

# THE MYSTERIOUS SEVEN

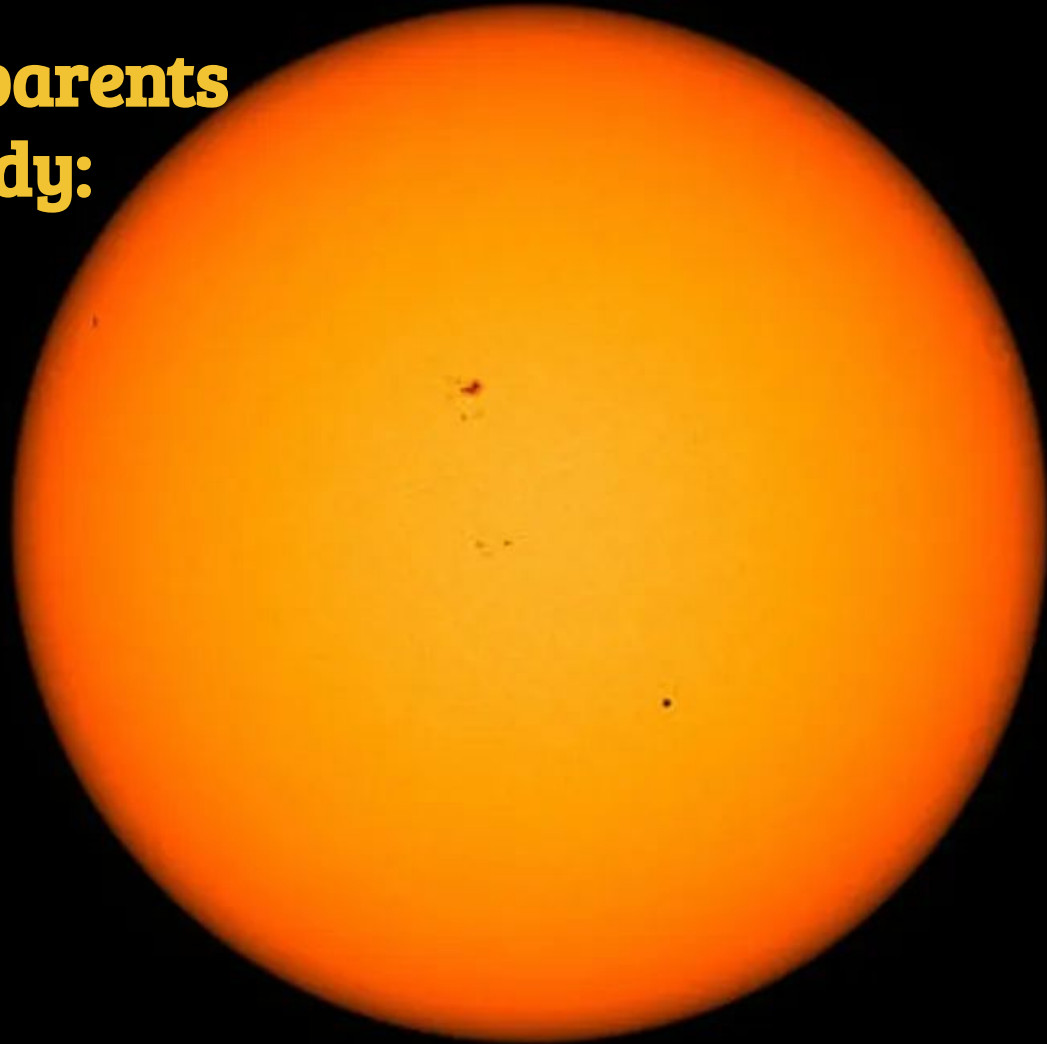
Seven signals astronomy can't explain (yet)



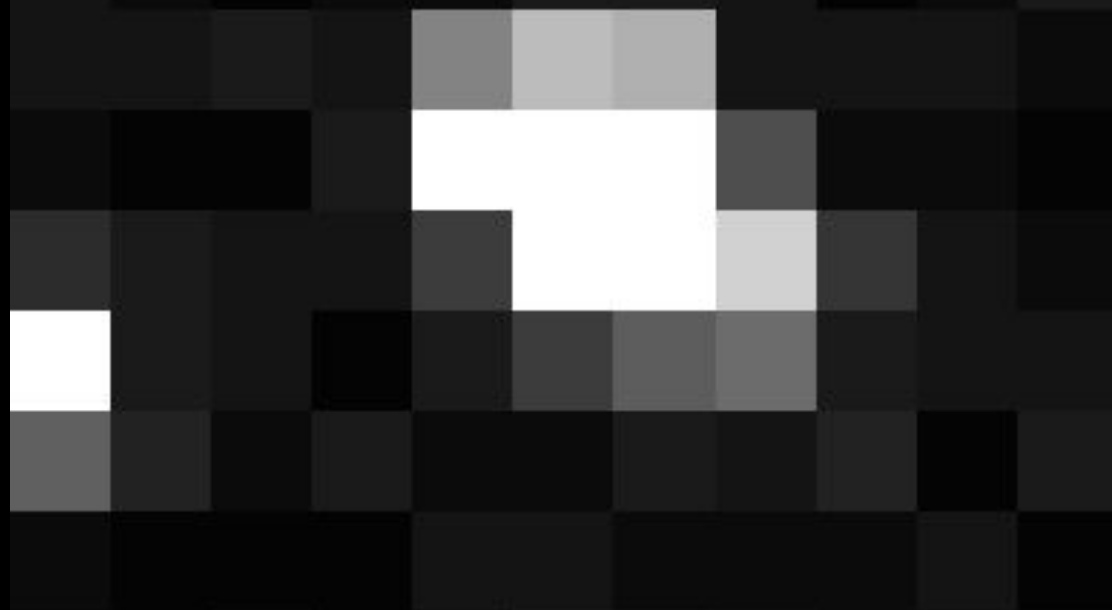
J 1407	Boyajian's Star	HD 139139
EPIC204376071	PDS-110	WD-1145
		KIC 2856960

*by Hugh Osborn, University of Bern*

**What my parents  
think I study:**



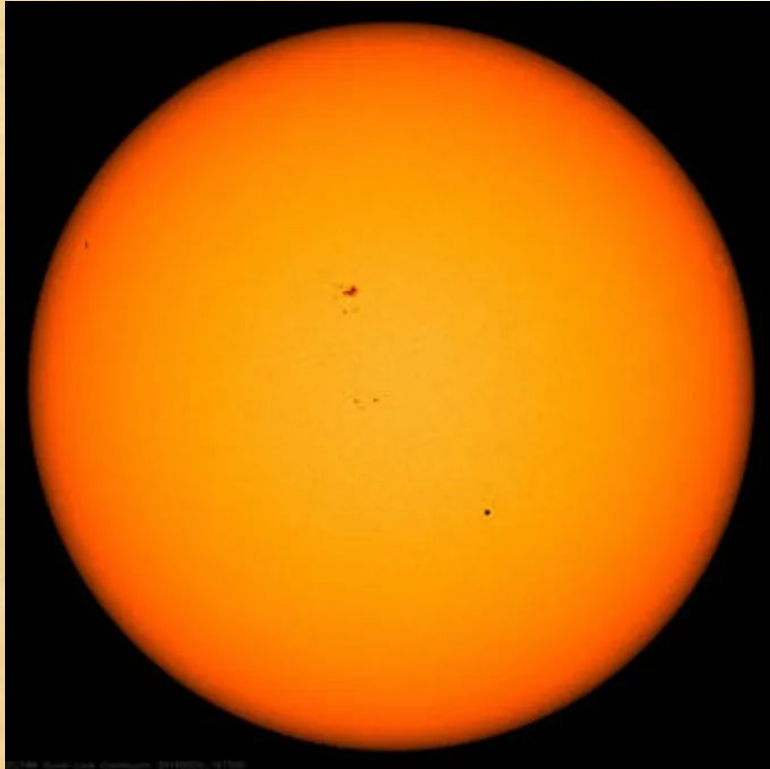
**What I actually  
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EPIC 200164267

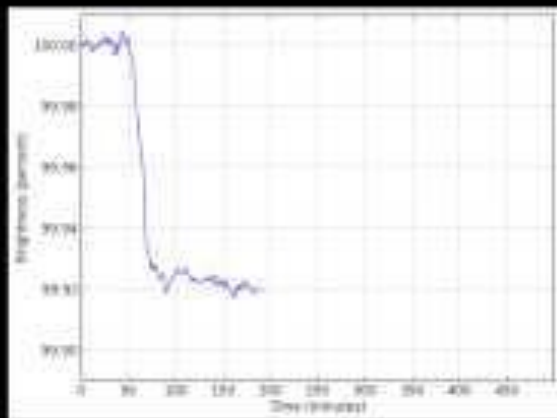
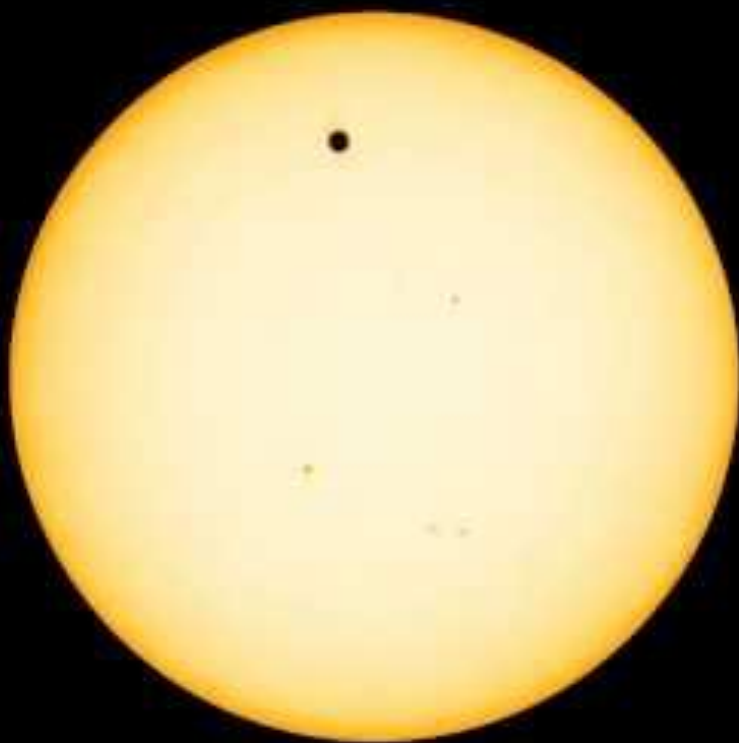
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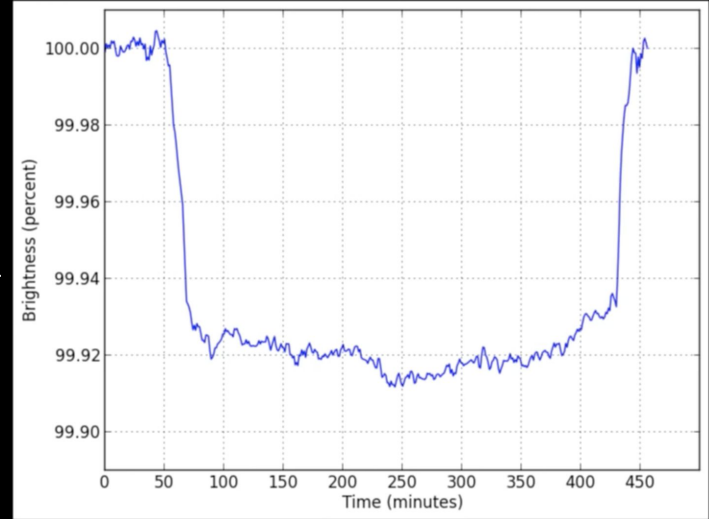
**What my parents  
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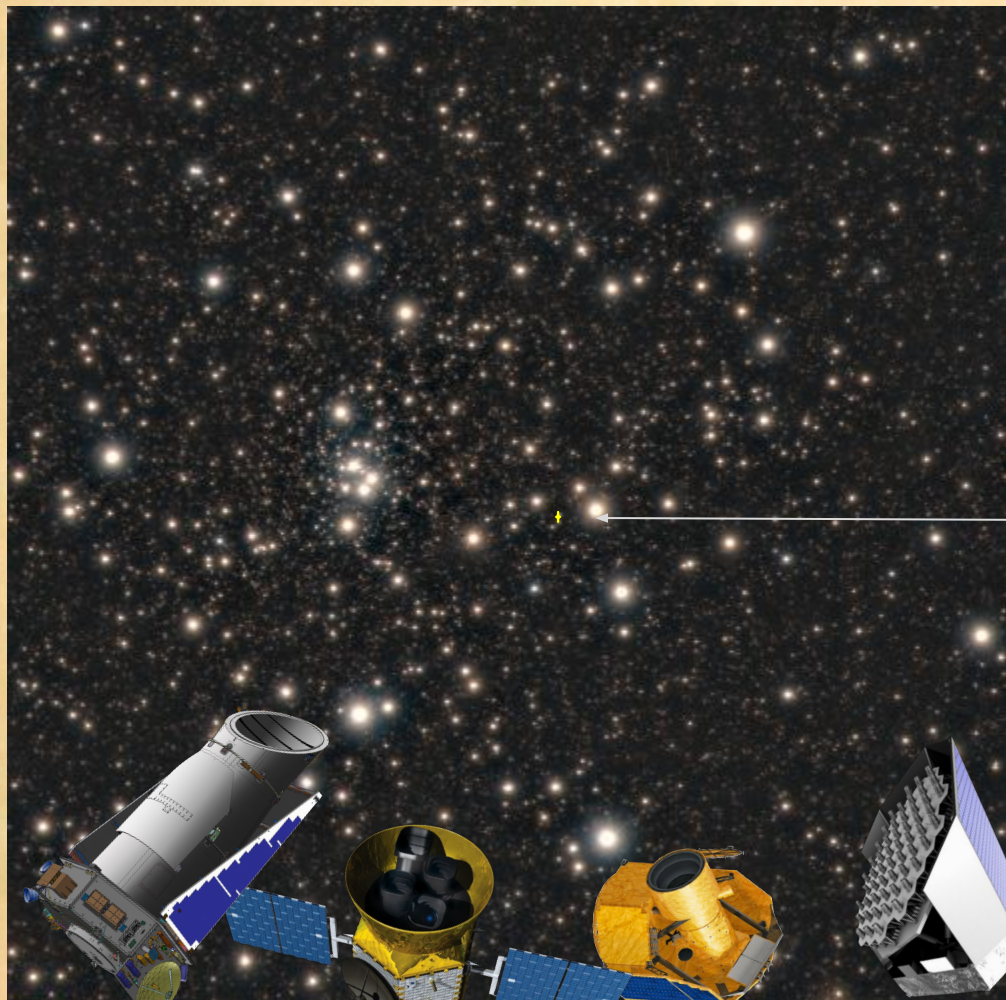


