ASTP720: Homework 6

Ryan Wills

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1 Introduction

I used a scipy peak finder to get the indicy of all of the dips and then used that to subtract the time of the peak off and center each of them around zero. This resulted in the light curve seen in Figure 1.

I then created a box plot function with parameters like center, width, and amplitude. A by-eye best fit can be seen in Figure 2 where the amplitude is 0.0072, the width is 0.08501, and the center is assumed to be zero.

My MCMC method takes the amplitude values of the light curve, the number of iterations, a list of initial guesses for the parameters amplitude, center, and width. I used a proposal distribution width of 5% of the parameter values so that it doesn't jump around too wildly. Using a while loop, the MCMC method generate a box model using the initial guesses and then calculates the likelihood of that guess. Then a proposal for each of the three parameters is drawn from a normal distribution with a proposal width of 5% of the parameter value. Then three different box models are created. Each has two current parameters and one proposal parameter. For example box model one uses center-current, width-current, and amplitude-proposal while the second box model might use center-current, width-proposal, and amplitude-current. The likelihood is then calculated for each of these box models. For each of these likelihoods, the Metropolis-Hastings ratio is calculated to determine whether or not to accept the proposal parameters. I am fairly certain that is what my MCMC method is doing. Unfortunately, the fit never converges and typically goes to zero for all three parameters (so at least I got the fit to the center of the box!).

Using Figure 2, my fit-by-eye, the fractional change in the light is 0.0072, which results in a radius of $0.152 R_{\odot}$

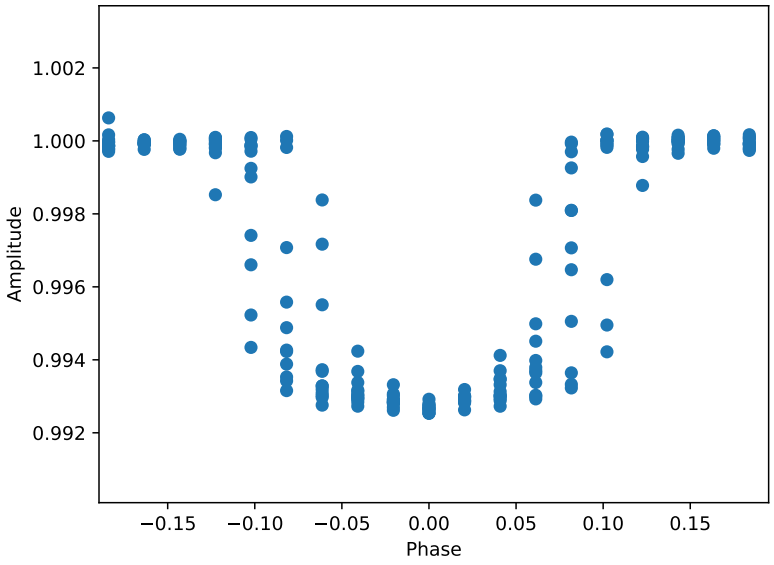

Figure 1: This is the resulting light curve from subtracting the time that the minimum for each dip occurs.

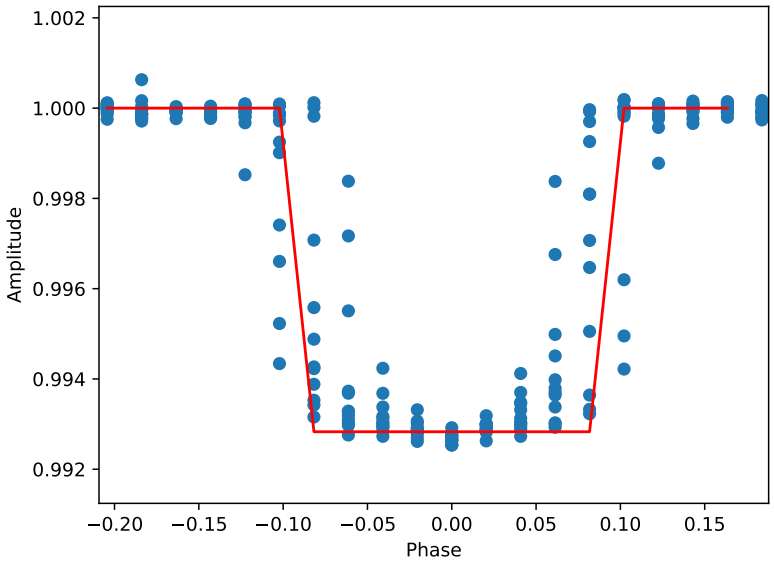

Figure 2: Amplitude is 0.0072, the width is 0.08501, and the center is assumed to be zero.

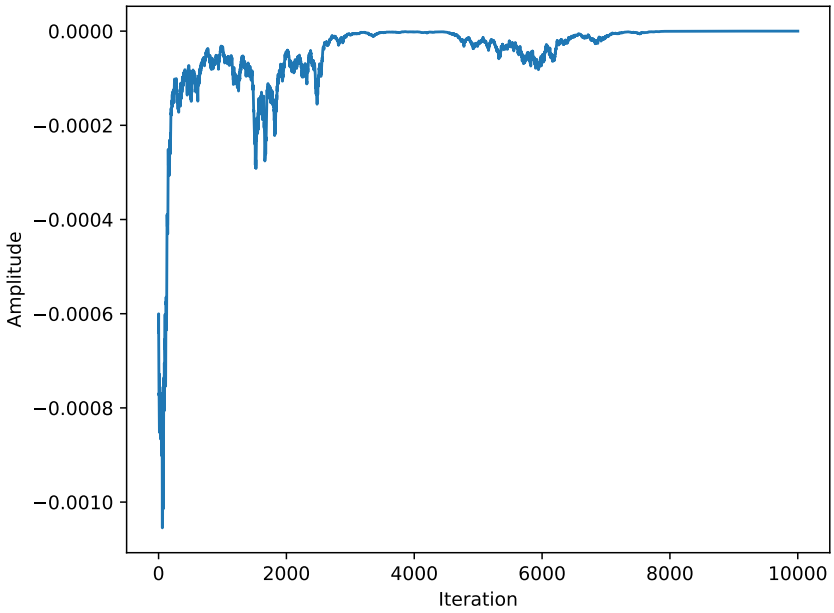

Figure 3: Plot of amplitude versus iteration of the MCMC simulation. For whatever reason it goes to zero.