Hello Earth!

A *grounded* introduction to Matlab

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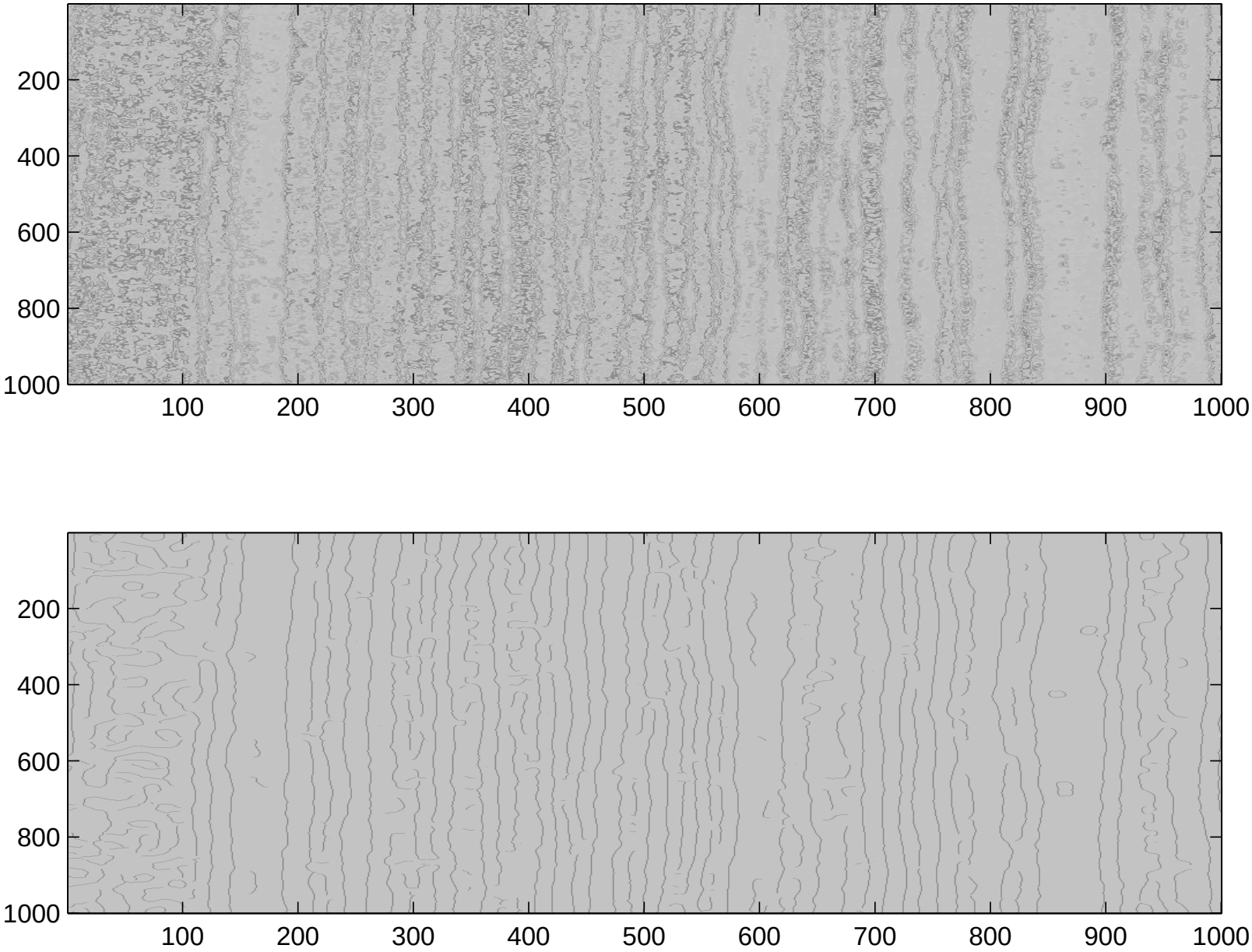
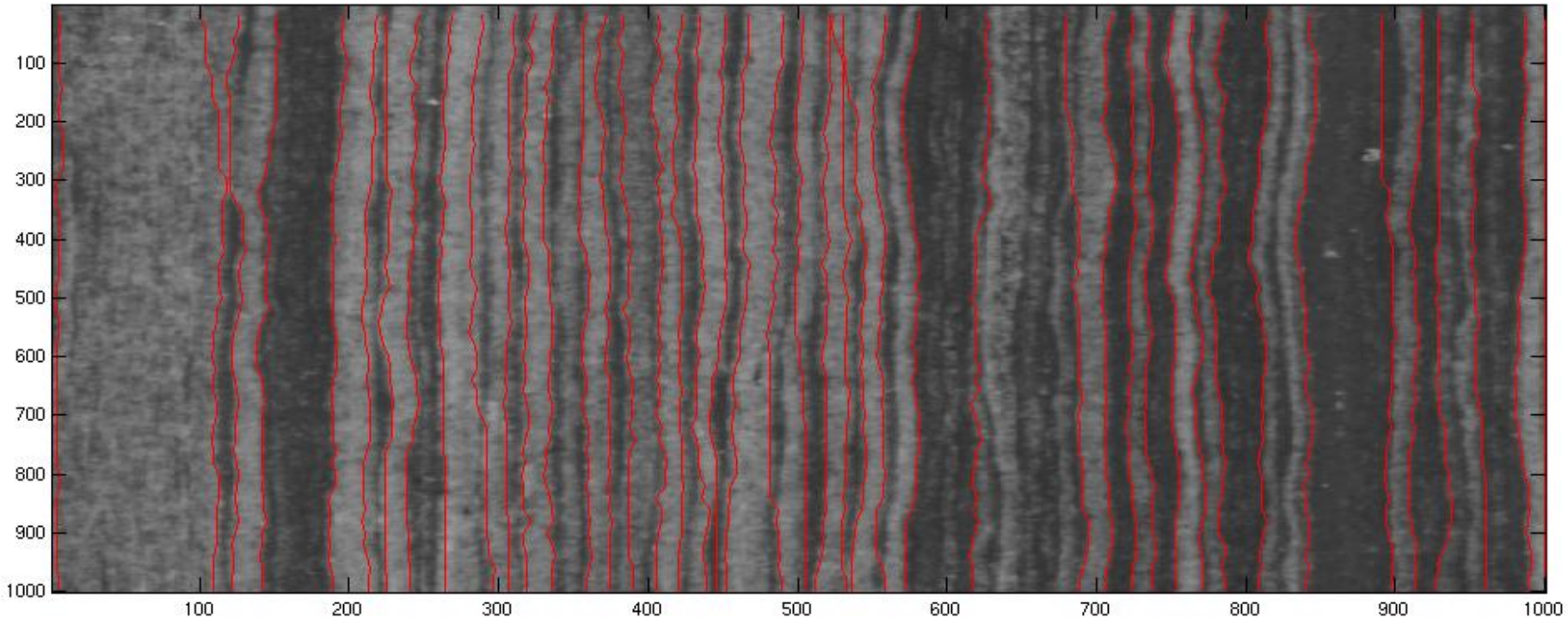
(Enter teacher)

Something canny *Matlab* can do



Something cunning *you* can do



The extreme basics — I

1. `help`

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2. `lookfor`

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3. `type`

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4. `who, whos`

The extreme basics — I

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3. `type`
4. `who, whos`
6. `diary`

The extreme basics — II

7. `plot`

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8. `xlabel,ylabel,title`

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11. `hold on, hold off`

The extreme basics — II

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14. `print`

The extreme basics — II

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8. `xlabel,ylabel,title`
11. `hold on, hold off`
13. `sprintf`
14. `print`
15. `load, imread`

Props

Name	Function	Example
`imread`	Reads an image file	`ix=imread('filename');`
`fullfile`	Constructs a valid path name	`ff=fullfile('dirn','fname');`
`size`	Queries the size of a variable	`s=size(ix);`
`plot`	Plots (x, y) values on a graph	`x=[1 2 3]; y=[10 20 30];` `plot(x,y,'o')`
`xlabel`	Uses a quoted string for an x-axis label	`xlabel('elevation [m]')`
`ylabel`	Uses a quoted string for a y-axis label	`xlabel('roughness')`

`hold on`	Keeps current axes for next time you plot anything	`x=[1 2 pi]; y=[10 20 30];`
		`plot(x,y,'bo'); hold on;`
		`plot(10*x,3*y,'rs')`

`linspace`	Makes an array of N evenly spaced values between a and b	`x=linspace(-3,3,100)`
`reshape`	Changes the dimensions of an array x to a rows and b columns	`x=linspace(-3,3,100);` `xr=reshape(x,20,5)`
`hist`	Makes a histogram (and plots it)	`x=linspace(-3,3,10);` `hist(x)`
`bar`		
`axis xy`		
`axis ij`		

The extreme basics — III

Addressing:

rows, columns, dimensions, range

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Logic:

logical, character, string, double

The extreme basics — III

Addressing:

