

JACOB LUHN

# THE FLICKER-JITTER RELATION AND PLANETS AROUND SUBGIANTS



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~~THE FLICKER-JITTER~~  
~~RELATION~~ AND PLANETS  
AROUND SUBGIANTS

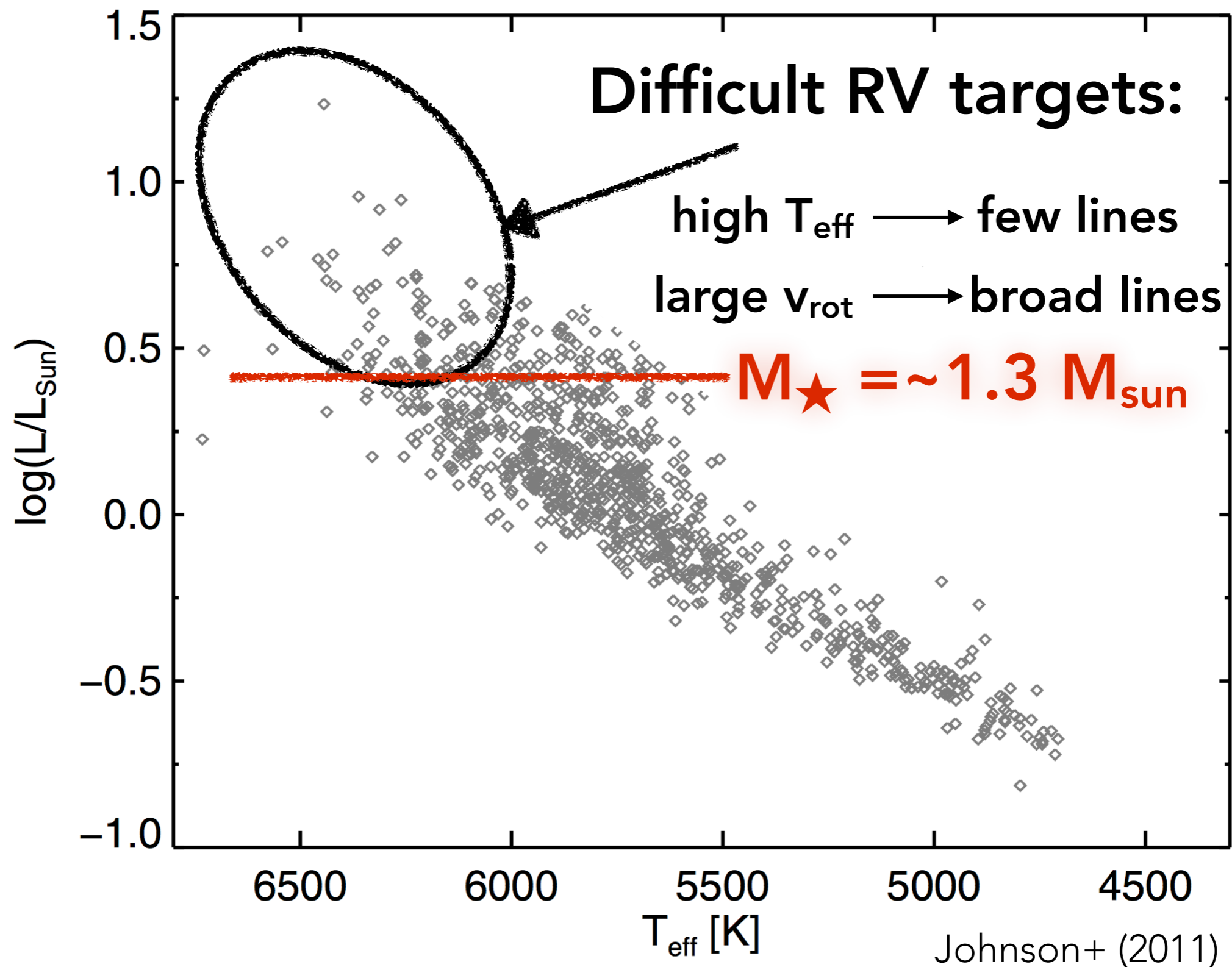


**PennState**

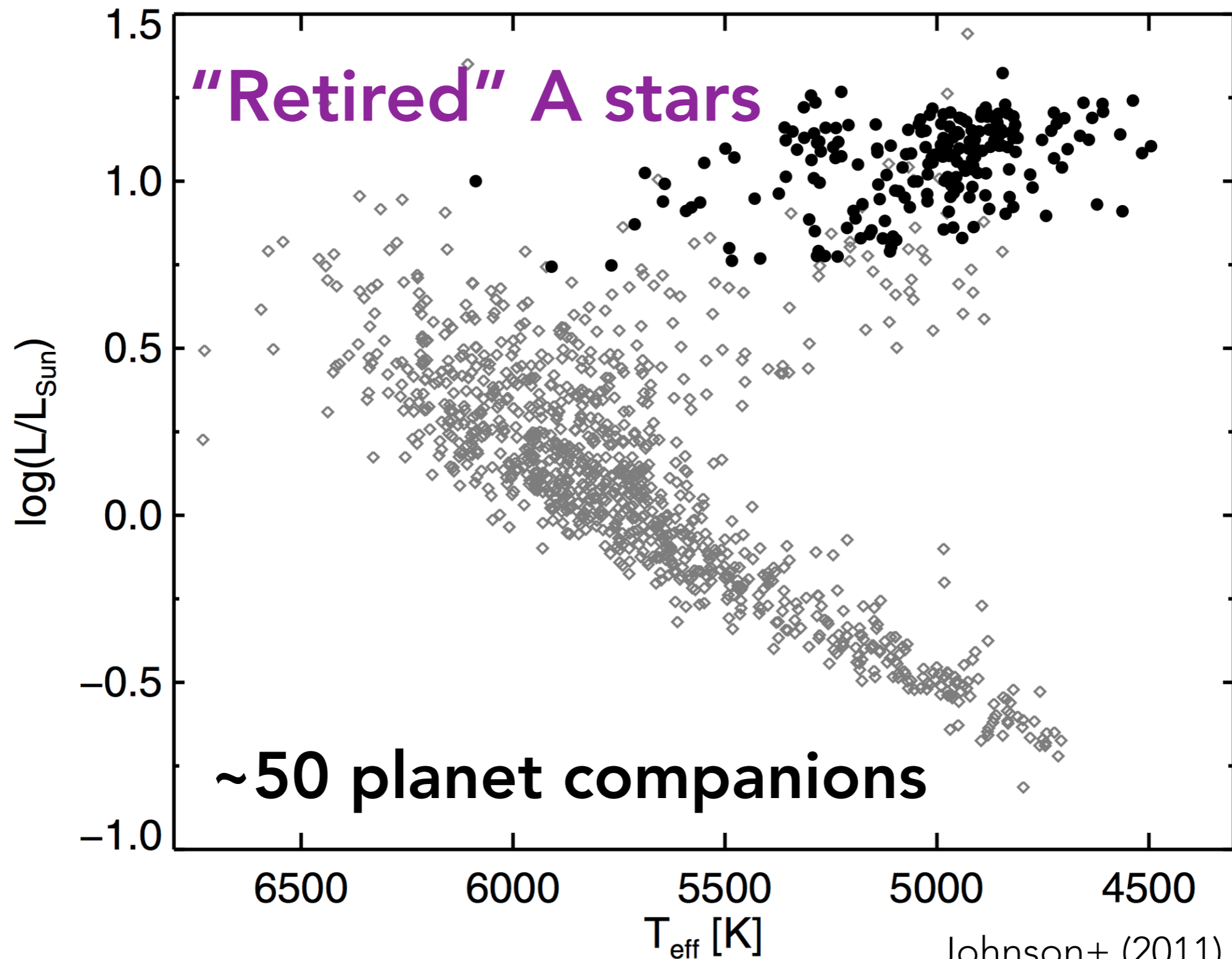
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# CALIFORNIA PLANET SEARCH



