Effect of stellar inclination on planet detectability

GROUP 3

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Hypothesis

What happens if you change the stellar inclination?

How does inclination influence the stellar activity?

How does stellar inclination influence the ability to detect a planetary signal in RV data?

Conclusions

Future Perspective

Questions

- What happens if you change the **stellar inclination**? Is the activity RV signal more or less important?

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- Is it therefore more difficult or easier to detect planets? Do you prefer to observe equator-on stars, or pole on stars for planet detection?

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- as the stellar inclination decreases, the magnitude of the RV signal decreases as well.
- as the host star is viewed more pole on the influence of stellar activity decreases, leading to an increased planetary detectability.

Question 1: Methodology

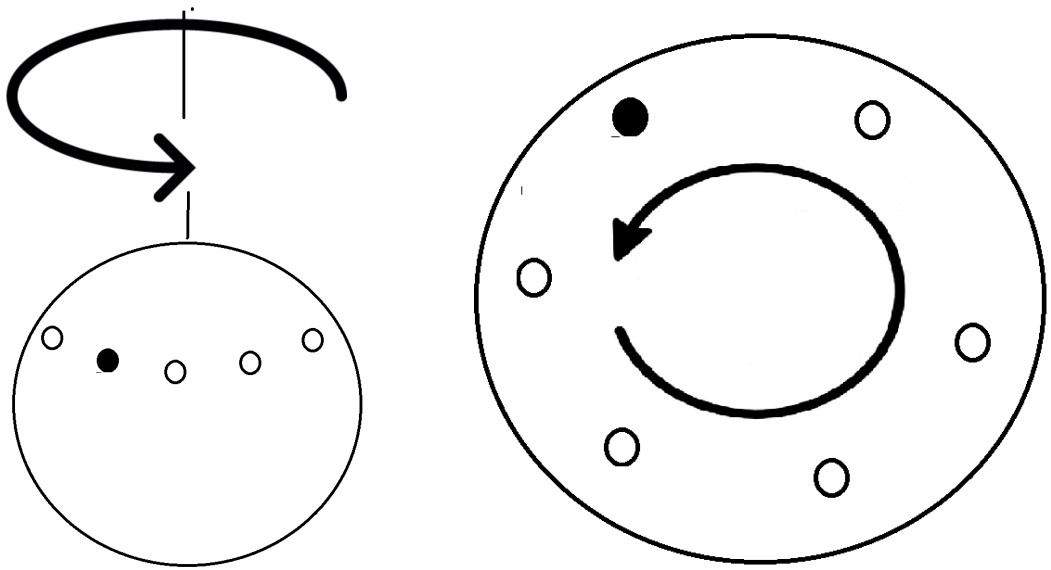

Figure: (a) Equator-on scenario, (b) Pole-on scenario.

