The Atmosphere of Transiting Exoplanet HAT-P-1b

Presented by

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Why do we want to study exoplanets?

→Formation and changes with time of planetary systems

→Developing techniques for studying Earth-sized planets

What is known about HAT-P-1b?

→Transiting exoplanet in orbit around ADS 16402B

→Distance from Earth is ~140parsec

→Orbital period – 4.47days

→Semimajor axis ~0.055AU

→Mass – 0.53M_J

→Radius – 1.36R_J

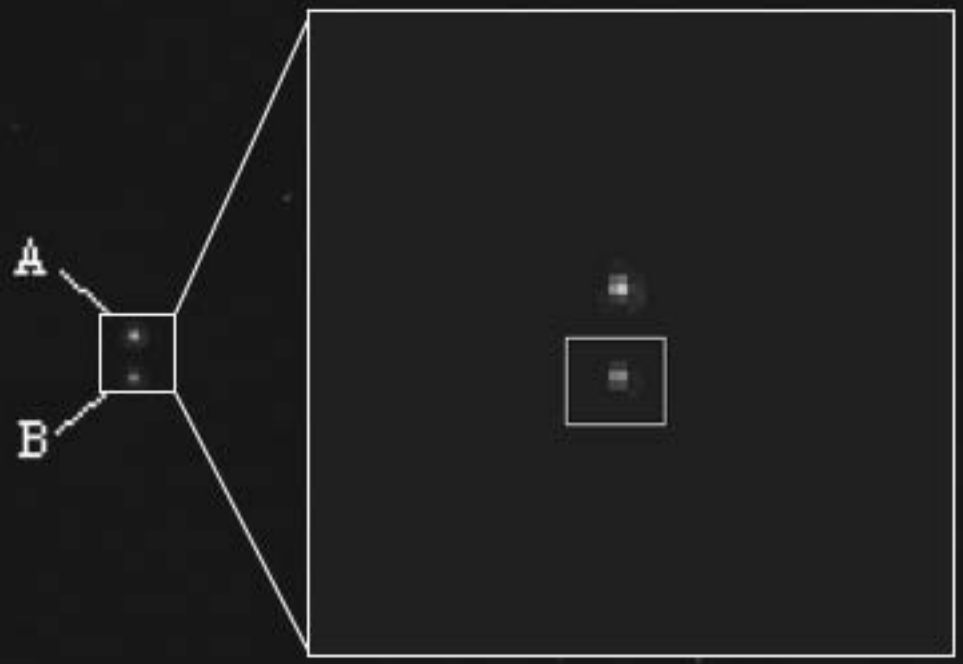
→Determined by Bakos et al. 2007 and improved by Johnson et al. 2008

Atmospheric properties? Temperature?

Secondary Transit

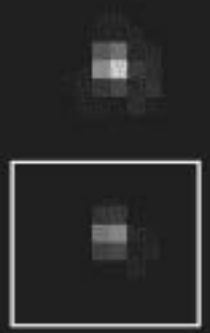
- The planet goes behind the star
- Infrared drop of brightness – Planet is brightest in IR
- Spitzer Space Telescope
- Measure the brightness of the star over time to see the secondary eclipse – light curve

