Jason Byrne <jbyrne6@gmail.com>

deriv graphs

6 messages

David Long <long.daithi@gmail.com> **9 February 2009 11:19**
To: Peter Gallagher <peter.gallagher@tcd.ie>, Shaun Bloomfield <shaun.bloomfield@tcd.ie>, James McAteer <rtjmca@gmail.com>, Jason <jbyrne6@gmail.com>

Hi

Attached two graphs showing the variation in % from the actual equation using deriv and deriv + smooth with increasing noise and increasing number of data points.

There is a huge variation at large numbers of data points and large noise as expected.

Should we meet at some stage very soon to discuss possible ways forward with respect to the Solar Physics paper?

Thanks

--
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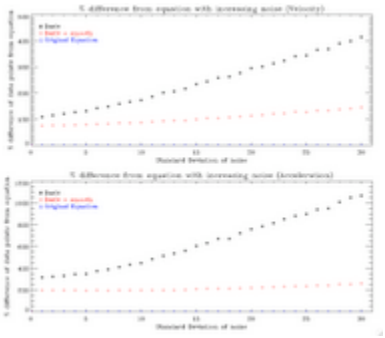
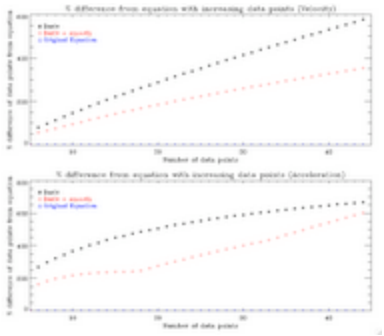
2 attachments



noise.png
19K



data_points.png
19K

Peter Gallagher <peter.gallagher@tcd.ie> **9 February 2009 14:31**
To: David Long <long.daithi@gmail.com>
Cc: Shaun Bloomfield <shaun.bloomfield@tcd.ie>, James McAteer <rtjmca@gmail.com>, Jason <jbyrne6@gmail.com>

Hi David - could you send me a more detailed description what those plots mean? Shaun and I just went through them but are not entirely sure how to interpret them. Could you let us know what conclusions you draw from them?

Thanks,

Peter.

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> [Quoted text hidden]
> <noise.png><data_points.png>

David Long <long.daithi@gmail.com> **9 February 2009 15:24**
To: Peter Gallagher <peter.gallagher@tcd.ie>
Cc: Shaun Bloomfield <shaun.bloomfield@tcd.ie>, James McAteer <rtjmca@gmail.com>, Jason <jbyrne6@gmail.com>

Ok...

There are 3 different sets of equations here -
- the calculated equation of velocity and acceleration, (triangle)
- the equations of velocity and acceleration using DERIV from the height + noise (asterisk)

- the equations of velocity and acceleration using DERIV from the smoothed height + noise (diamond)

I took:
- difference = abs((calculated v) - (actual v))/(calculated v)
- noise was found by using RANDOMN with both a set standard deviation of 2 and also a varying standard deviation.

In each case, calculated v was found from the calculated equations of velocity and acceleration. Actual v was the velocity found using DERIV.

Difference was found for each data point, and the mean difference found. The difference does vary from data point to data point, so the mean was taken in an attempt to get an average distance. This was repeated ~1000 times in order to get an average value for the noise as this varied from iteration to iteration.

Once the iterations had been carried out, there were ~1000 different values for the mean difference between lines for a given number of data points and given standard deviation of noise. The mean of this value was taken as the average value of the difference between lines and this was multiplied by 100 to give a percentage and then plotted.

The plot for increasing noise gives the variation from the calculated equation for 8 data points with the standard deviation of the noise increasing from 1 to 30. While the use of DERIV by itself gives quite rapidly increasing difference for both velocity and acceleration, the use of DERIV with smoothed data does not show the same level of change. There is still a difference however, but it remains roughly constant.

The plot for increasing number of data points shows a rapid increase for both the use of DERIV by itself and also the smoothed data with DERIV.

These results would suggest that for a given number of data points, the use of smoothed data with the DERIV function does tend to keep errors constant and relatively low. However, for constant signal, the use of more data points increases errors regardless of the methods used. The DERIV function is not therefore a viable function for use with such a small sample set. Instead, the best method would be the fitting of an equation to the measured data and subsequent differentiation of this equation. However, this does pre-determine the physical nature of the data and may not be suitable where there are questions about the nature of the data.

In this particular situation, there are two realistic options available:

- Pull the paper. This is the simplest option and would allow a thorough re-writing of the results.
- Request more time for re-drafting citing delayed calculations. This is more complicated as it would involve re-drafting of the paper. In particular, the accelerations would have to be removed as they are no longer valid within errors. The mean velocities could be calculated using a linear estimate, which should illustrate the difference between passbands. A paragraph would also have to be added discussing the problems with the DERIV function and suggesting possible alternatives (if any).

I think that it is the wrong paper to be suggesting possible fits to the data - Ideally this would be a future paper that would address the physical nature of the disturbances using all available data sets (e.g. Radio, H alpha etc.) and also (possibly) simulations. However, I do think that it is important that we underline the difficulty posed by the use of DERIV with such small data sets, especially since we are not the only group using this method (c.f. Veronig et al. 2008). While it may be an embarrassment to admit that our method was incorrect, we may still be able to say something about the general nature of these disturbances, and warn others about the dangers of this method.

I hope that plots are a bit easier to understand now...

Let me know what you think.

Thanks

Dave

2009/2/9 Peter Gallagher <peter.gallagher@tcd.ie>

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Peter Gallagher <peter.gallagher@tcd.ie> **9 February 2009 18:42**
To: David Long <long.daithi@gmail.com>
Cc: Jason Byrne <jbyrne6@gmail.com>, "R. T. James McAteer" <james.mcateer@tcd.ie>, Shaun Bloomfield <shaun.bloomfield@tcd.ie>

Thanks, David. The plots are much clearer to me now. How about the four of us get together in front of a whiteboard tomorrow and go through your and Jason's simulations? Say 3:30?

Peter.

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james mcateer <james.mcateer@tcd.ie> **9 February 2009 19:08**
To: Peter Gallagher <peter.gallagher@tcd.ie>
Cc: David Long <long.daithi@gmail.com>, Jason Byrne <jbyrne6@gmail.com>, Shaun Bloomfield <shaun.bloomfield@tcd.ie>

can we make that 3:45, after my lecture?

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R. T. James McAteer

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Peter Gallagher <peter.gallagher@tcd.ie> **9 February 2009 22:10**
To: james mcateer <james.mcateer@tcd.ie>
Cc: David Long <long.daithi@gmail.com>, Jason Byrne <jbyrne6@gmail.com>, Shaun Bloomfield <shaun.bloomfield@tcd.ie>

Yep, fine with me.

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