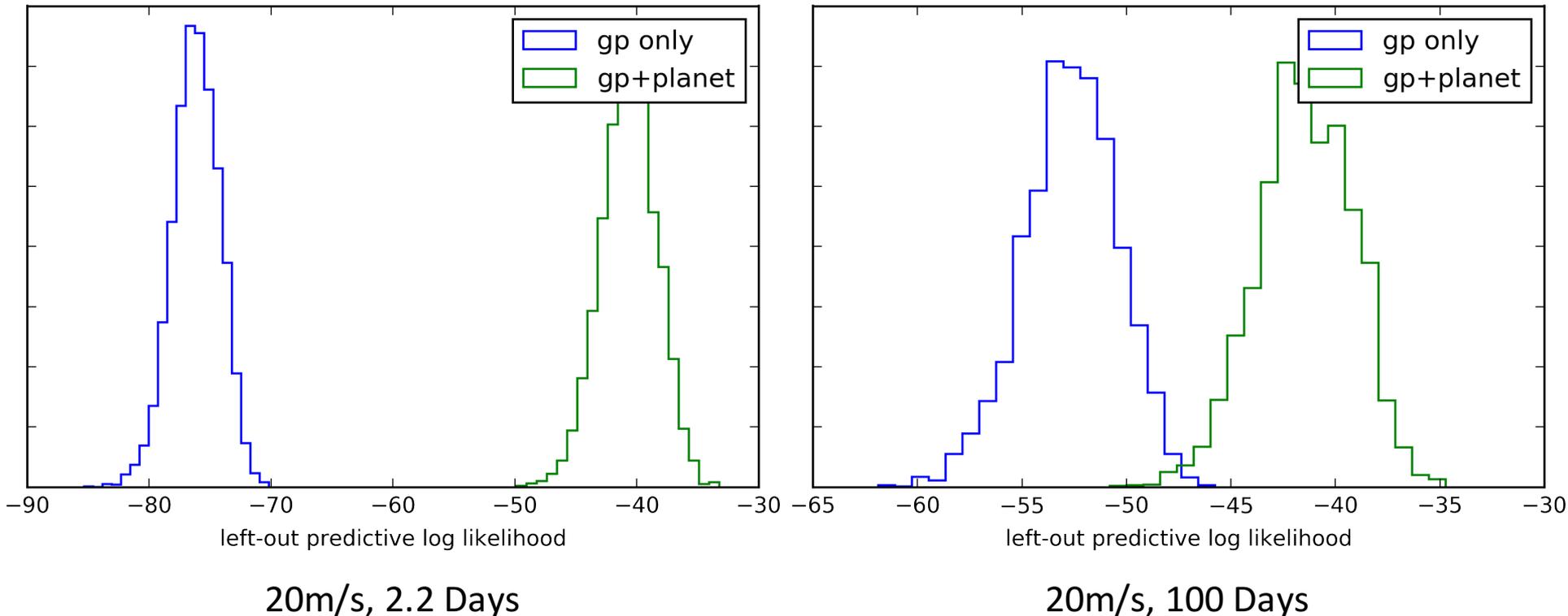- Plot model likelihood

Stellar Variability

Chosen Planets

- High amplitude (20m/s), short period (2.2 days)
- High amplitude (20m/s), long period (100 days)
- Low amplitude (2m/s), short period (2.2 days)