Sample data



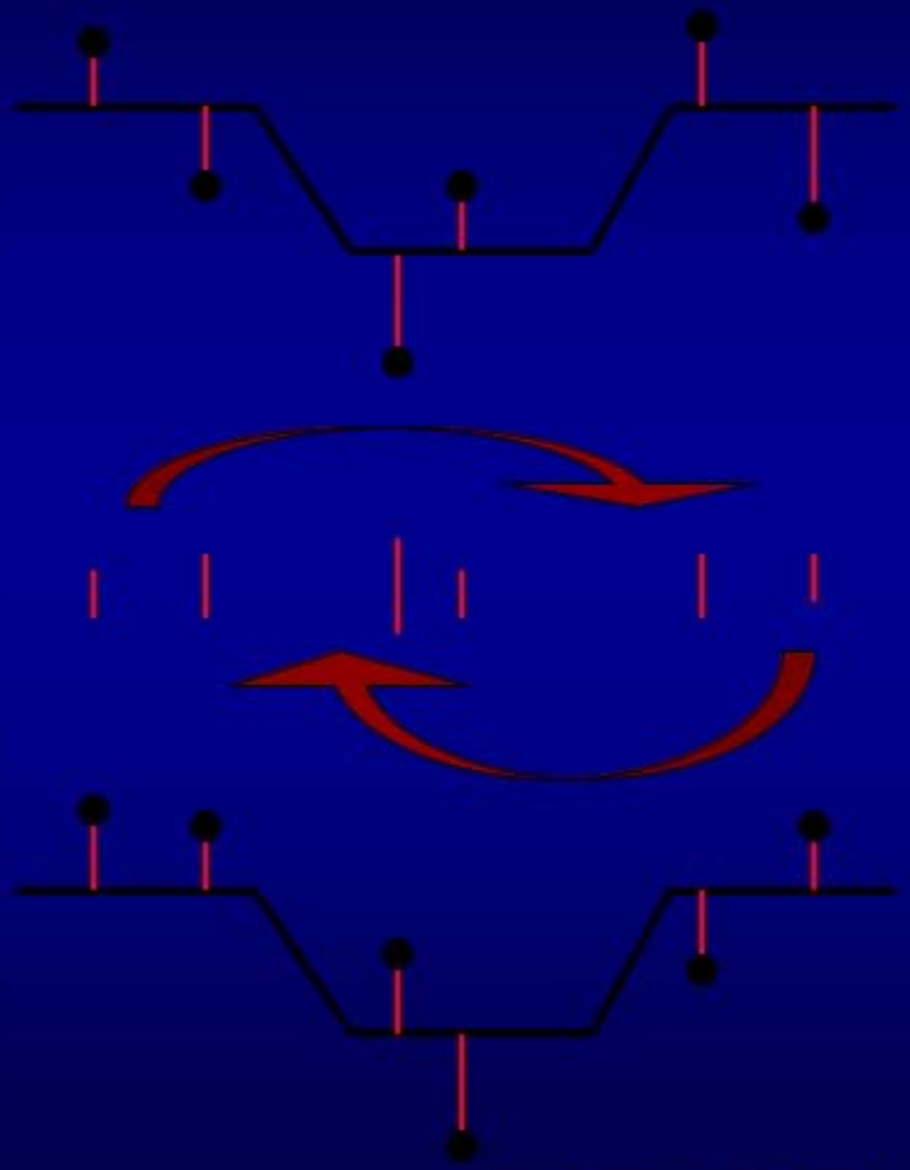
Calibration and photometry

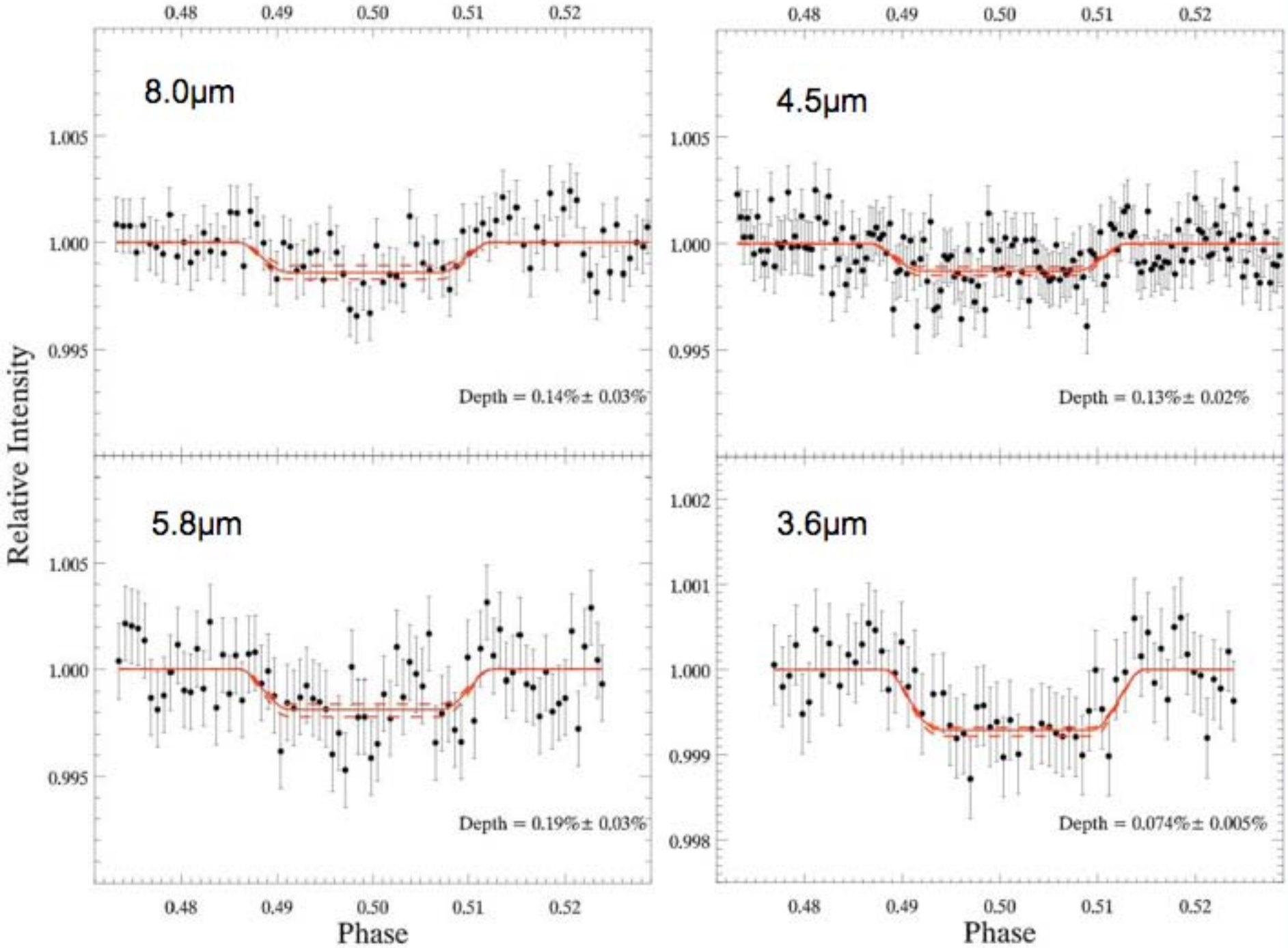
- →Clean cosmic rays
- →Integrate pixel values from a photometry aperture box around the star
- →Determine background level
- →Remove baseline
- →Intra-pixel variation