# JOHNSON+ SAMPLE OF SUBGIANTS



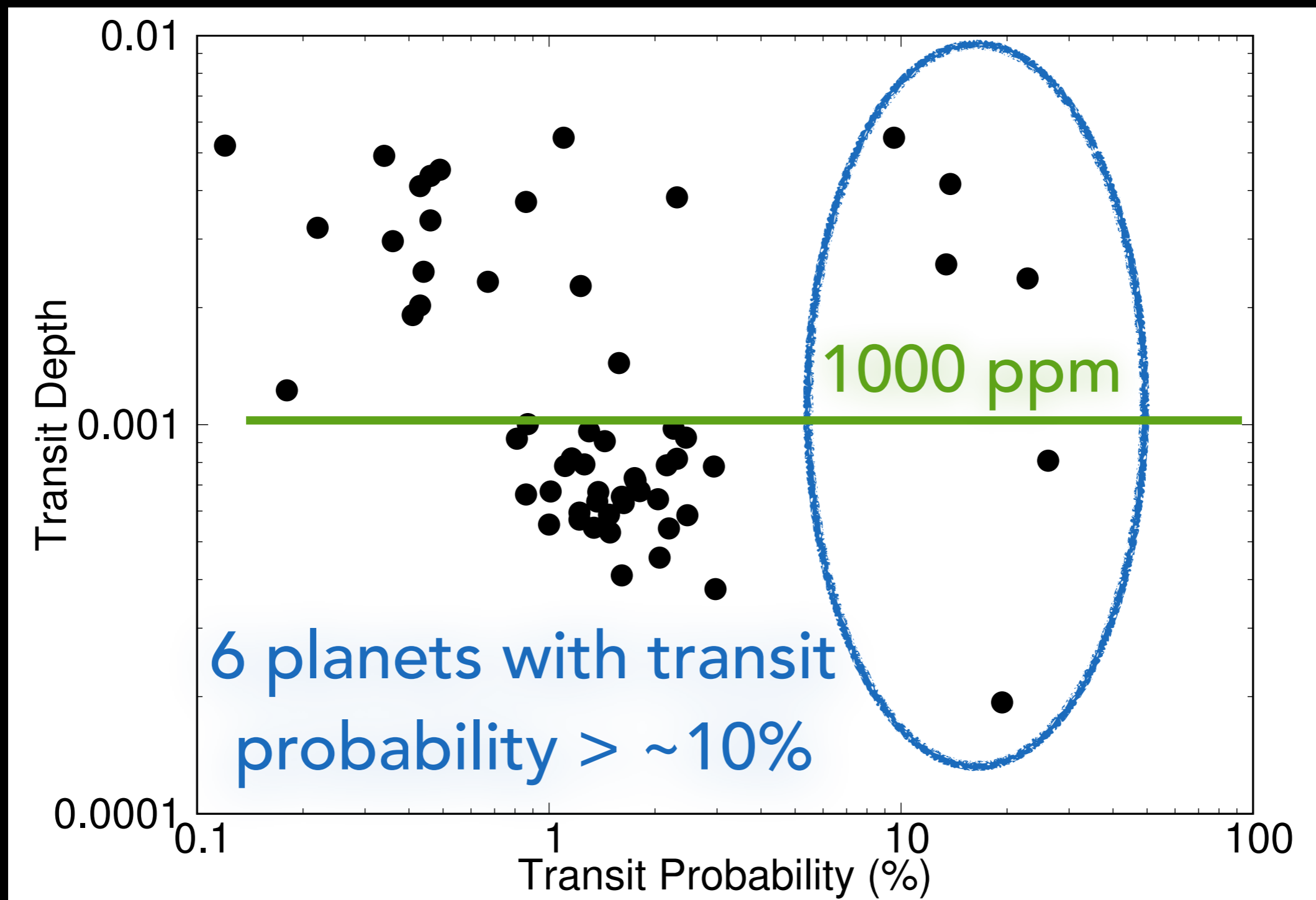
# BENEFITS OF TRANSIT FOLLOW-UP

- **Constrain true mass of planets**
- **Model independent stellar densities**
- **Targeted search near transit times rather than dedicated surveys**

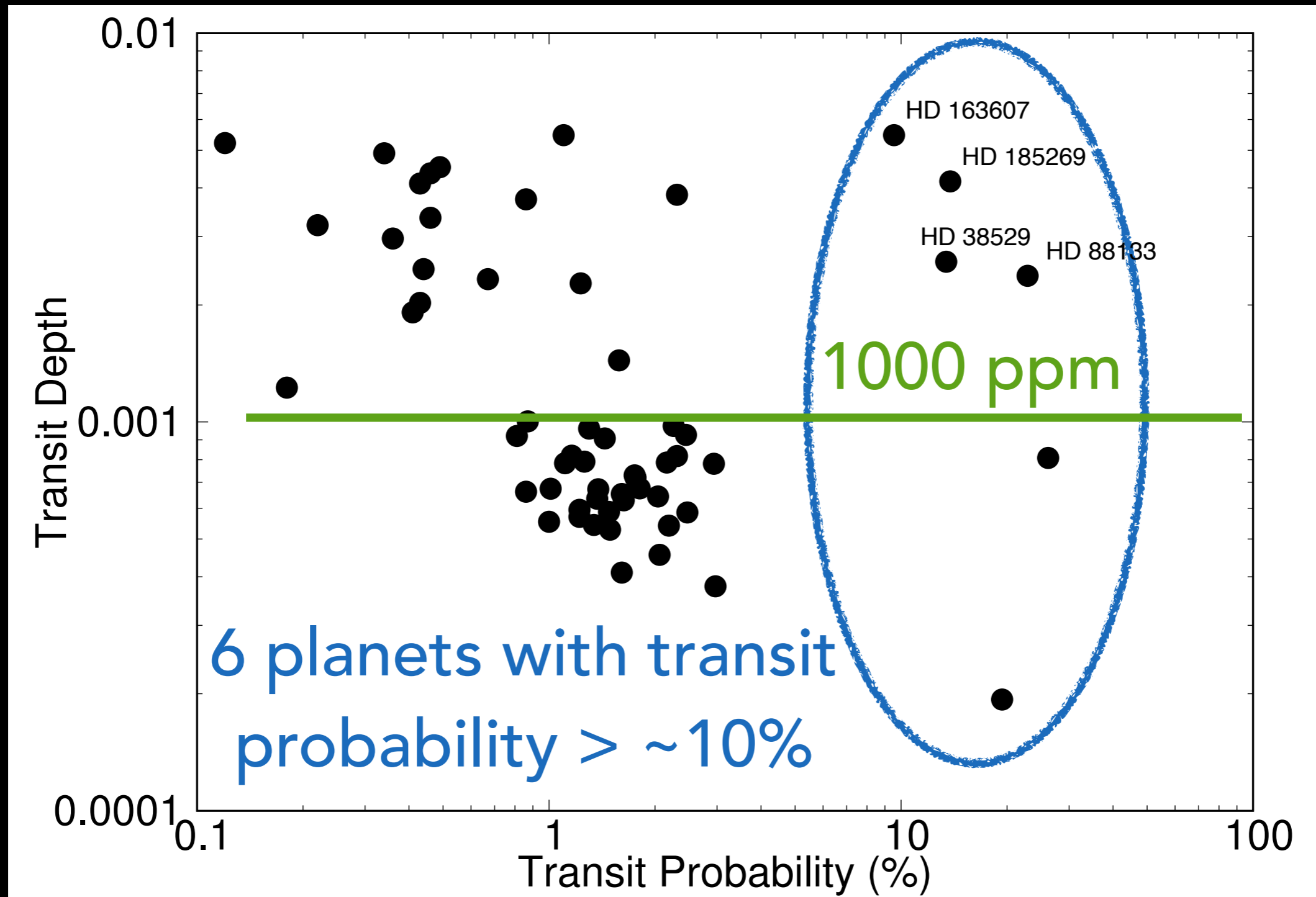
# TRANSIT PARAMETERS REQUIRE NEW RV FITS

1. Many planets have additional observations since their discovery
2. Updated stellar properties from Brewer et al. (2016) provide more precise parameters