**What I actually  
study:**







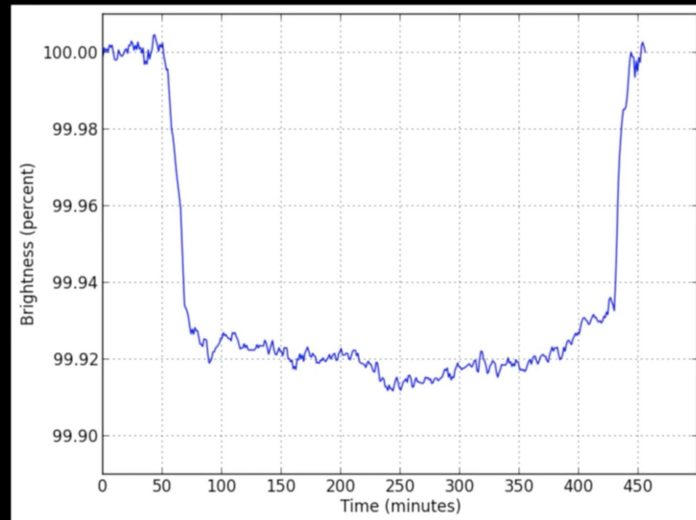


Kepler

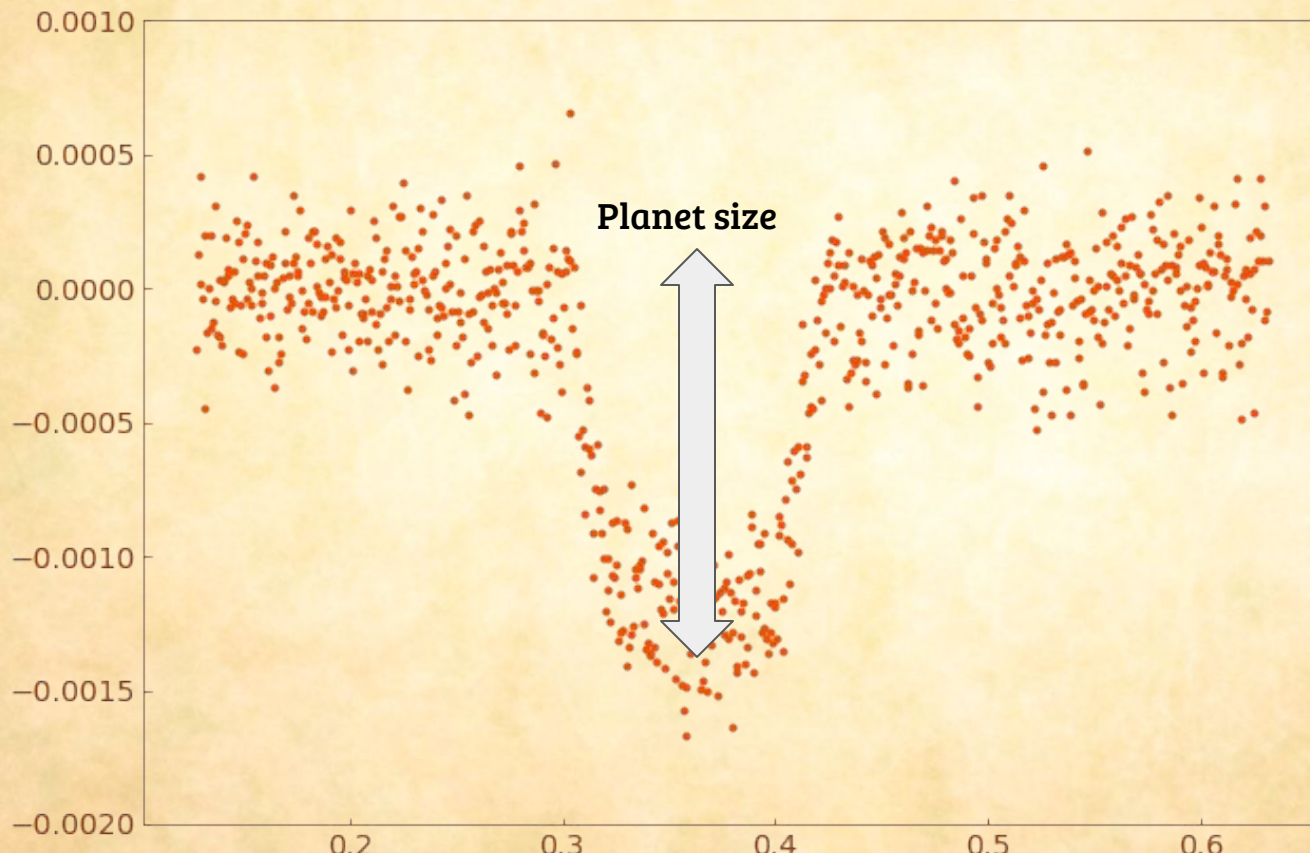
TESS

Cheops

PLATO

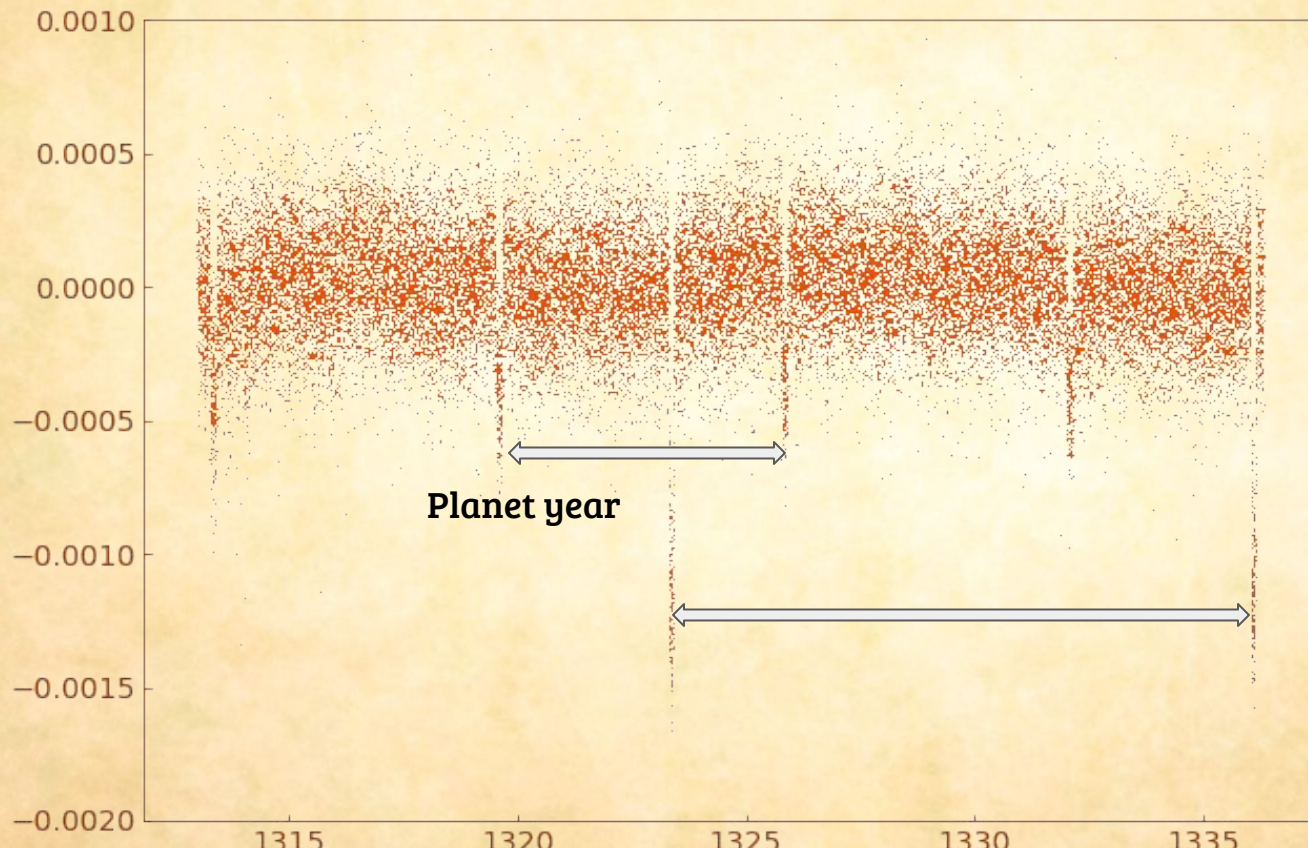


# Transiting planets

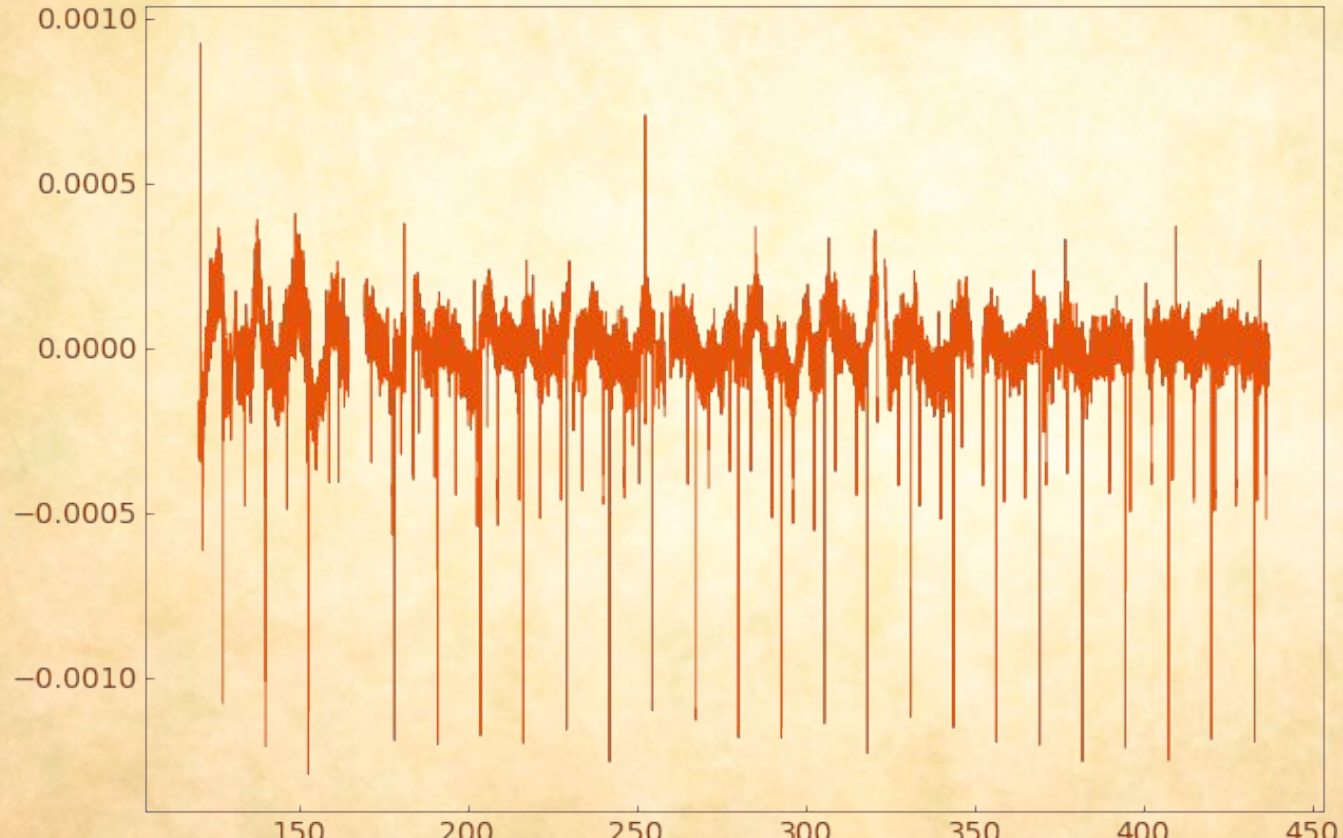




# Transiting planets

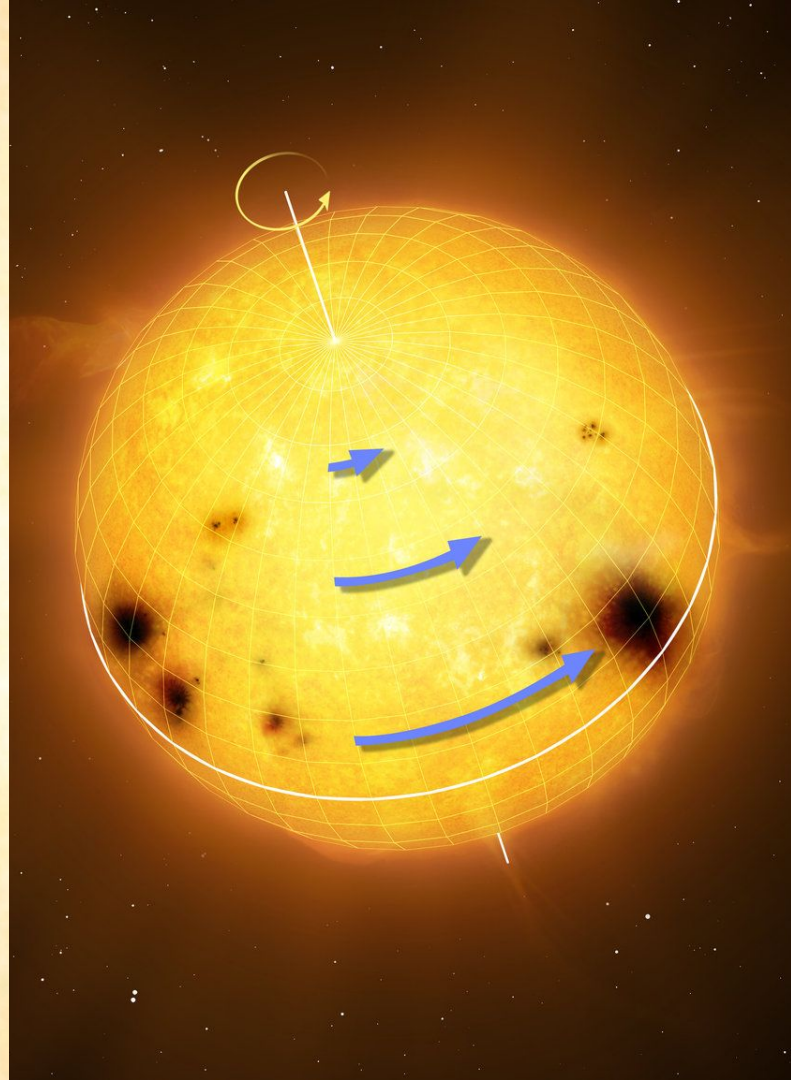
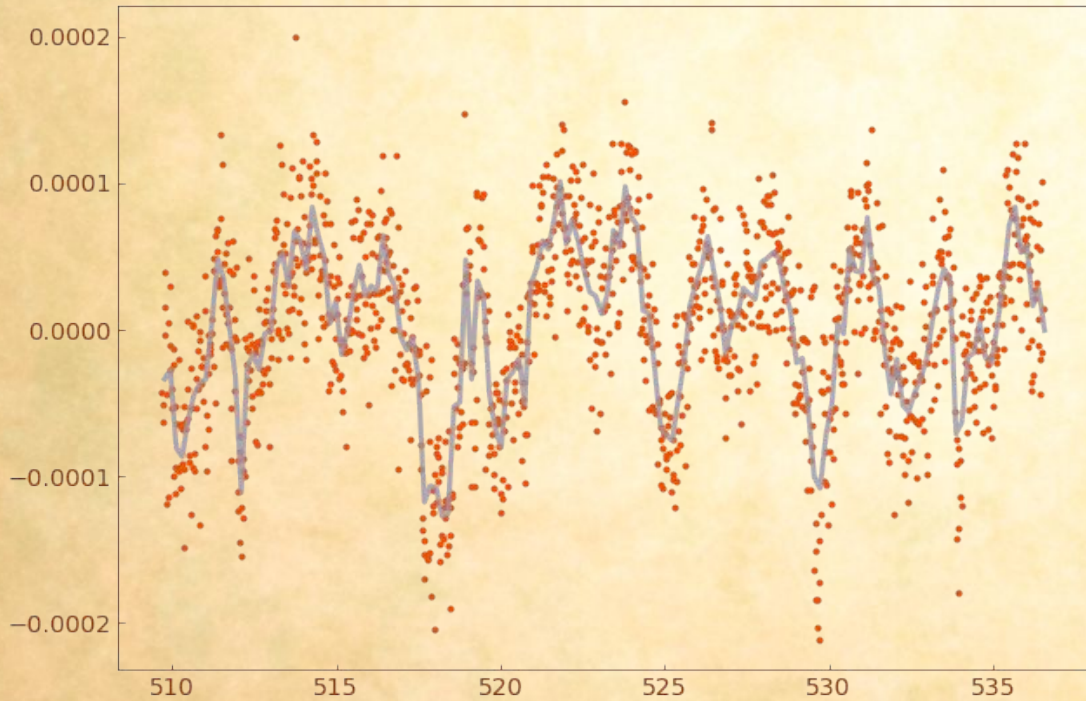


# Transiting planets

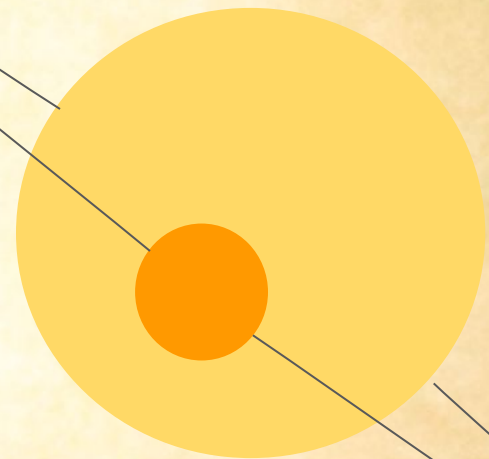
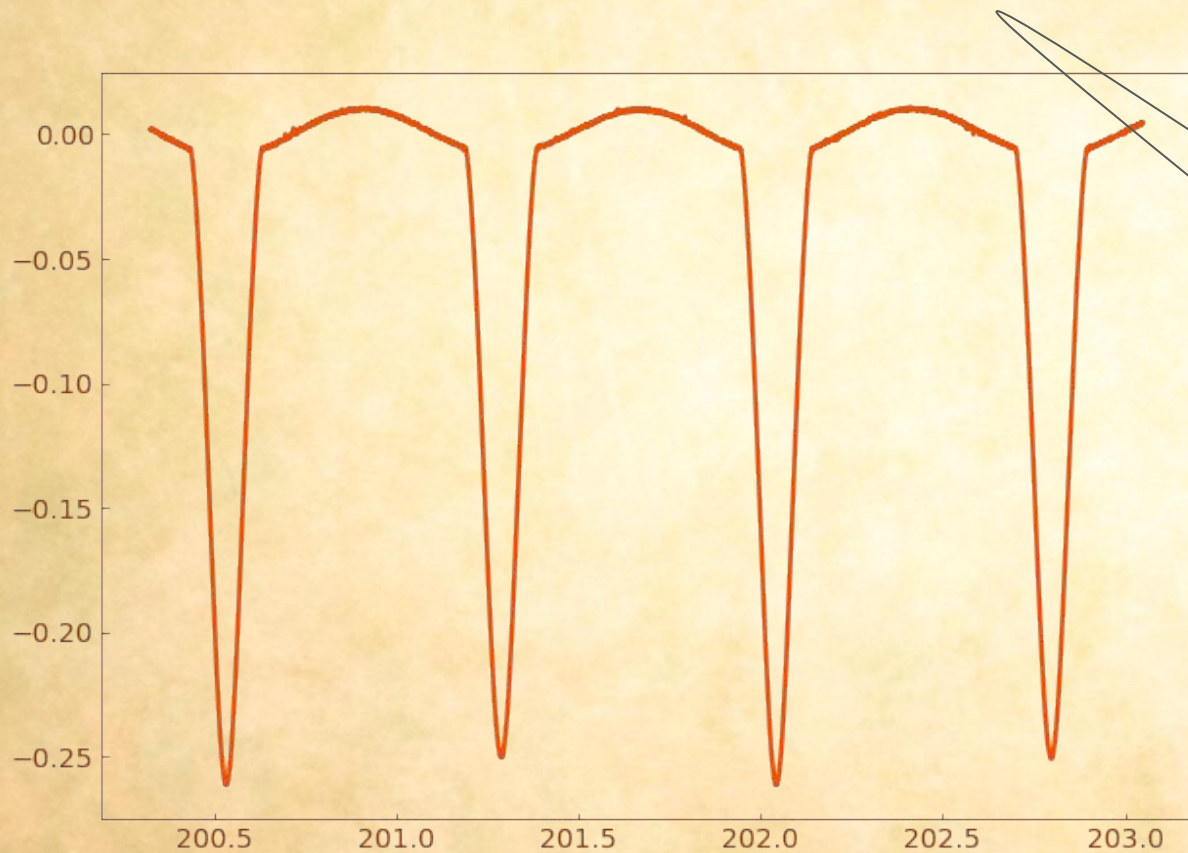




# Variability



# Eclipsing binaries





# THE MYSTERIOUS SEVEN

Seven signals astronomy can't explain (yet)



*J 1407*

*Boyajian's Star*

*HD 139139*

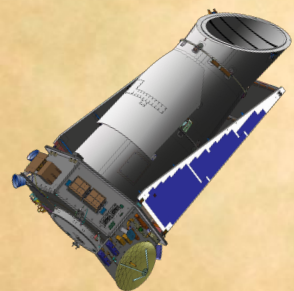
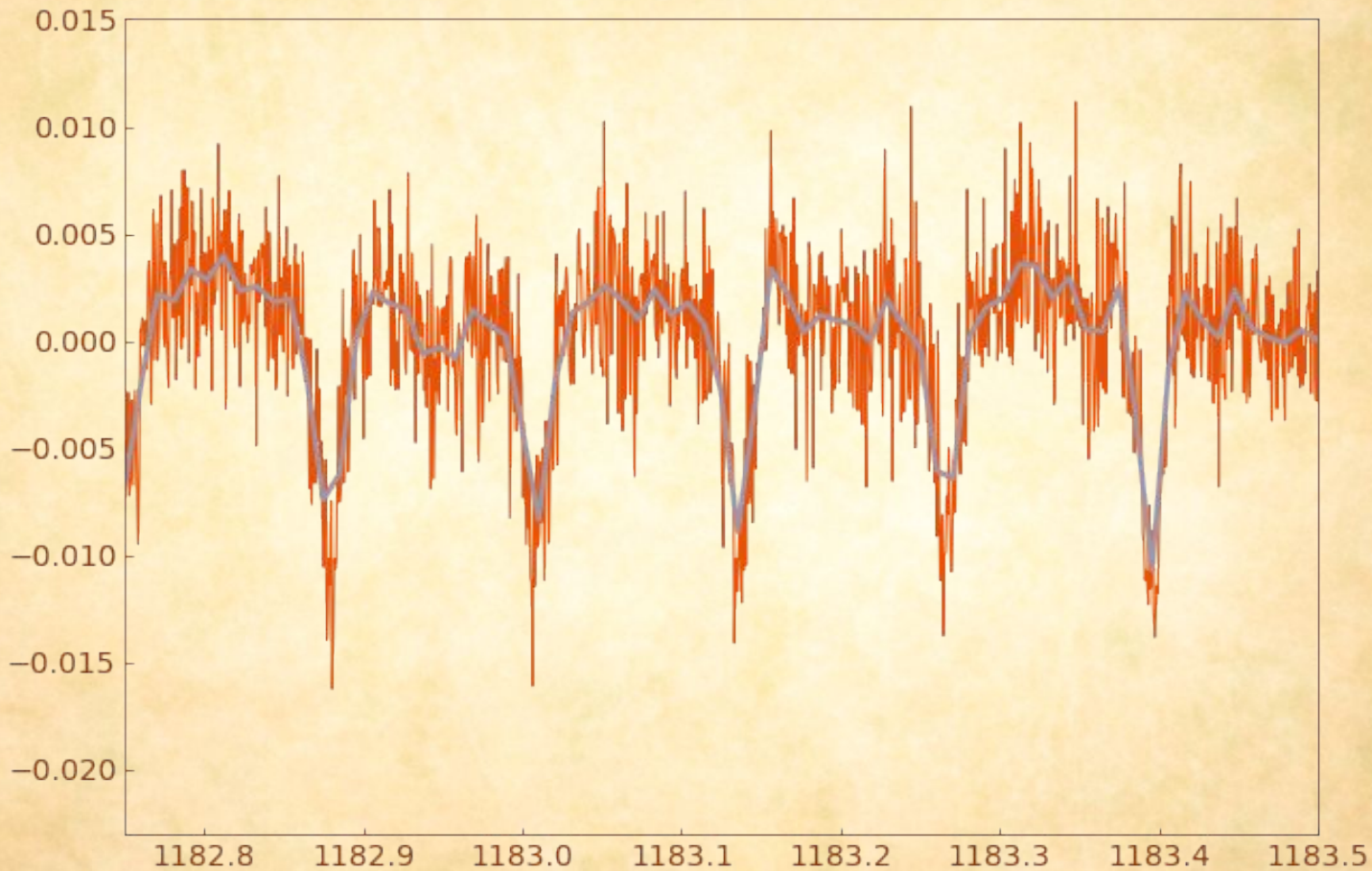
*EPIC204376071*

*PDS-110*

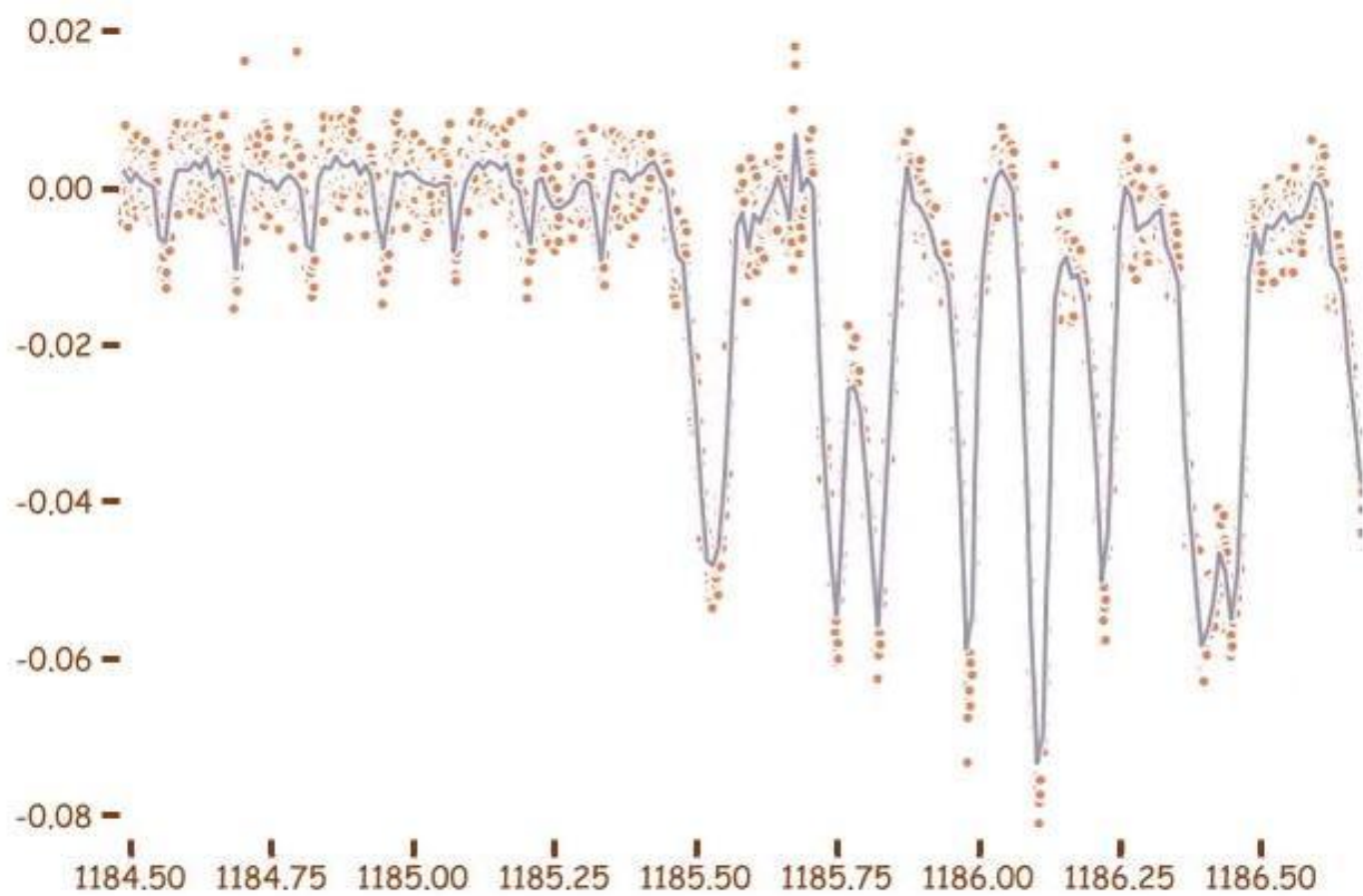
*WD-1145*

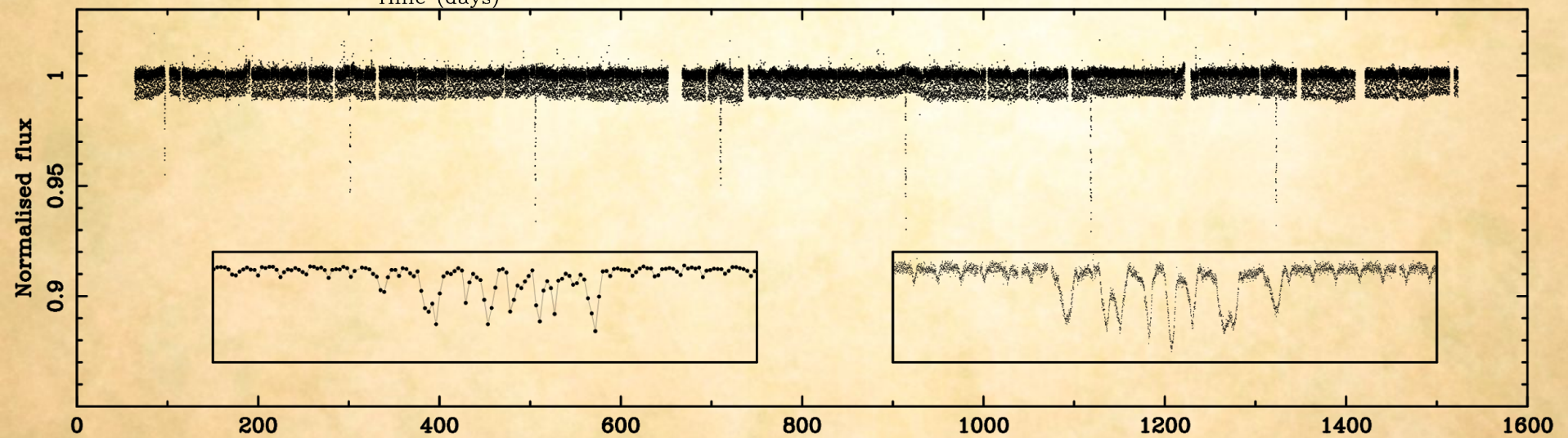
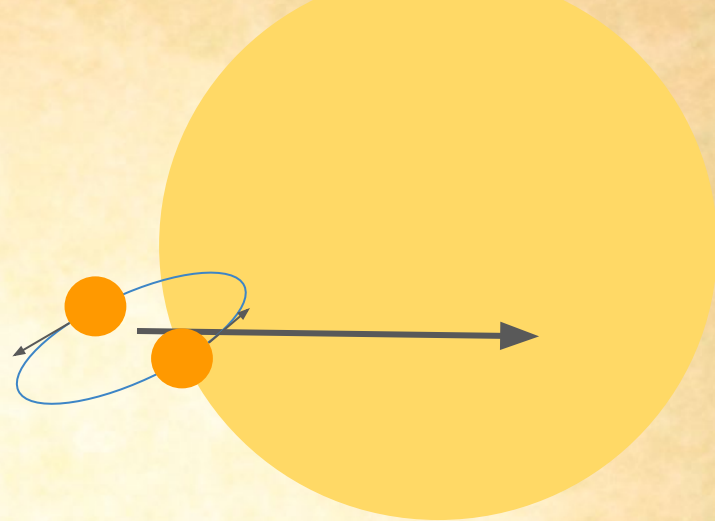
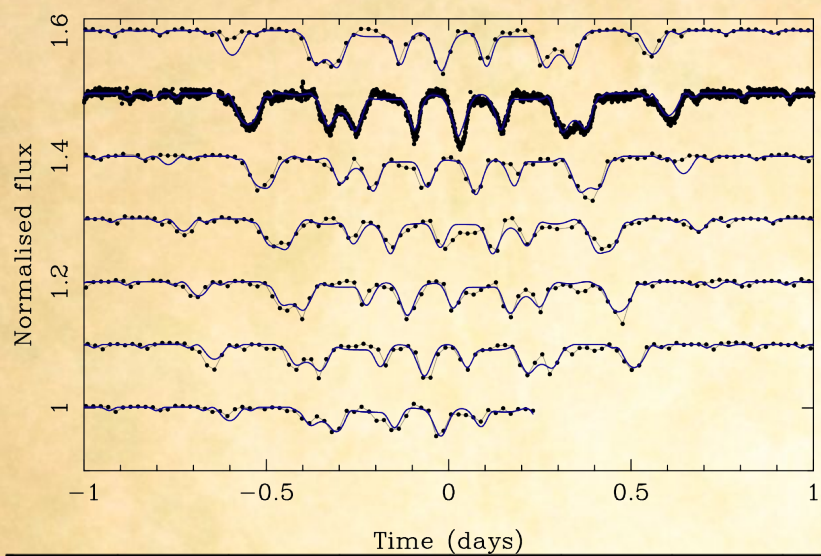
*KIC 2856960*