Question 1: Analysis

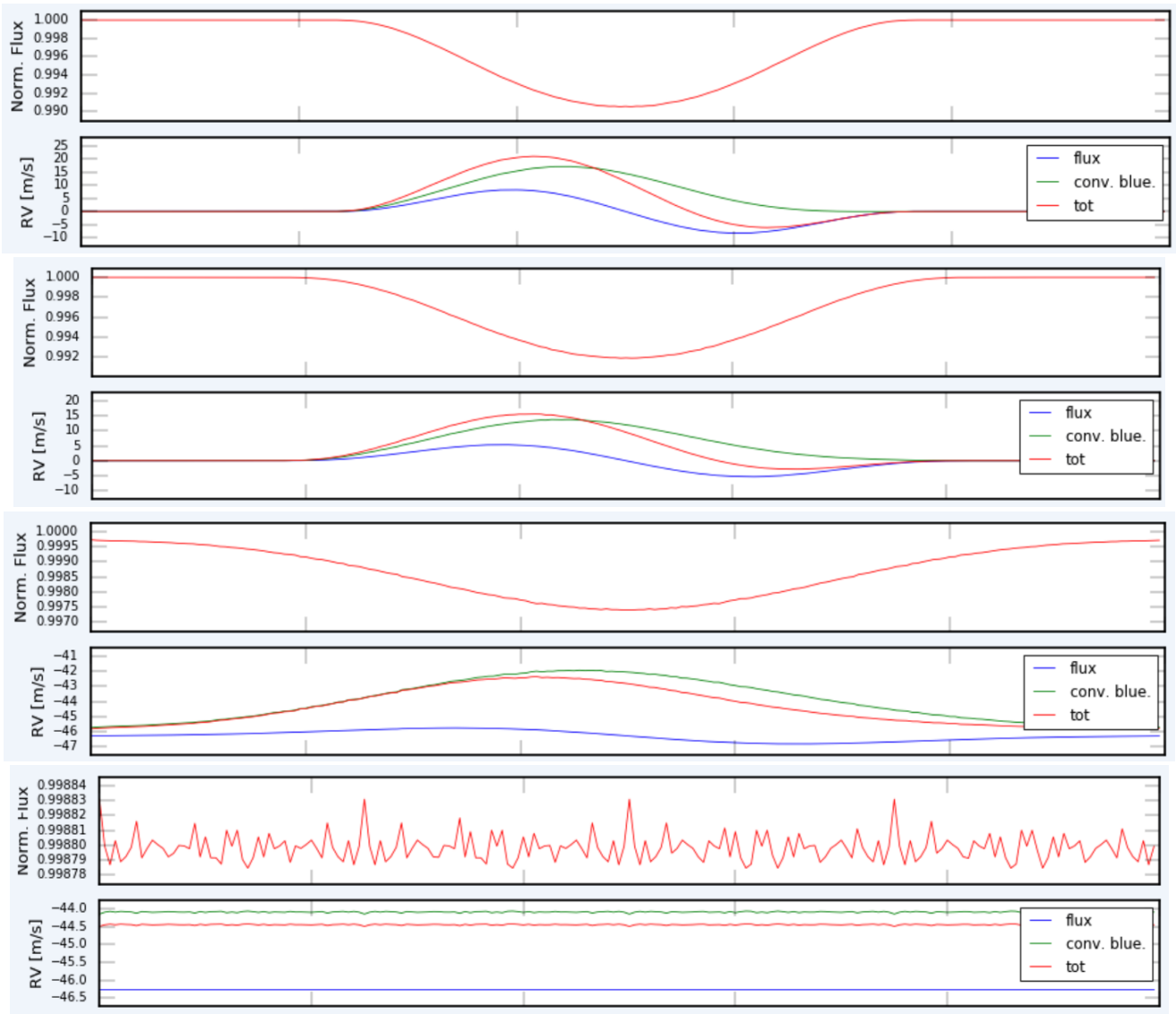

Figure: from the top to the bottom: inclination $= (90, 45, 10, 0)$.

Question 2: Methodology

- Stellar parameters: same as those of the sun.

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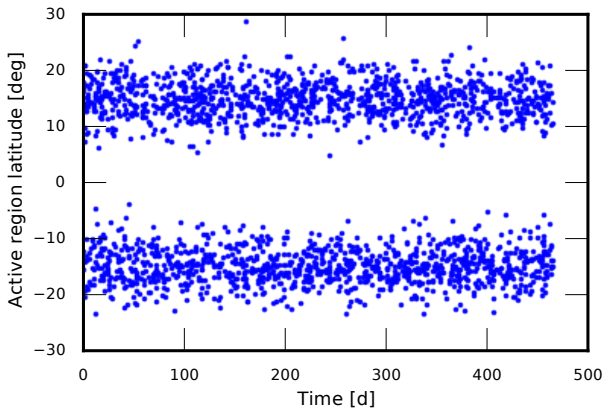
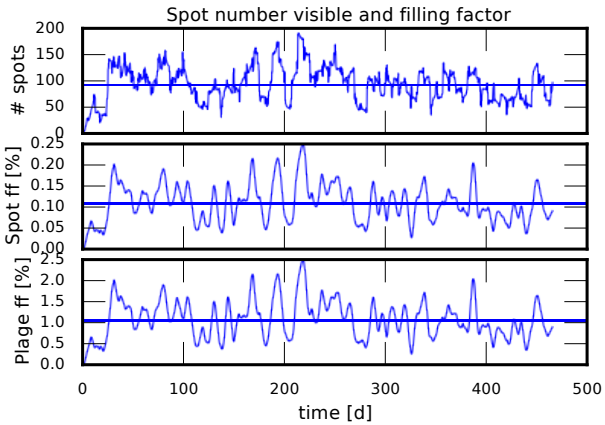
- Stellar inclination: is allowed to vary (90, 60, 45 and 30 degrees).