# TRANSIT PARAMETERS OF SUBGIANT RV PLANETS

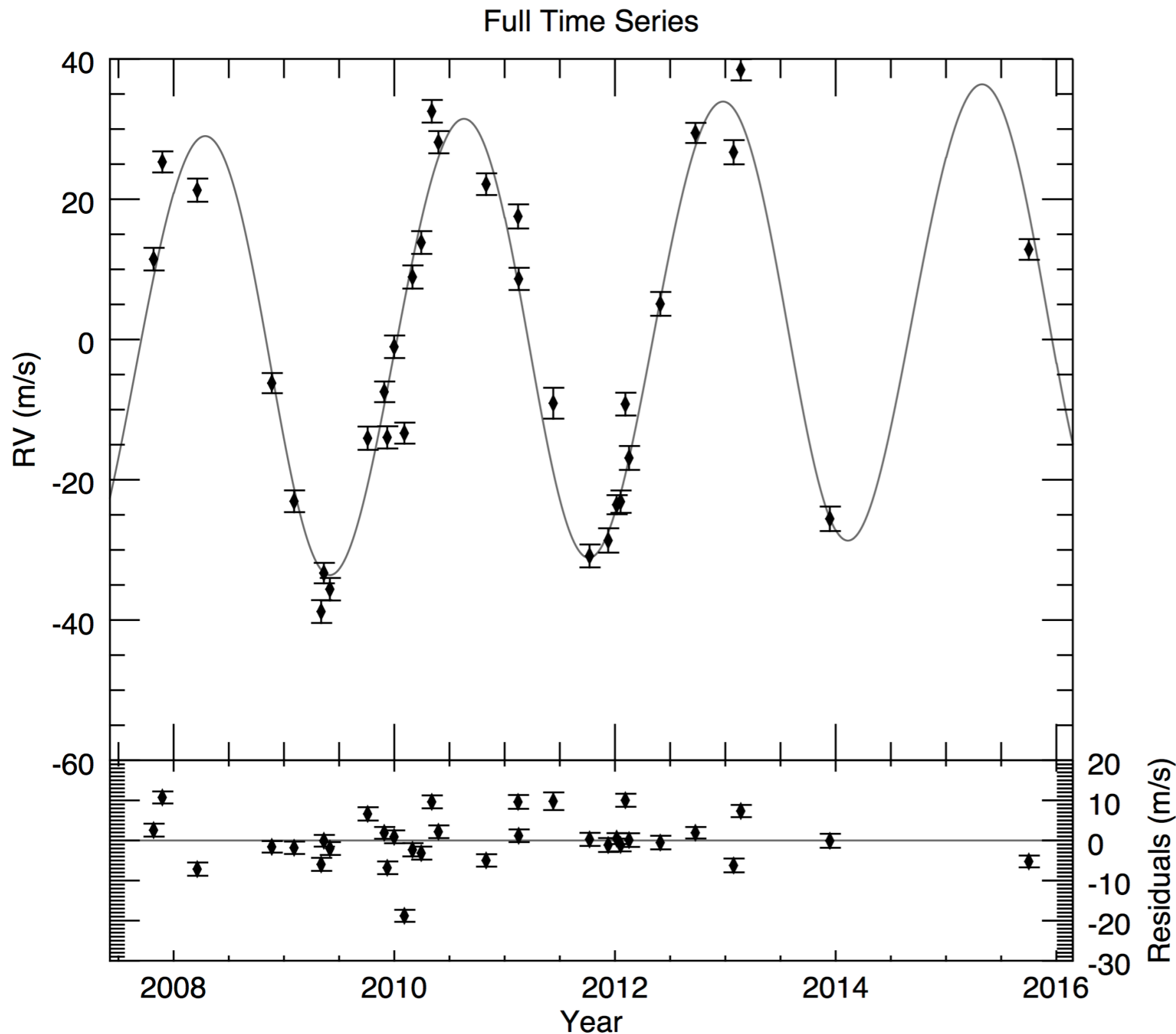


# TRANSIT PARAMETERS OF SUBGIANT RV PLANETS



# "LUHN-1" b

Luhn+ 2017, in prep



## Star

$$M = 1.21 M_{\text{sun}}$$

$$R = 4.96 R_{\text{sun}}$$

## Planet

$$m_{\text{ini}} = 1.6 M_{\text{JUP}}$$

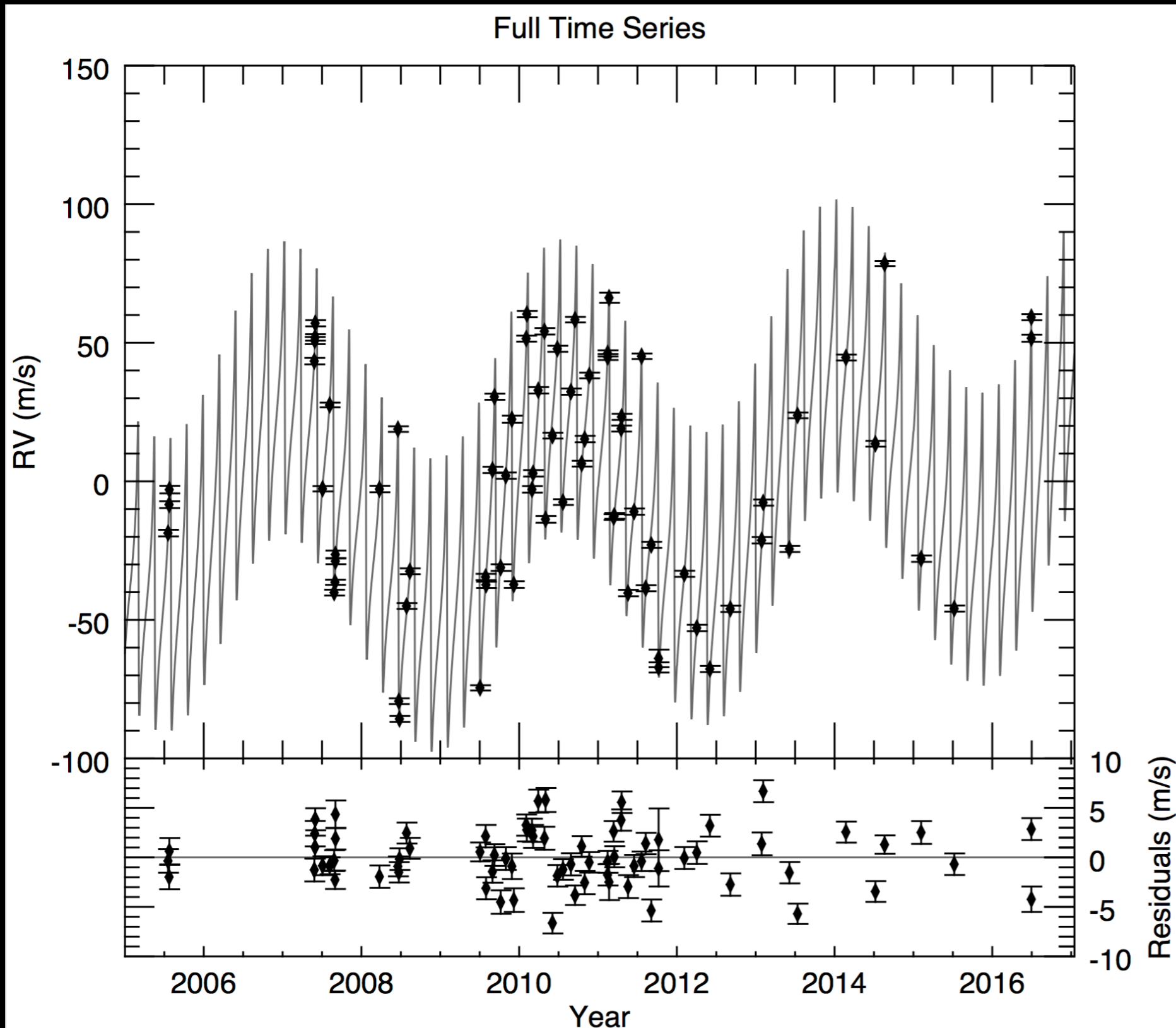
$$P = 857 \text{ days}$$

$$a = 1.88 \text{ au}$$

# HD 163607 d

a 3rd planet in previously  
2 known planet system

Luhn+ 2017, in prep



