

# ***Astronomy News***

范祖侑

Fan, Tsui

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***High Energy Astrophysics Group, NTHU***

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30 September 2010 Last updated at 12:22 GMT



## 'Goldilocks planet just right for life'

By **Katia Moskvitch**  
Science reporter, BBC News



An artist's impression of Gliese 581g and its parent star

**Astronomers have detected an Earth-like exoplanet that may have just the right kind of conditions to support life.**

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Men say prominent pastor Eddie Long used his position to coerce them into having sex as teens



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Sarah Shourd is freed while two other hikers prepare to face trial in Iran for alleged spying



**Chilean miners trapped**  
Crews work to free 33 Chilean workers; miner's new baby named Esperanza



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President makes push on taxes, economy, jobs, education ahead of midterm elections

September 30th, 2010

01:12 PM ET

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## '100 percent' chance for life on newly found planet?



An artist rendering shows the four inner planets of the Gliese 581 system and their host star.

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# *The Paper*

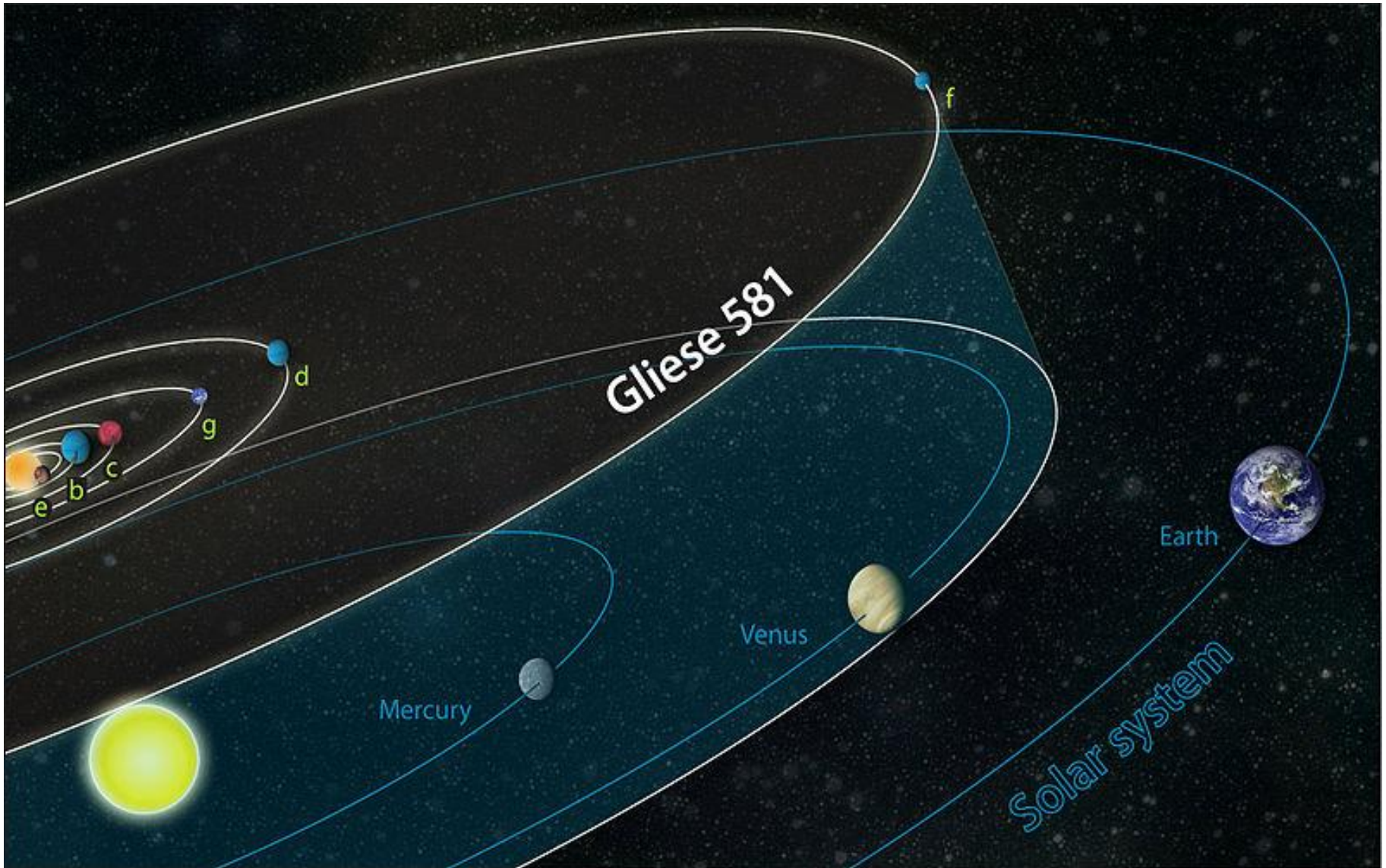
## **The Lick-Carnegie Exoplanet Survey: A $3.1M_{\oplus}$ Planet in the Habitable Zone of the Nearby M3V Star Gliese 581**