Question 2: Analysis

Compare the extreme cases of inclination.

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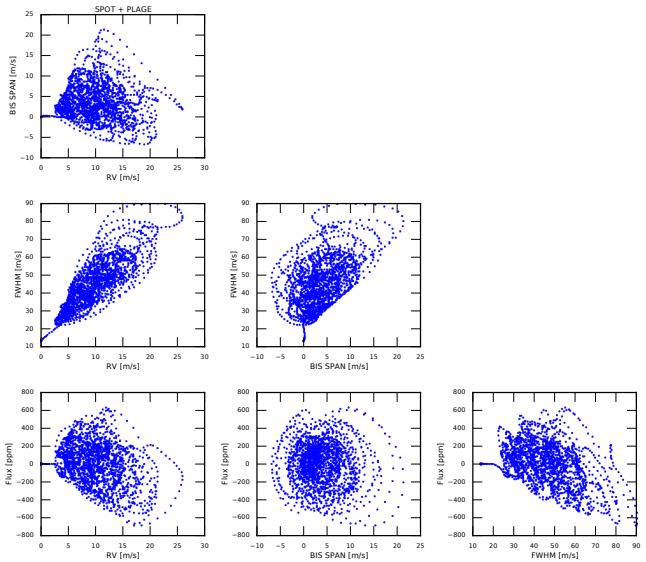
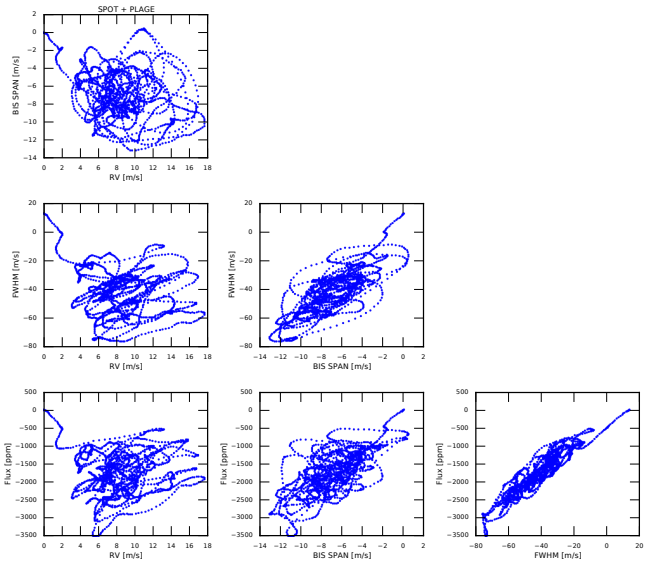
- At 30 degrees SPOT AND PLAG correlations show ridge structure for FLUX vs FWHM.





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Compare the flux and RV effects.