rows, columns, dimensions, range

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18. `transpose`
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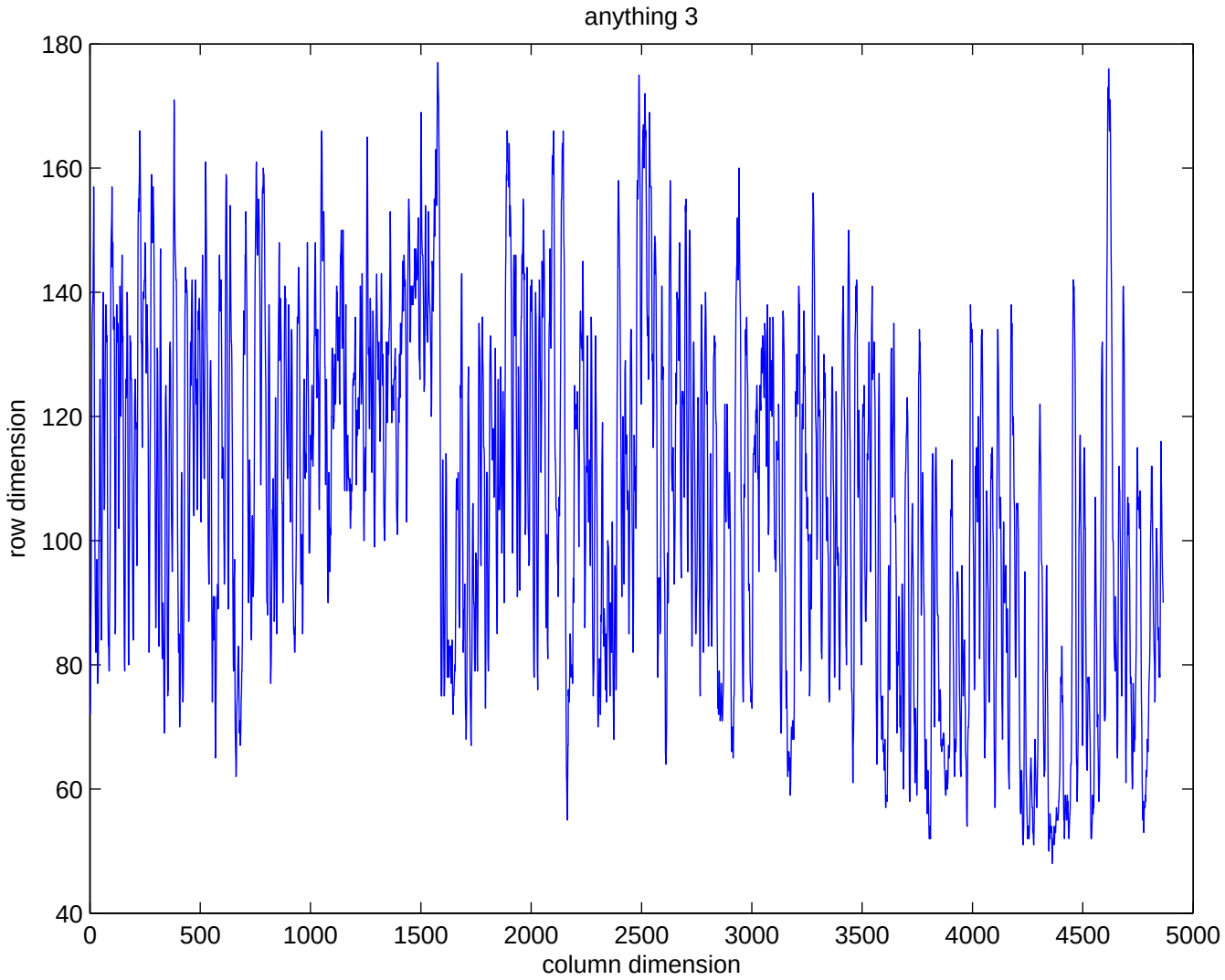
20. `linspace`

Logic:

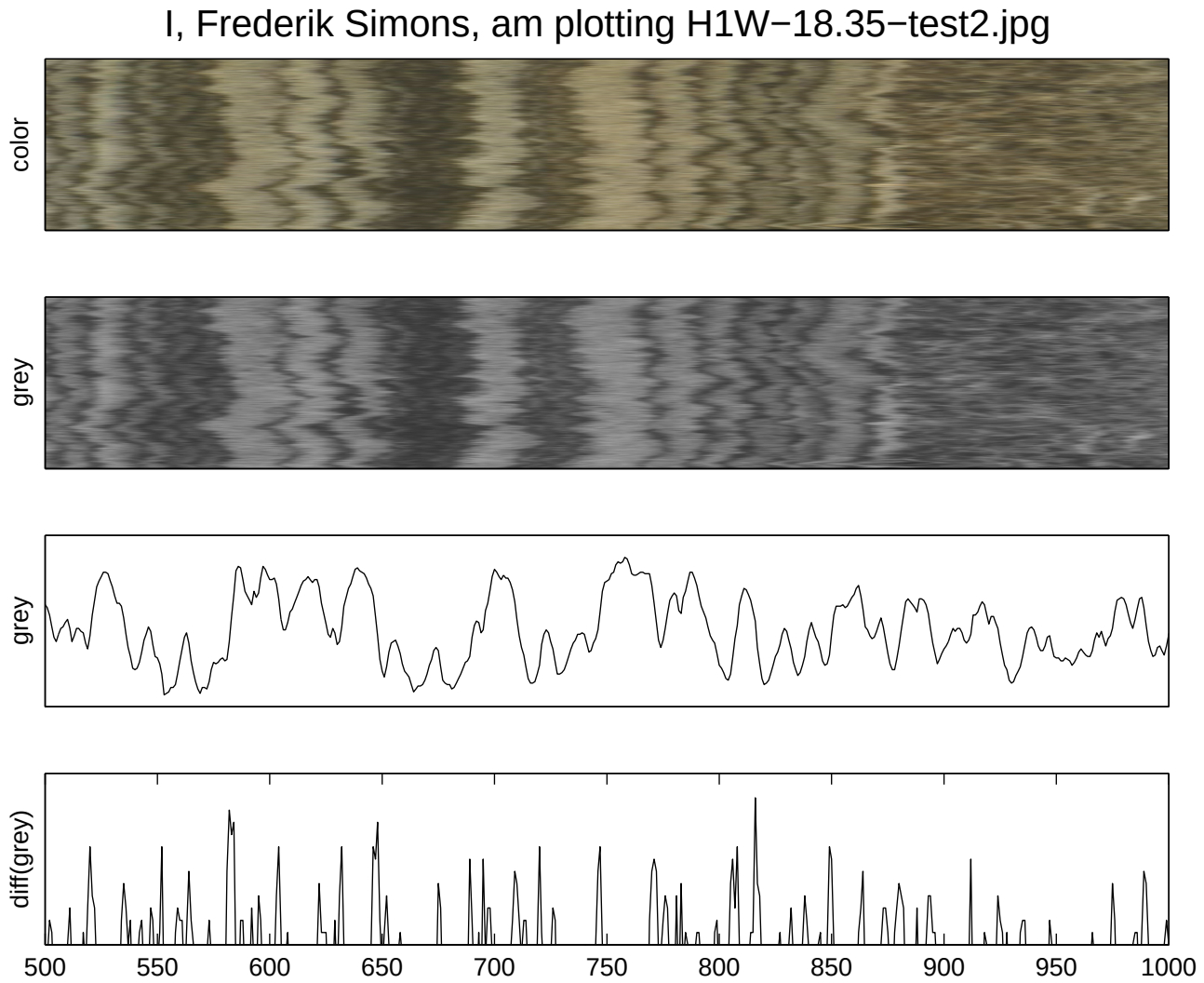
logical, character, string, double

21. `<, >, ==, ~, &, |`

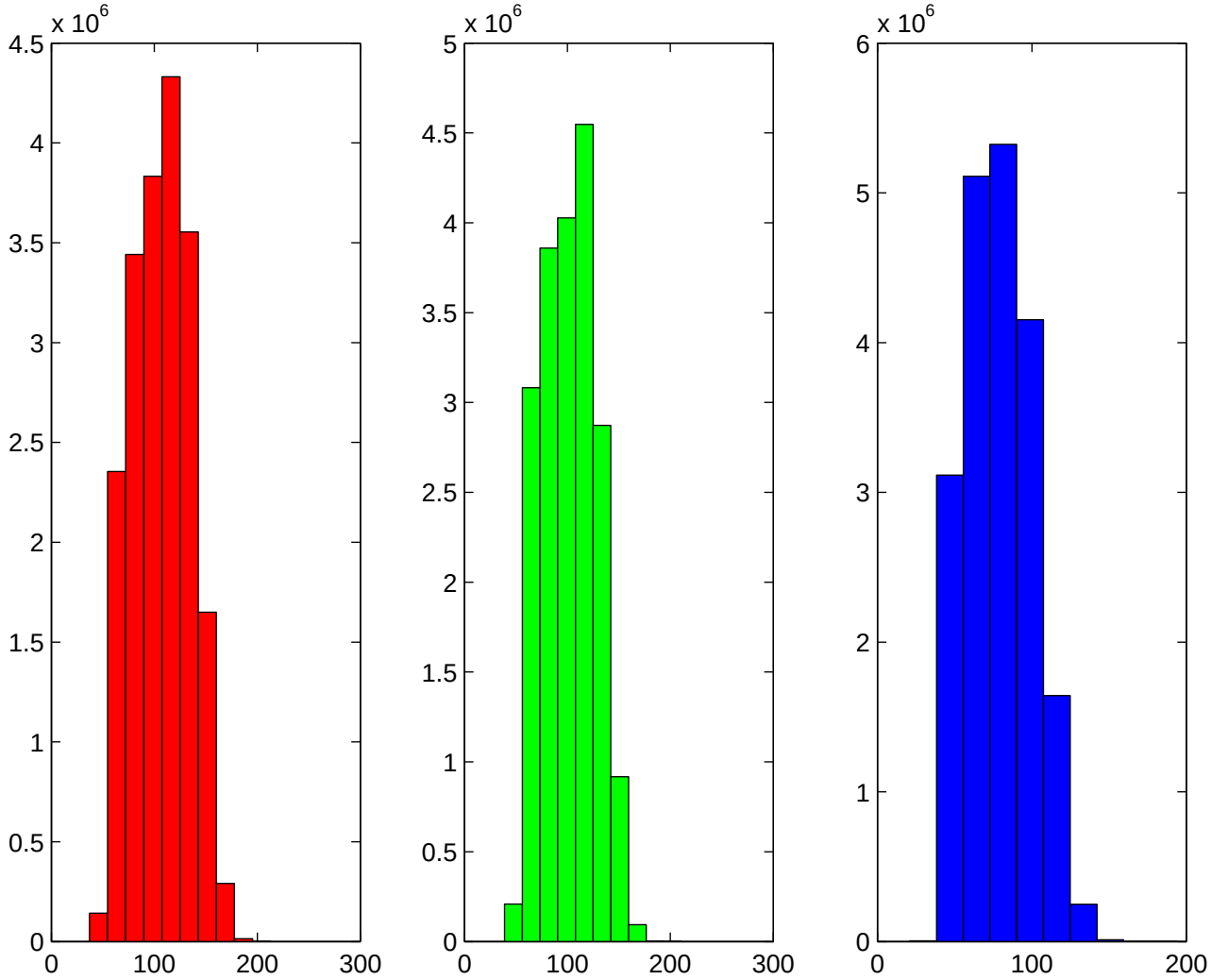
Going commando



Walkthrough



Script!


x 10^6
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
0
100
200
300
x 10^6
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
0
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300
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100
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Homework 1

Navigate to Course Materials, Software Installation and Templates.