Steven S. Vogt, R. Paul Butler, E. J. Rivera, N. Haghighipour,  
Gregory W. Henry, Michael H. Williamson

arXiv:1009.5733v1

(Submitted on 29 Sep 2010. Accepted for publication in ApJ)

# The System



# *Parent star and the planet*

- Gliese 581

- Distance to Sun 6.3 pc
- Mass  $0.31 M_{\odot}$
- Radius  $0.29 R_{\odot}$
- Spectral M3V

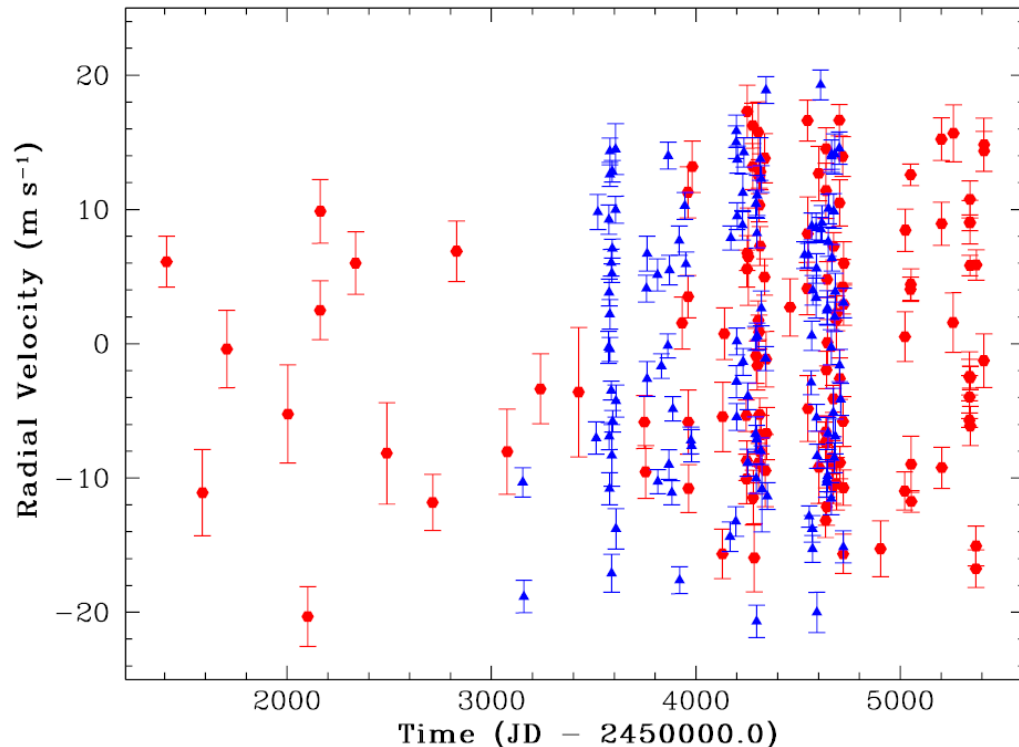
- Gliese 581 g

- Distance to Gl581  $\sim 0.146$  AU
- Mass  $3.1 M_{\oplus} \sim 4.3 M_{\oplus}$
- Orbital period  $\sim 36.6$  days

# *RV observations*

- HIRES (High Resolution Echelle Spectrometer)
  - at Keck I
  - Time span  $\sim 11$  years
  - RV precision  $< 3$  (m/s) for M dwarfs brighter than  $V=11$

- Combined RV data
  - red: HIRES, 122 RVs
  - blue: HARPS, 119 RVs (High Accuracy Radial velocity Planet Searcher at the ESO La Silla 3.6m telescope )