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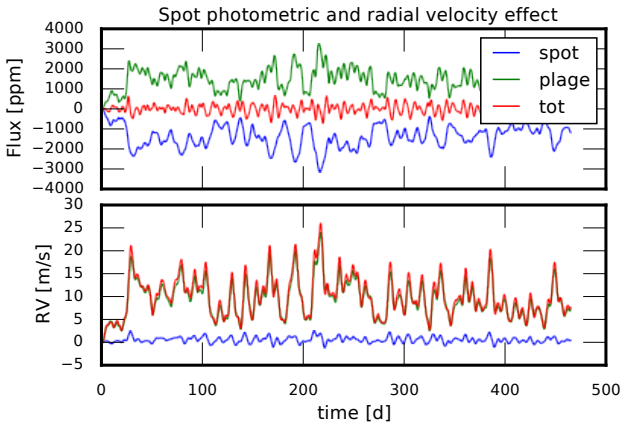
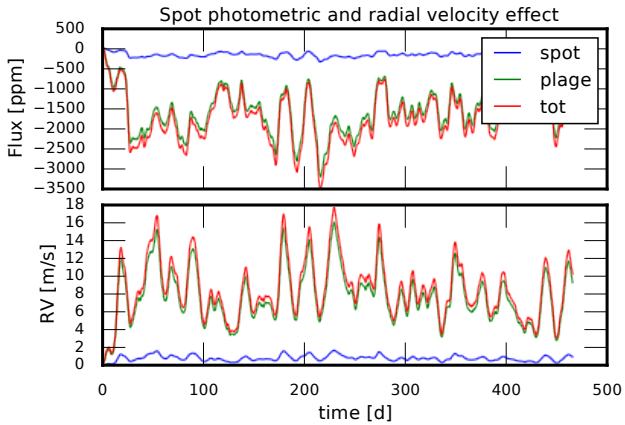
- at 90 degrees the flux vs time total floats around zero and the RV total ranges from near zero to 25 m/s.
- at 30 degrees the flux total a plage flux are both very negative. The spot flux appears unchanged (perhaps because it was not updated in SOAP2). The RV range is between 0 ans 17 m/s.





Question 2: Results

- As the stellar inclination approaches zero (pole on), the structure of the correlations change, becoming more ridge like in some dimensions.
- As the stellar inclination decreases the magnitude of the RV signal decreases

Question 3 Methodology

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- Planet has a RV semi-amplitude of 3 m/s and period of 10 days .

Question 3: Analysis

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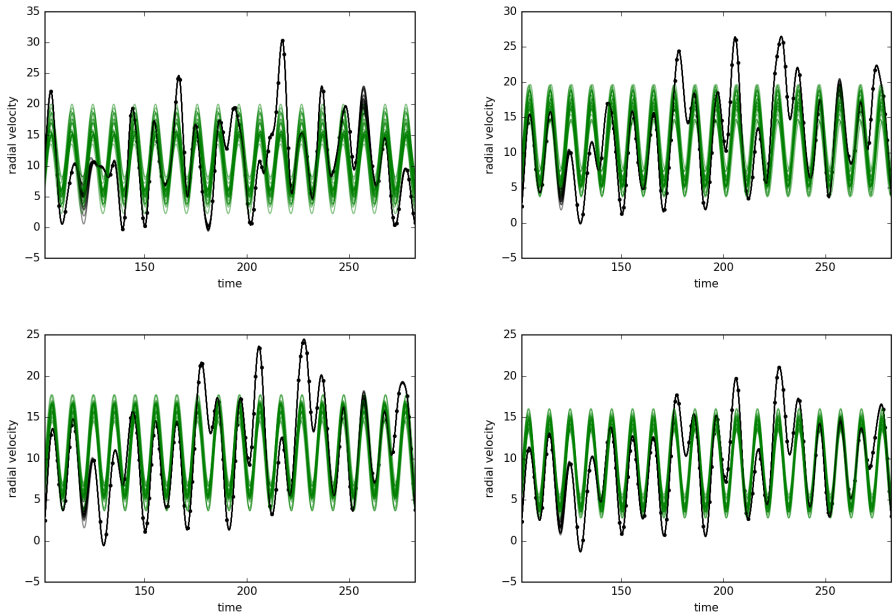