1. Install Matlab as per the instructions.
2. Start Matlab: you will be making a Very Simple Plot.
3. Create ("edit") a new code (*.m) file called "lab01b.m" and in it,
   type the following few instructions, or some slight variations
   thereof, according to your taste (i.e. vary the numbers):

```
x=linspace(0,pi,100);
A=1; B=3; f1=0; f2=0;
y1=A*sin(x+f1); y2=B*cos(x+f2); y3=y1+y2;
figure (1)
plot(x,y1,'r'); hold on; plot(x,y2,'g'); plot(x,y3,'b')
title('yournetidl01b')
hold off; axis tight
print('-dpdf','yournetidl01b')
```

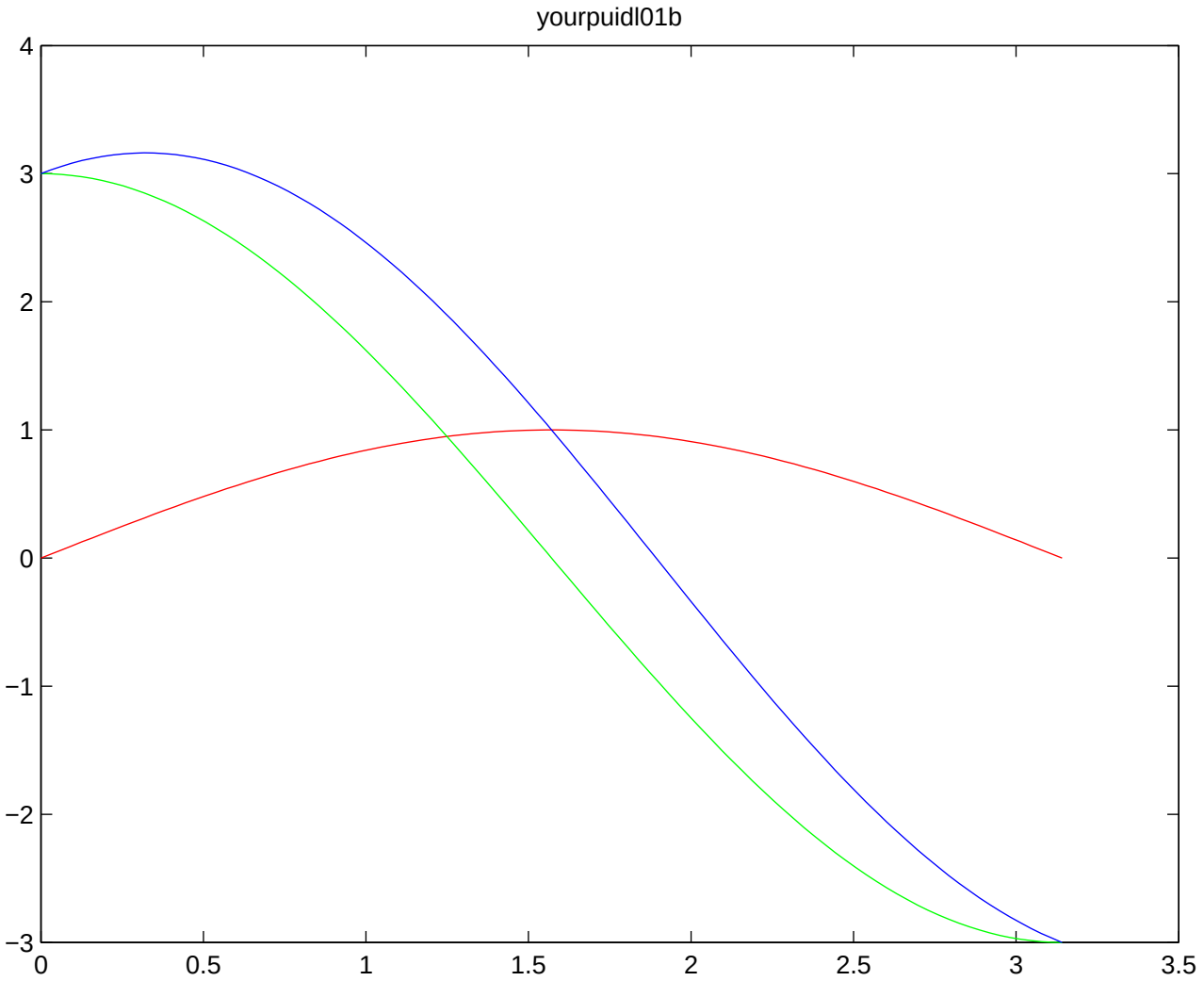
4. Save this file, see that you can find it again.

5. In step 3, "yournetid" is once again your Princeton netid of course.

6. Now "run" or "execute" this "script" and make sure that something
   pops up on your screen - and that a PDF gets made!

7. Find the PDF that you just made ('yournetidl01b.pdf').
   That is your second Assignment! Upload it to Blackboard by the deadline.