## Star

$$M = 1.12 M_{\text{sun}}$$

$$R = 1.76 R_{\text{sun}}$$

## Planet

$$m \sin i = 1.31 M_{\text{JUP}}$$

$$P = 6550 \text{ days}$$

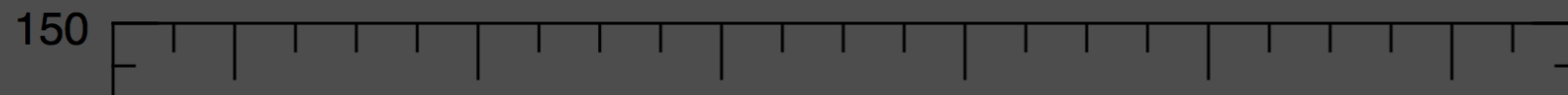
$$a = 7.12 \text{ au}$$

# HD 163607 d

a 3rd planet in previously  
2 known planet system

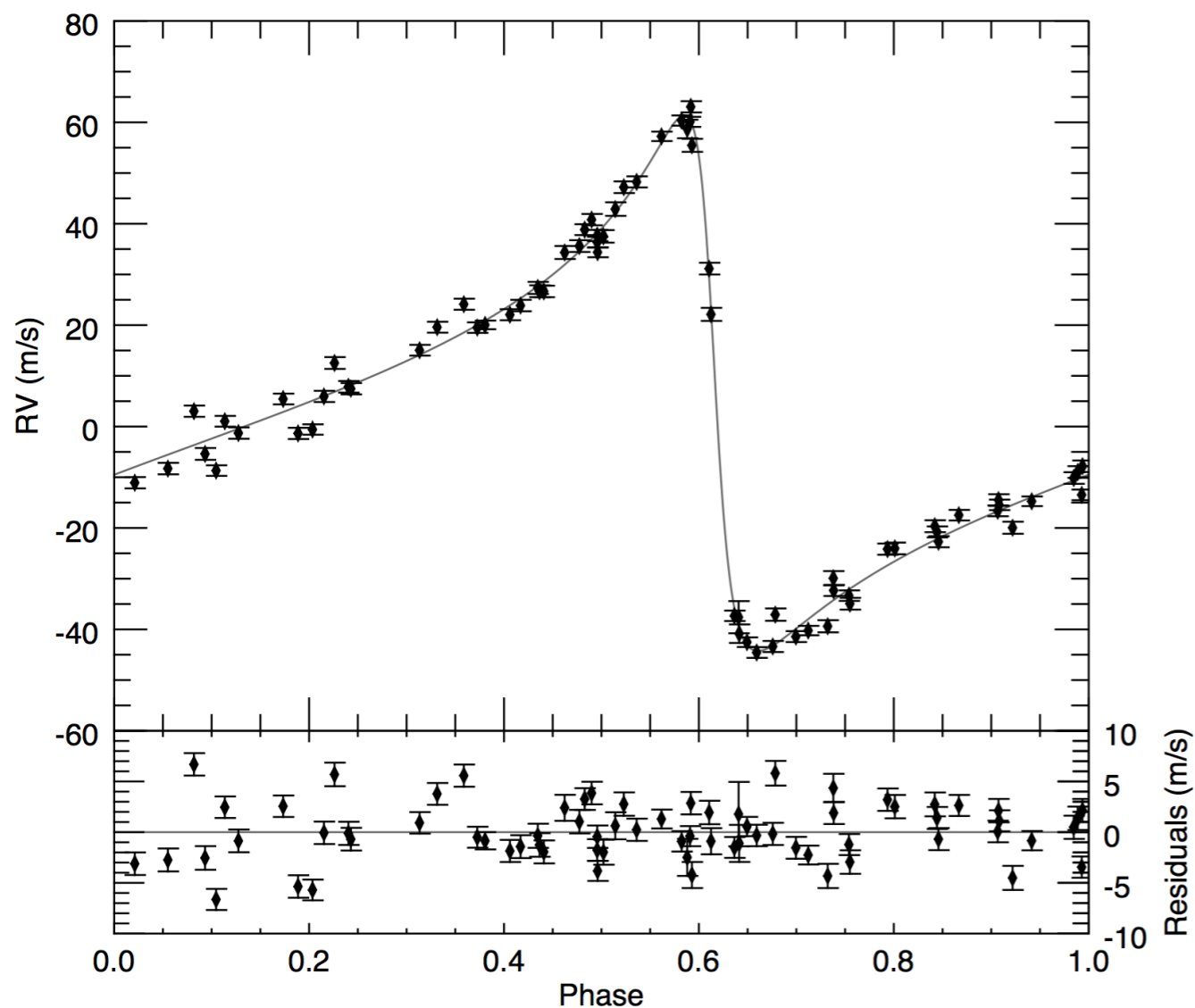
Luhn+ 2017, in prep

Full Time Series

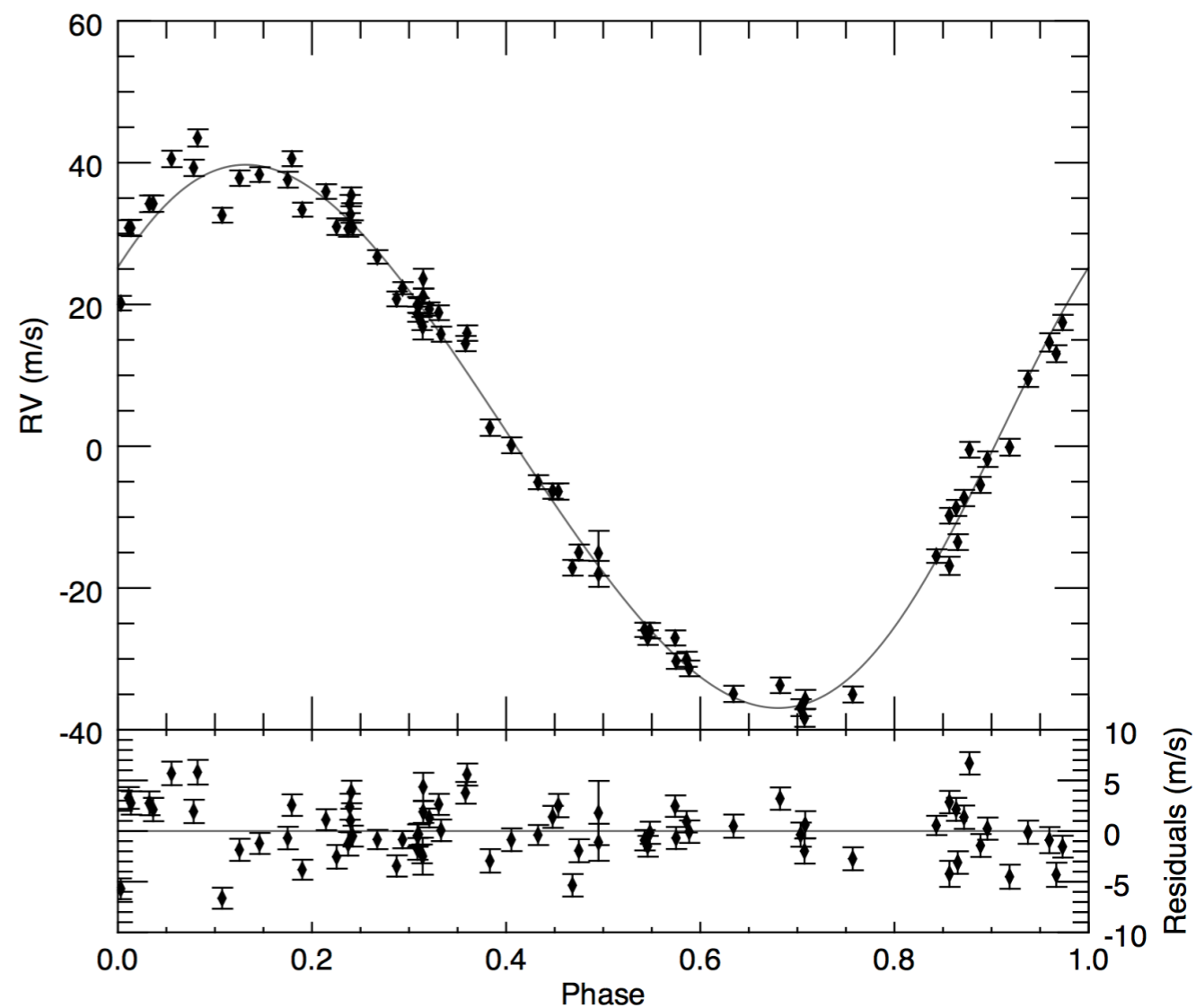


Star

Phase Curve - Planet 1



Phase Curve - Planet 2