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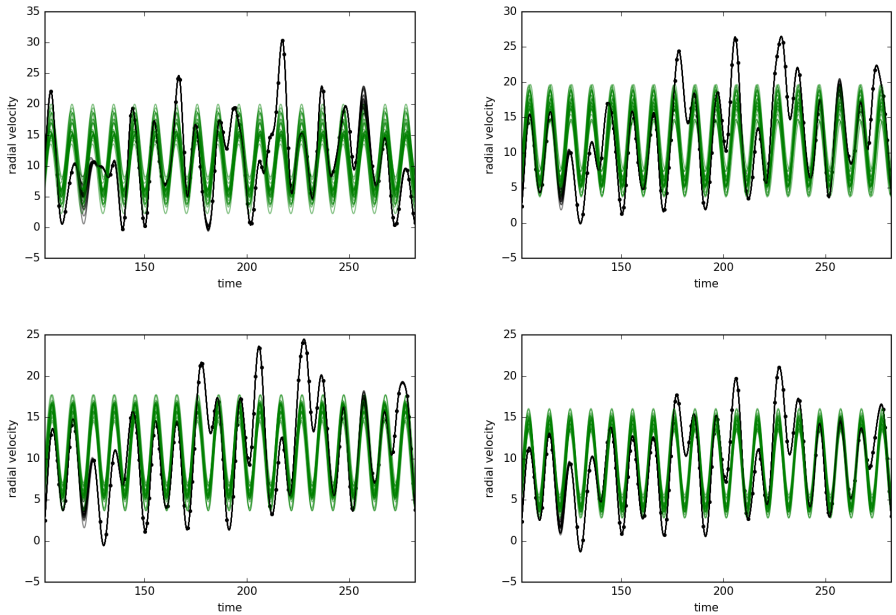
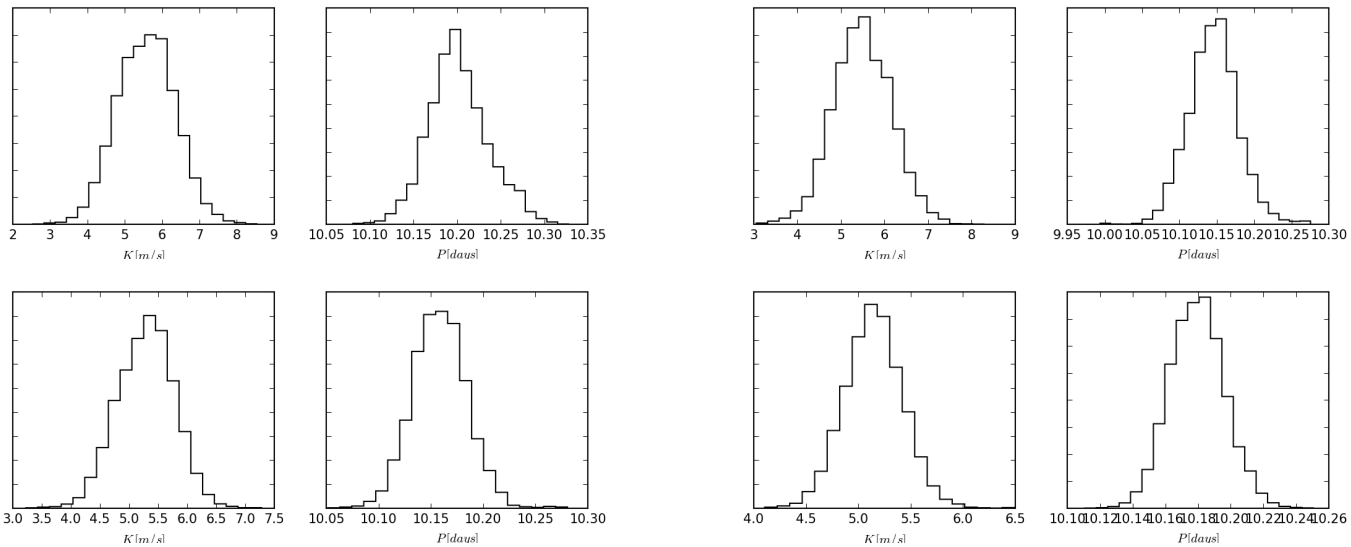


- Amplitude of stellar activity induced RV increases as inclination increases.

Question 3: Analysis

Compare planet parameter histograms.