# KIC 2856960

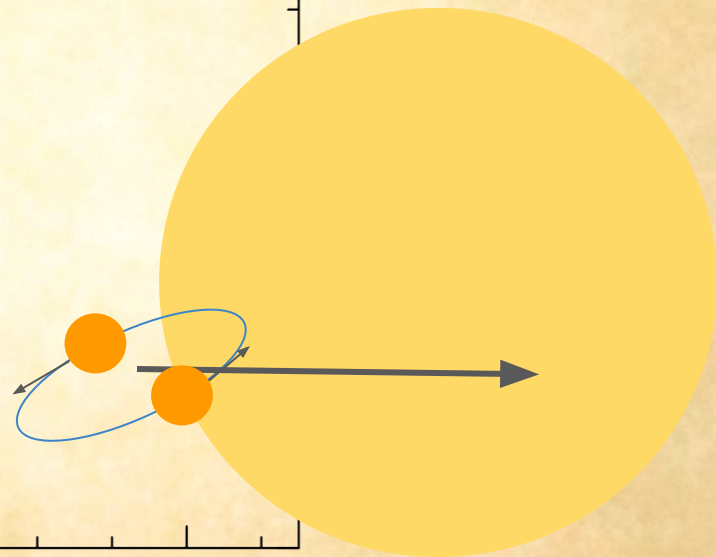
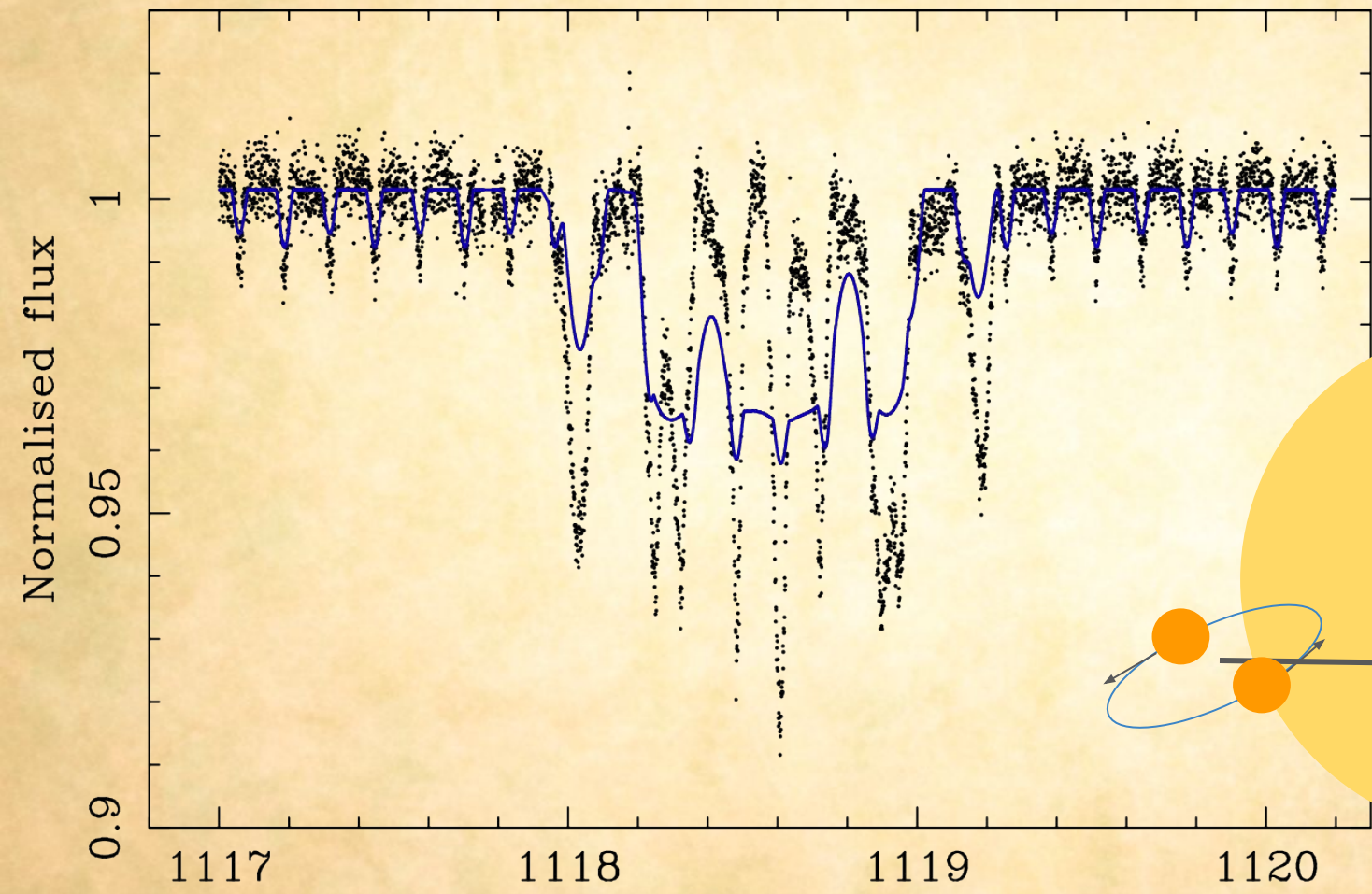


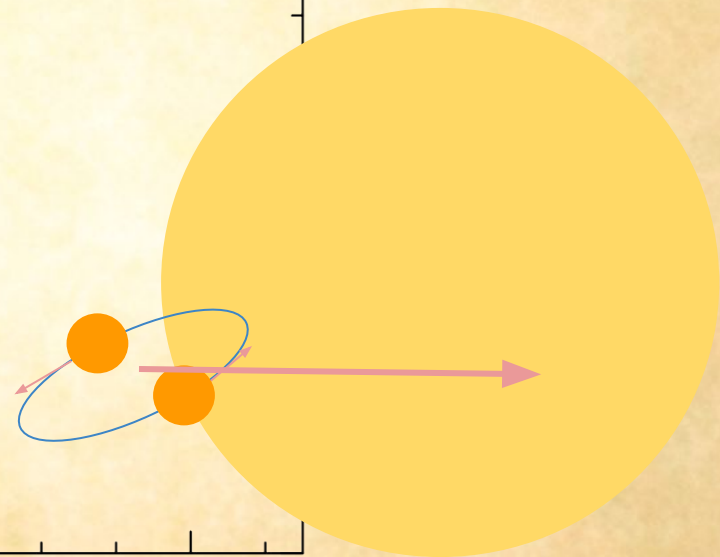
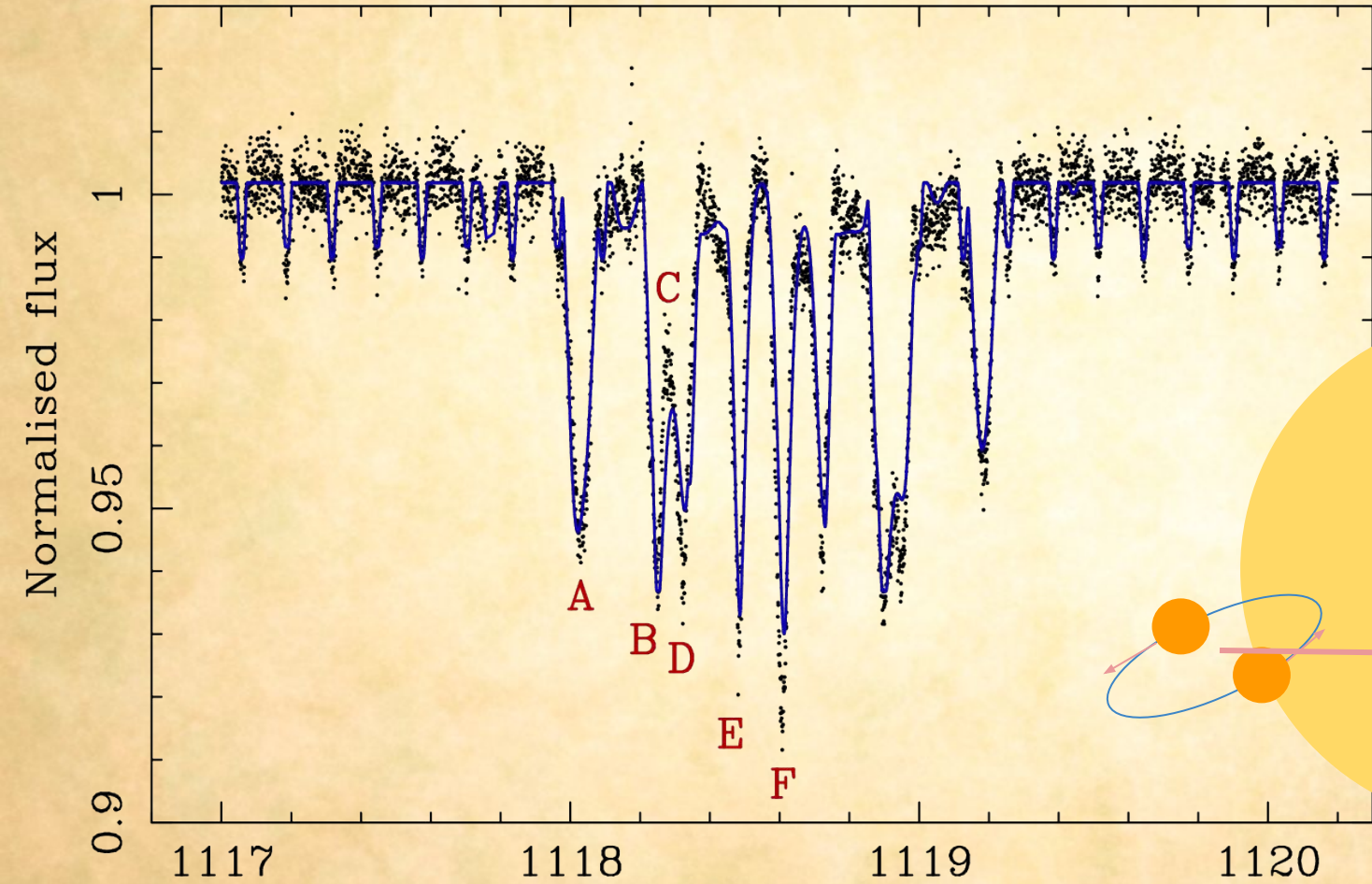




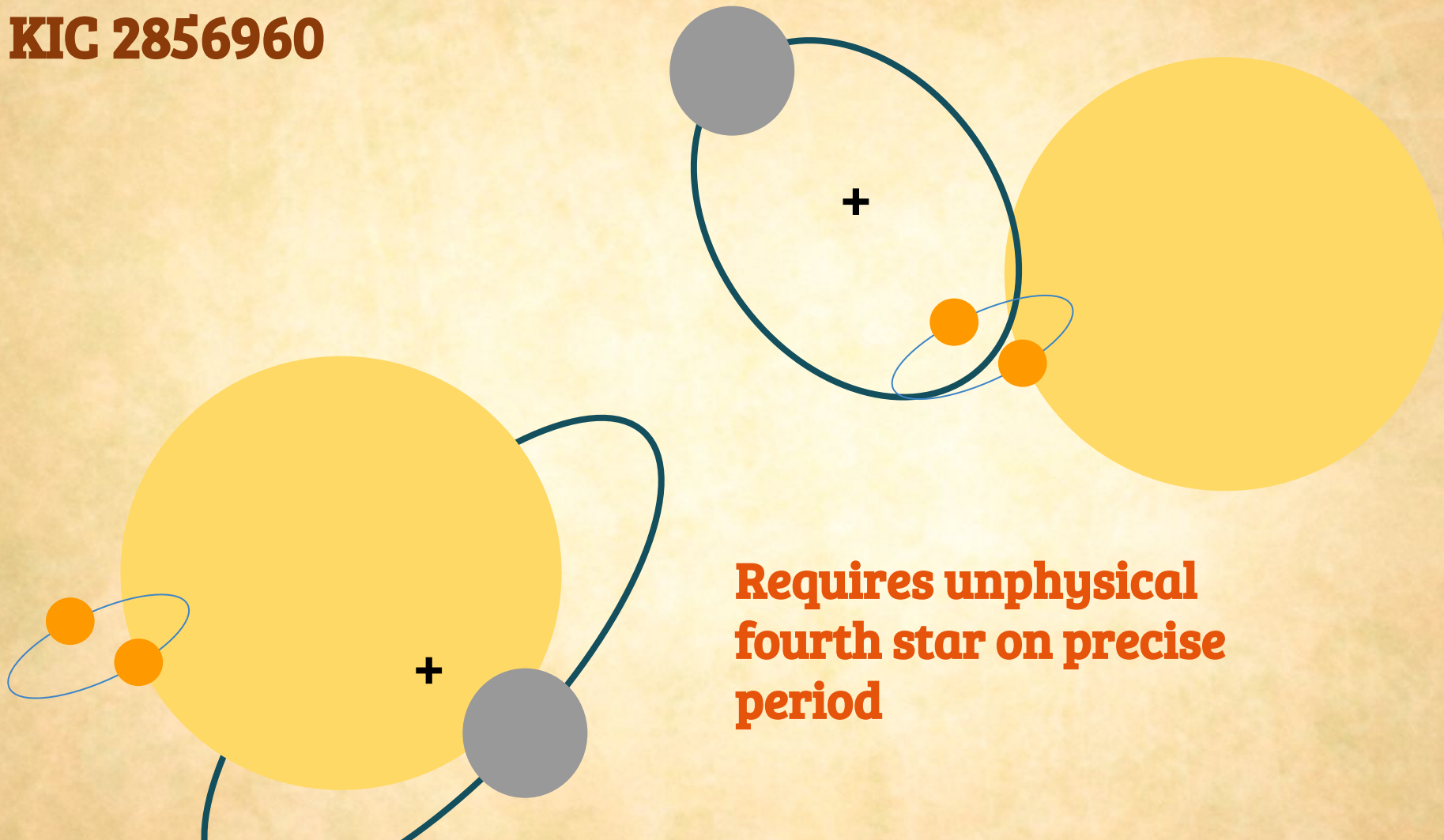








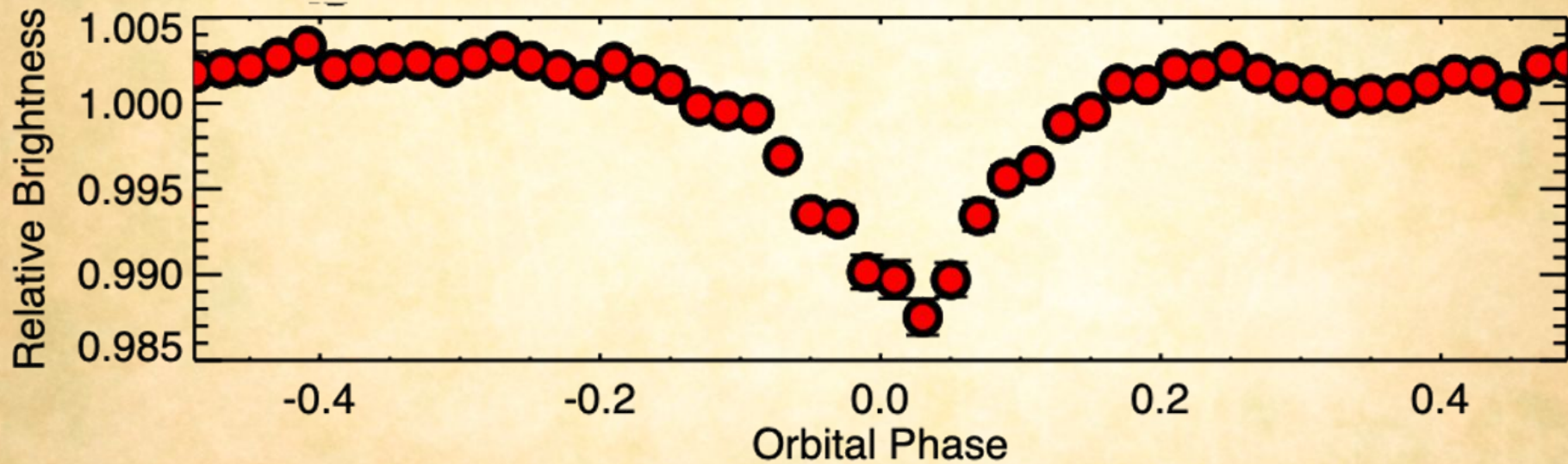
**KIC 2856960**



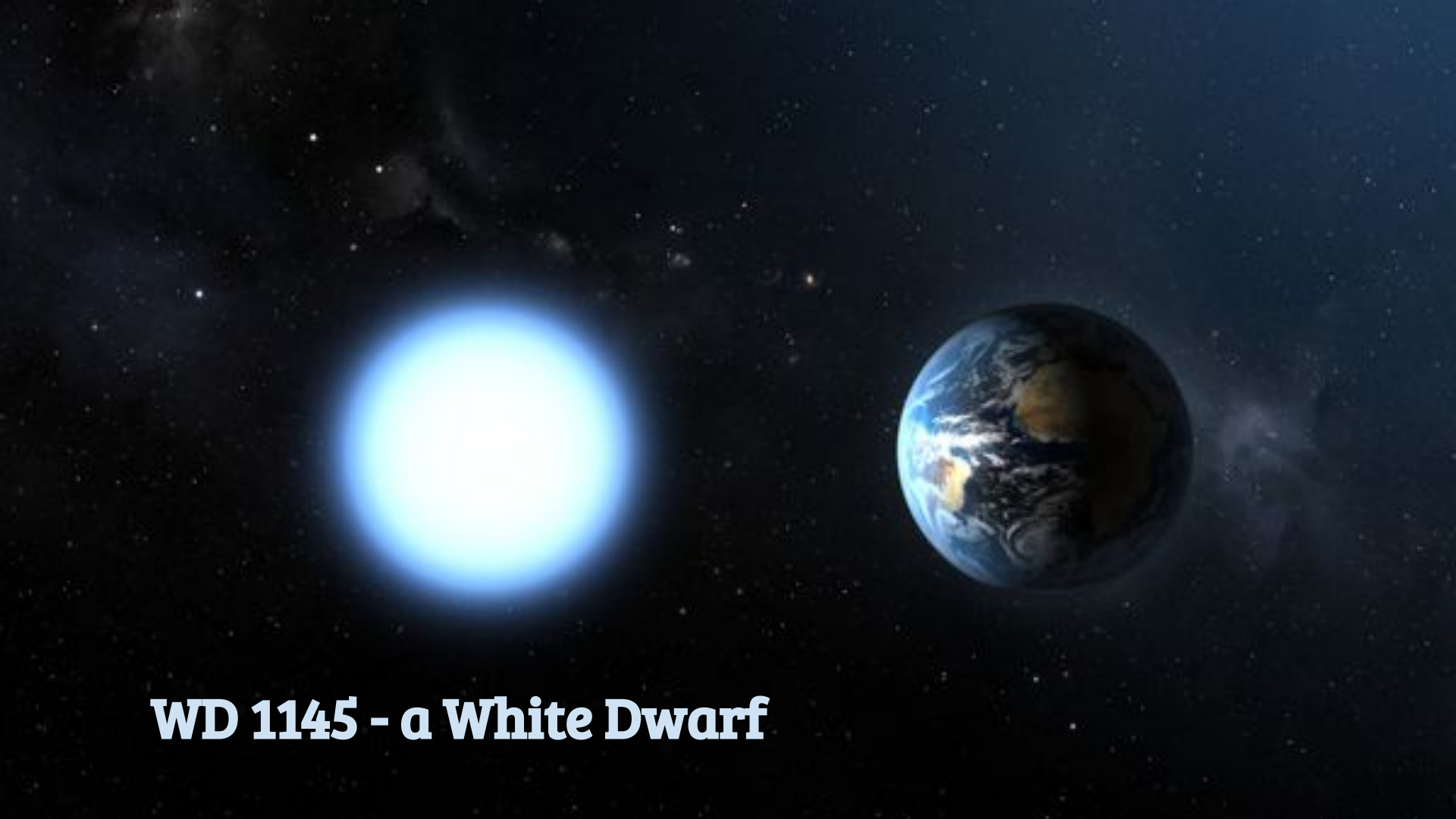
**Requires unphysical  
fourth star on precise  
period**



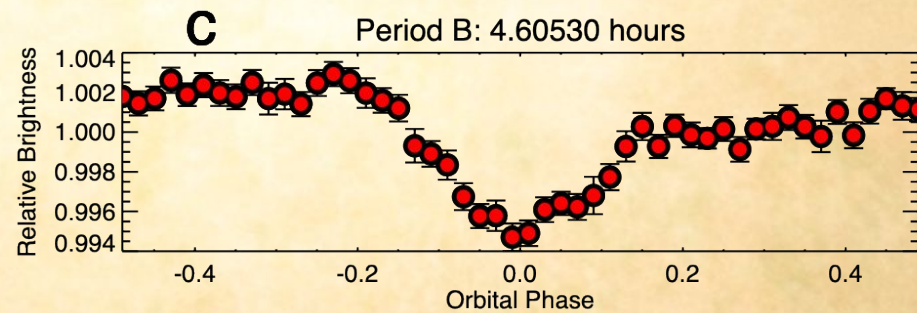
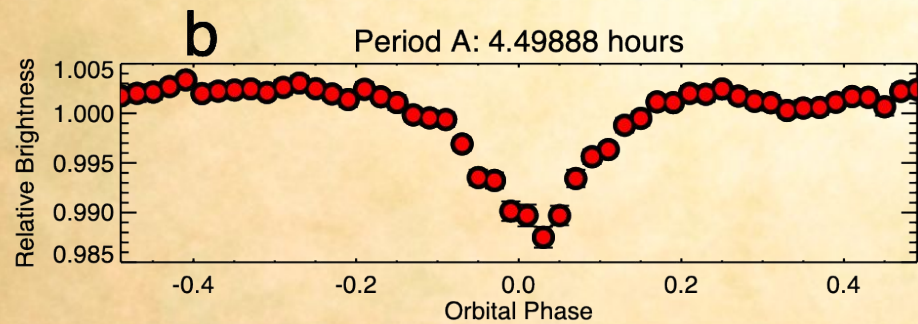
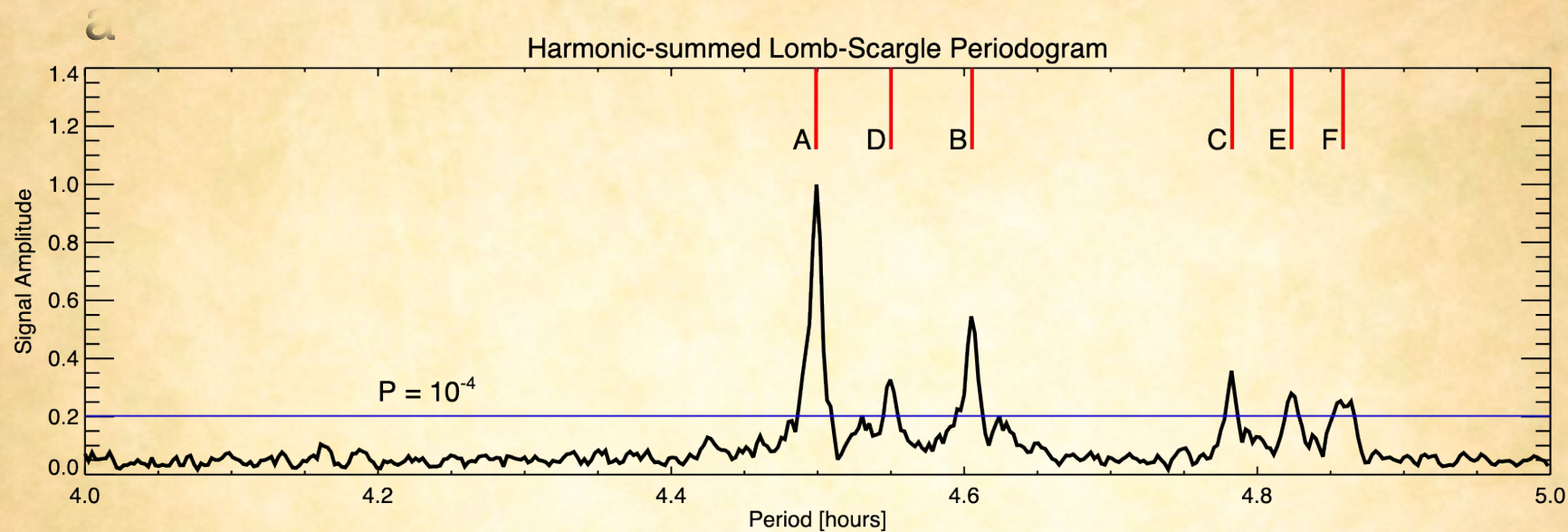
# WD-1145