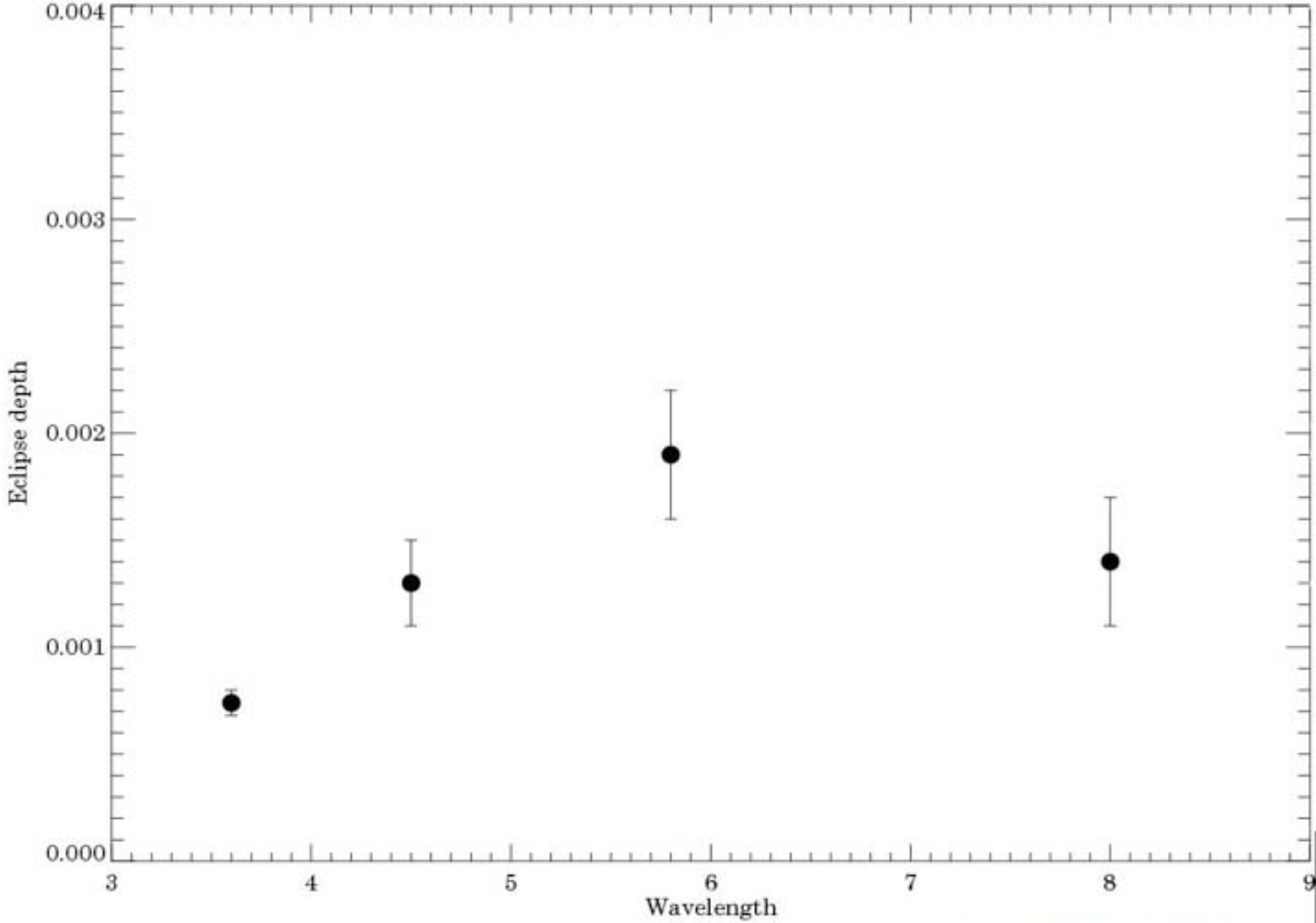


Error Analysis

- →Bootstrap Monte Carlo simulations
- →Fit the model in the simulated data set
- →Fit eclipse model to the data and get eclipse depth
- →Repeat ~1000 times
- →Eclipse depth standard deviation




8.0μm
Depth = 0.14% ± 0.03%
4.5μm
Depth = 0.13% ± 0.02%
5.8μm
Depth = 0.19% ± 0.03%
3.6μm
Depth = 0.074% ± 0.005%
Relative Intensity
Phase
Phase
0.48
0.49
0.50
0.51
0.52
1.005
1.000
0.995
1.002
1.001
0.999
0.998