Homework 1



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Figures/Embellishment

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Documentation/Help/Date

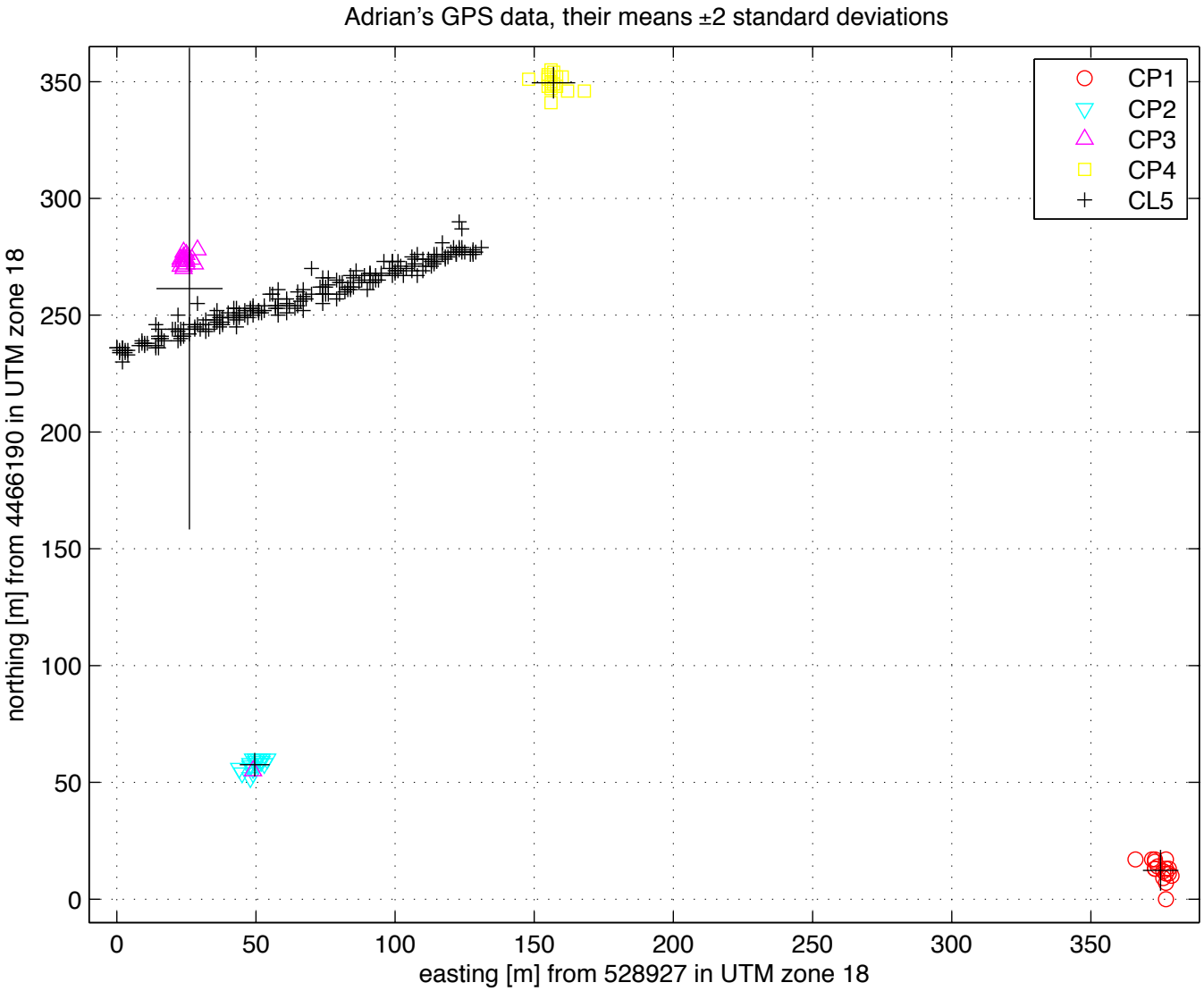
Input/Output

Computation/Algorithm

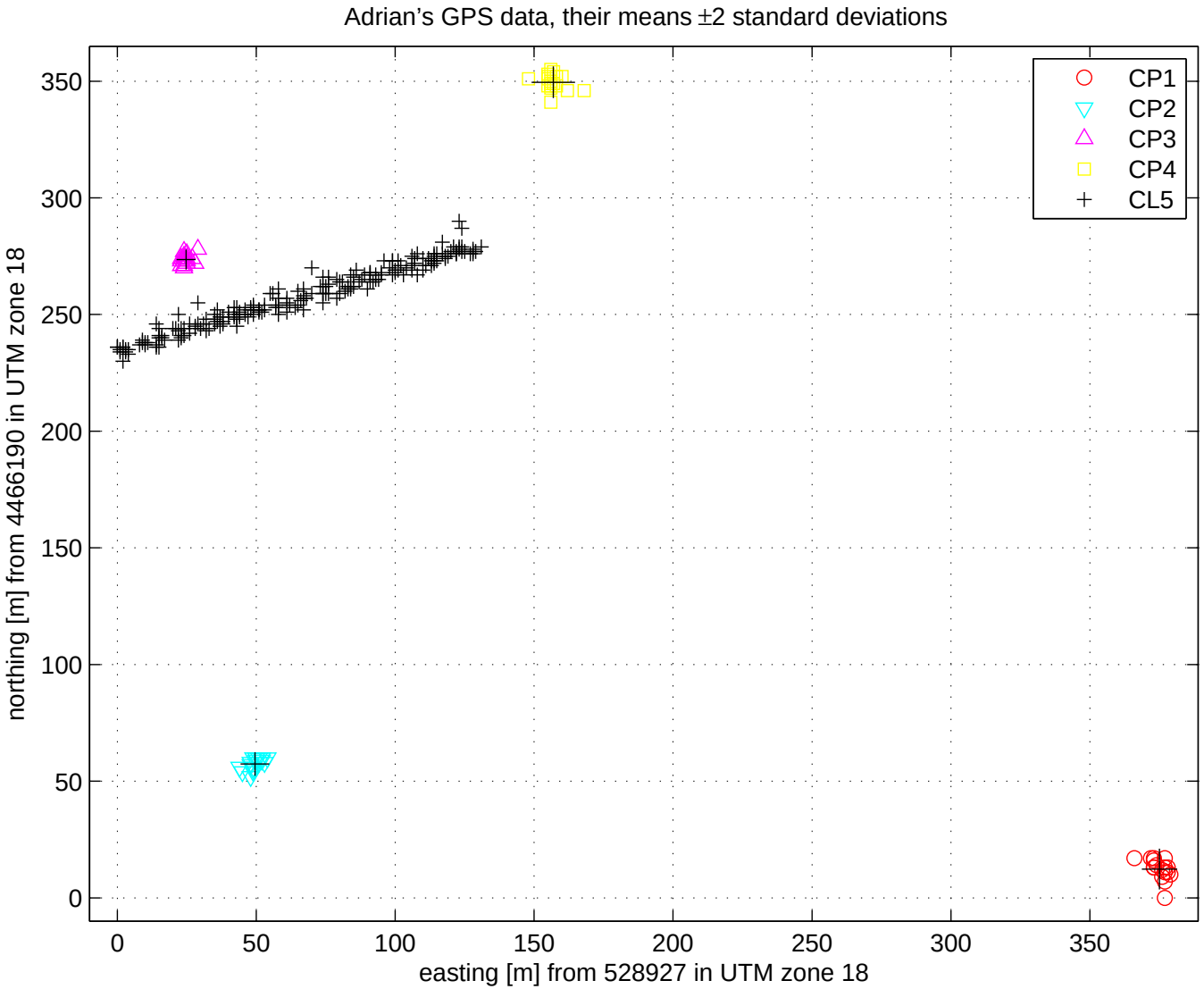
Figures/Embellishment

Variable Output

Homework 2 — Data collection



Homework 2 — Data curation



Homework 3 — Data analysis

Hypothesis . Shorter dune wavelengths appear on steeper slopes because winds are not able to travel far before touching the ground and depositing sediment; higher dune amplitudes occur on steeper slopes because the distance of the slope to the boundary layer decreases at a quicker rate, resulting in higher velocity sediment-carrying winds that can carry and deposit more sediment.

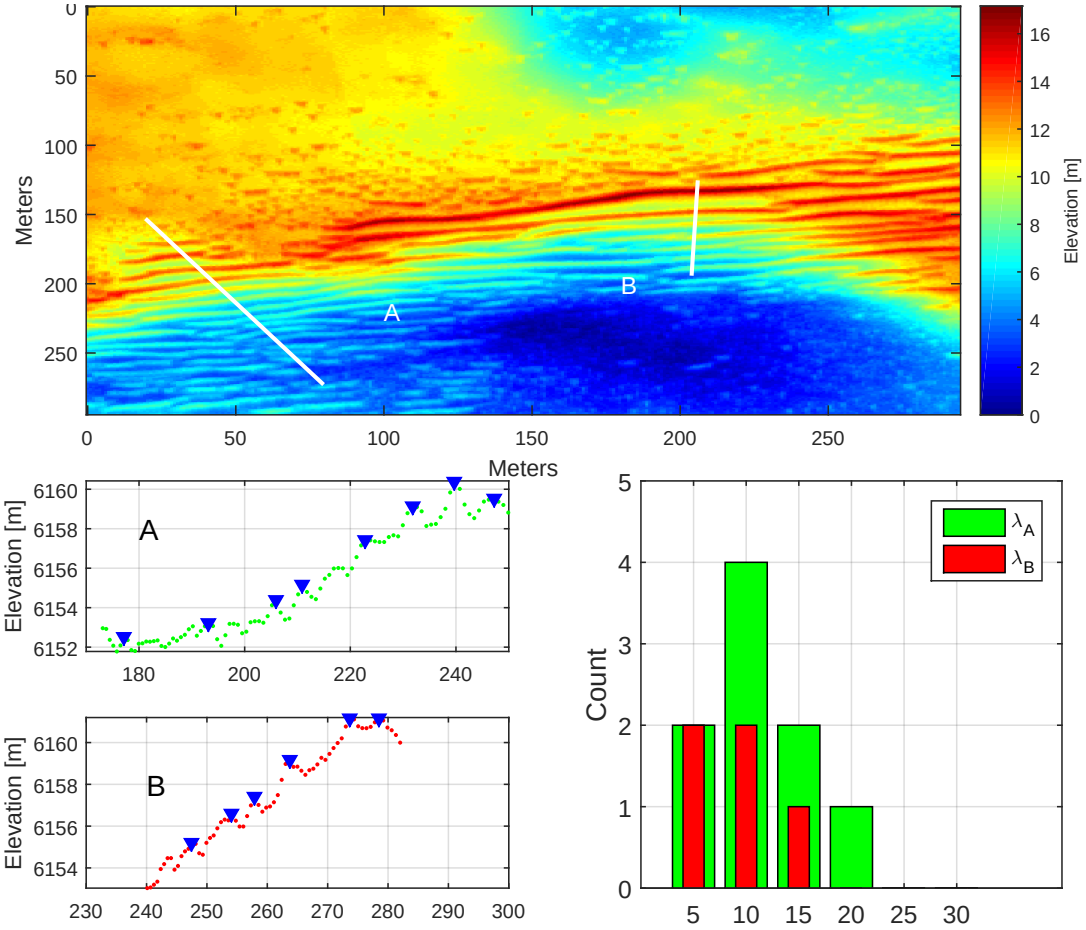


Figure 1: Transect A crosses 8 transverse dune peaks and transect B crosses 6 dune peaks . Transect B follows a steeper slope than transect A. The average dune wavelength found along transect B was 7.54m; along transect A the average dune wavelength was 12.47m. The average dune amplitudes (not shown in figure) were 1.02m for transect B and 0.82m for transect A. Image was downloaded from $< http : //www.uahirise.org/dtm/dtm.php?ID = ESP_032814_1670 >$

Homework 3 — Data analysis

Hypothesis. As the elevation of the dunes in Iaxartes Tholus increases, the dunes increase in size (wavelength and amplitude), possibly due to a more abundant sand supply.

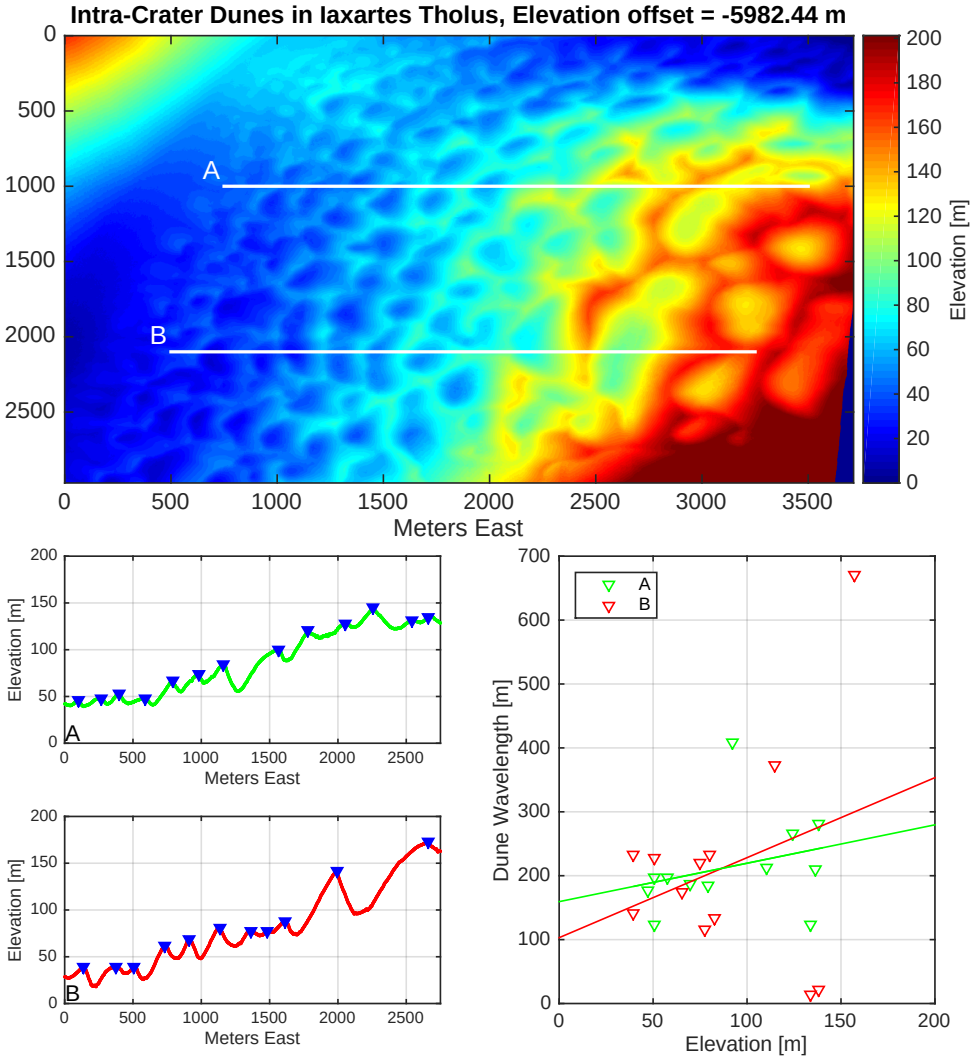


Figure 1: Intra-crater dunes in Iaxartes Tholus vary with elevation. Transect lines show increasing wavelength and amplitude as the elevation increases. Digital elevation model came from `http://www.uahirise.org/dtm/dtm.php?ID=ESP_018938_2520`.

Homework 3 — Data analysis

4 **Hypothesis.** Based on the geometry in figure 1, the transected dunes are Barchan dunes.