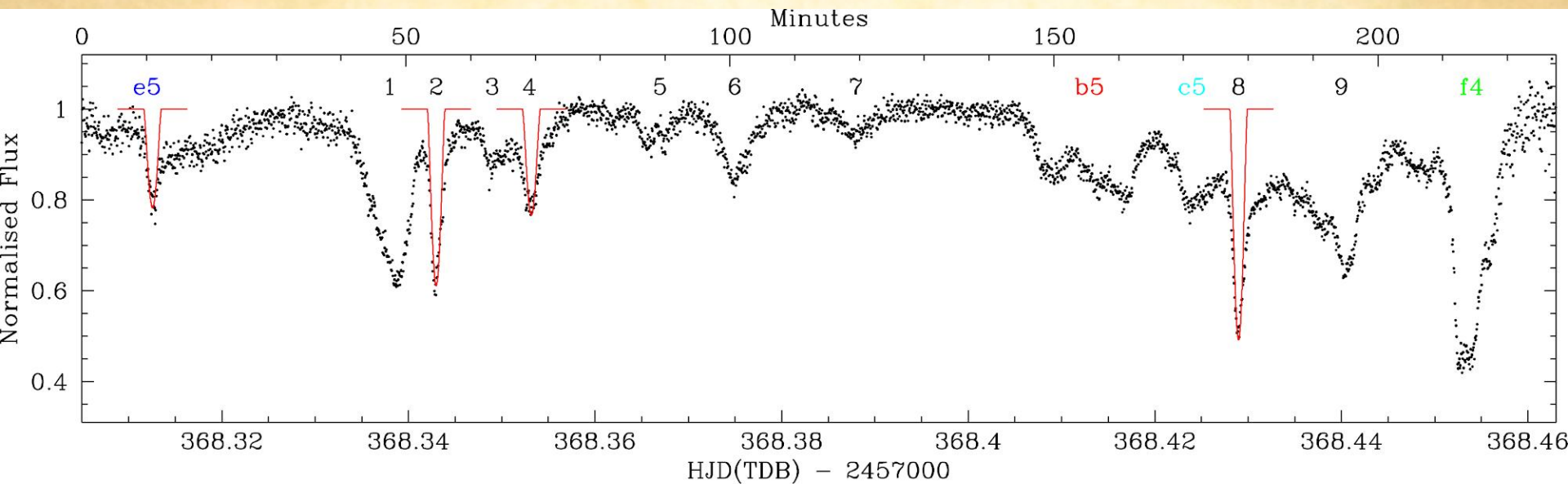




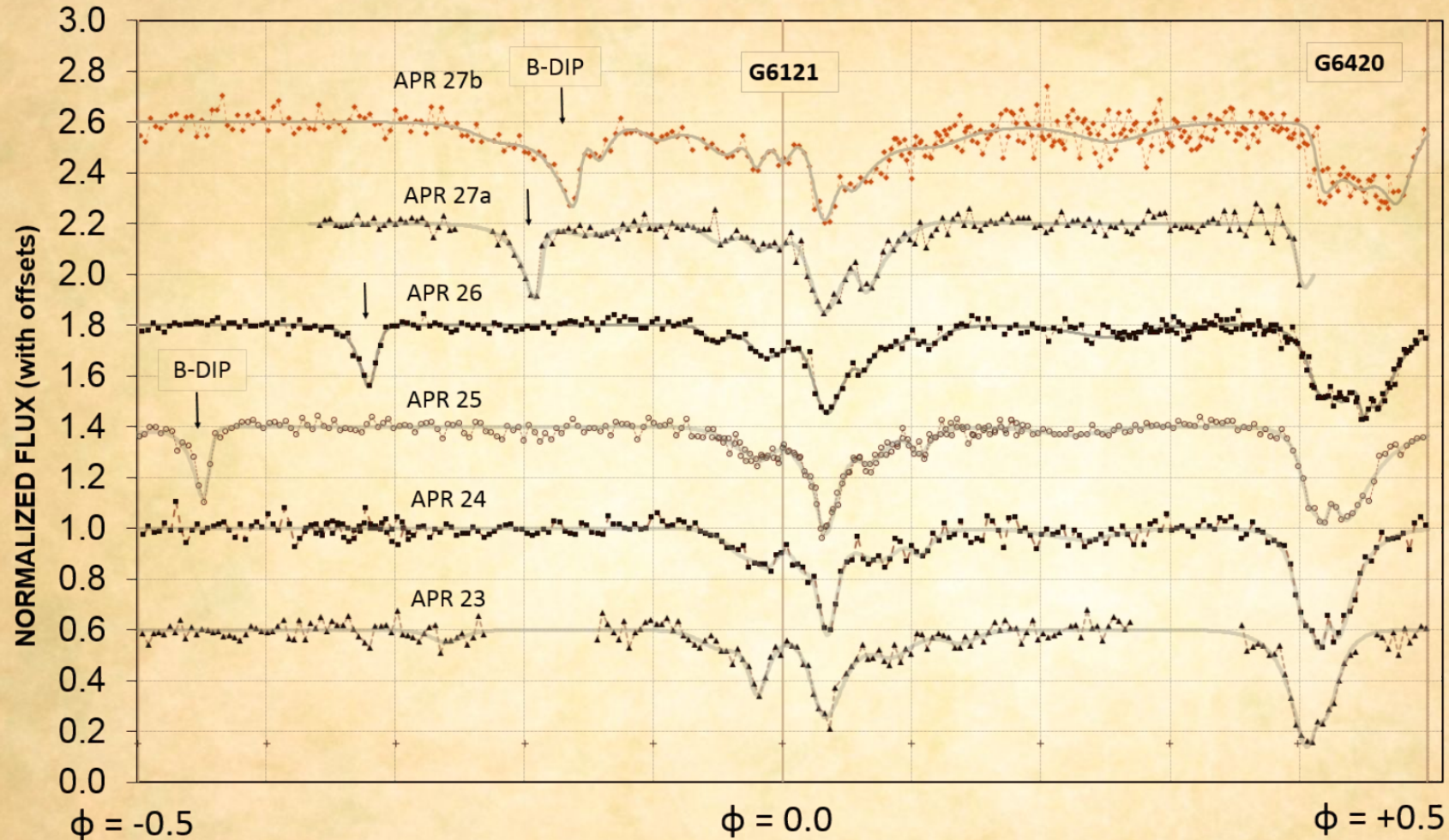
**WD 1145 - a White Dwarf**



# WD-1145



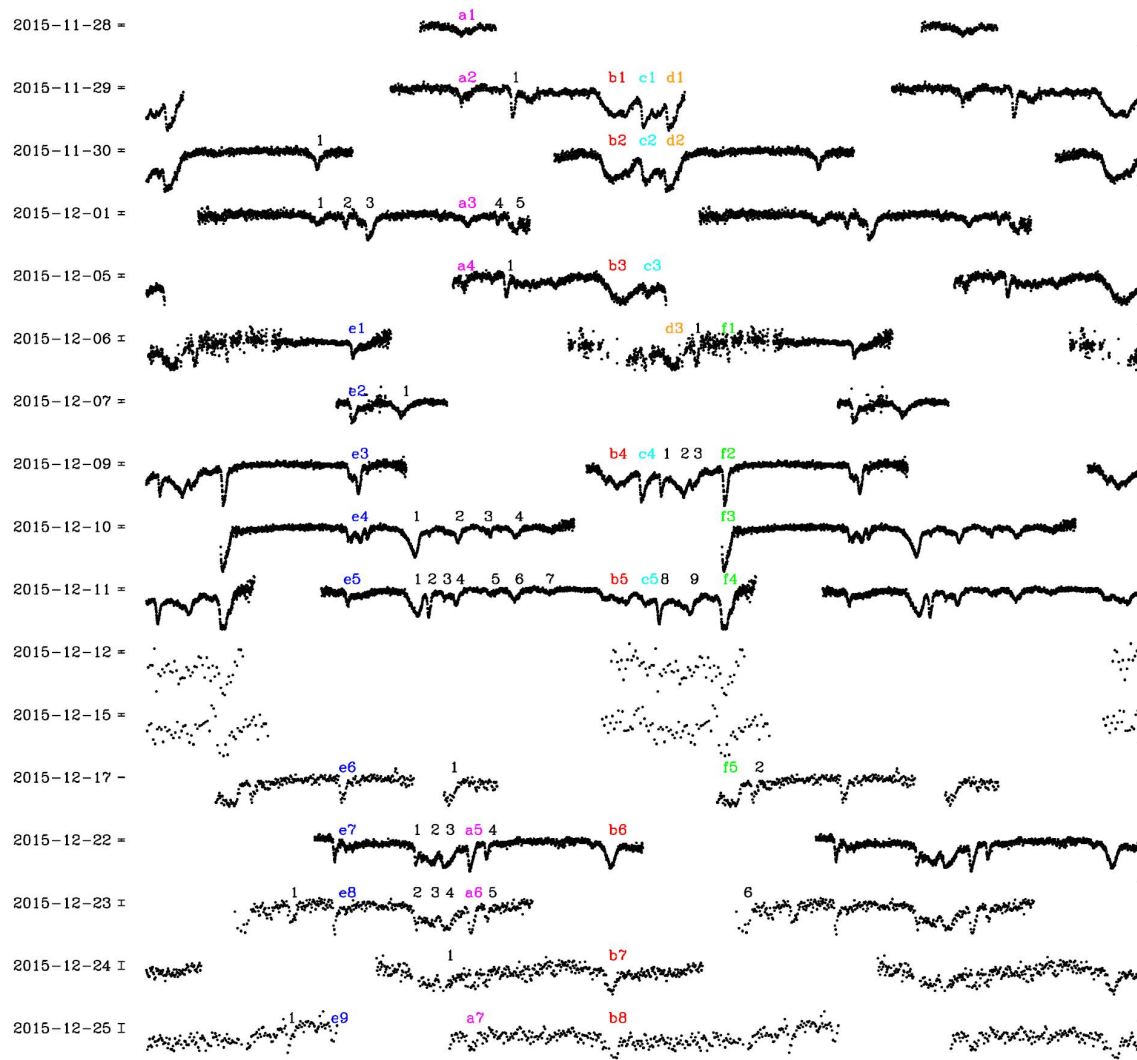




PHASE, USING P = 4.4916 HRS, BJD = 2457480.8083

# WD-1145

Normalised Flux





· ASTEROID

JUN

G6420

MAY

APR

G6121

MAR

FEB

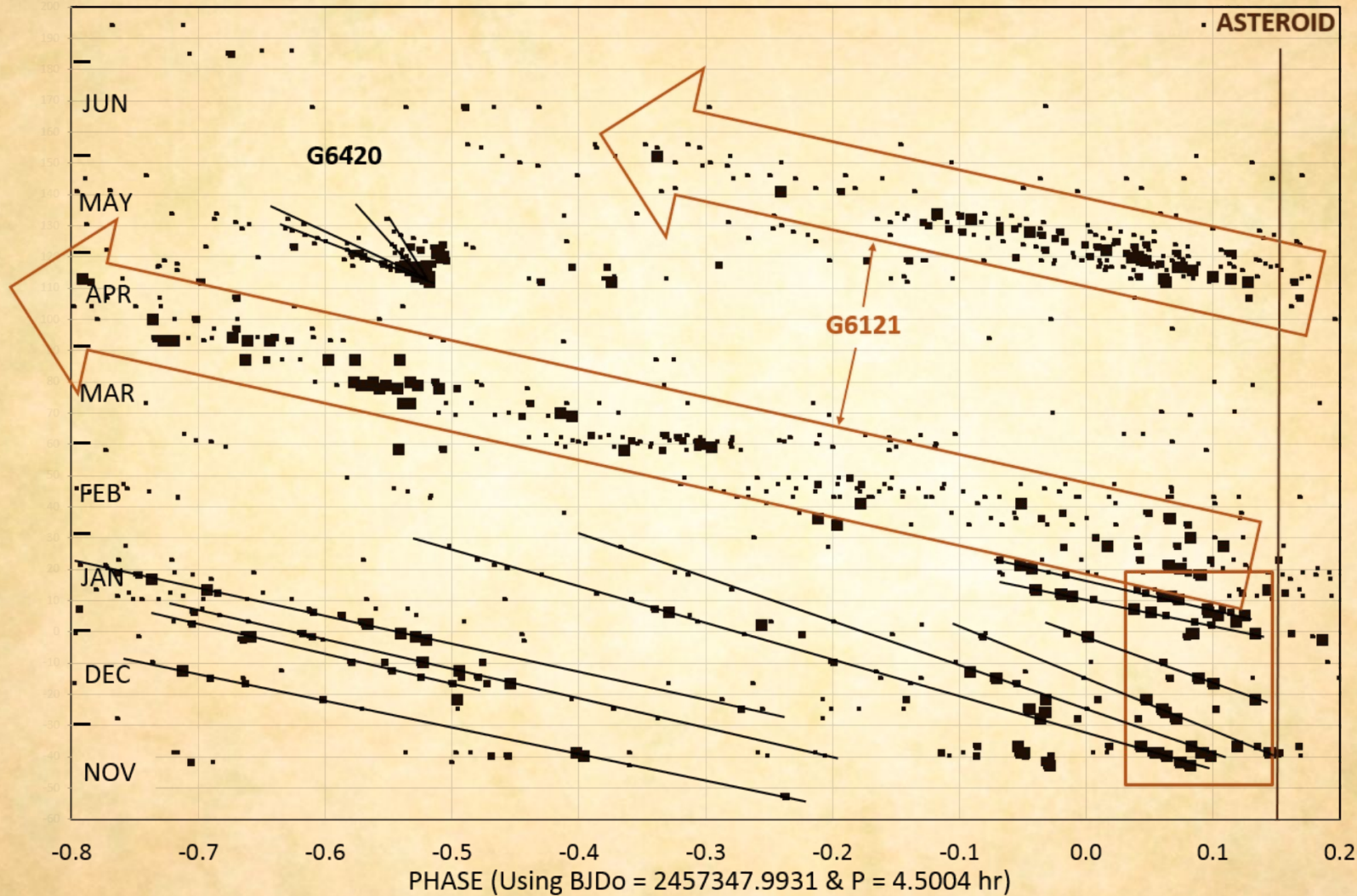
JAN

DEC

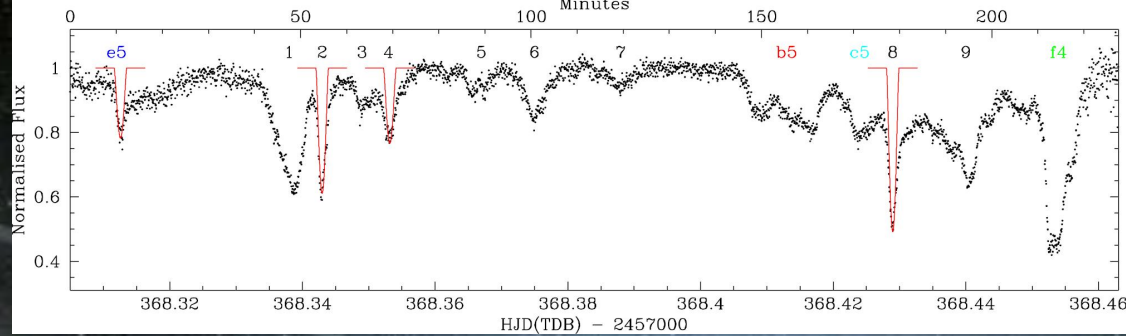
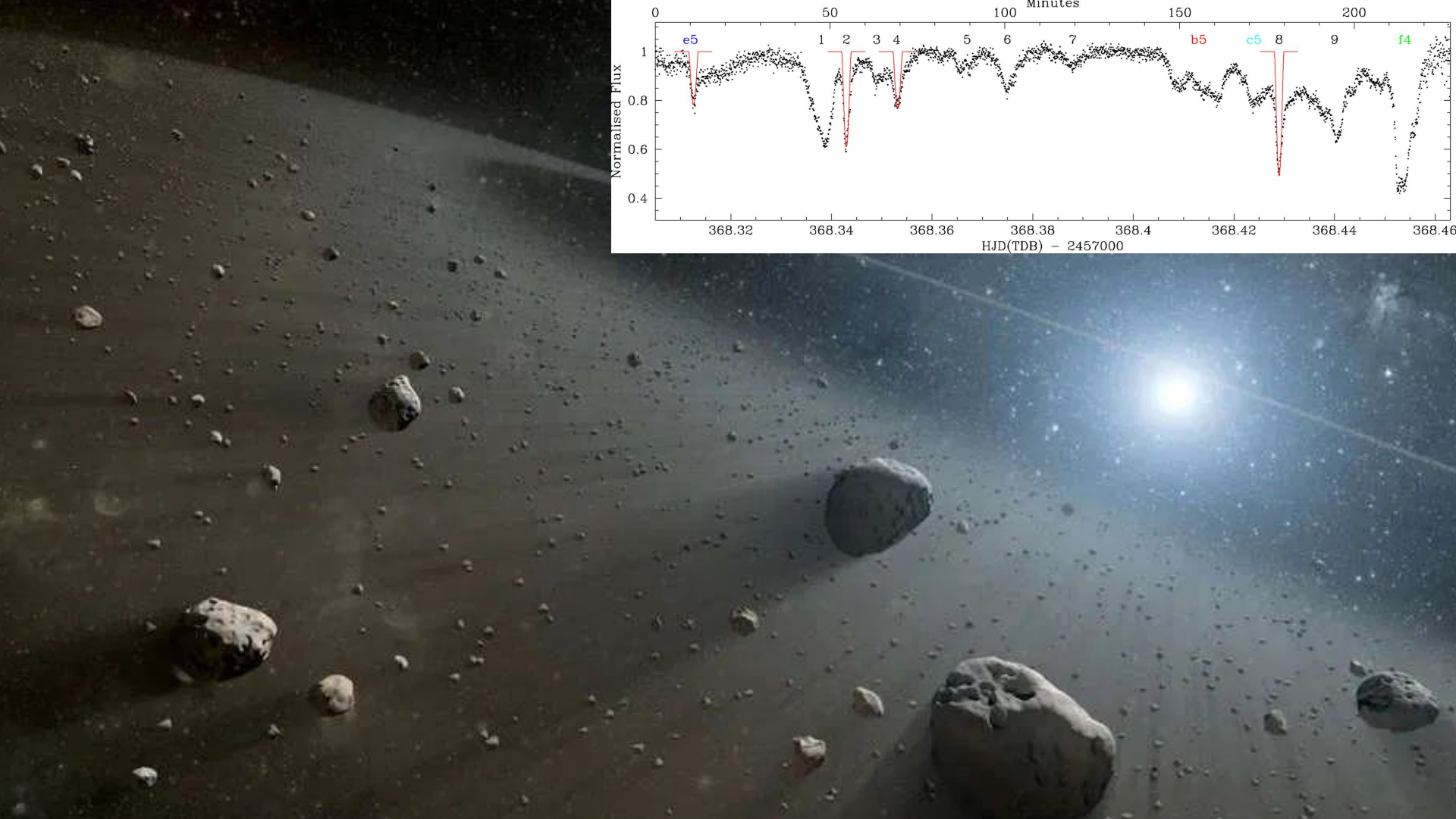
NOV

-0.8 -0.7 -0.6 -0.5 -0.4 -0.3 -0.2 -0.1 0.0 0.1 0.2

PHASE (Using BJD<sub>0</sub> = 2457347.9931 & P = 4.5004 hr)

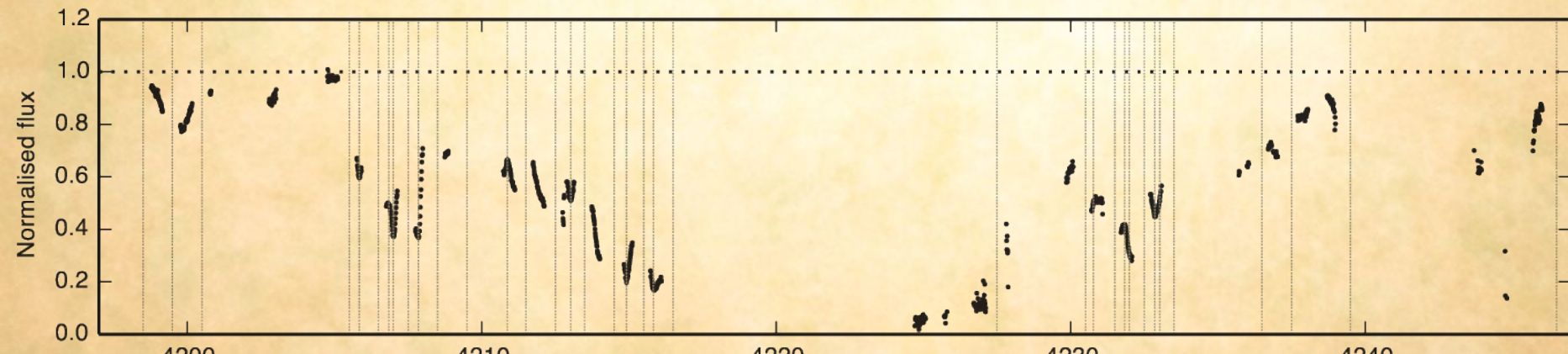
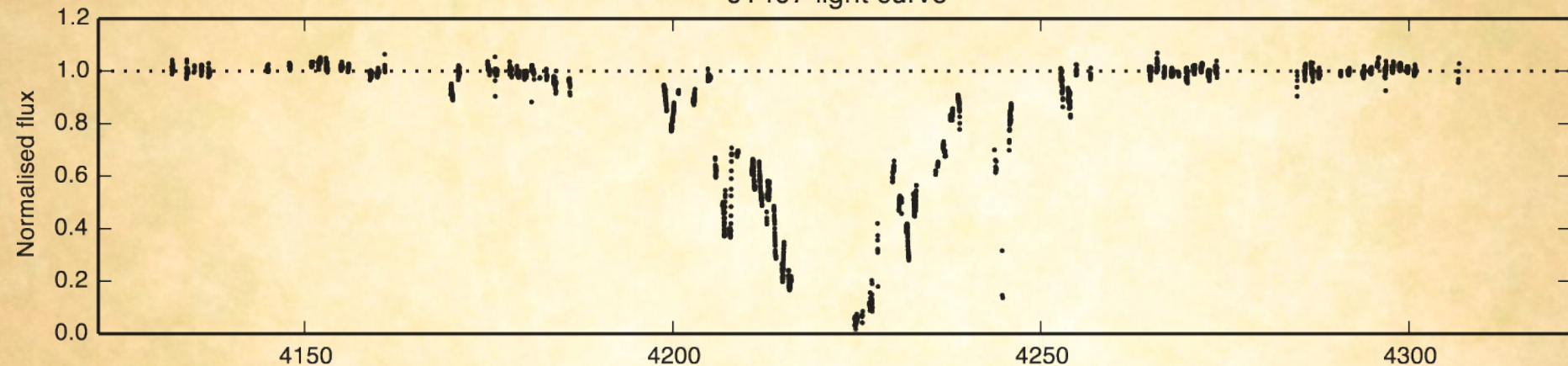






# Mamajek's Star (J1407)

J1407 light curve



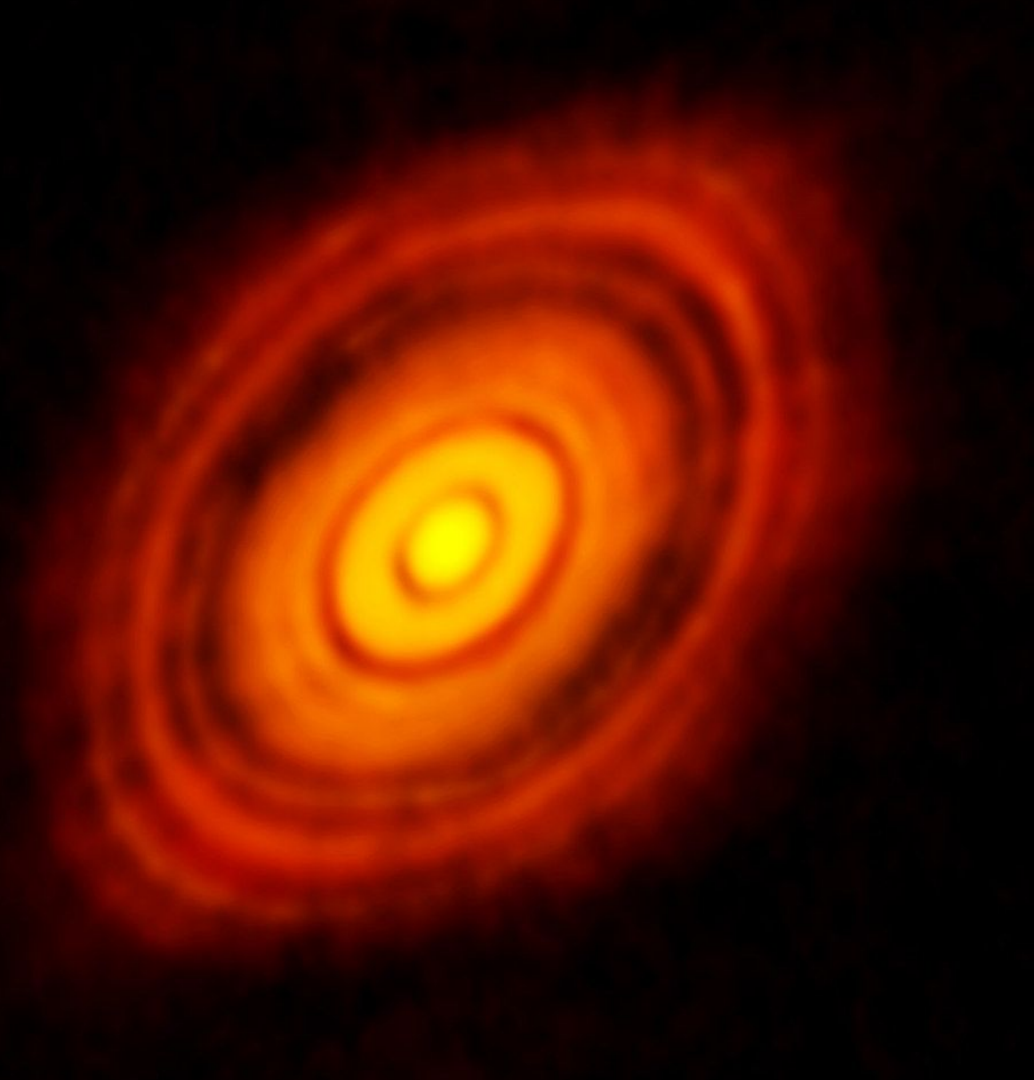


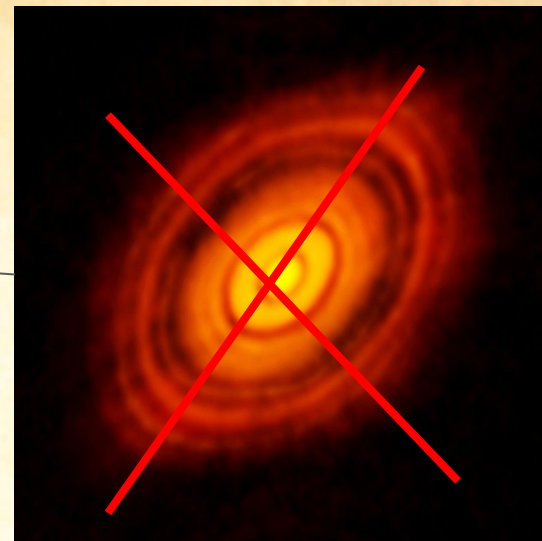
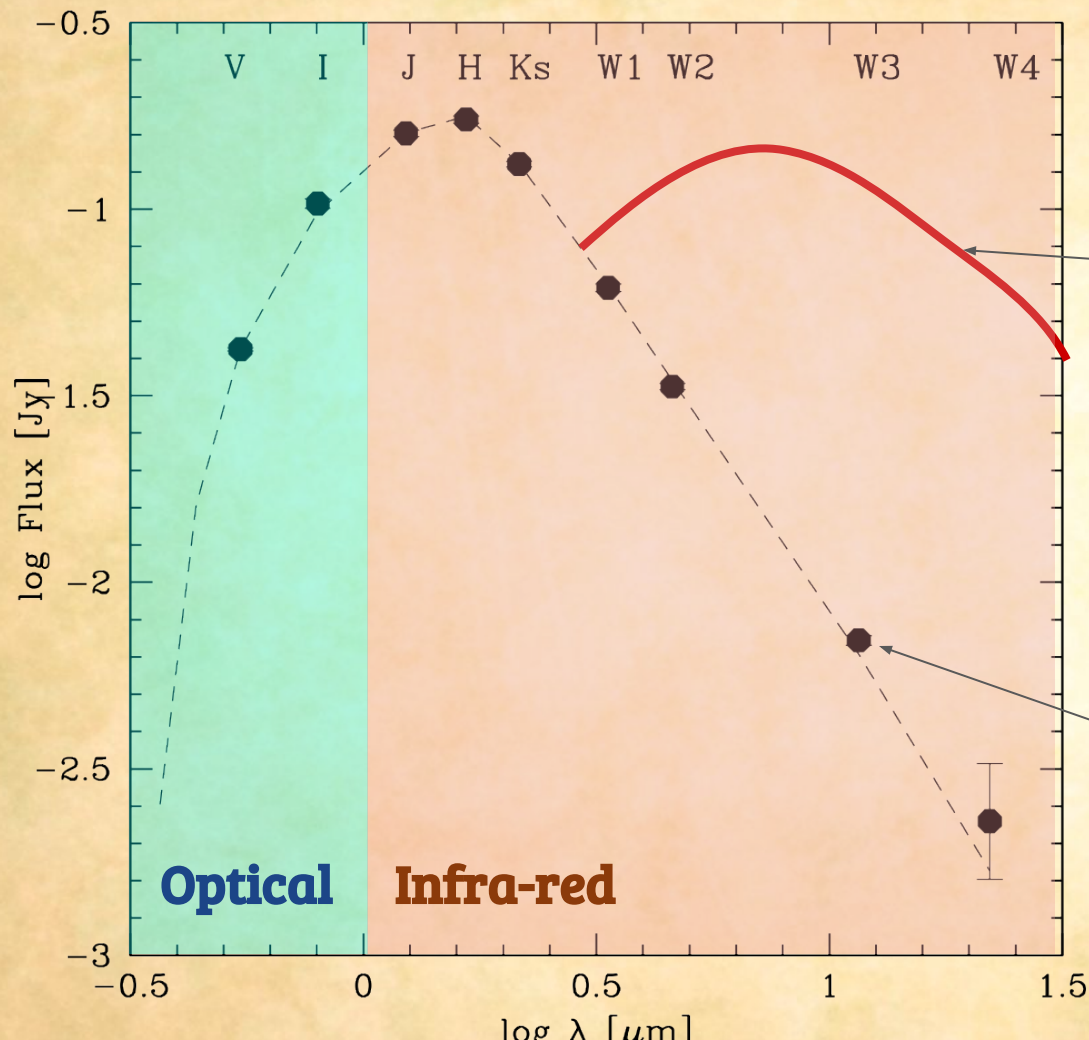