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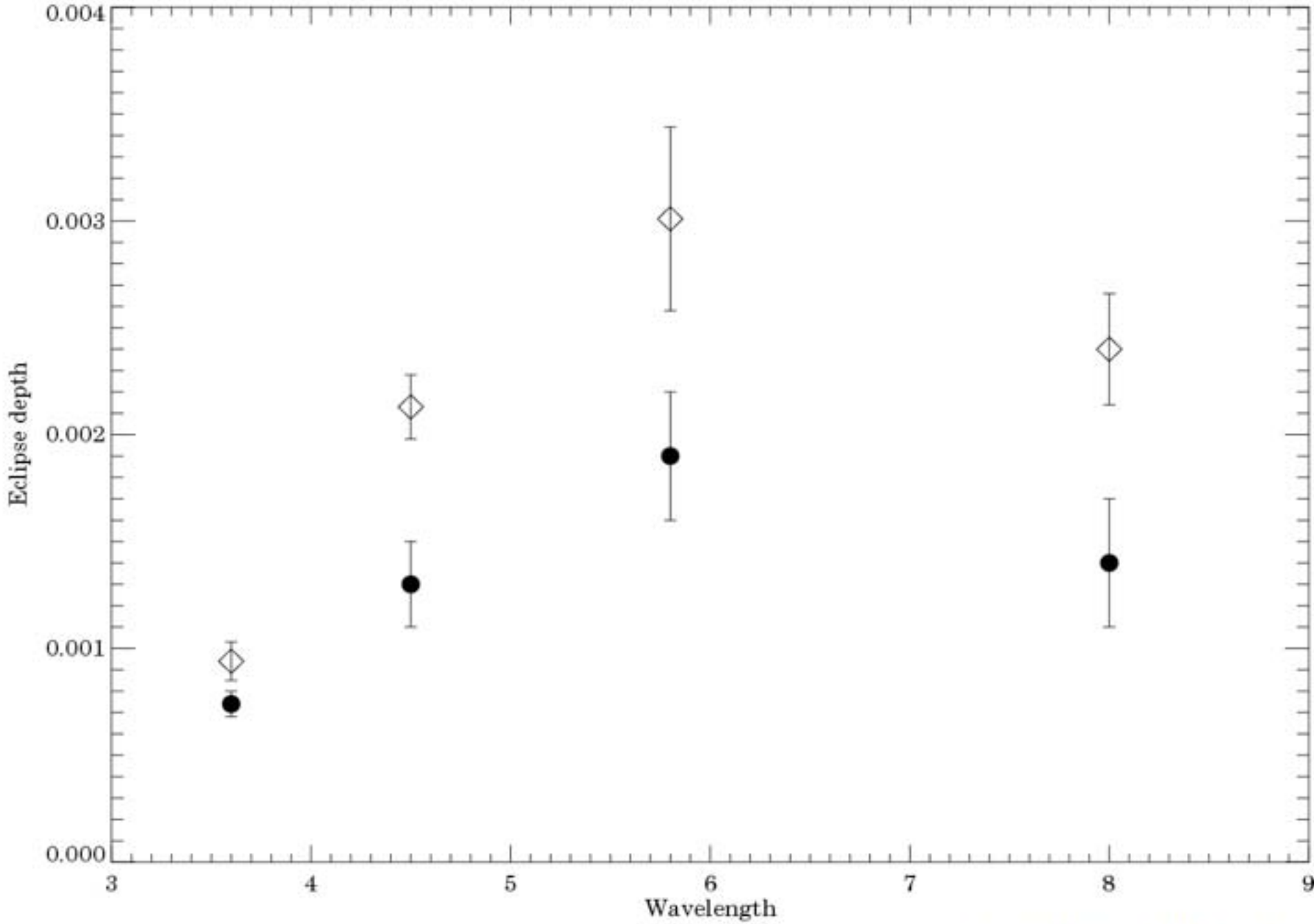