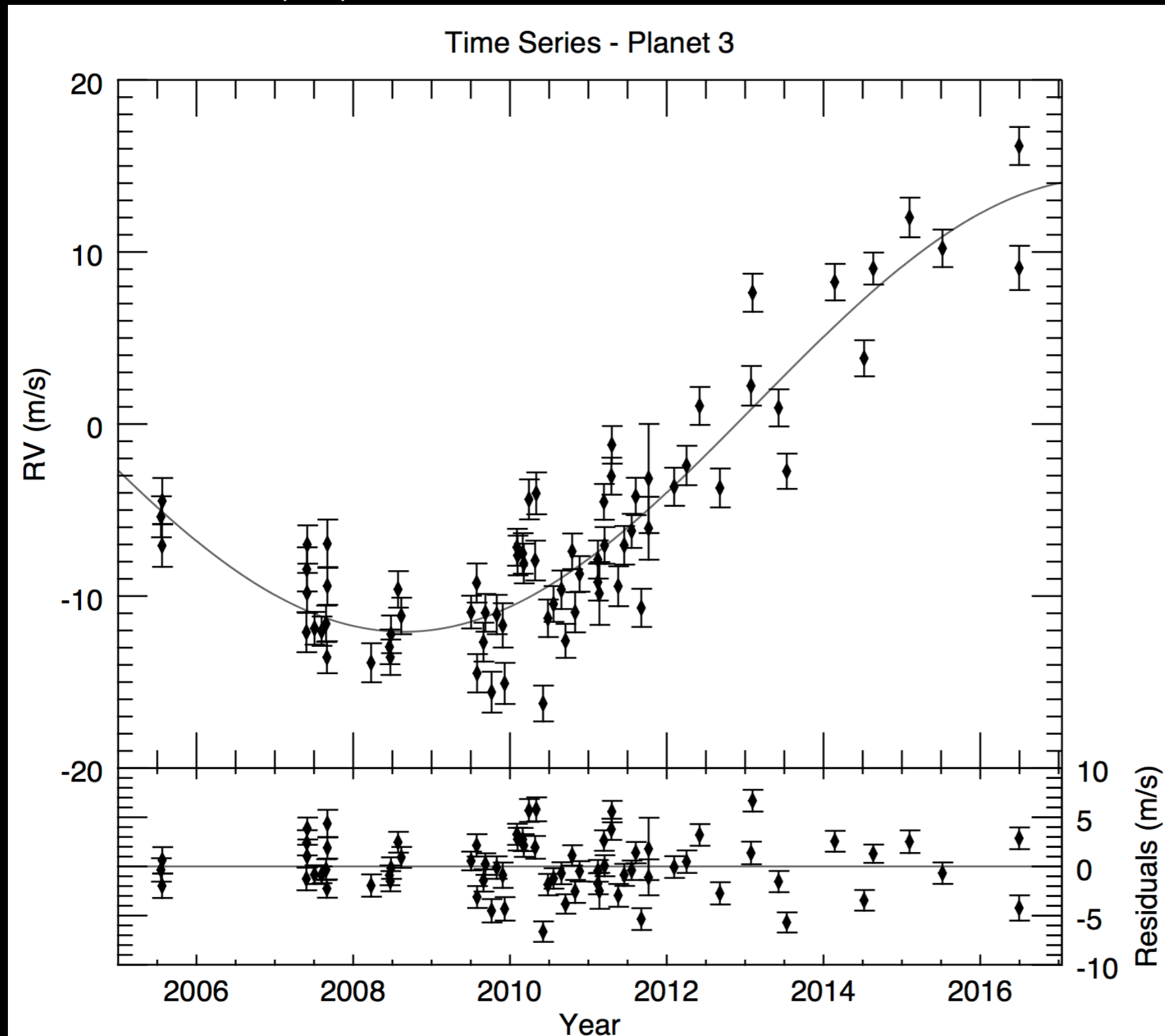
P~75 days

P~1200 days

# HD 163607 d

a 3rd planet in previously  
2 known planet system

Luhn+ 2017, in prep



## Star

$$M = 1.12 M_{\text{sun}}$$

$$R = 1.76 R_{\text{sun}}$$

## Planet

$$m \sin i = 1.31 M_{\text{JUP}}$$

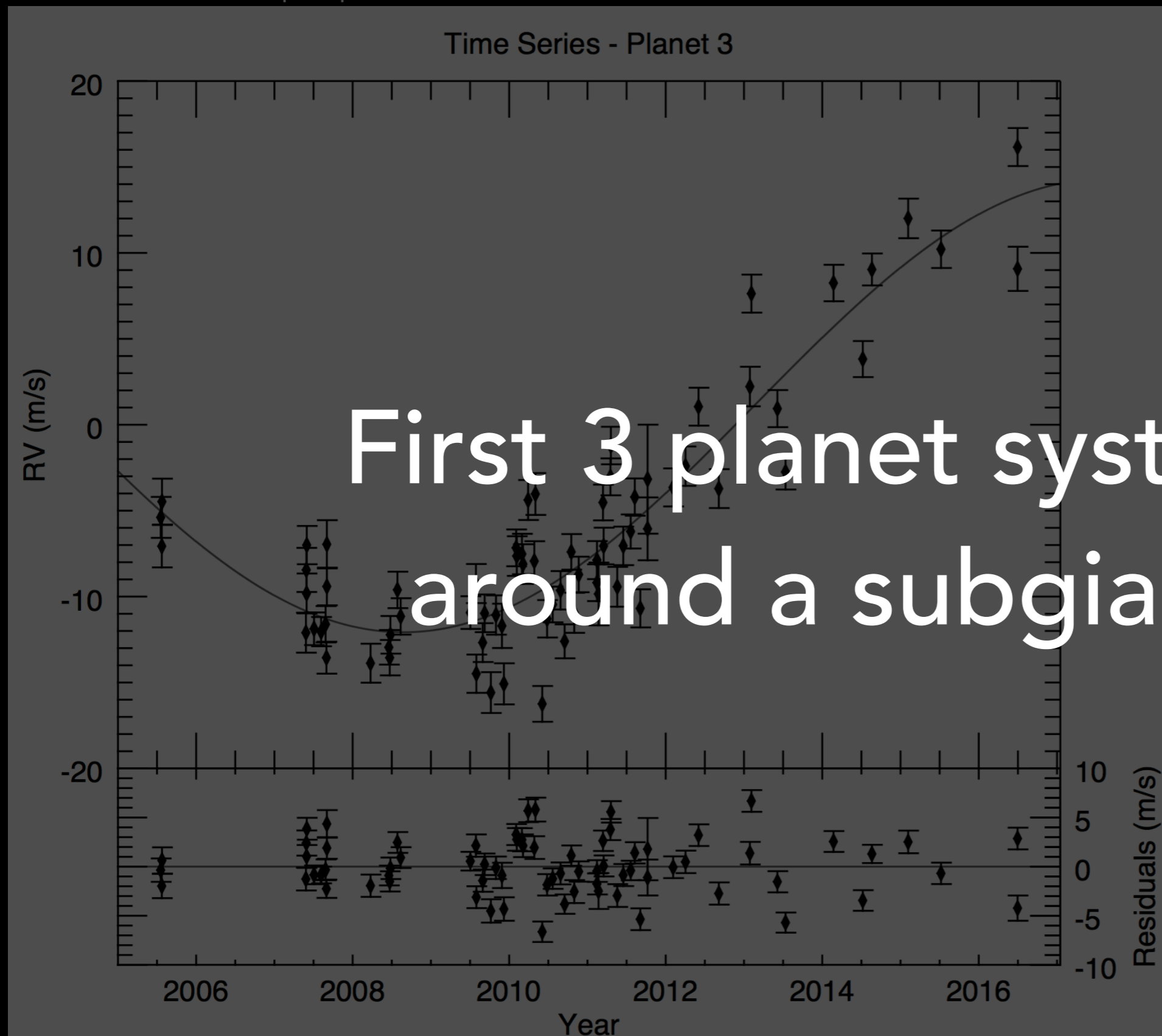
$$P = 6550 \text{ days}$$

$$a = 7.12 \text{ au}$$

# HD 163607 d

a 3rd planet in previously  
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## Star