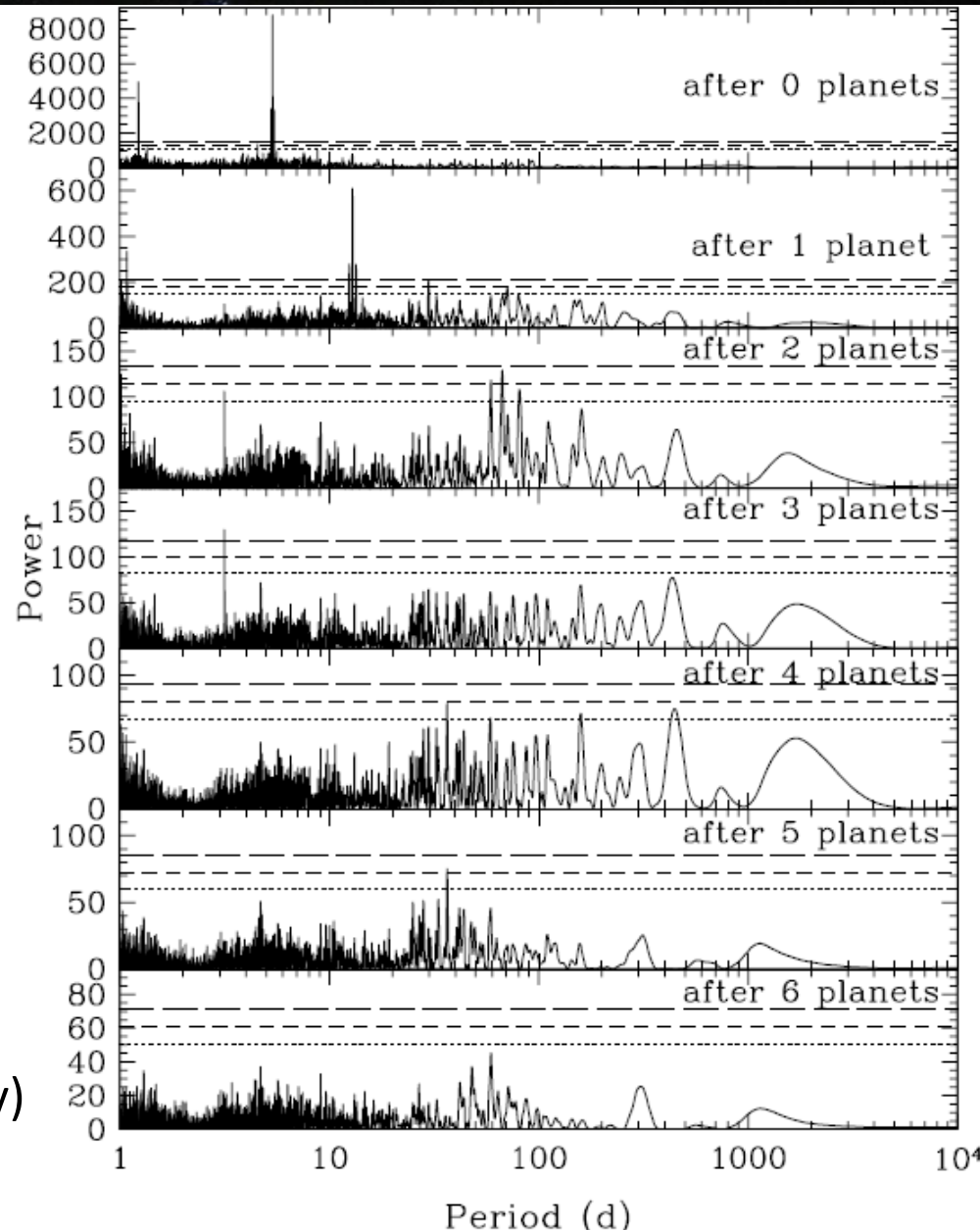


# Period analysis

- Power spectra of the residuals to the 1~6 planet solution

– b	5.37 d
– c	12.9 d
– d	67 d
– e	3.14 d
– f	433 d
– g	37 d

(Horizontal lines (top to bottom):  
0.1%, 1%, 10% false alarm probability)