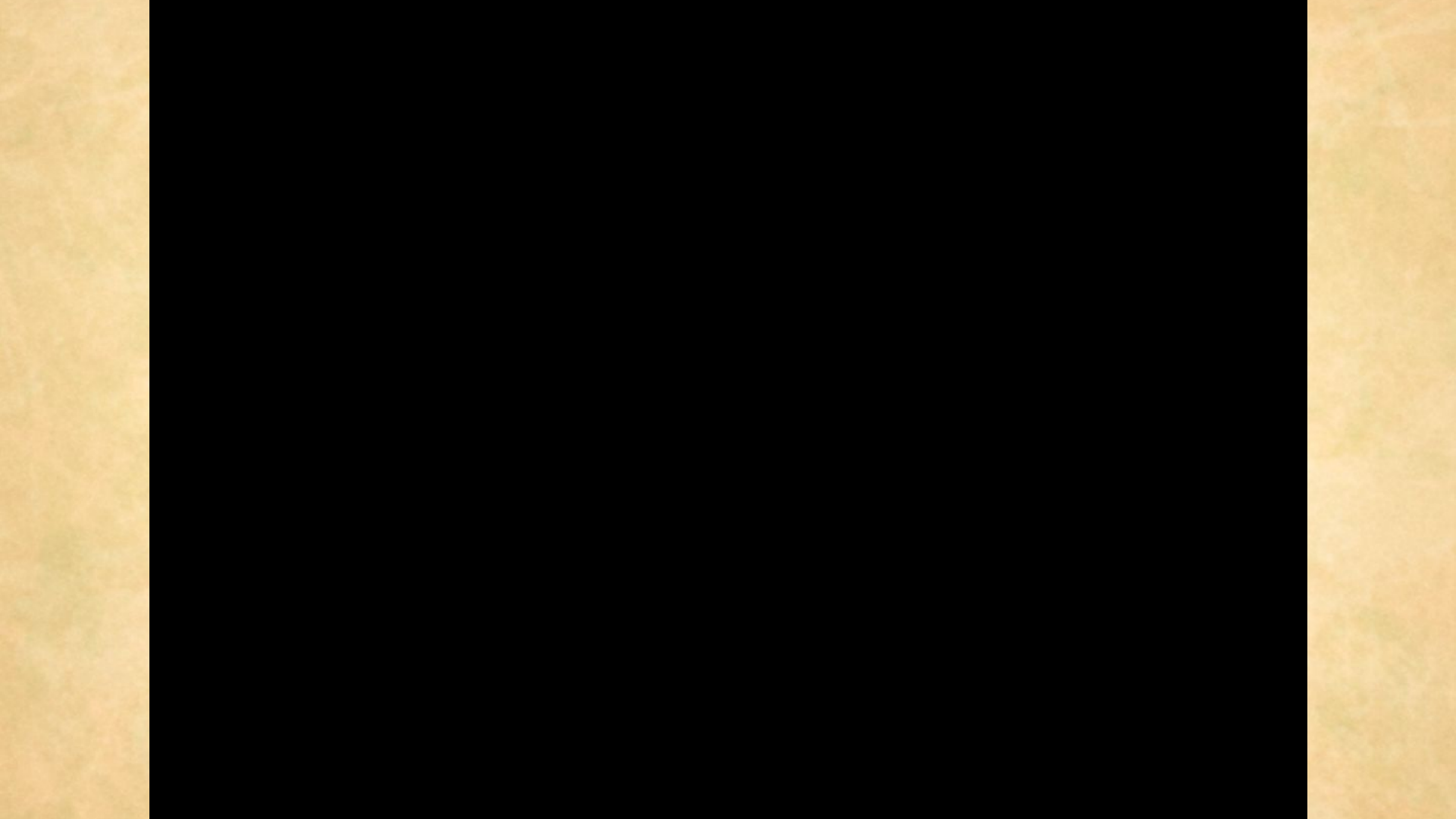
Young stars have  
protoplanetary dust discs

Dust can cause deep & weird  
dips!





Observations



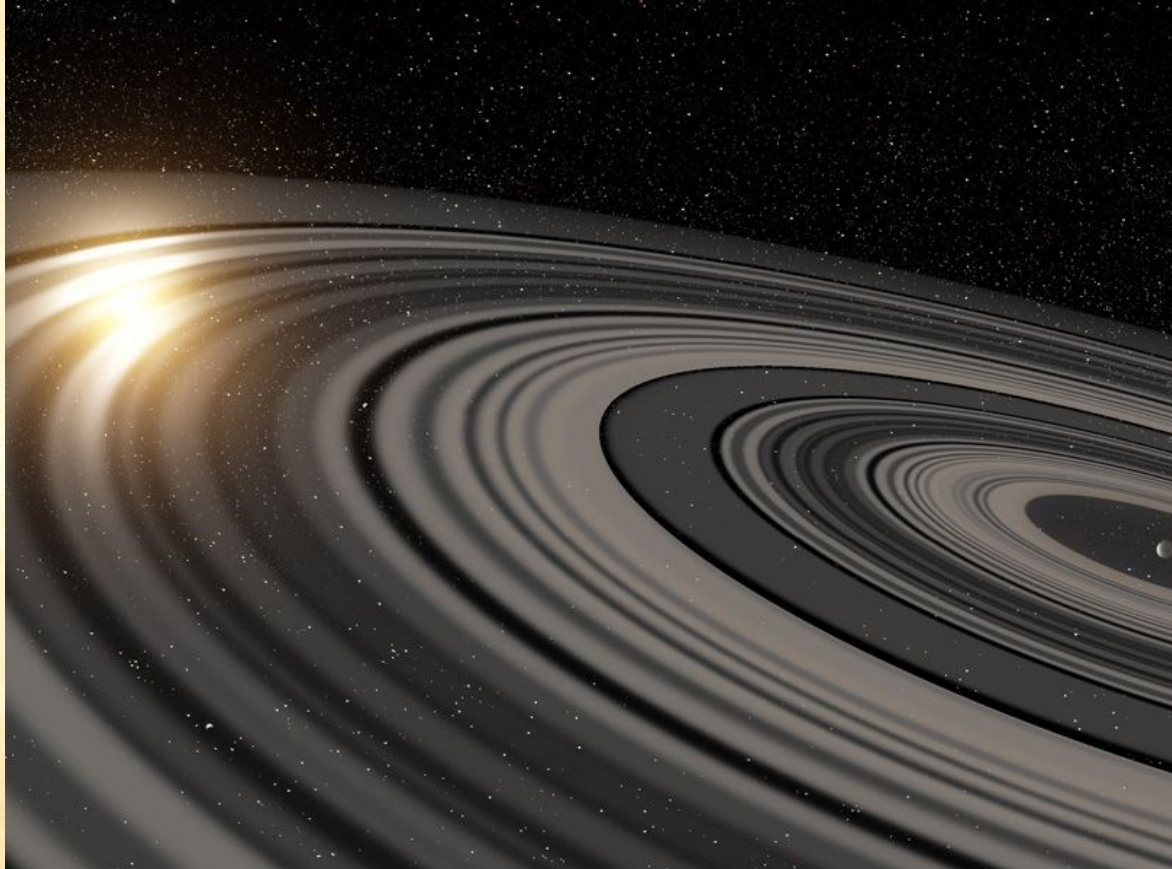


# J1407

Disc velocity suggests a size  
~0.5AU across and a distance  
of ~1AU.

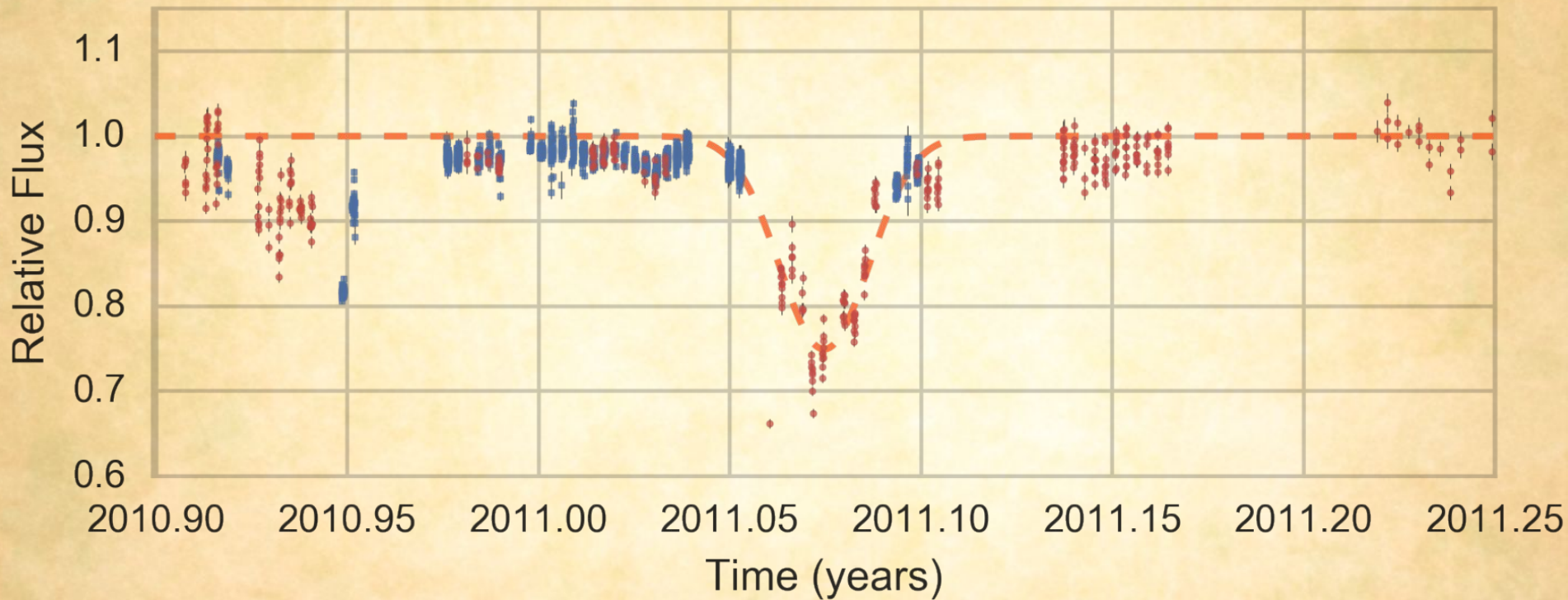
15 years of data shows no  
repeat!

Requires highly eccentric  
orbit... which would not be  
stable!