- Low amplitude (2m/s), long period (100 days)
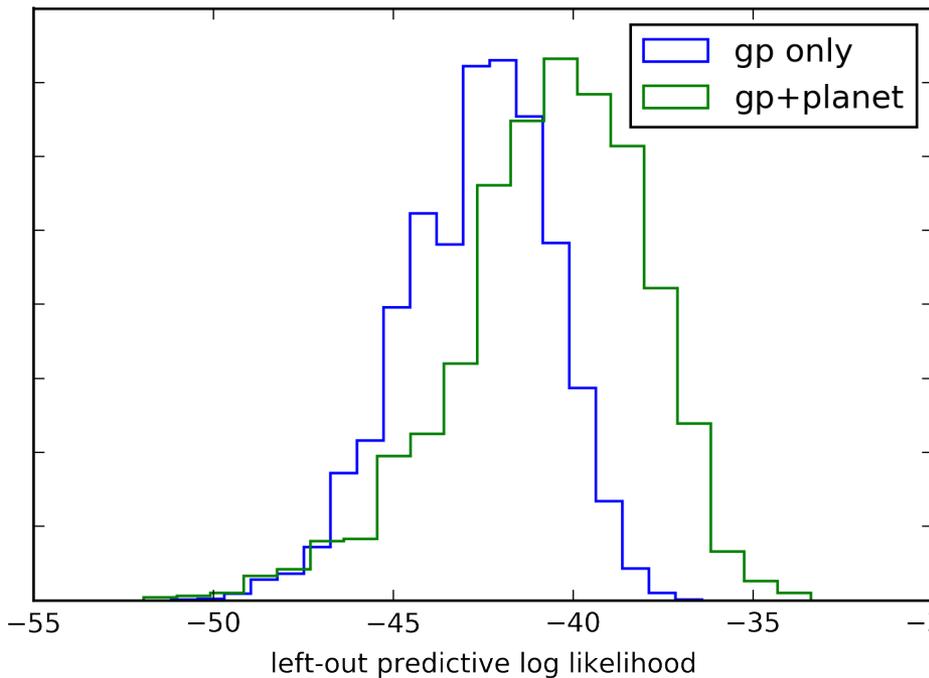
GP + MCMC in action

High Amplitude Planet

20m/s, 2.2 Days

20m/s, 100 Days

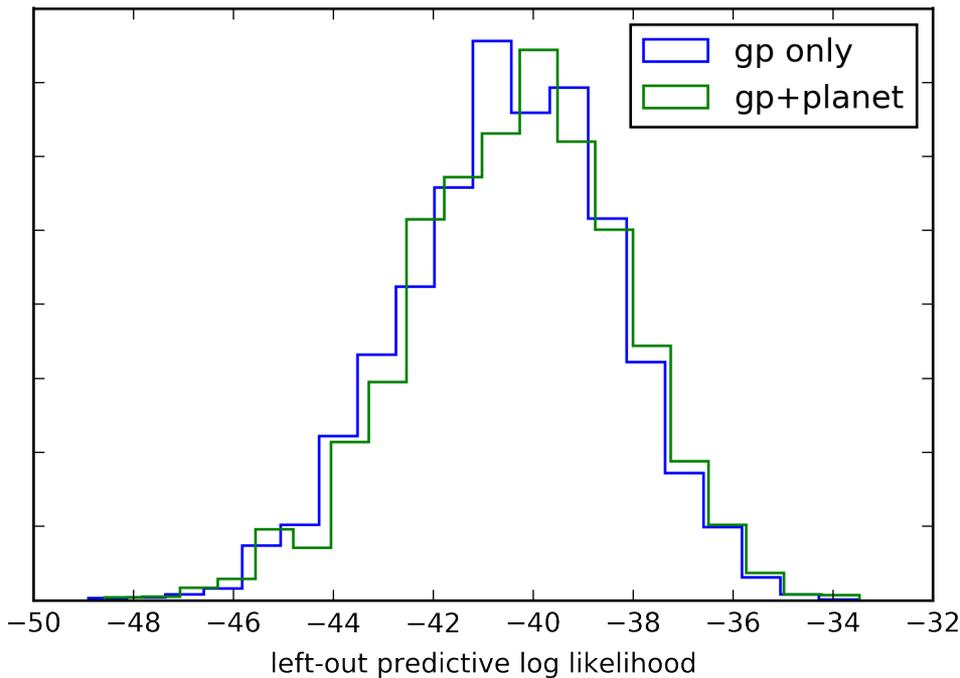## Short period planet easier to detect!