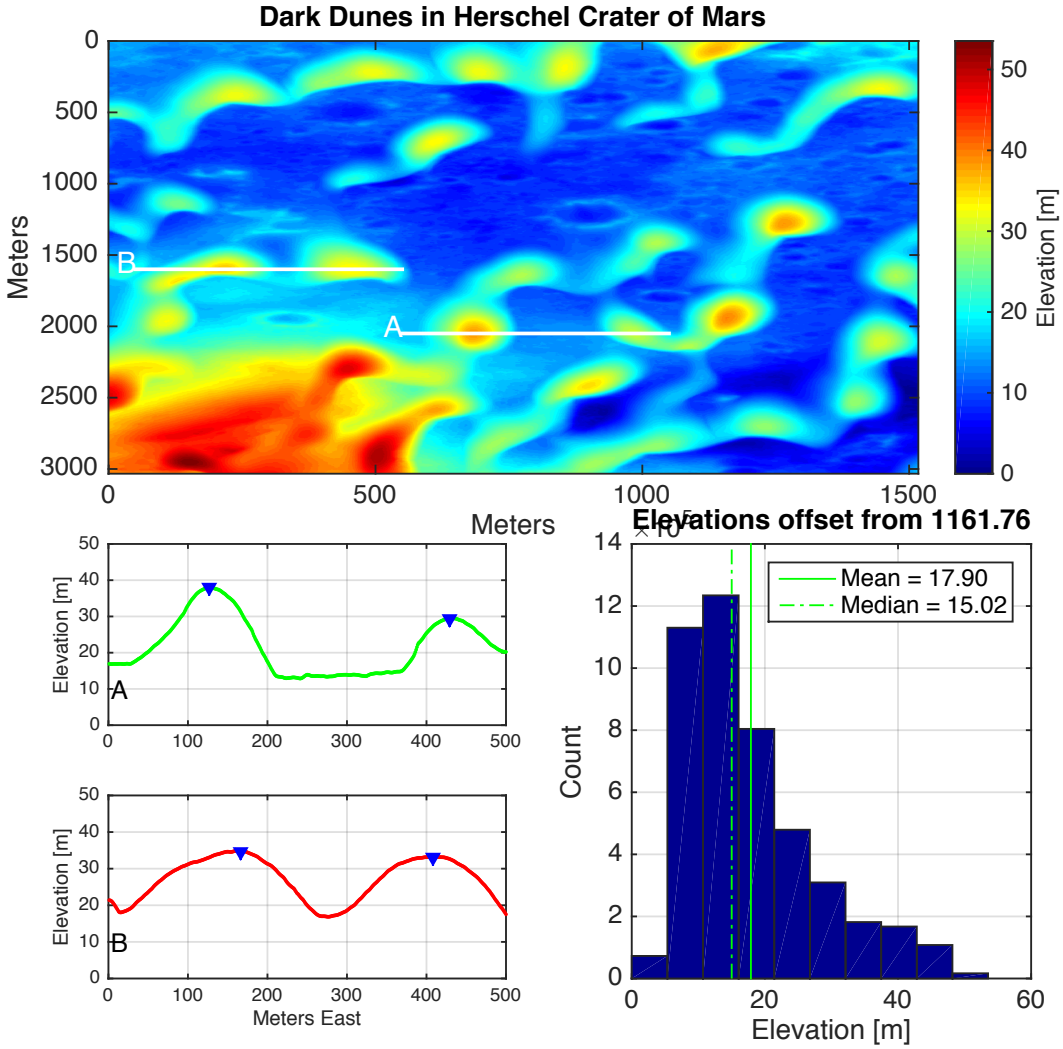
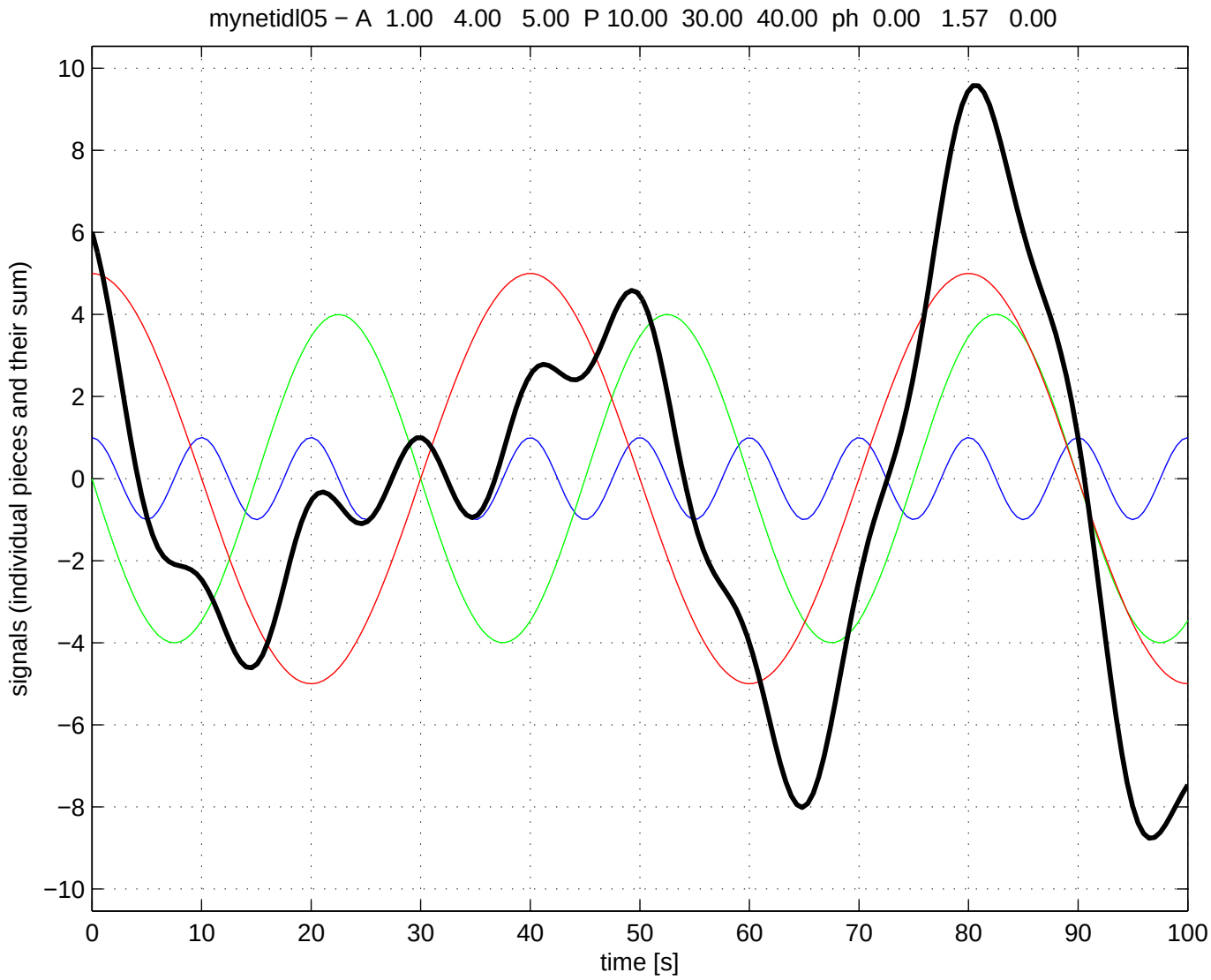


Figure 1: The heat map represents the elevation of sand dunes on Mars, with two transects, A and B, drawn over two specific dunes. The elevation, along with the peaks, of those dunes are then graphed as A and B respectively below the heat map. The histogram is a count of how often certain elevations were measured and the mean and median of those measurements.

Homework 3 — Data reduction



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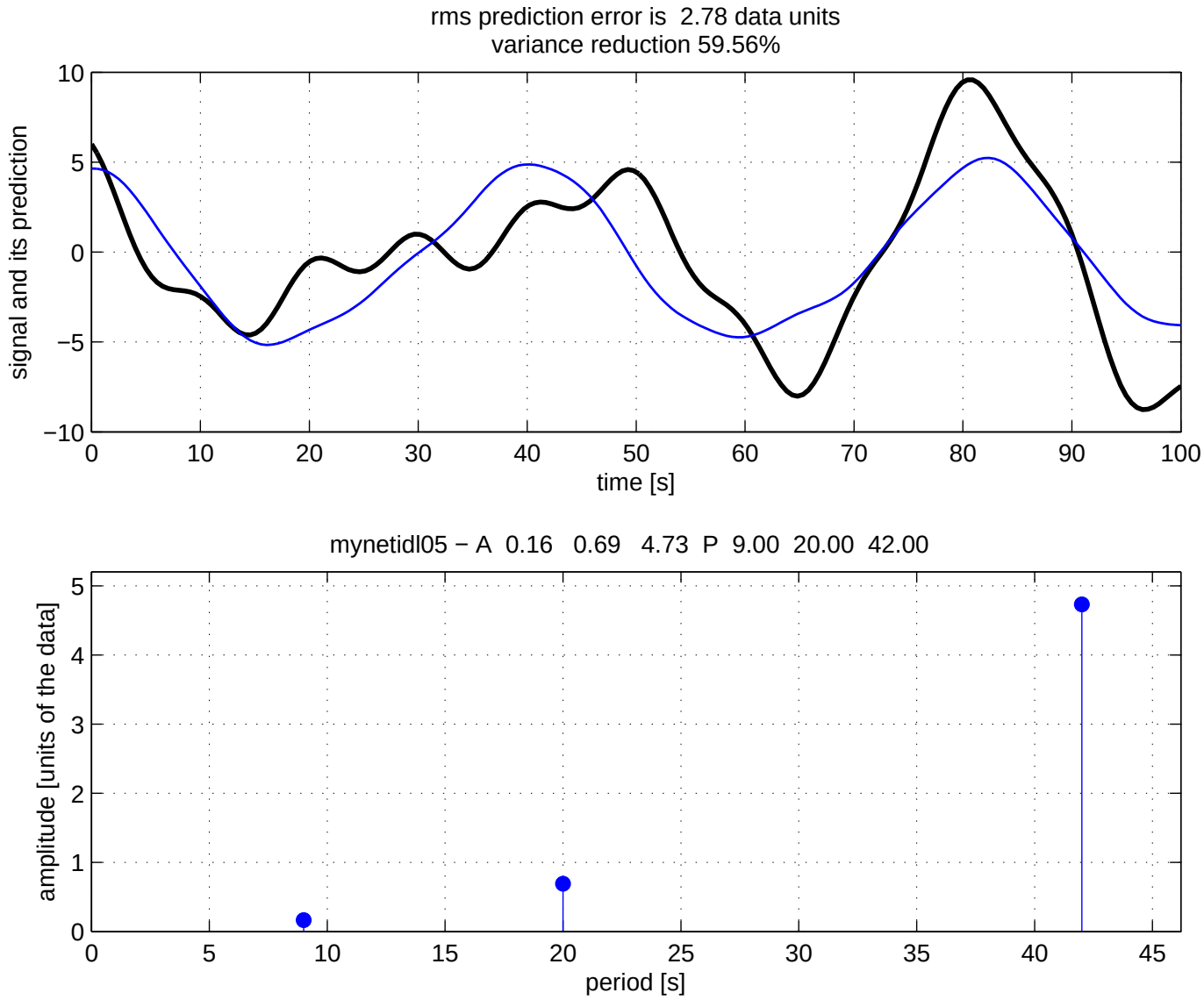