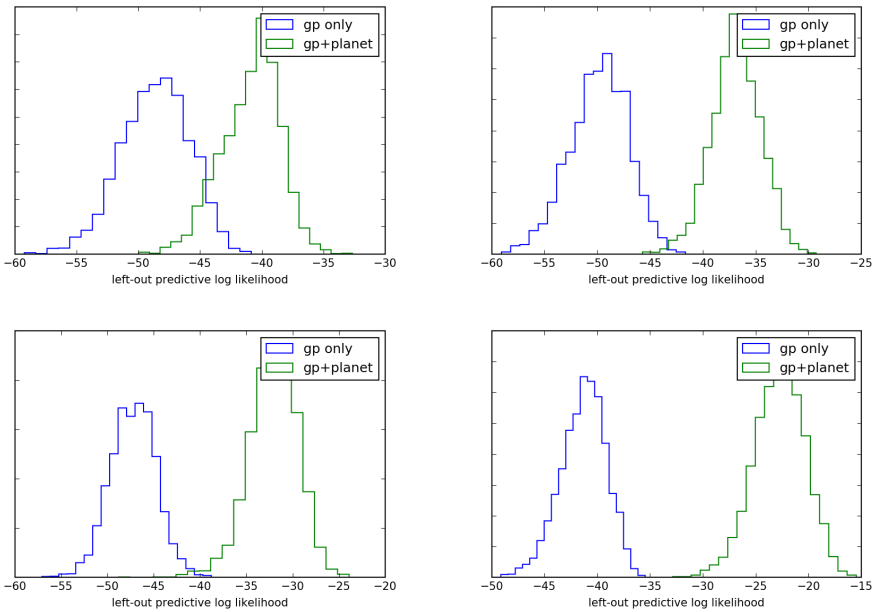
- width decreases as inclination decreases.



Question 3: Analysis

Compare lnZ of GP only and GP + planet histograms.

- Distance between the two increases as inclination decreases.



Question 3: Results

- As the host star is viewed more pole on the influence of stellar activity decreases. This in turn increases planetary detectability.

Conclusions

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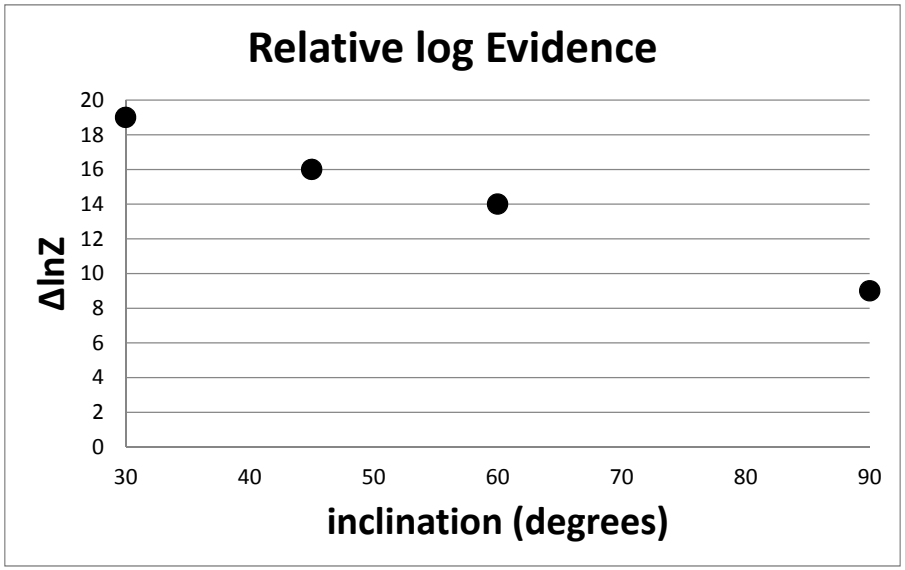
- The variation in the activity radial velocity decreases the further away we get from the equator-on case.



Future Perspective

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- To change the planet equatorial plane.
- Different types of stars.