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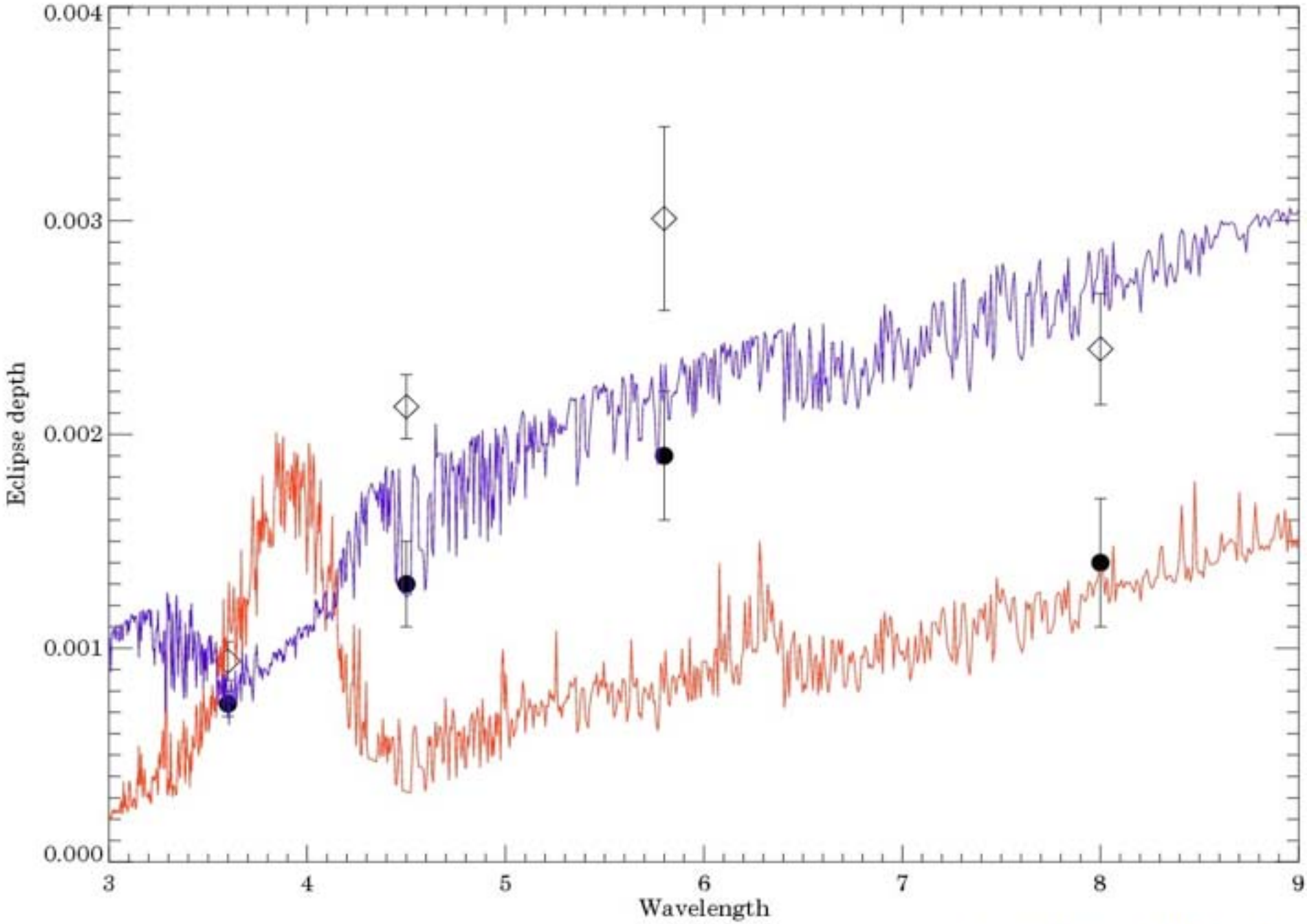