$$M = 1.12 M_{\text{sun}}$$

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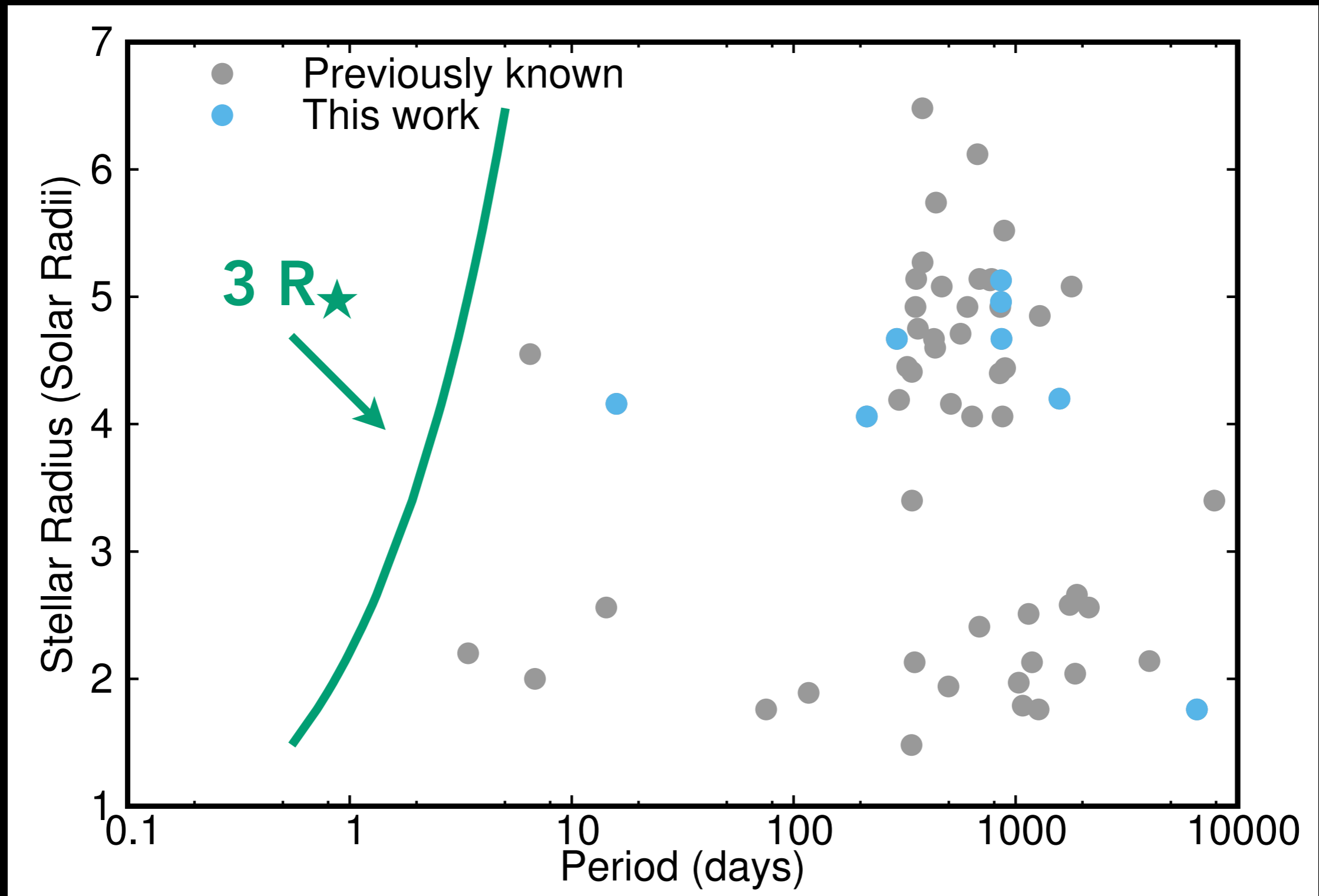
$$m \sin i = 1.31 M_{\text{JUP}}$$