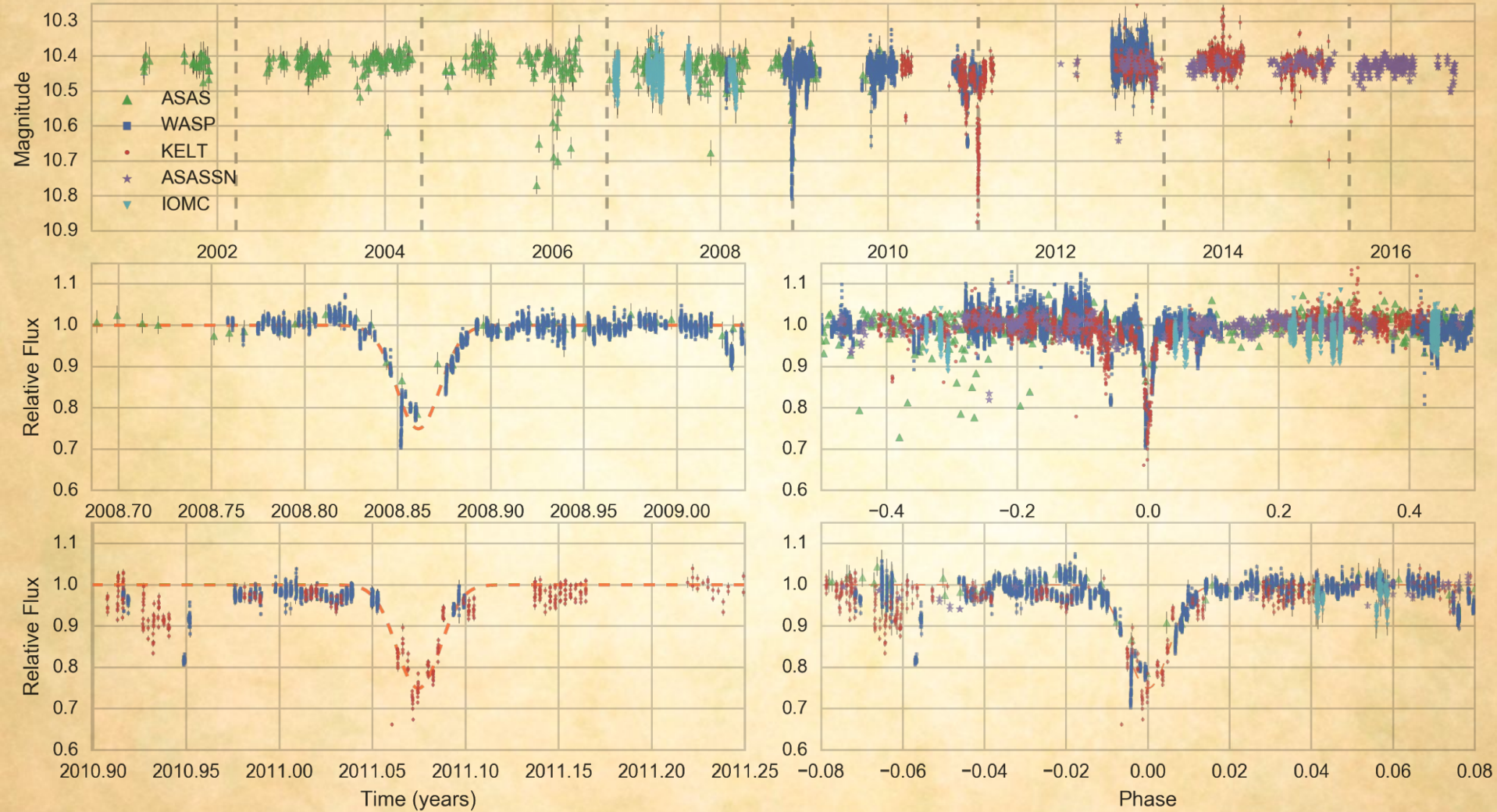


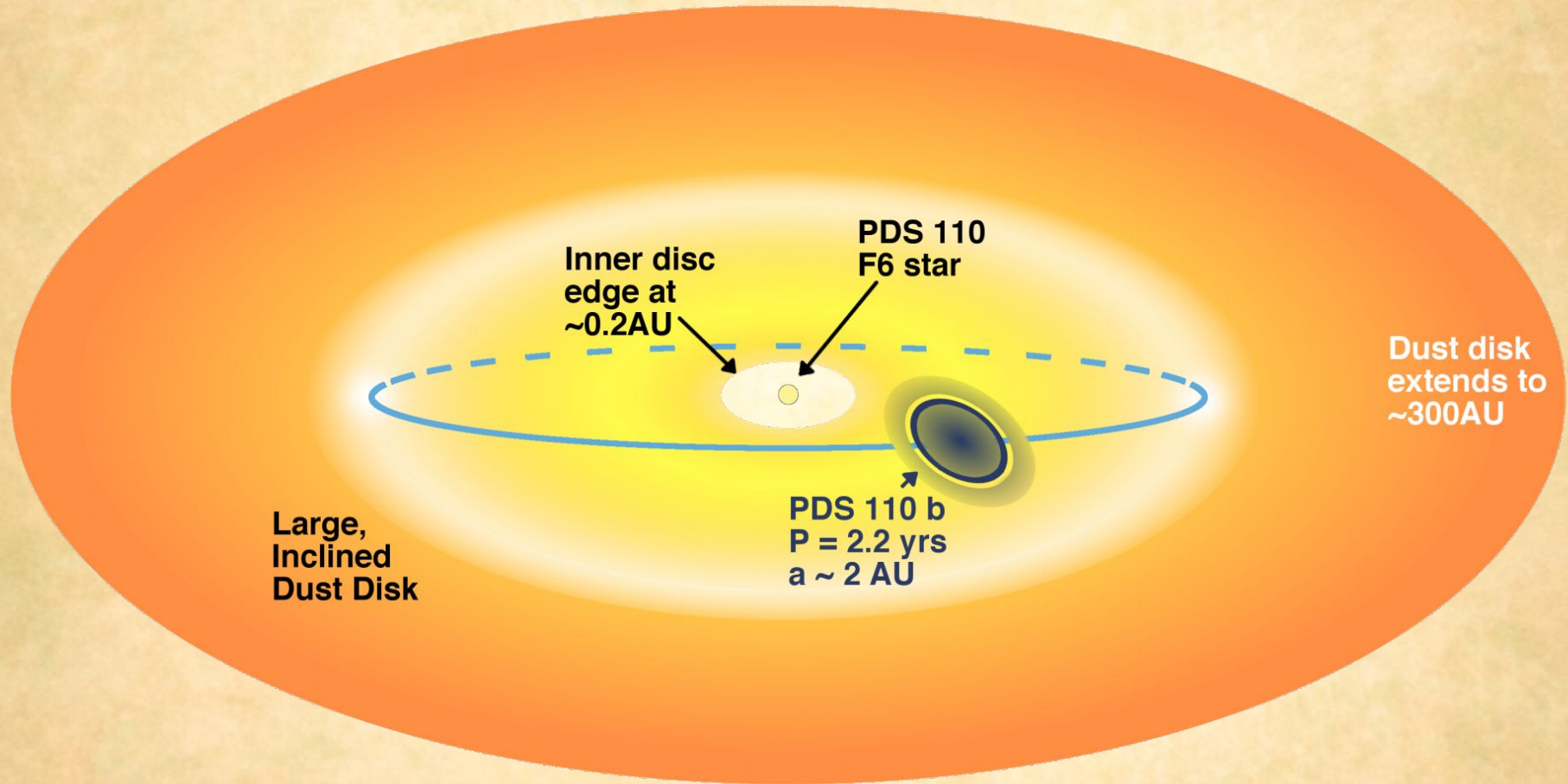
# PDS-110

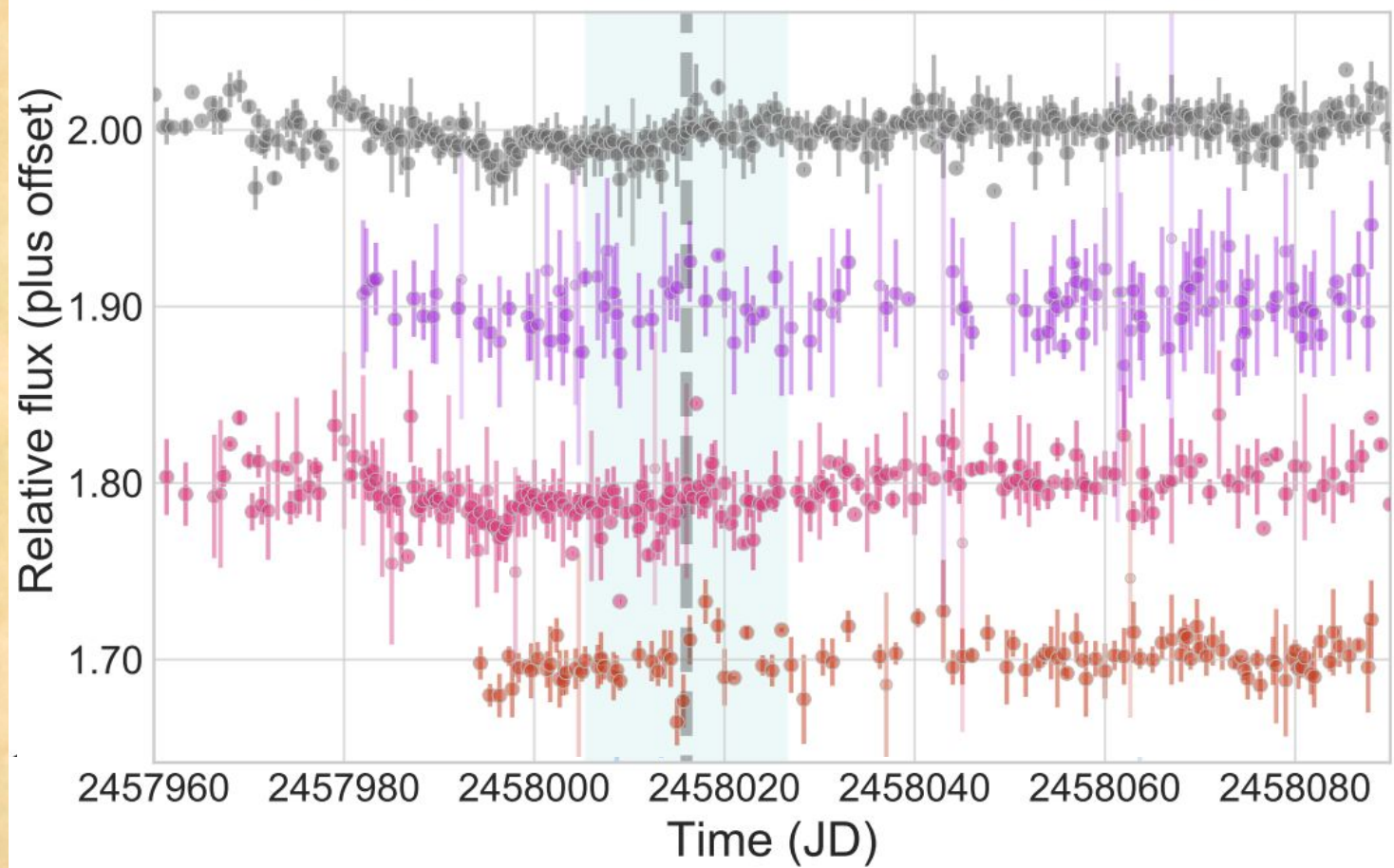




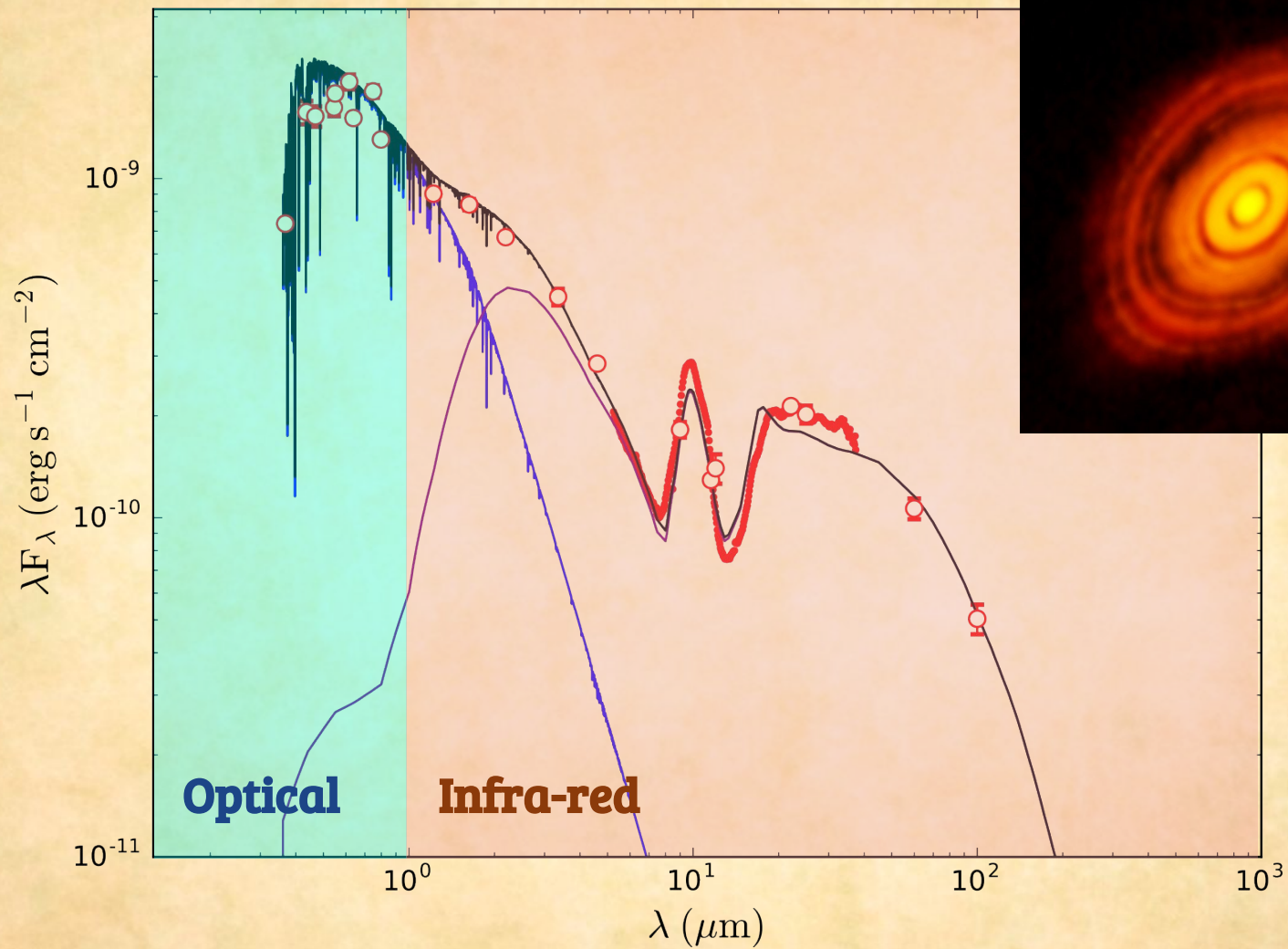


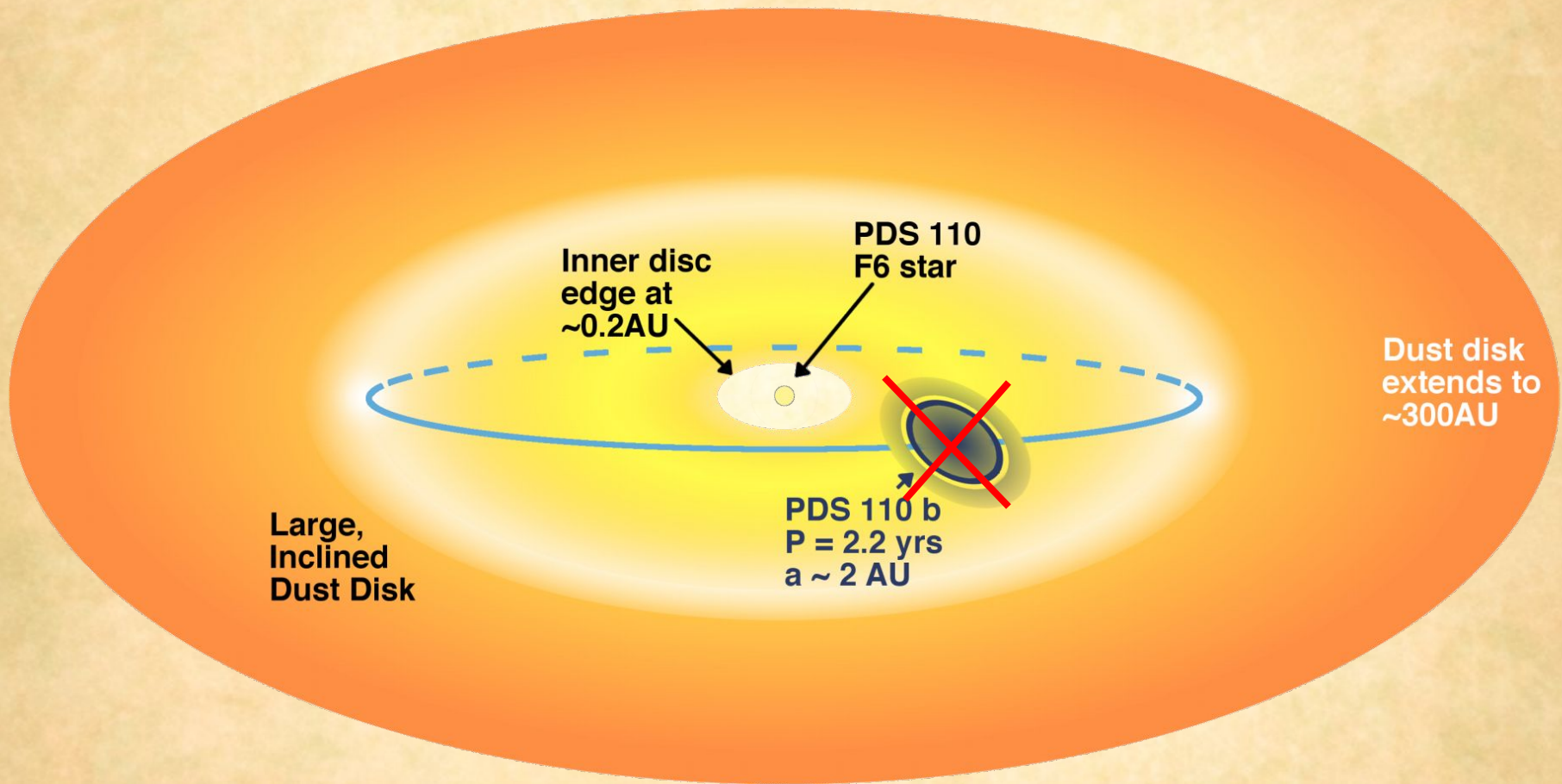




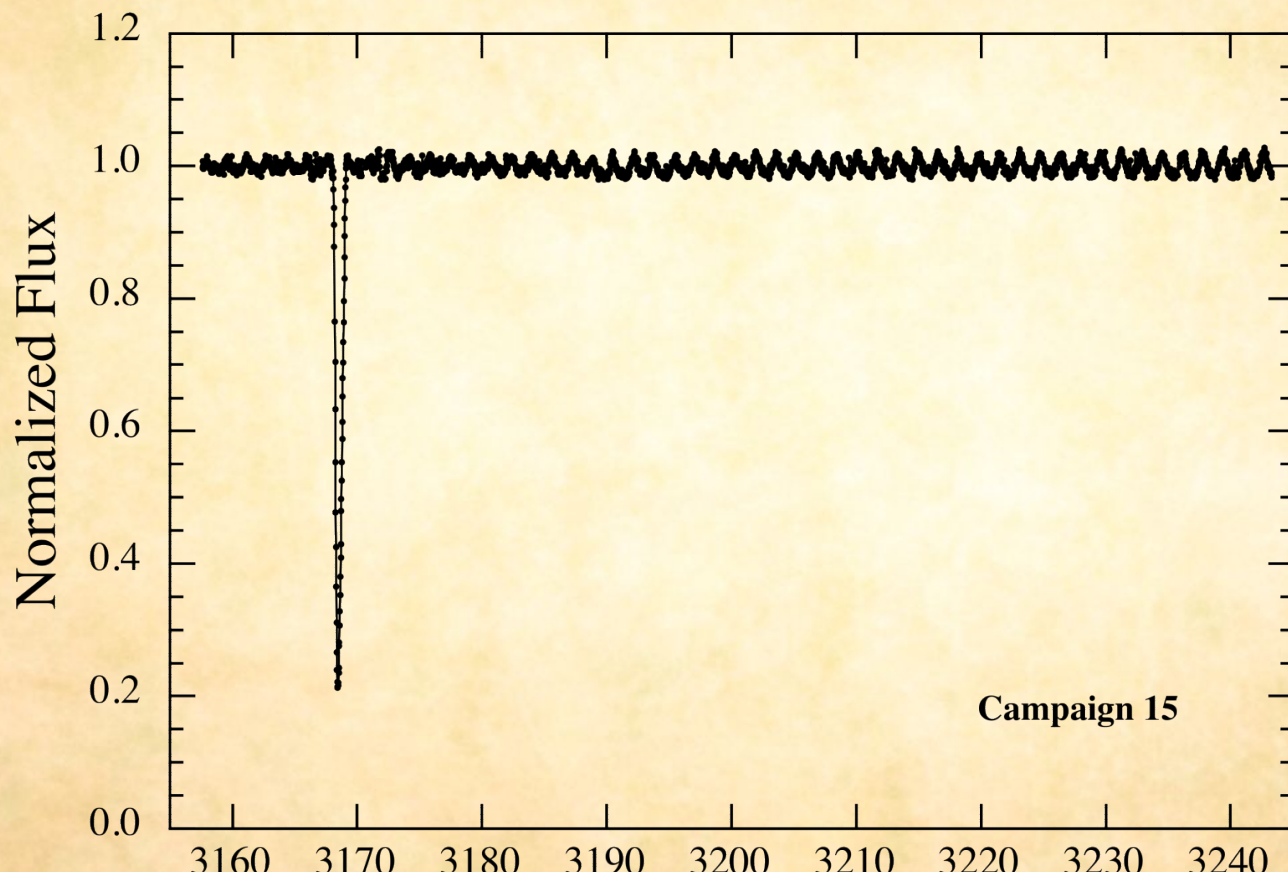




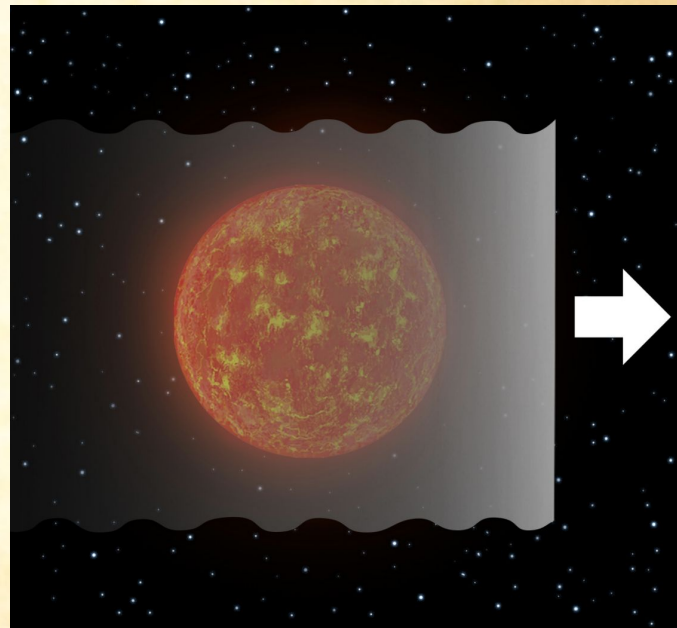
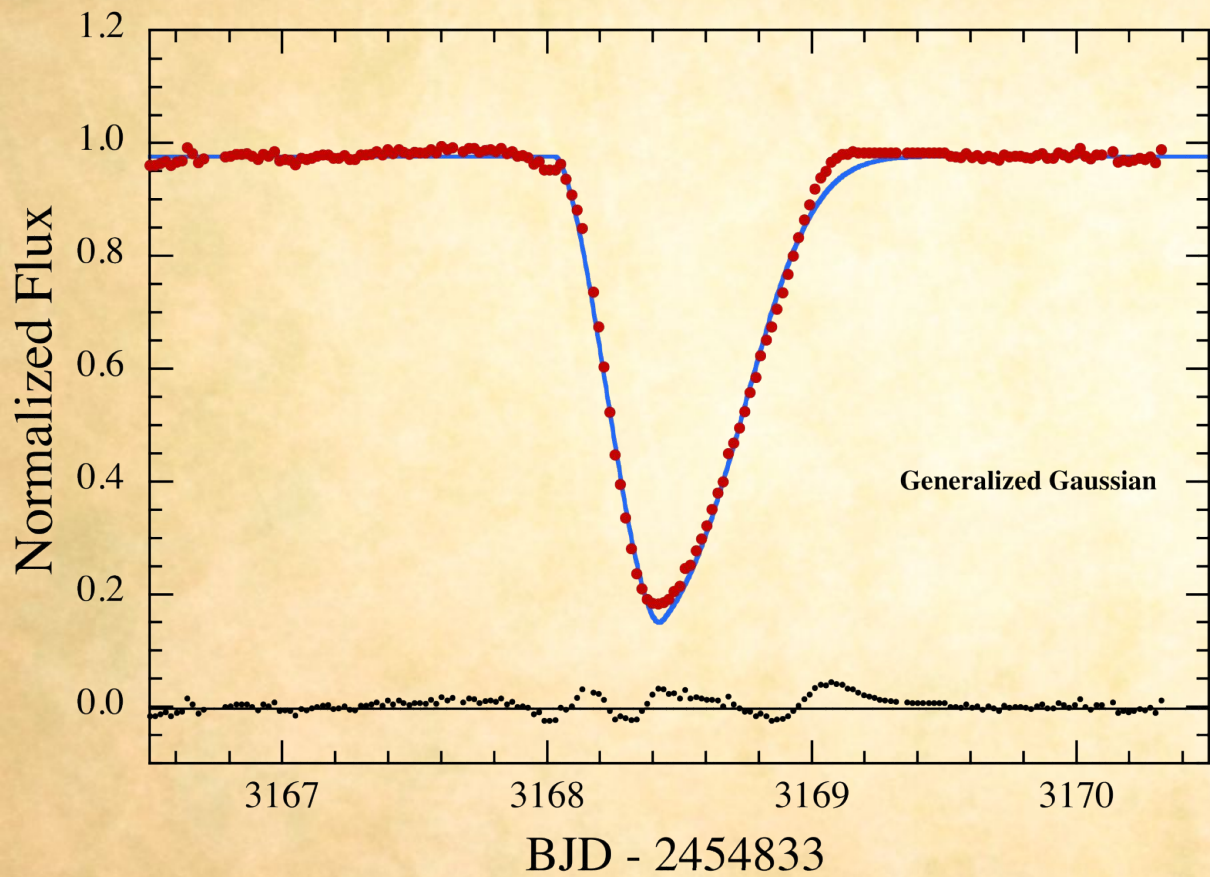


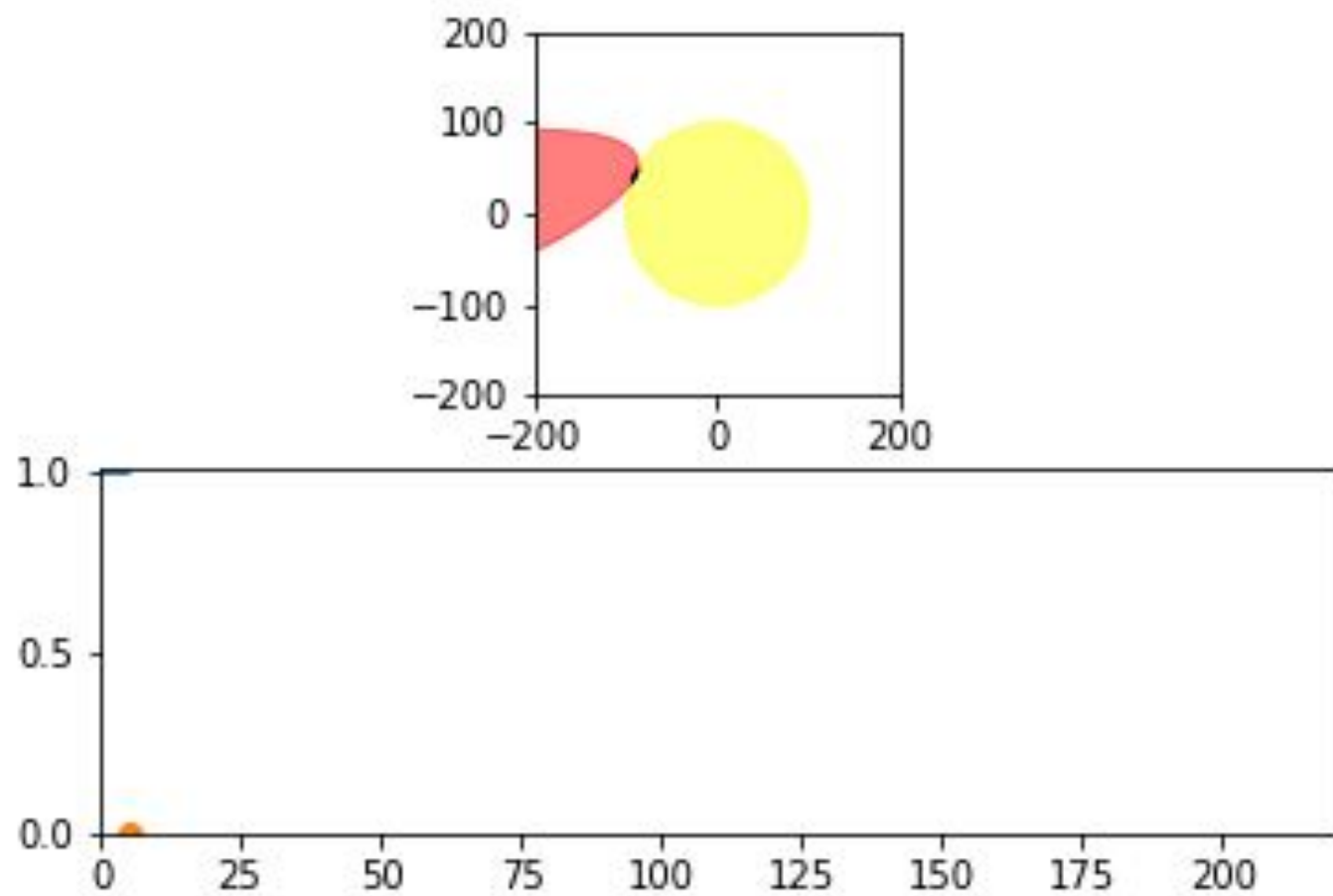


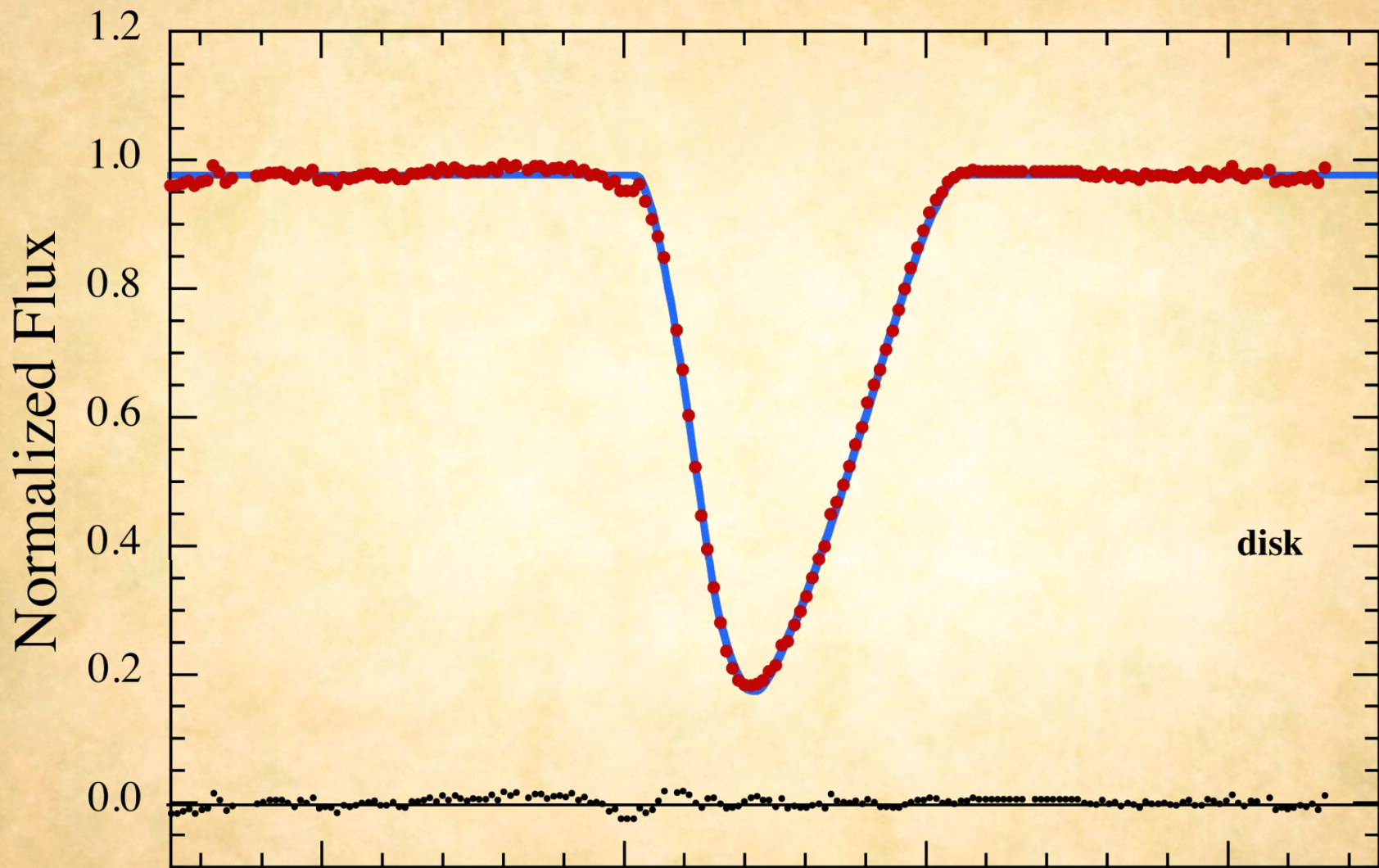
# EPIC 204373041 (The Shark Tooth)









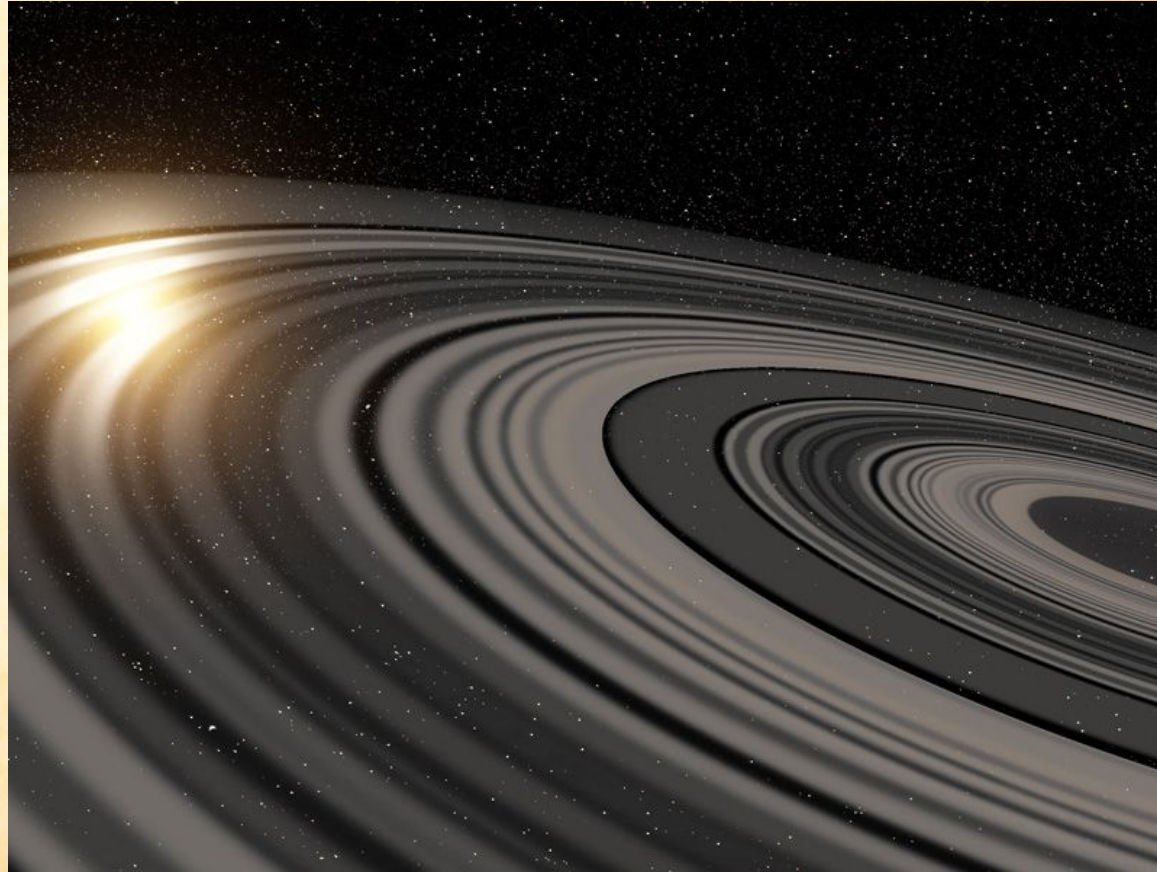




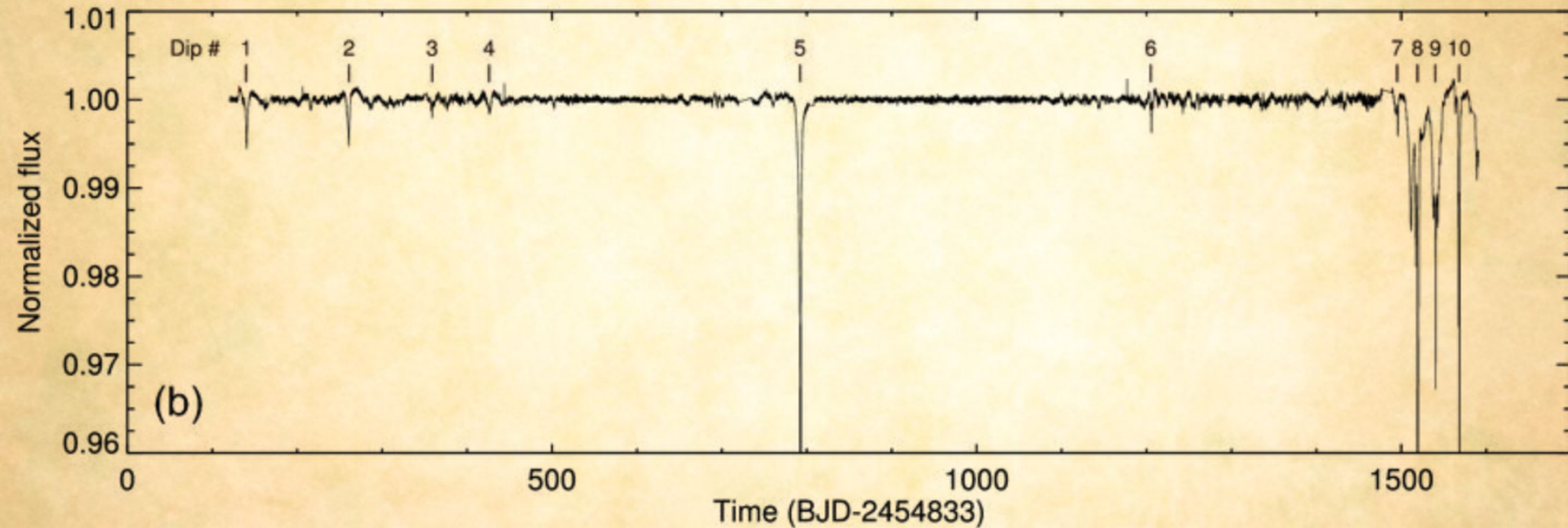
# EPIC 204373041 (The Shark Tooth)

Again - eclipse does not repeat  
repeat!