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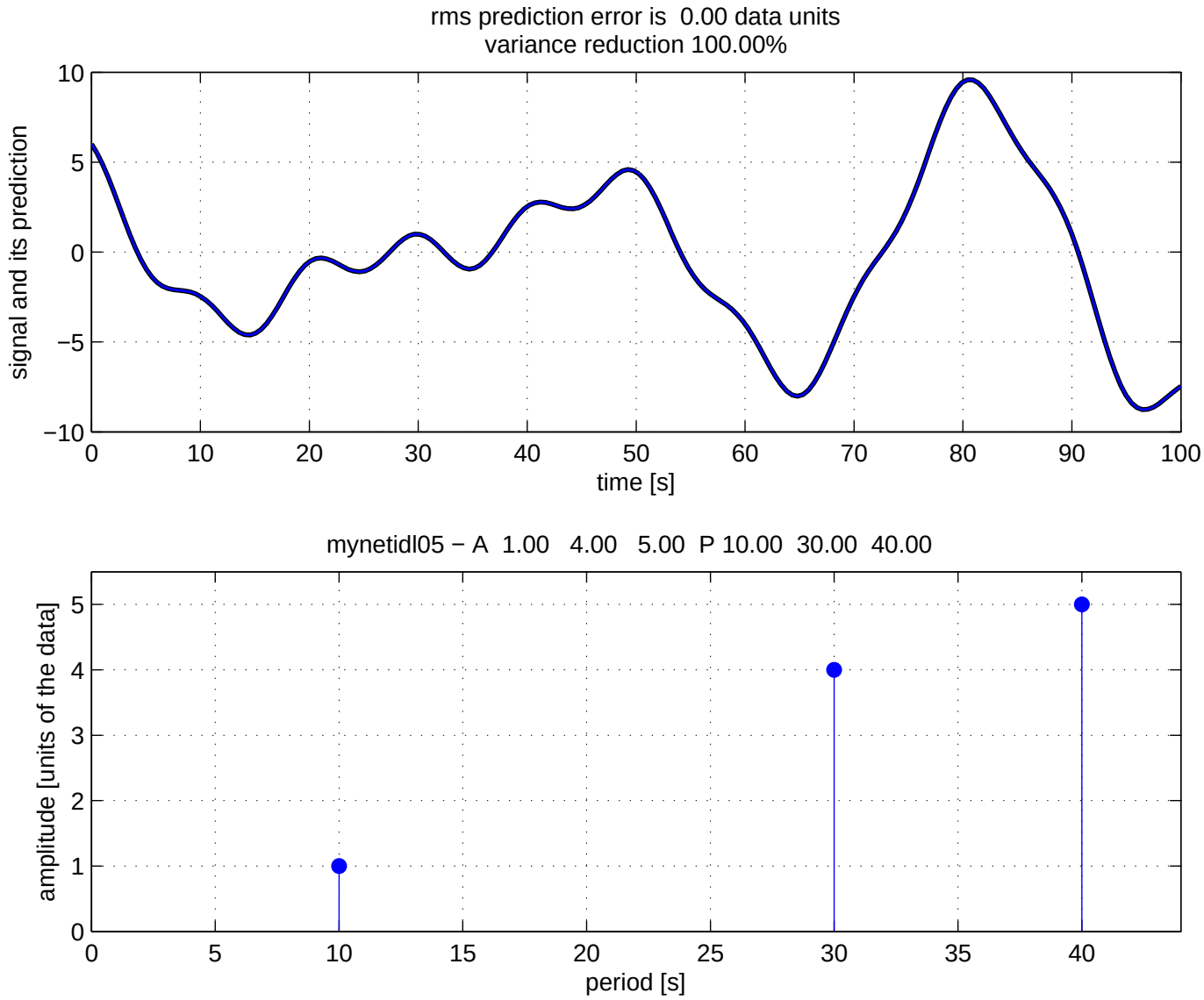

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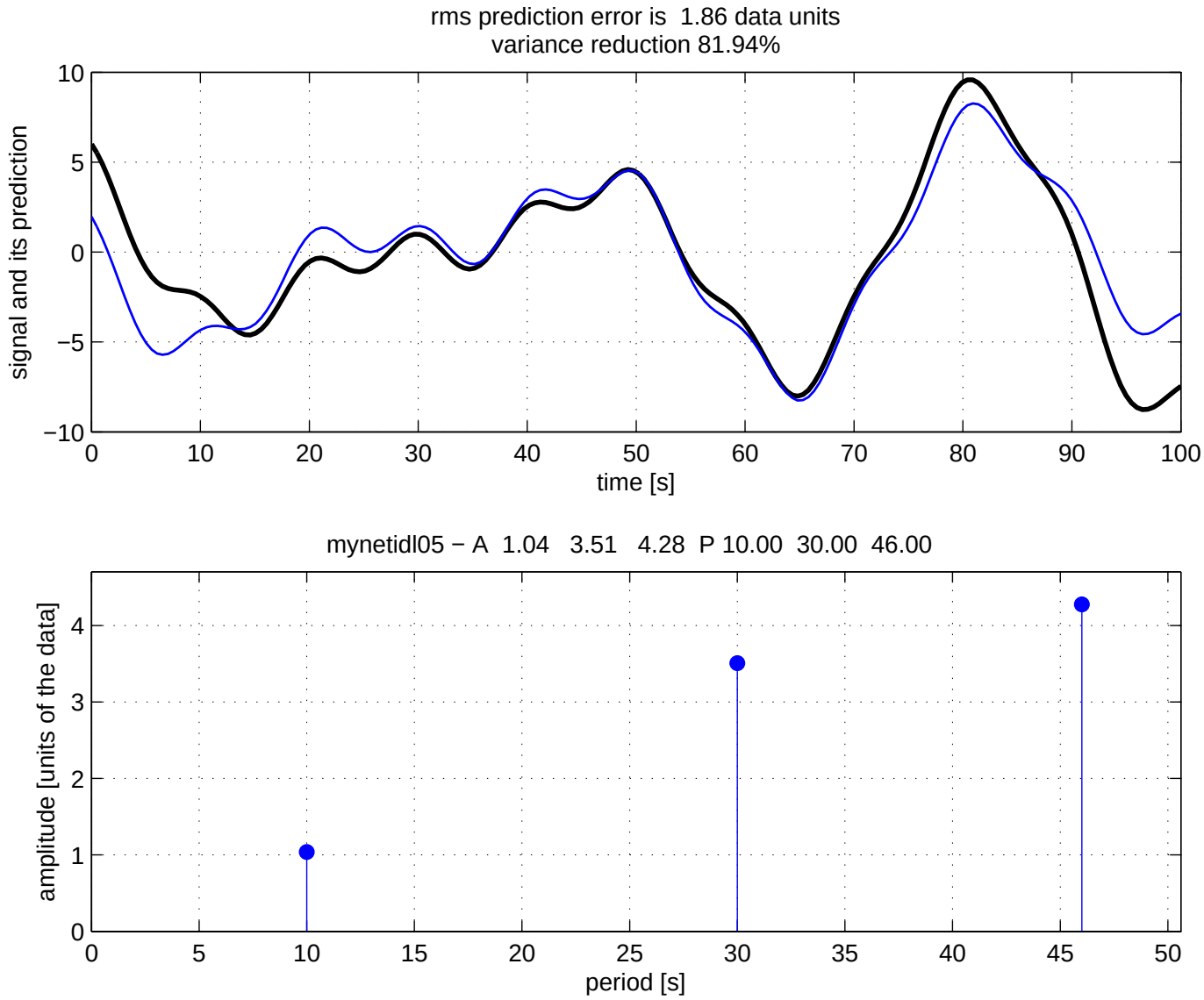

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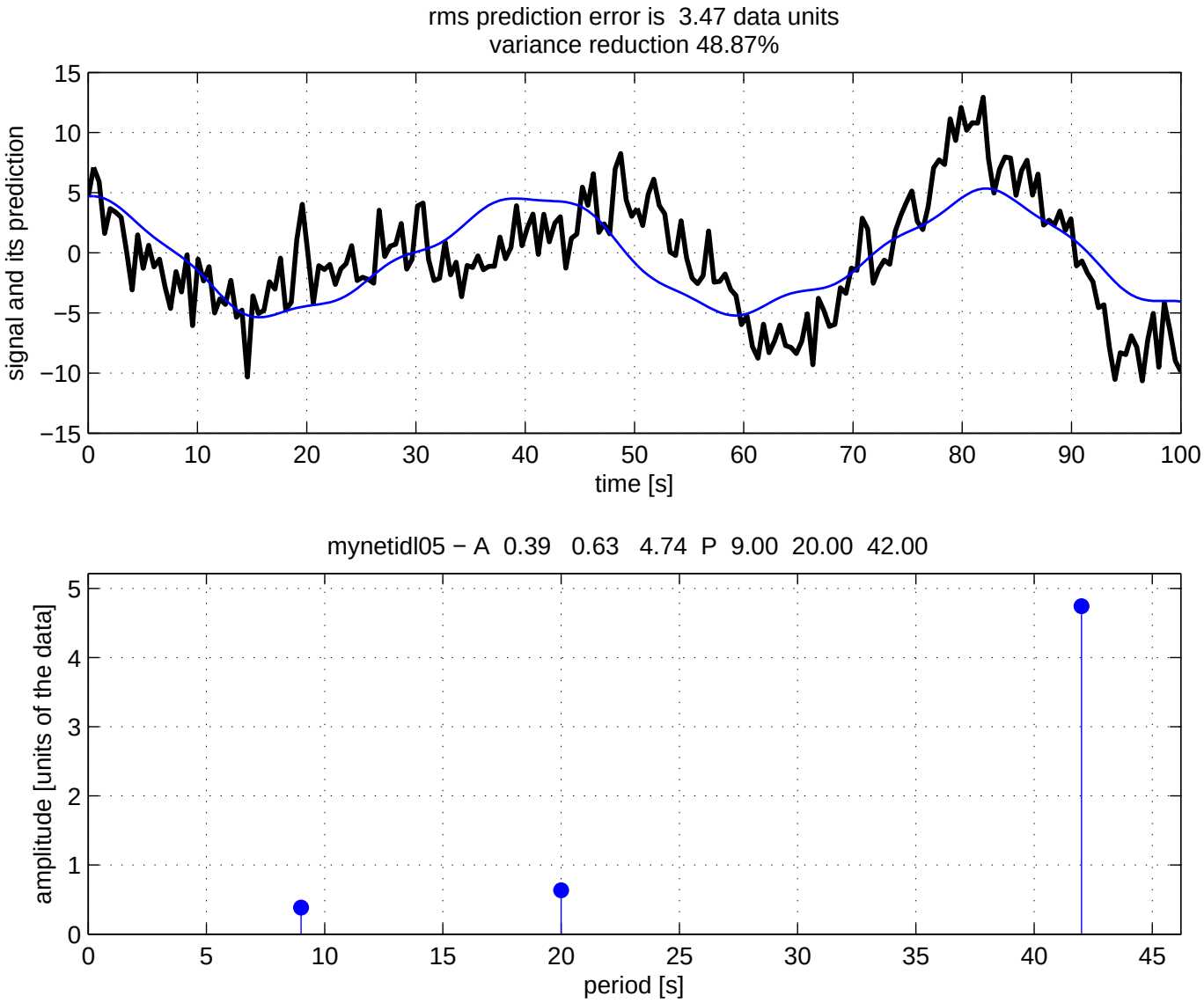