$$P = 6550 \text{ days}$$

$$a = 7.12 \text{ au}$$

# 8 NEW PLANETS AROUND SUBGIANTS

~15% increase in number of known RV planets around subgiants

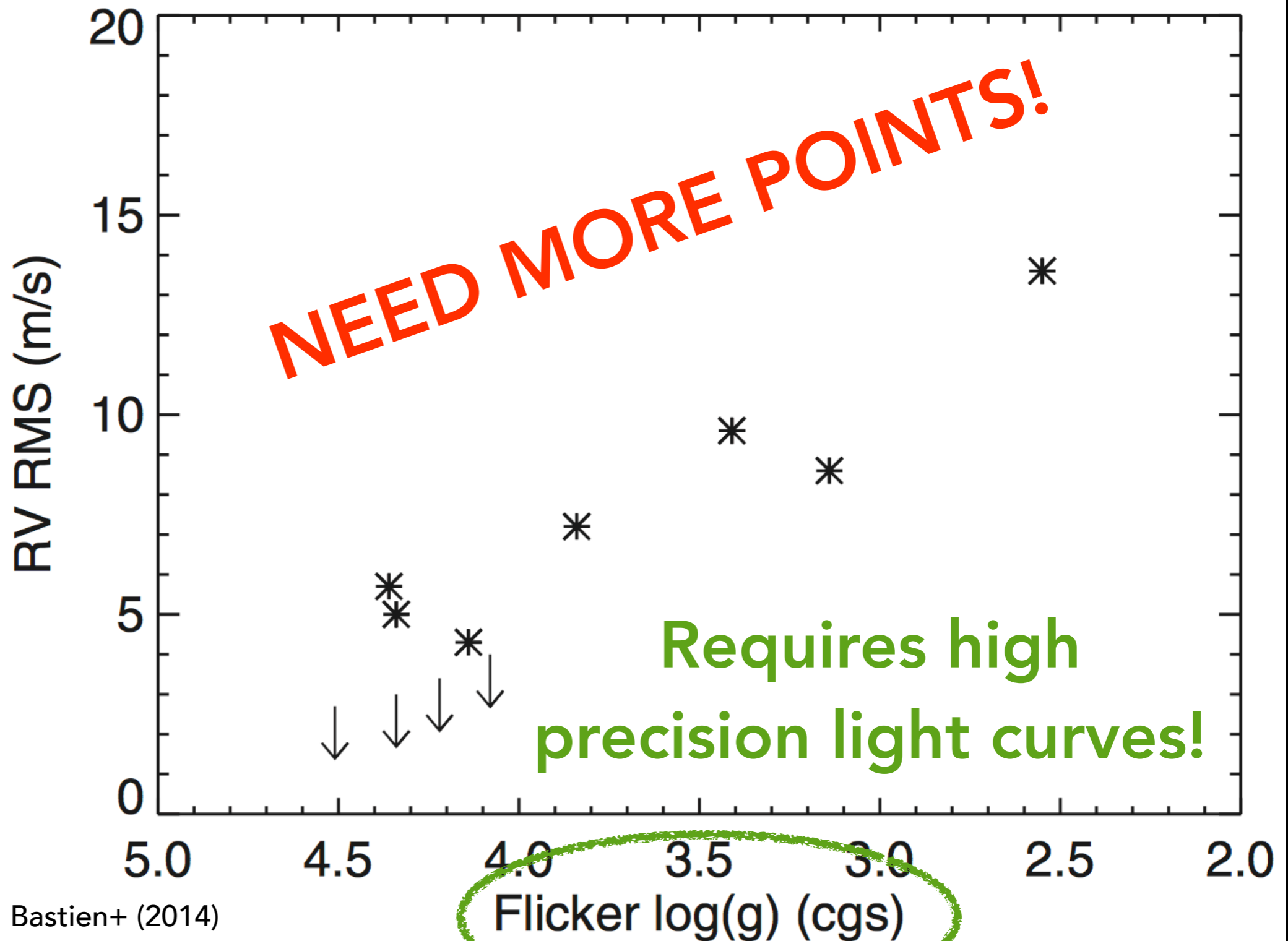


# FUTURE WORK

Updating the relation  
between photometric flicker  
and RV jitter

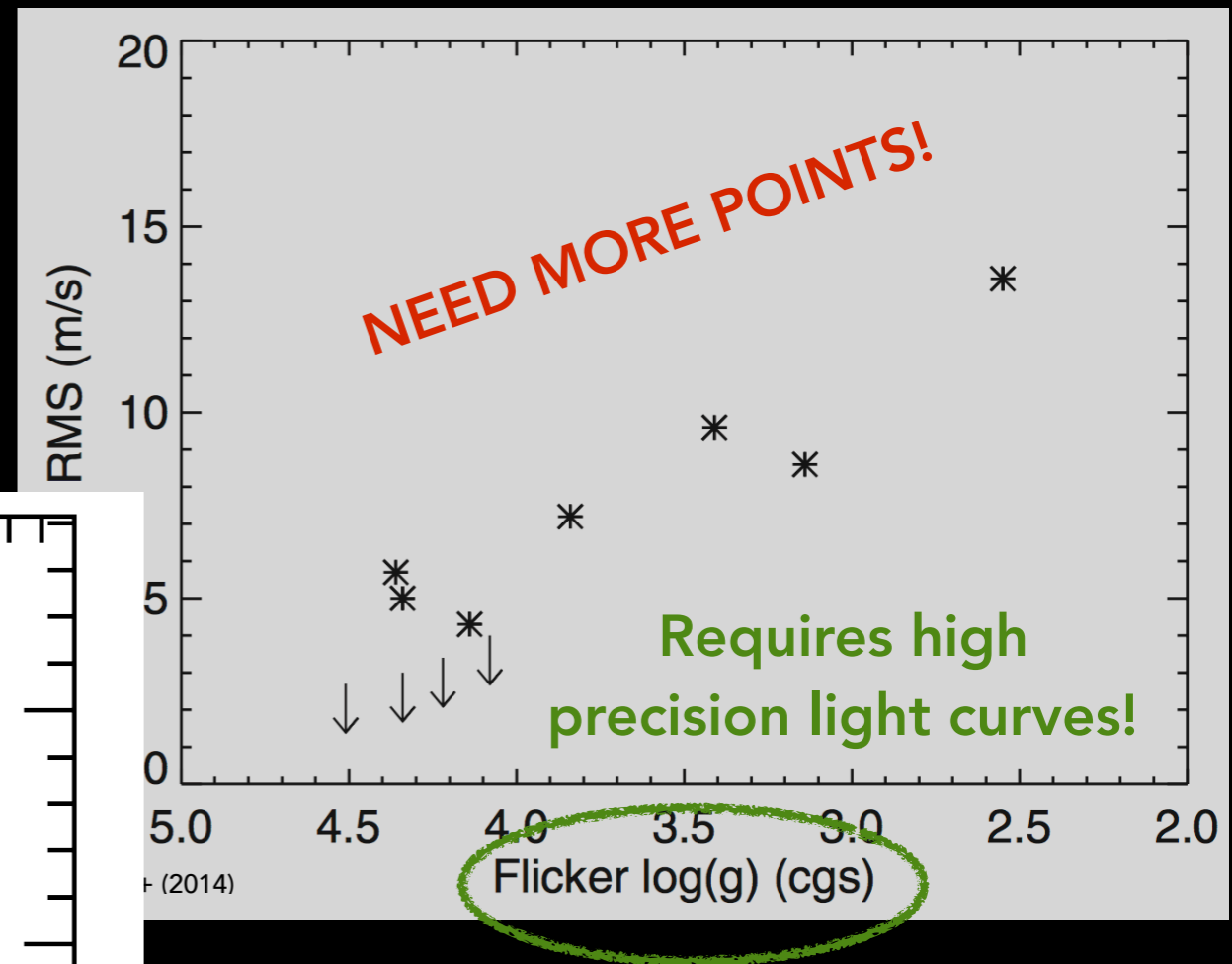
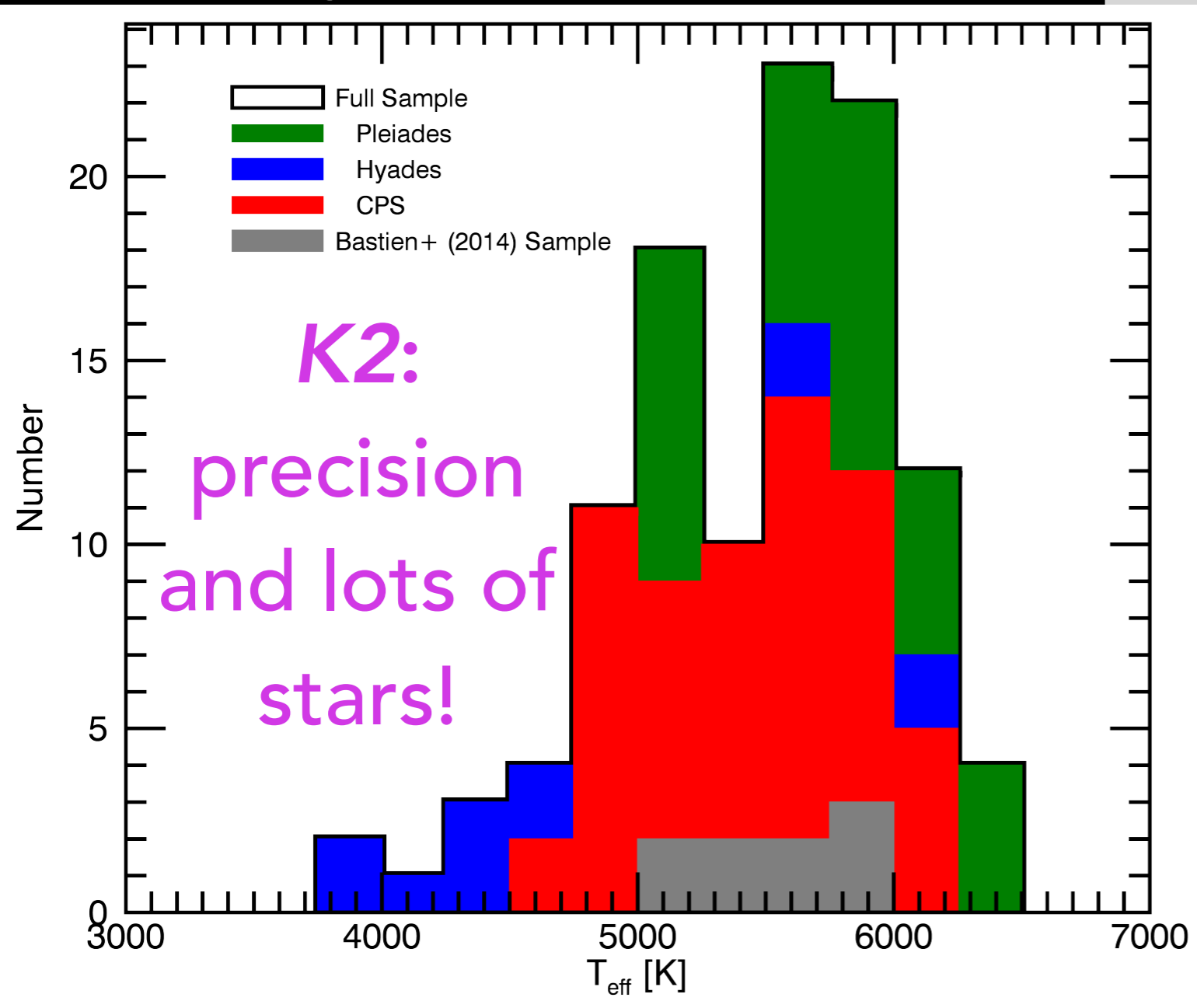
# FUTURE WORK