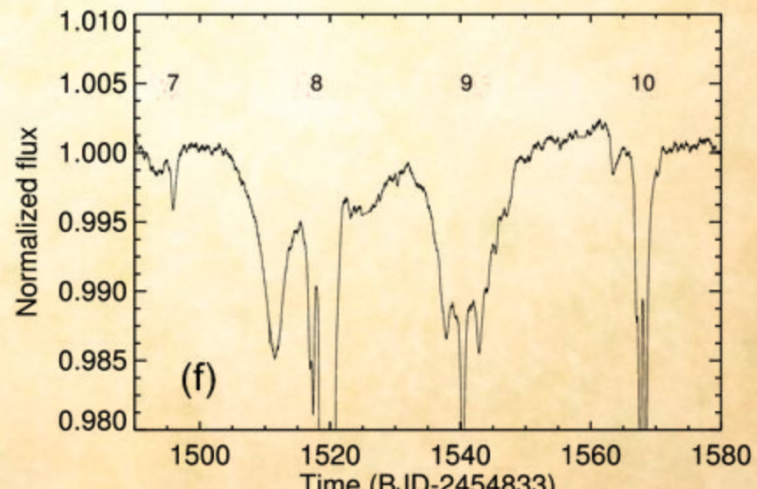
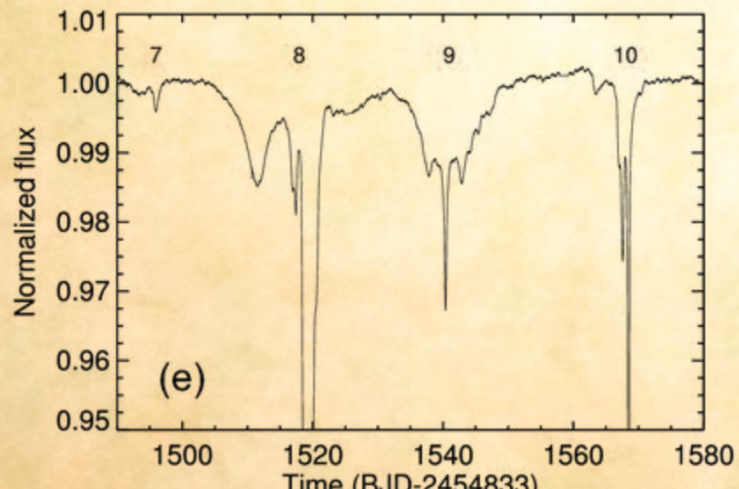
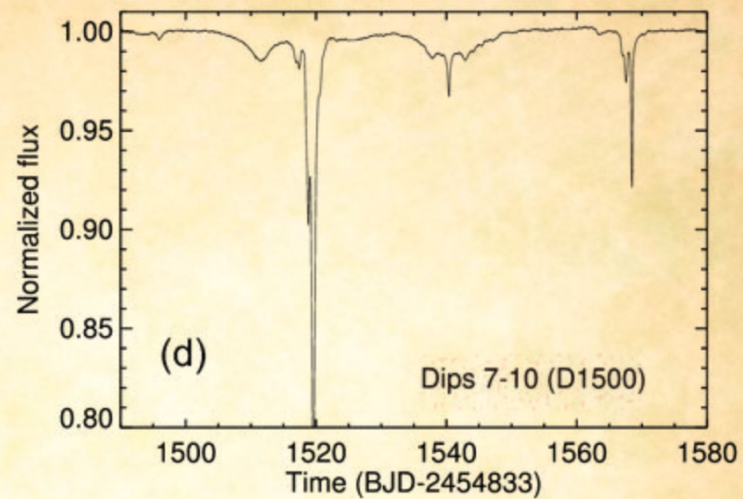
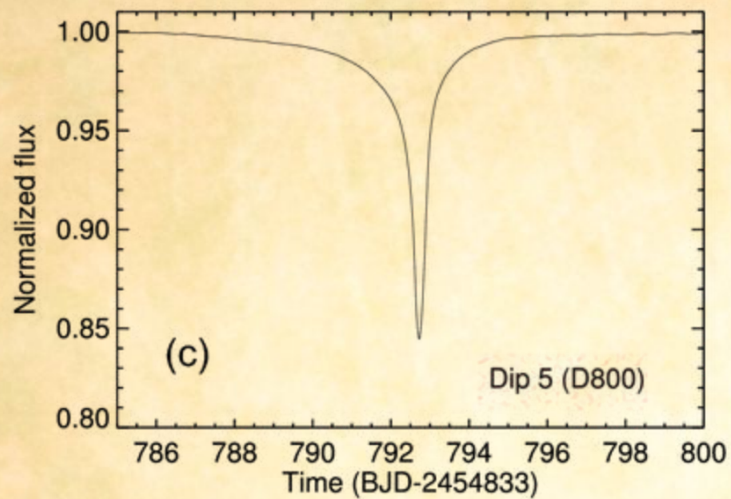
Requires eccentric orbit...  
which would not be stable!



# KIC 8462852 (Boyajian's Star)

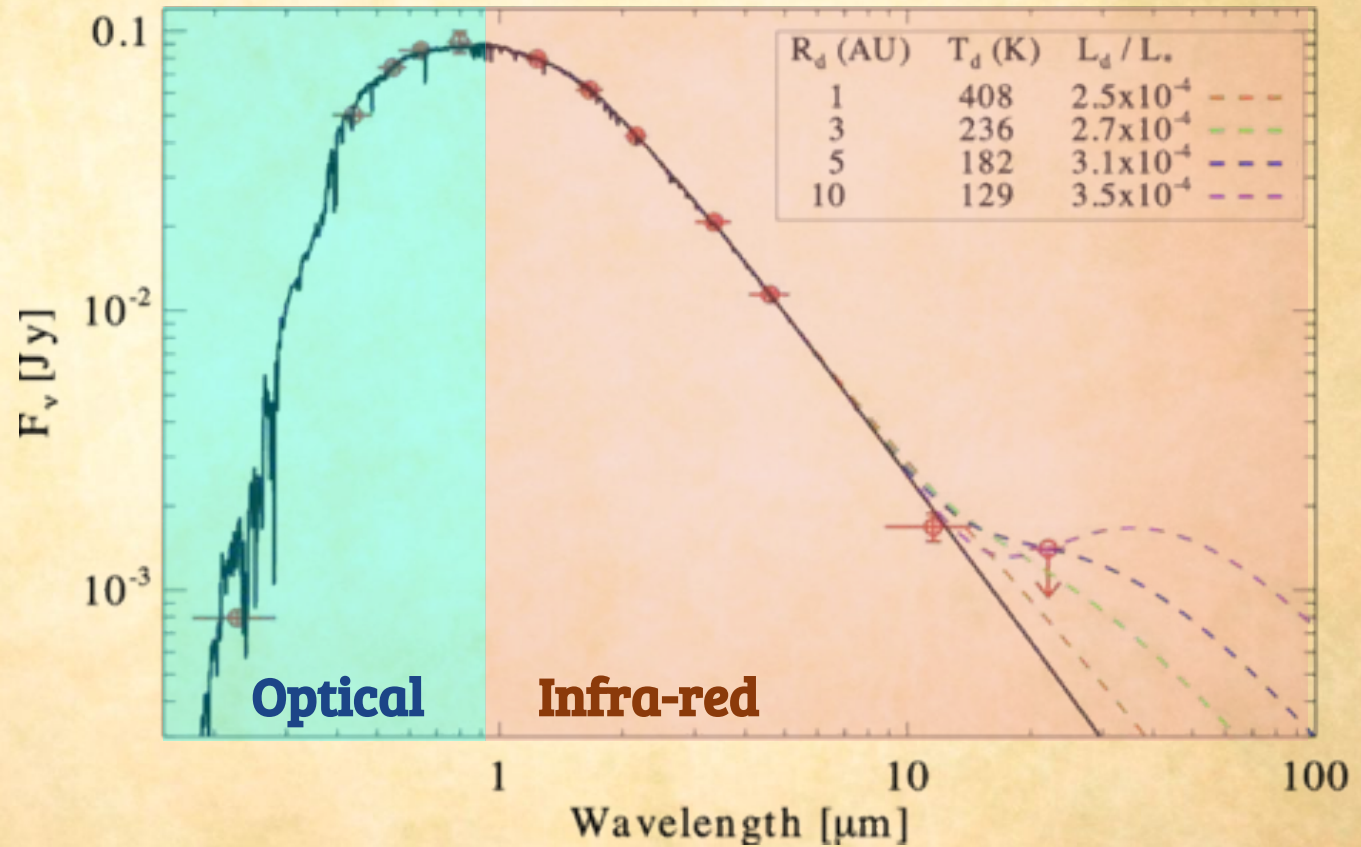








No IR = no dust?!



## Have researchers discovered an alien MEGASTRUCTURE? 'Bizarre' star could be surrounded by a Dyson sphere built by extraterrestrials, researchers claim

- KIC 8462852 is located 1480 light-years away from Earth
- Has produced a series of bizarre light fluctuations team cannot explain
- One theory is that a vast megastructure is obscuring the light from it

By [MARK PRIGG FOR DAILYMAIL.COM](#) 

**PUBLISHED:** 01:58 GMT, 14 October 2015 | **UPDATED:** 21:53 GMT, 15 October 2015



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**521**

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Researchers have revealed a 'bizarre' star they say could be surrounded by a huge alien mega structure known as a Dyson sphere.



# Could it be aliens?

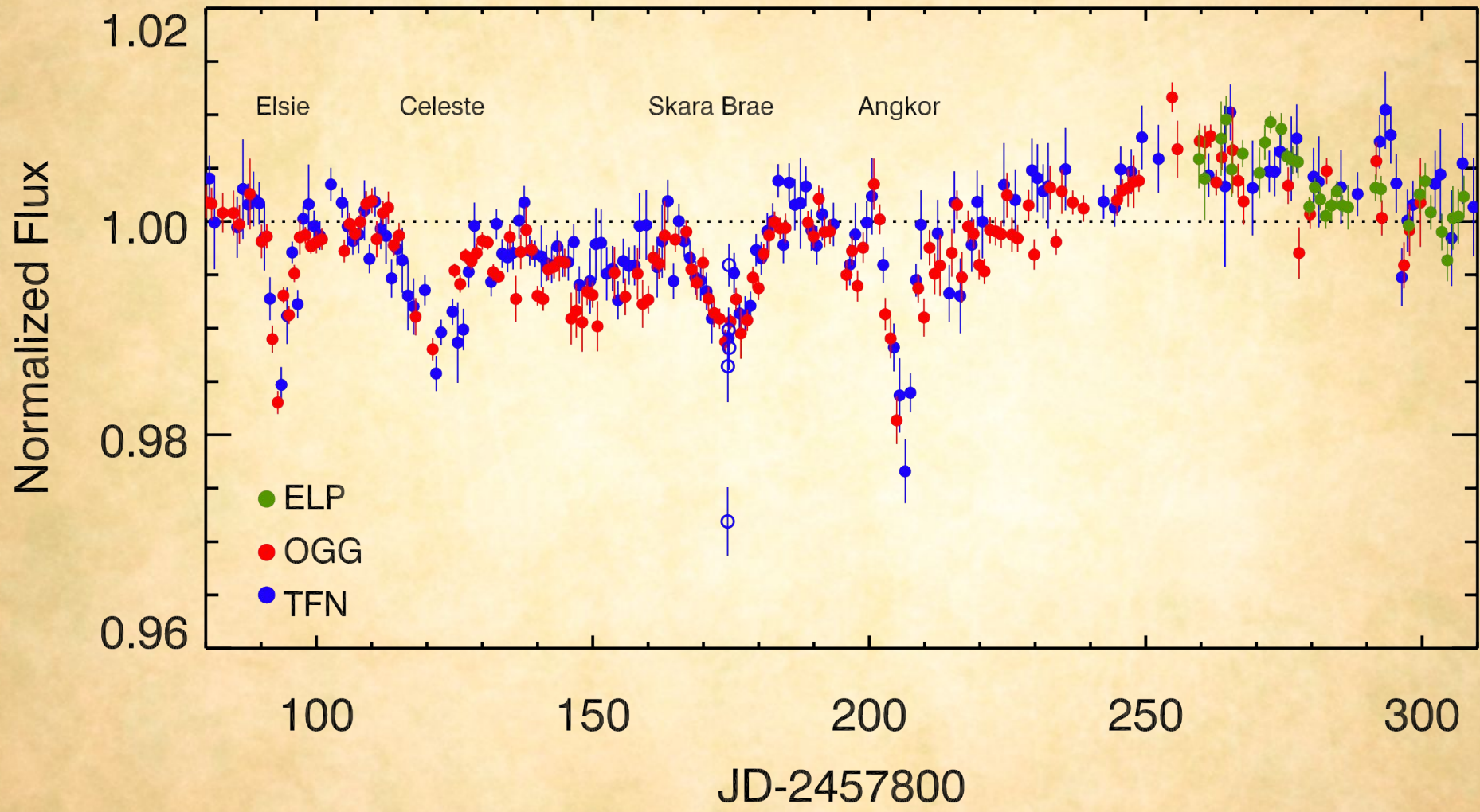
Dyson sphere predicted

Predicts warm structure - i.e. IR excess

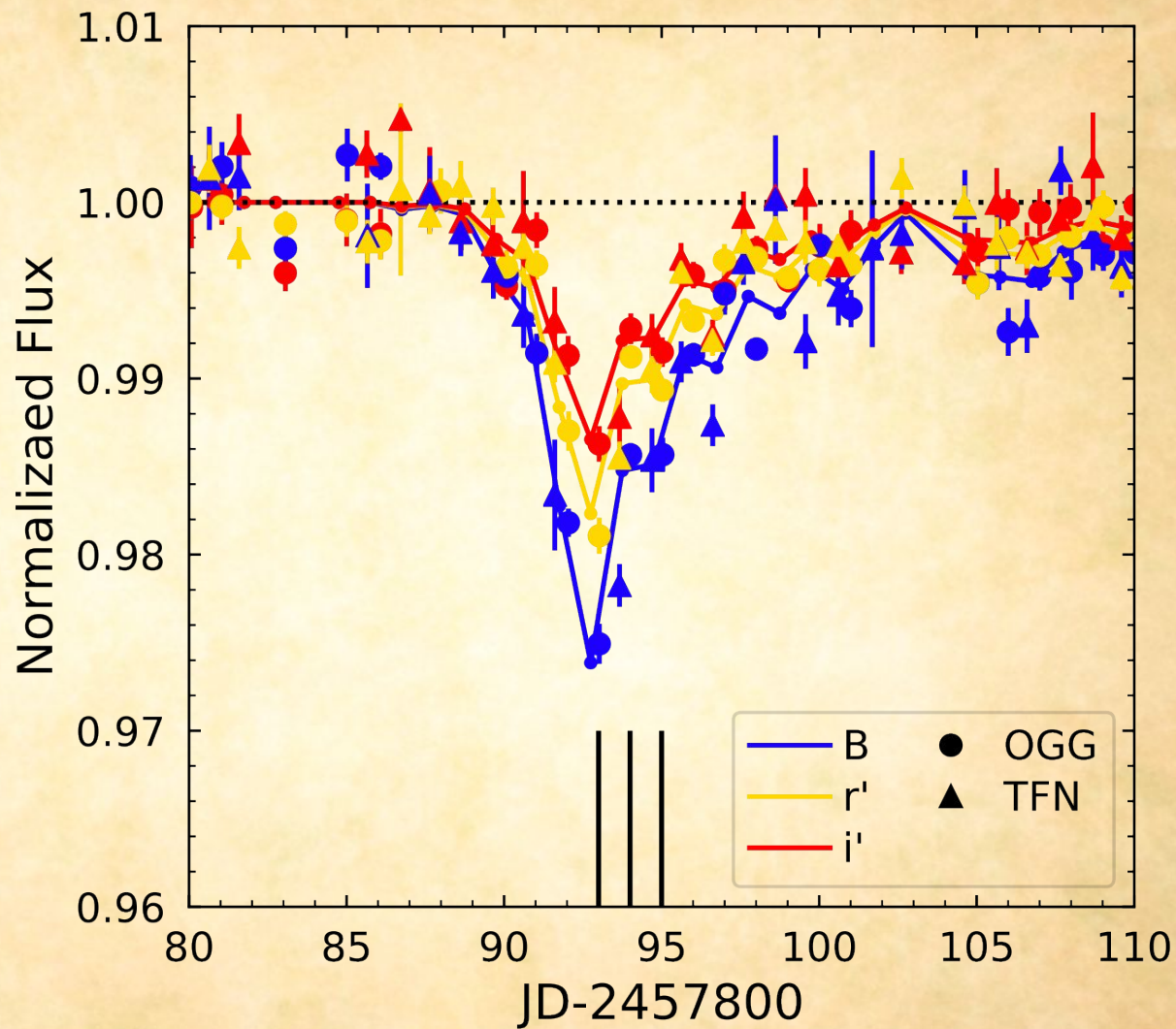
Predicts eclipses are the same in all colours

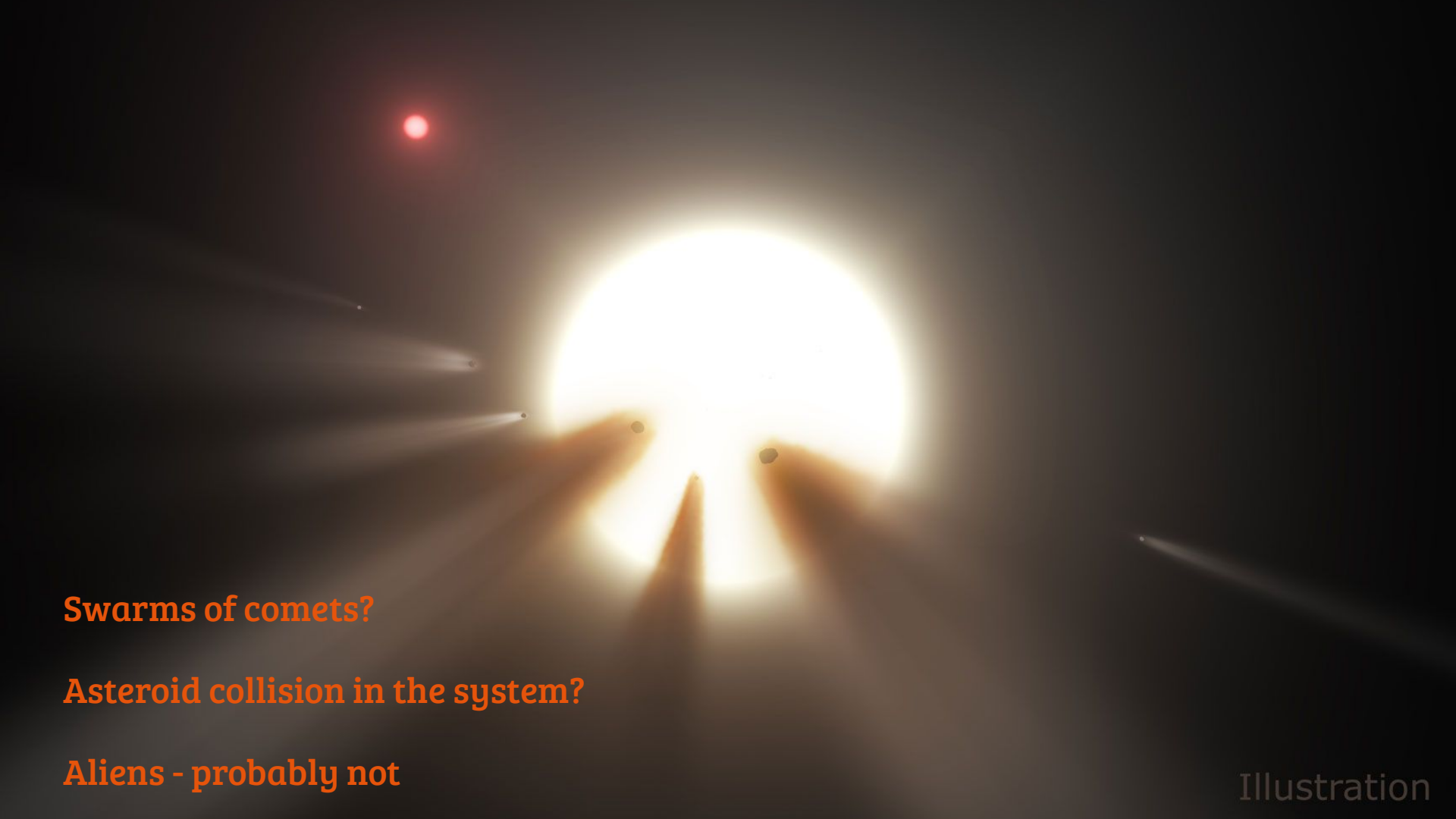






Difference in depth with  
colour = small particles





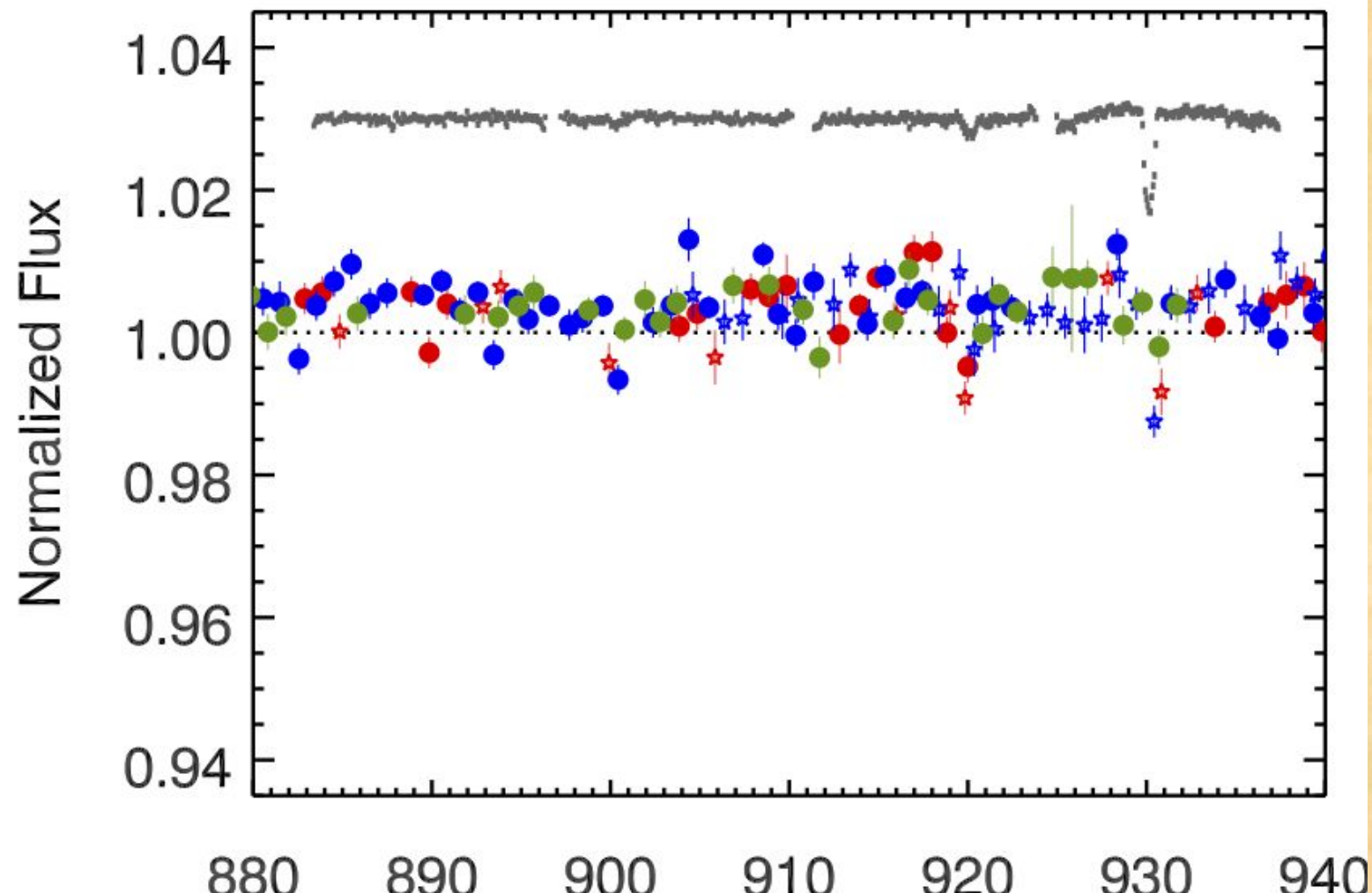
Swarms of comets?