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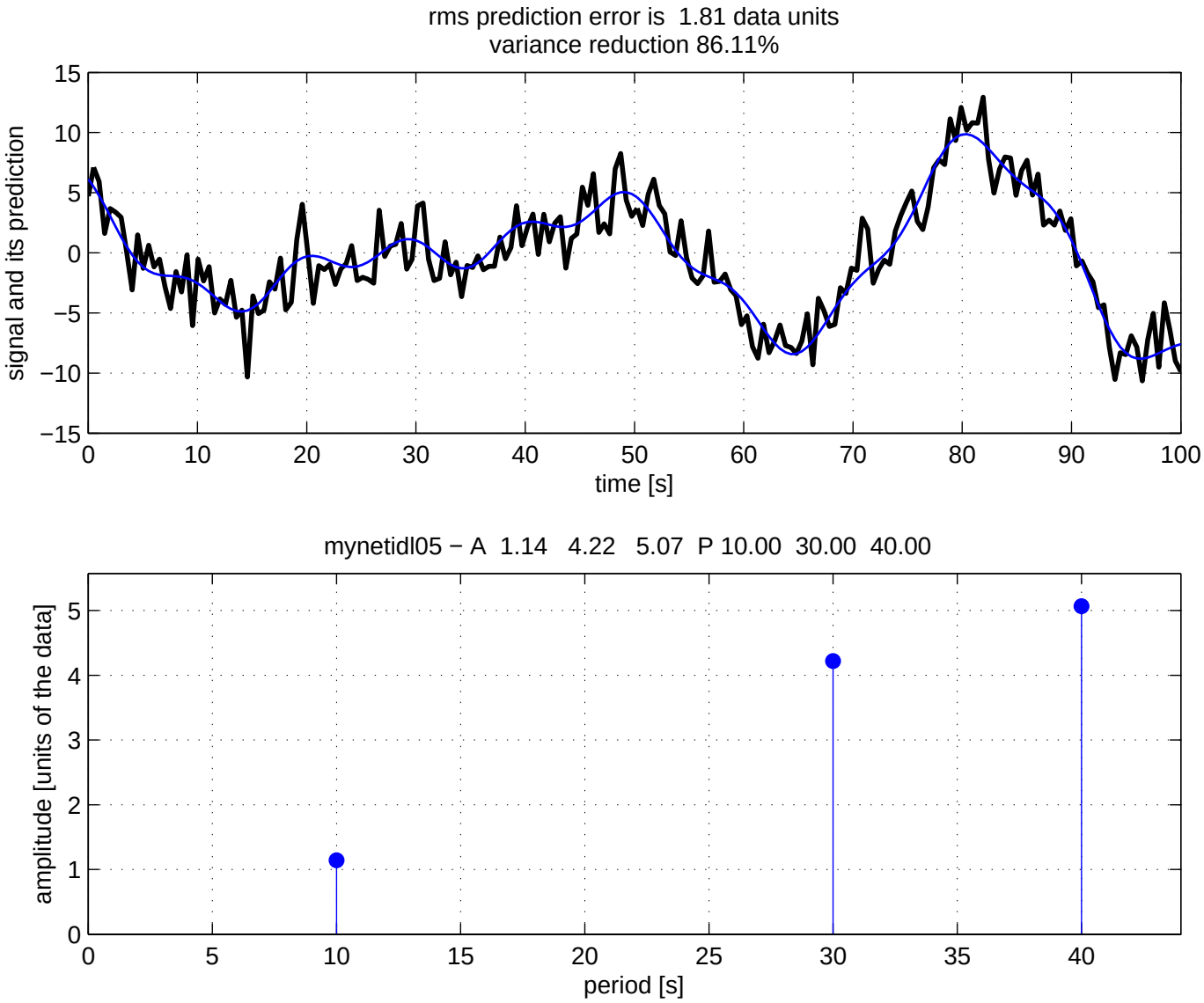

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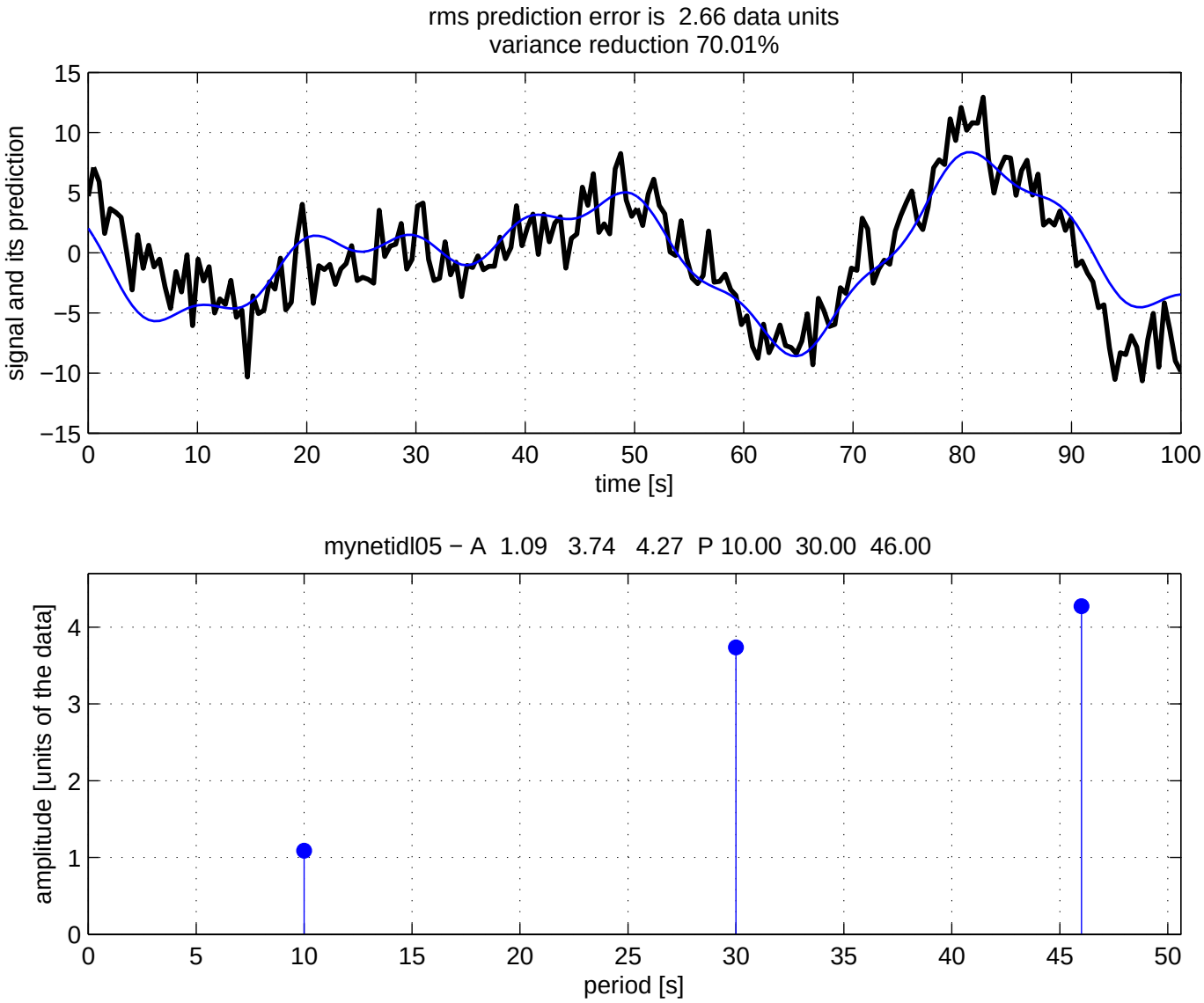