Updating  
between p  
and RV jitt



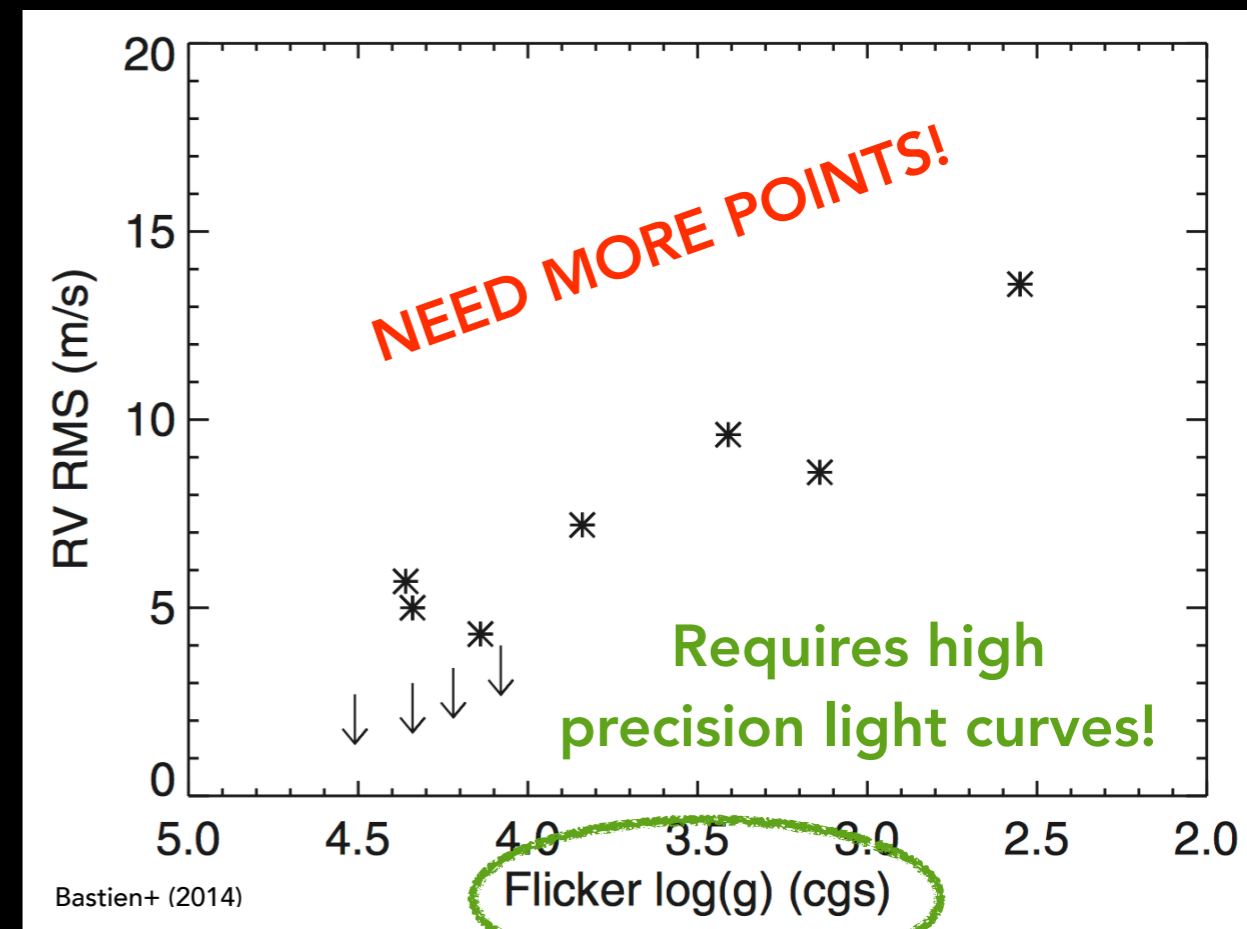
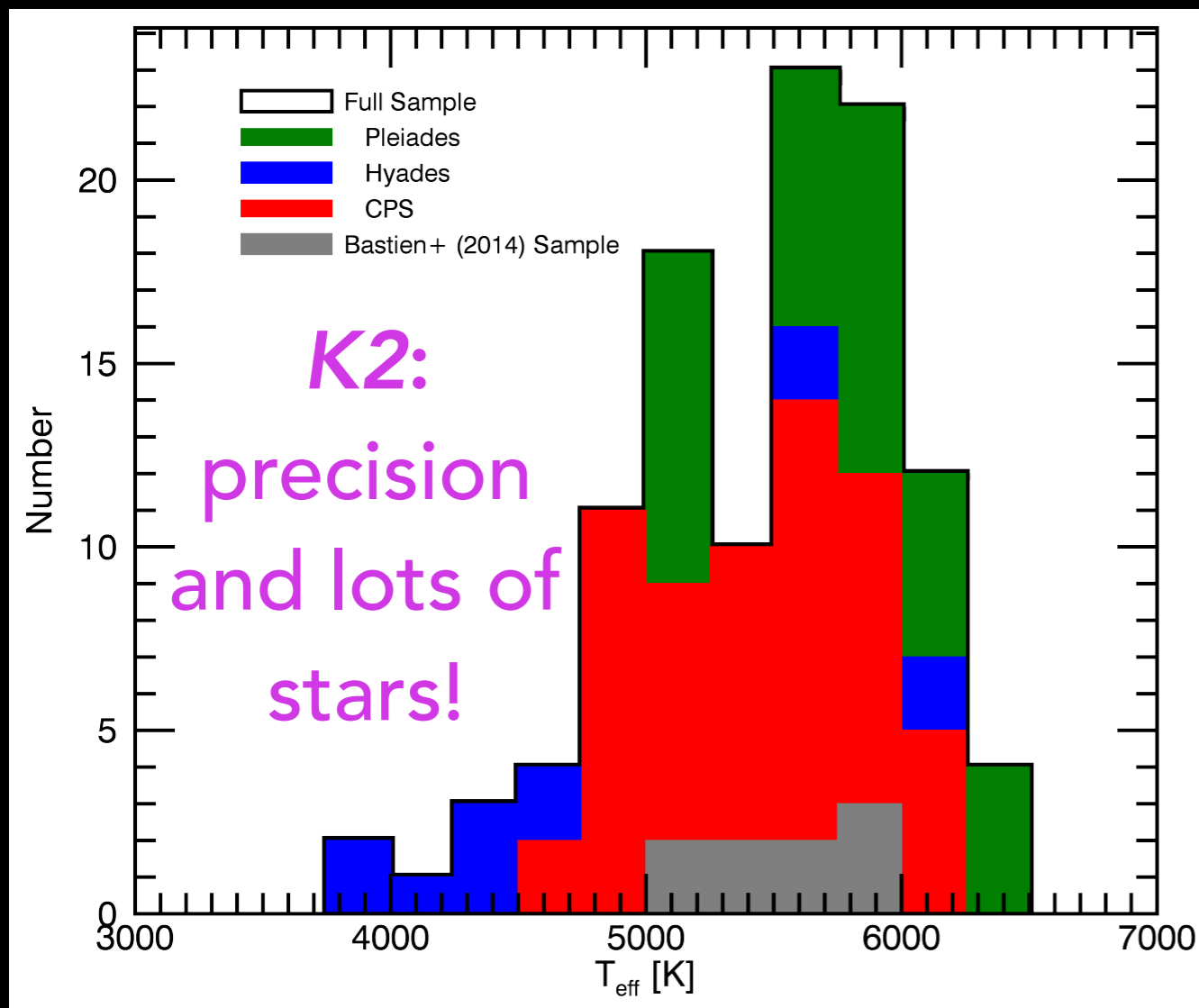
# FUTURE WORK

Updating the relation  
between photometric flicker  
and RV jitter



# FUTURE WORK

Updating the relation  
between photometric flicker  
and RV jitter



Updated relation with *K2*  
stars will provide *RV jitter*  
predictions for as many  
*TESS* stars as possible