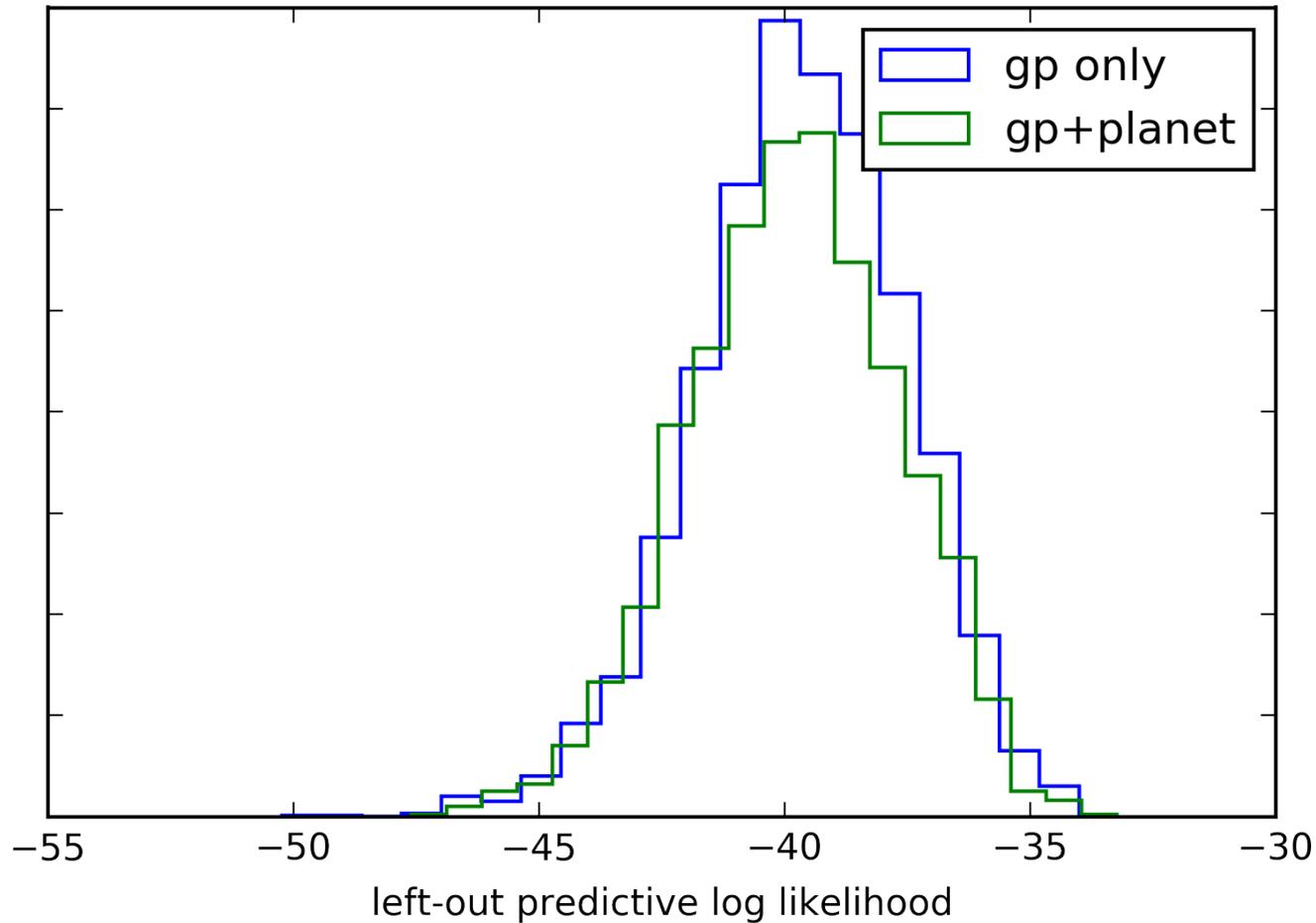# Low Amplitude Planet

2m/s, 2.2 Days   2m/s, 100 Days

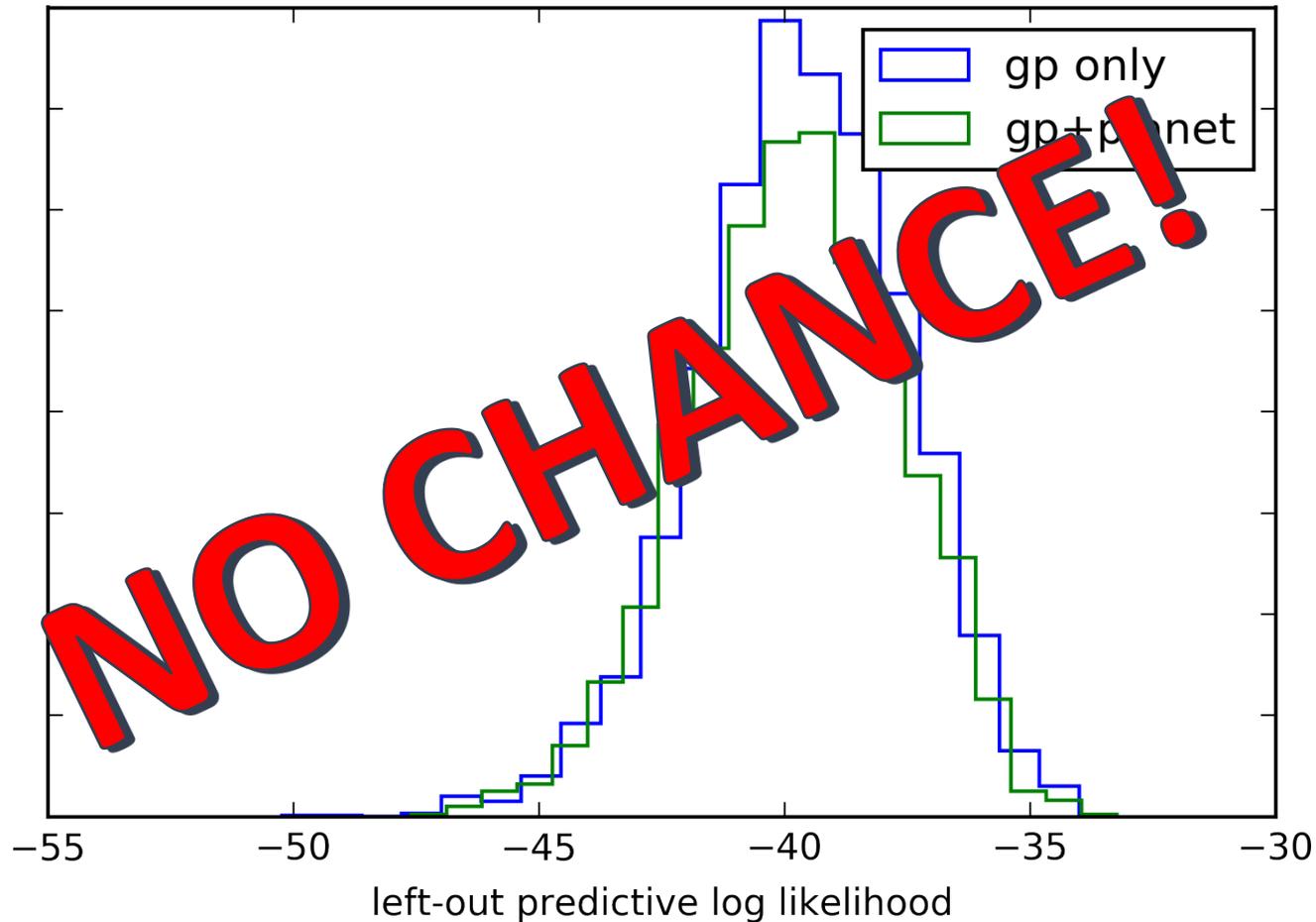Short period planet easier to detect – but not conclusive

Very low Amplitude planet?

0.5m/s, 2.2 Days

Very low Amplitude planet?

0.5m/s, 2.2 Days

Conclusions

Shorter period planets are easier to detect:

- More periods to fit

Ways to improve detectability:

- More intense observations
- Longer observational run
- Target lower mass stars

Thanks!

References:

- http://nexsci.caltech.edu/workshop/2016/RV_hands_on_session_guide.pdf

- http://adsabs.harvard.edu/abs/2016PASP..128f6001F