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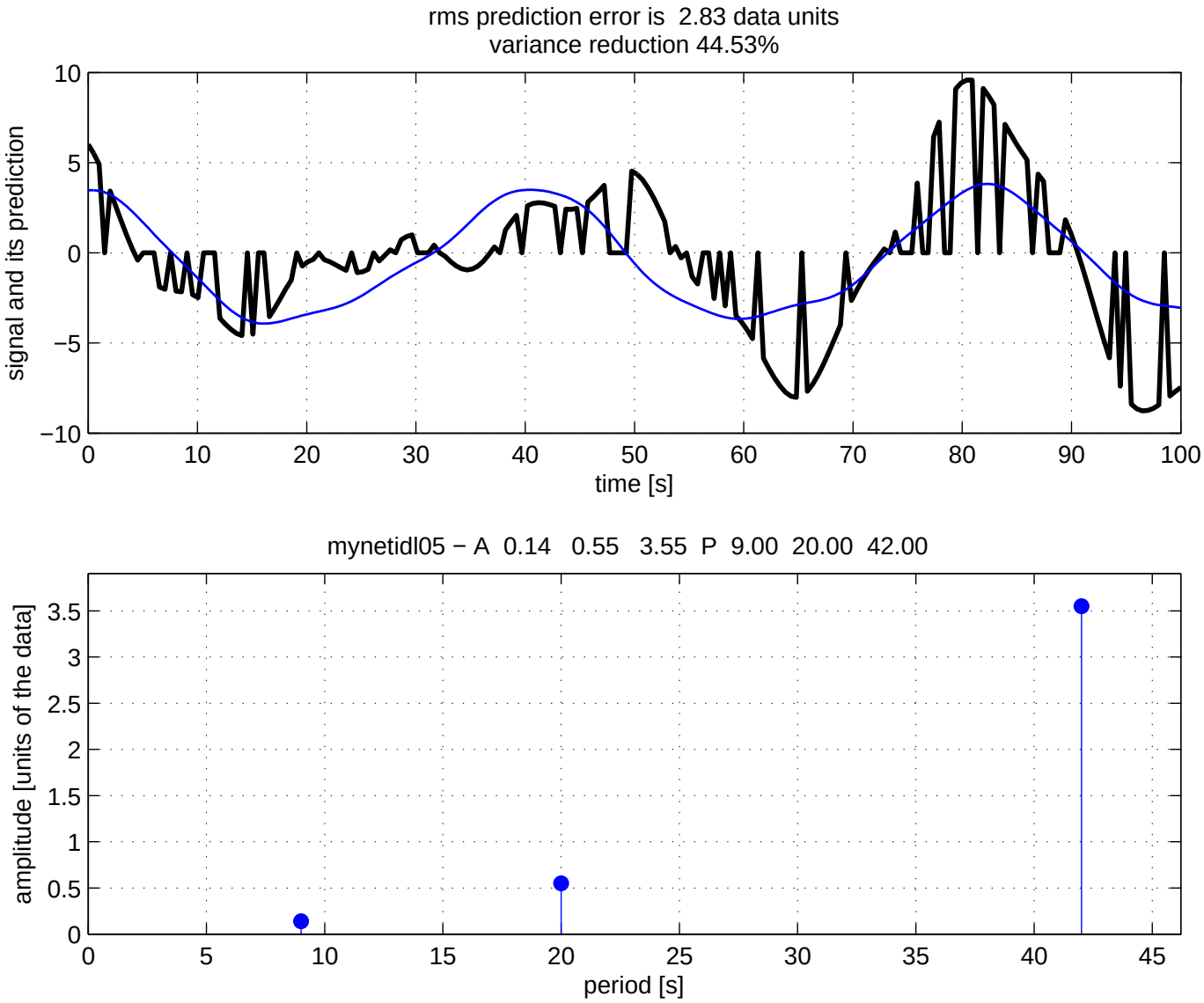

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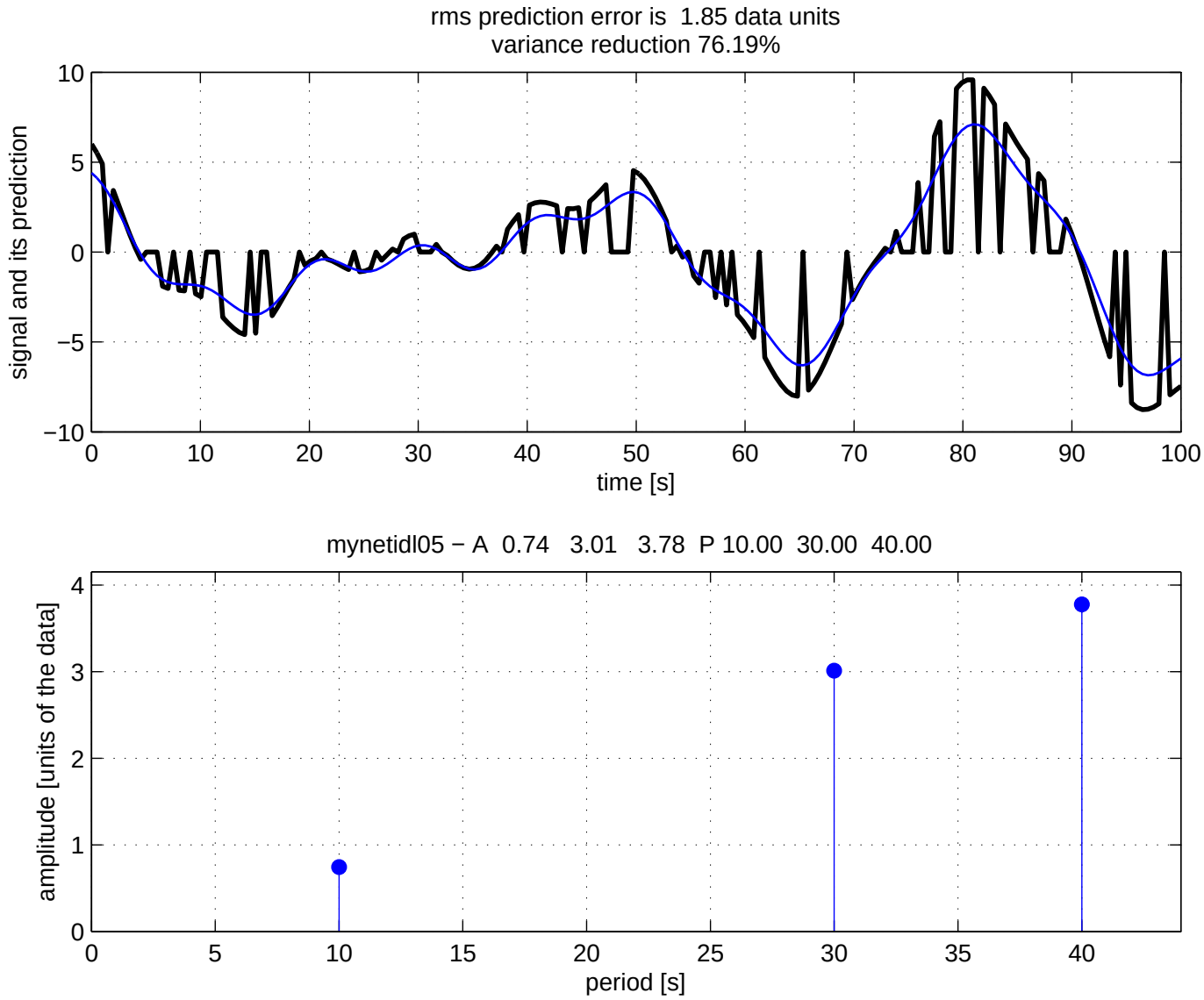

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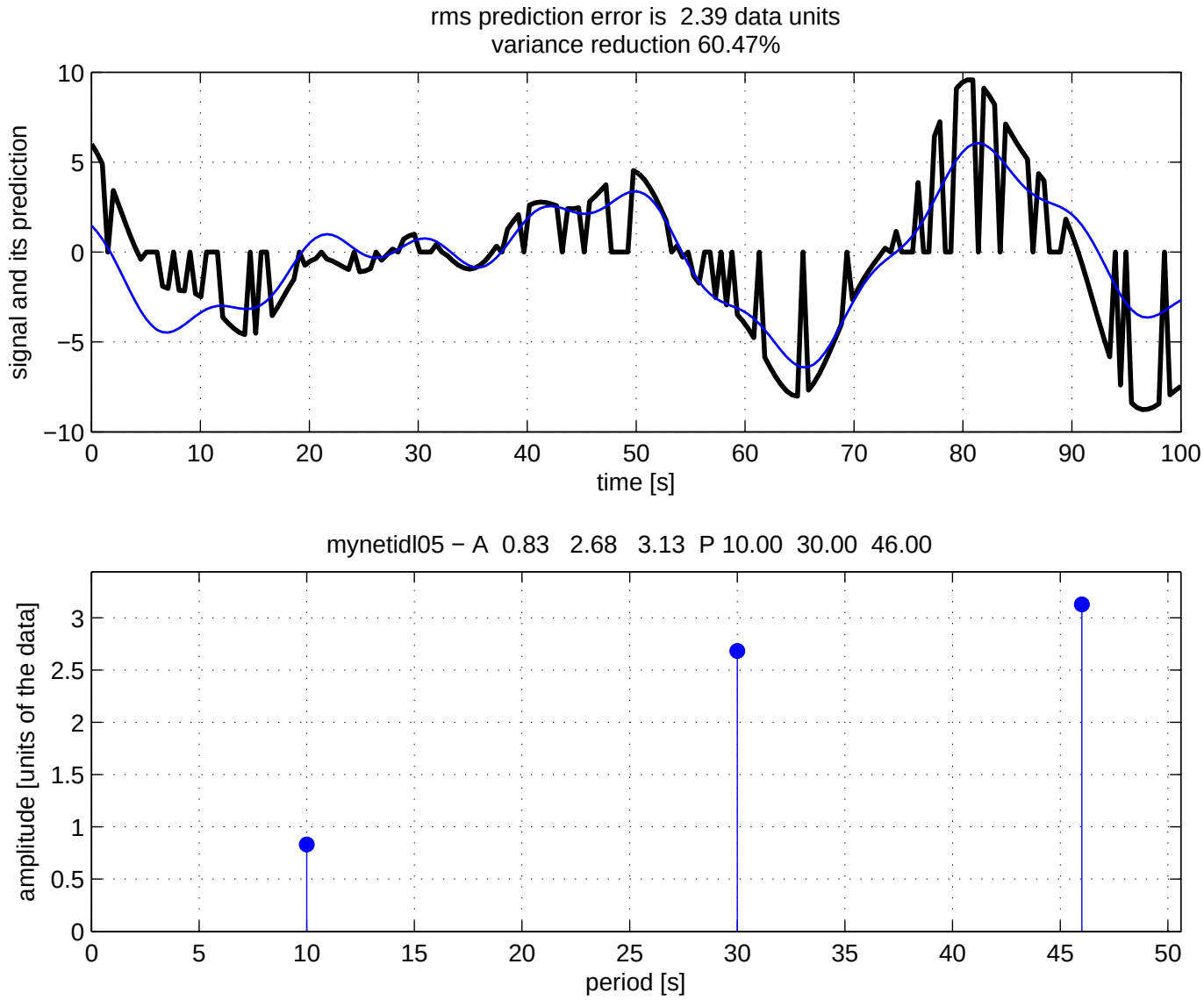

Homework 4 — All of the above