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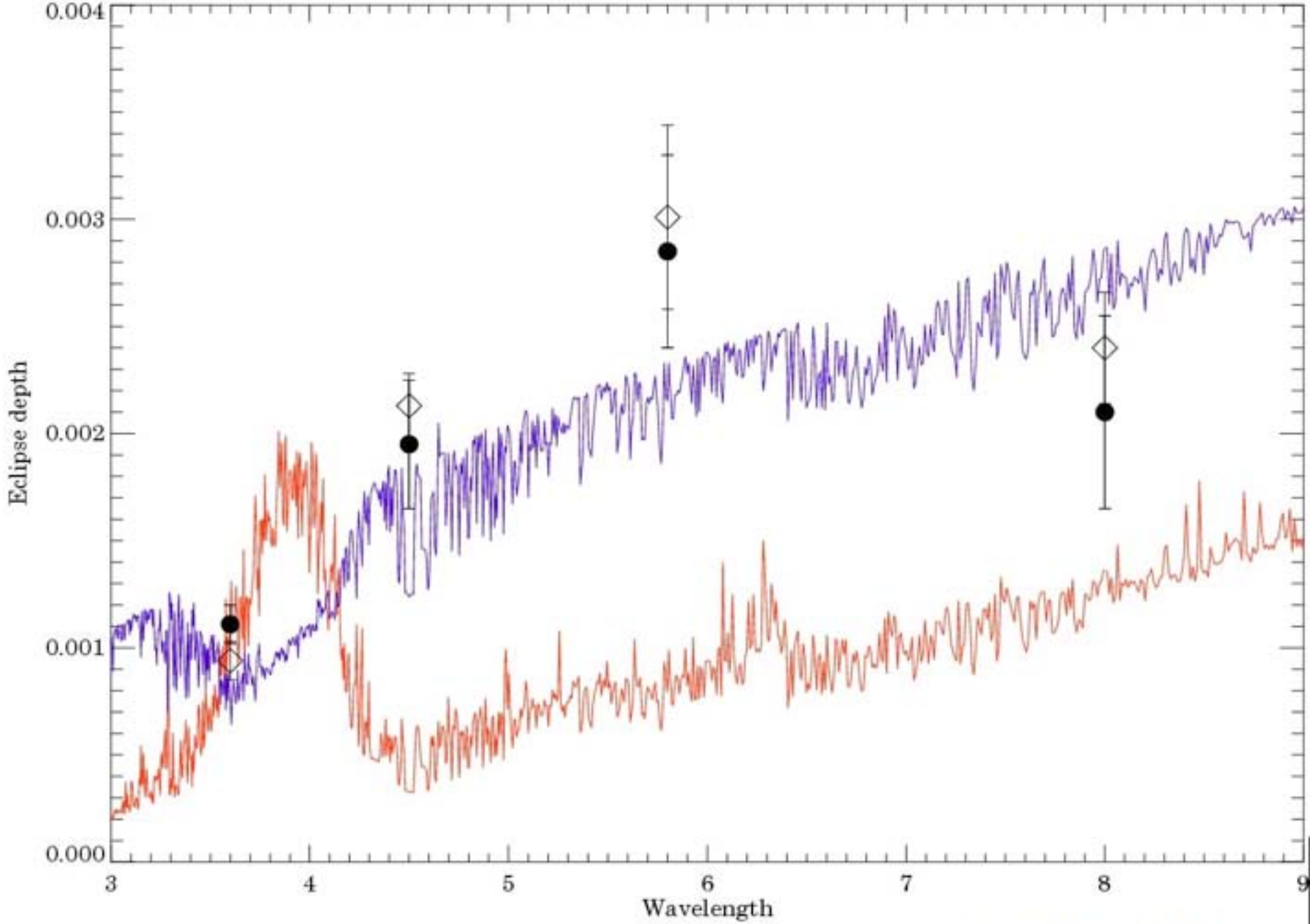

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Thanks!

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