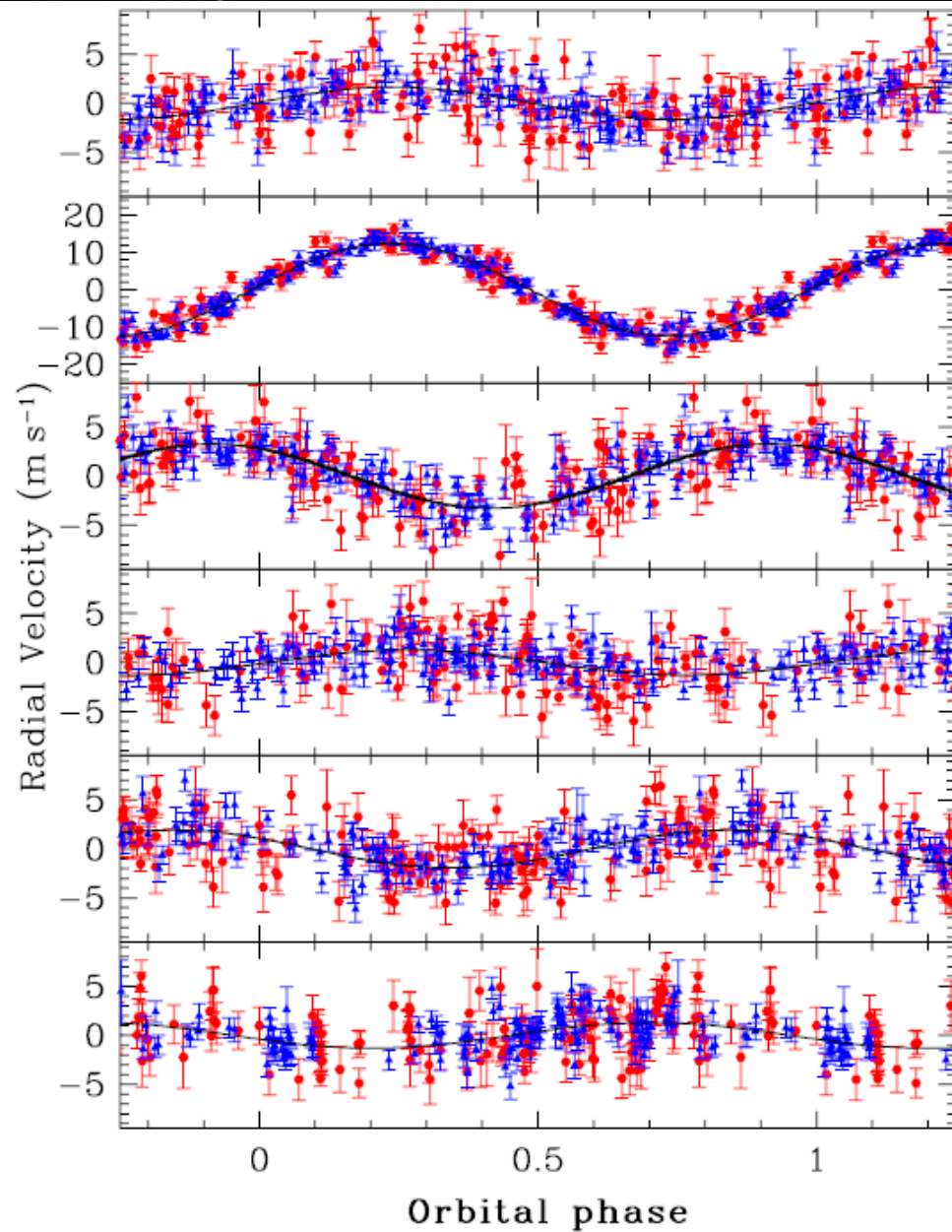


# Period analysis

- Phased reflex barycentric velocities of the host star due to:

– e	3.14 d
– b	5.37 d
– c	12.9 d
– g	37 d
– d	67 d
– f	433 d

(red: HIRES; blue:HARPS)





# Planet g

- Gliese 581 g

- Distance to Gl581            0.146 AU
- Mass                                3.1 ~ 4.3  $M_{\oplus}$
- Radius                              1.3 ~ 1.5  $R_{\oplus}$
- Surface gravity                1.1 ~ 1.7 g
- Orbital period                 36.6 days
- $T_{\text{surface}}$                         236 ~ 258 K (-37 ~ -15 °C)  
    [Earth: 288K (15 °C)]
- Probably tidal locked

# $\eta_{\oplus}$

- $\eta_{\oplus}$  (Lunine et al. 2008)
  - The fraction of stars that have at least one potentially habitable planet (Exoplanet Task Force Report)
- Within 6.3 parsec
  - 116 known solar or later type stars
  - 2 known system with habitable planet (Gl 581 & Solar System)
  - $2/116 \sim 1.7\%$
  - Only  $\sim 60$  of these 116 nearest stars are being monitored by various programs