Asteroid collision in the system?

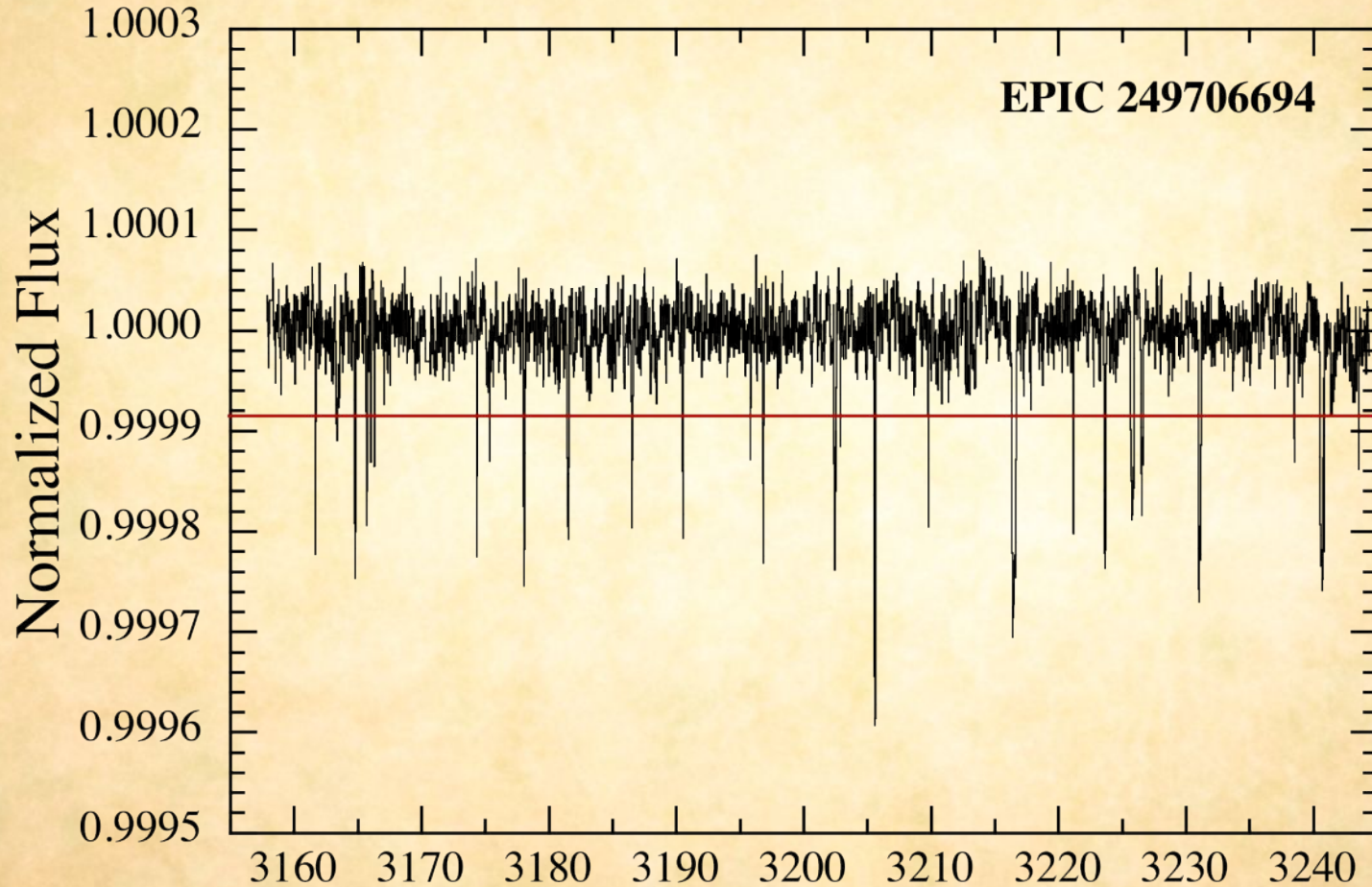
Aliens - probably not

Illustration

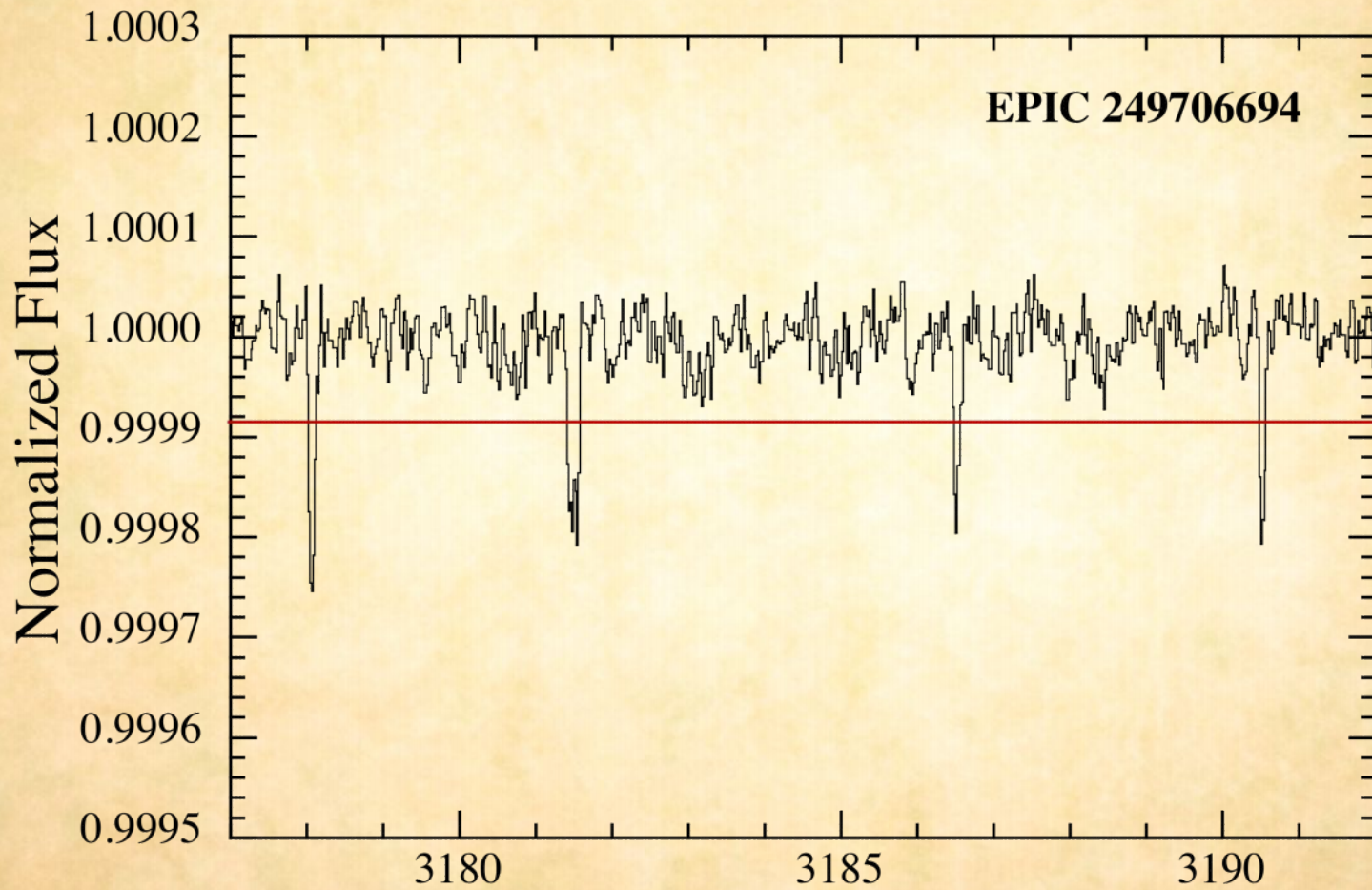




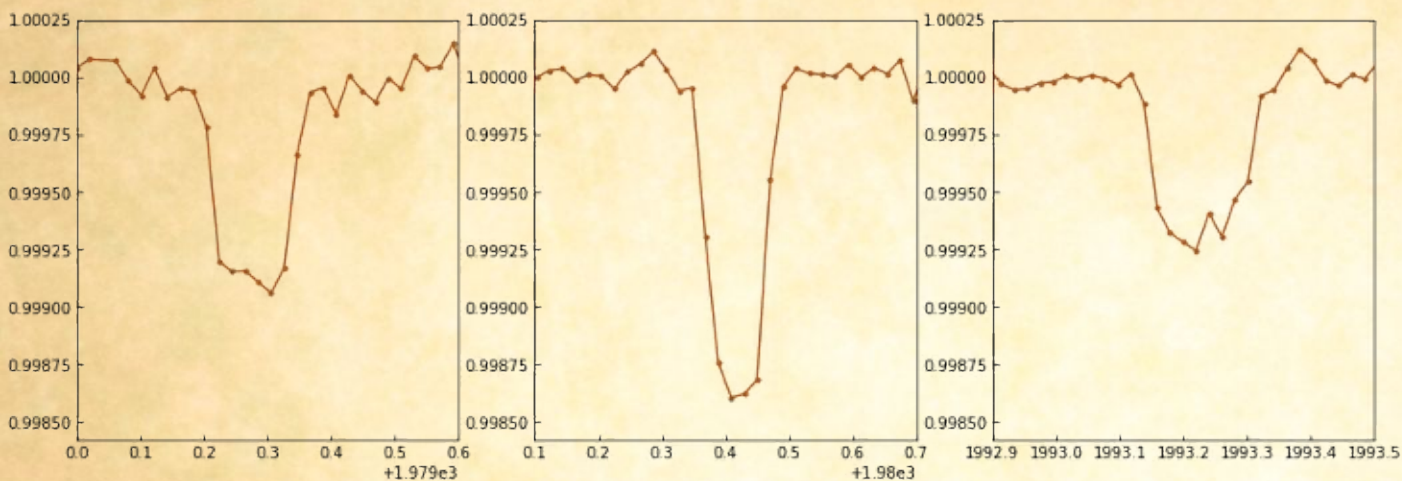
# HD 139139 (The Random Transiter)



# HD 139139 (The Random Transiter)

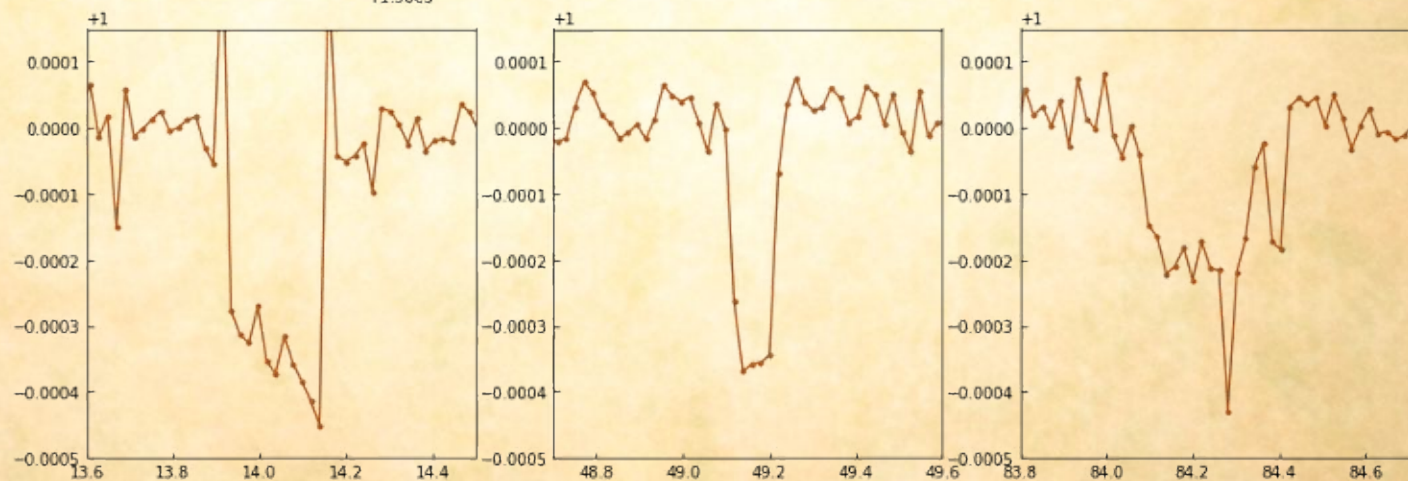


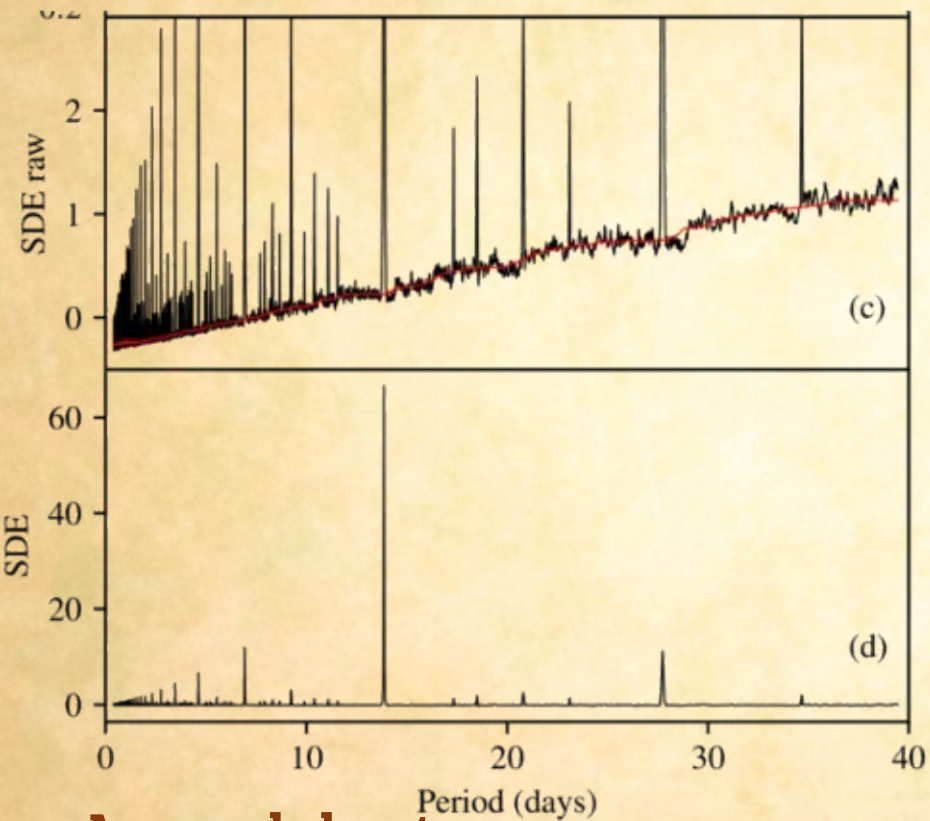




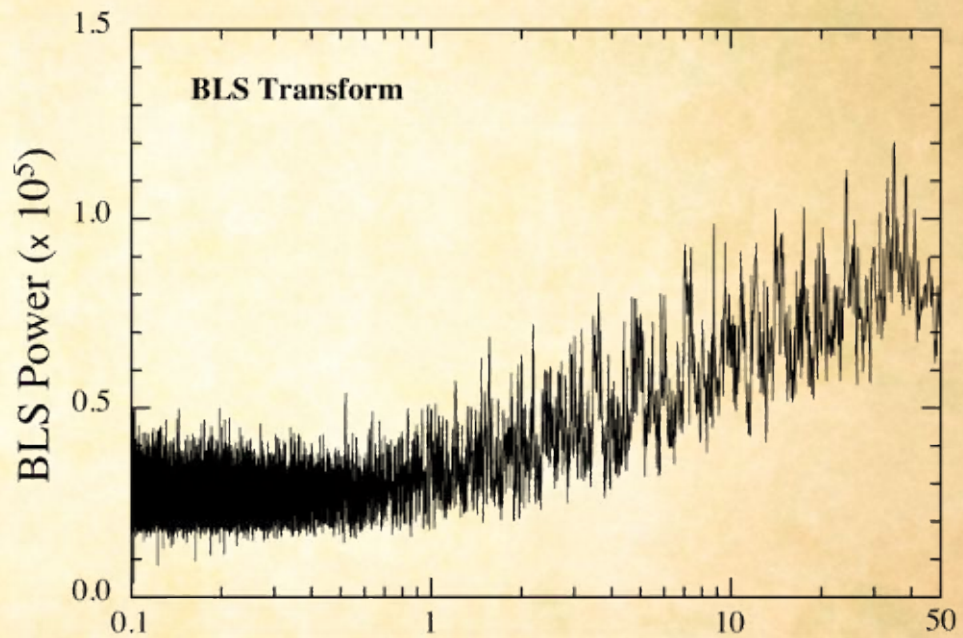
**K2-3b/c/d**

**HD 139139**

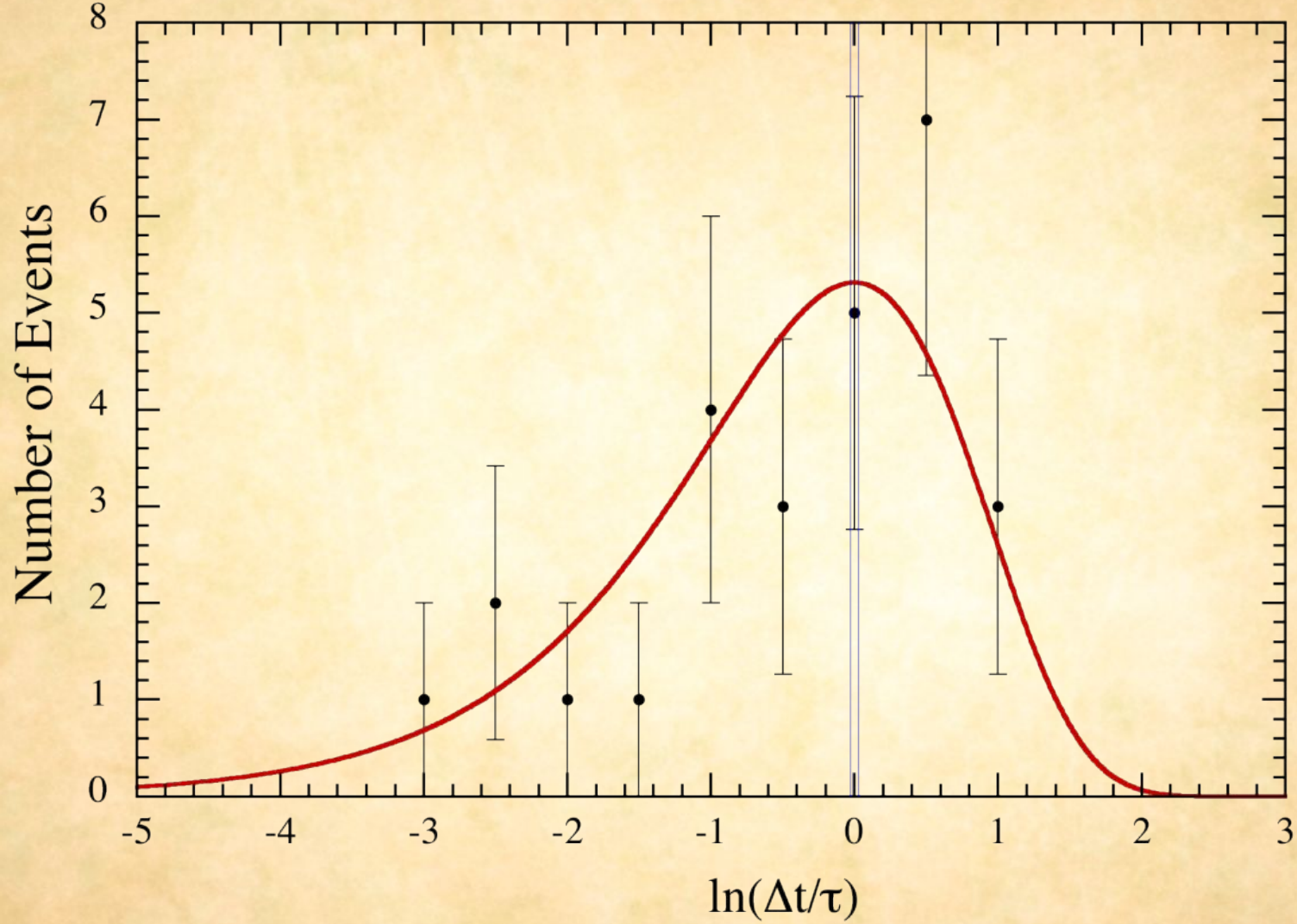




**A normal planet**



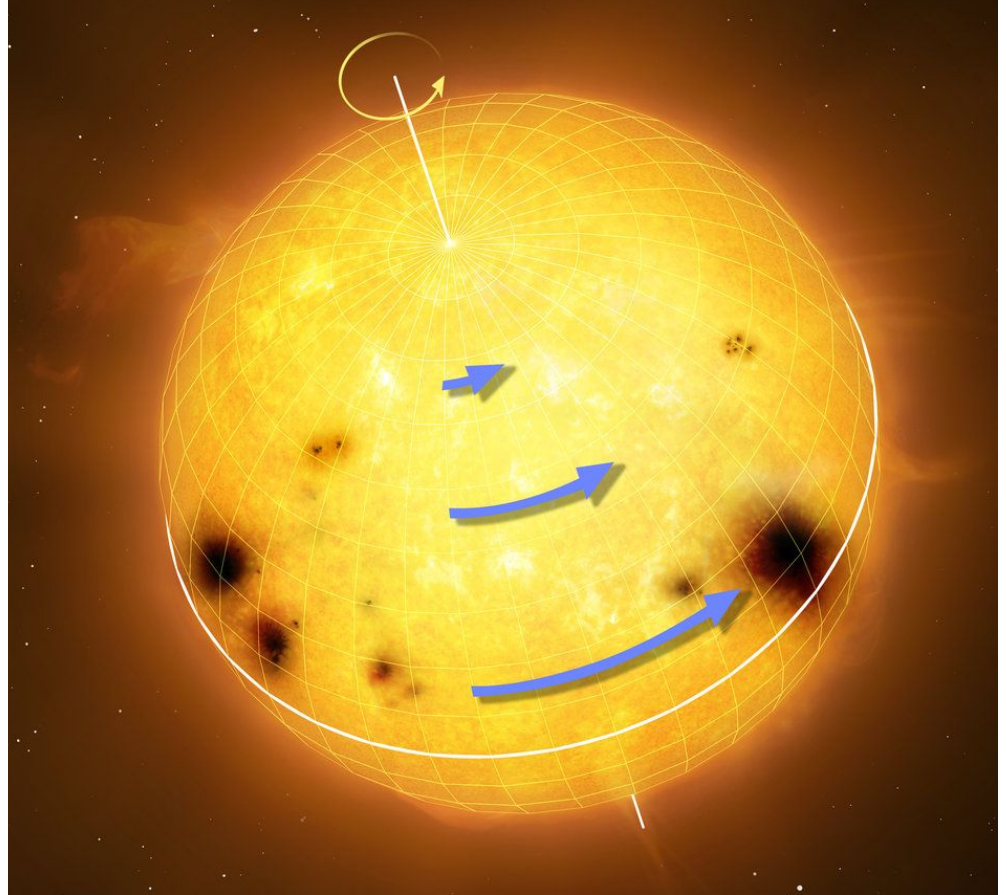
**HD 139139**





# Possible explanations

- A plethora of planets
- A disintegrating planet?
- Dust-emitting asteroids?
- Planets in a Binary system?
- Quadruple star system?
- Dust around a young star with a disc?
- Stellar variability?



# Could it be aliens?

## Structures found serendipitously?

- No infra-red.

## Deliberate signalling?

- Anti-laser physically impossible?
- Would require structures blocking light... why?

Neither seem likely...





*Once you eliminate the  
impossible, whatever remains,  
no matter how improbable,  
must be the truth.*



**Arthur Conan Doyle**



Thanks

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Podcast: exocast.

Available on Spotify, iTunes, etc

Including Brett & Dan

