AOSC 652: Analysis Methods in AOSC

Assignment #8: Practice with Python or IDL
Due: Monday, 24 October 2016 (at start of class)

Name: _____

80 points total
Late penalty: 10 pts per day

In this assignment, you will create either a Python or IDL program that will read data, calculate a least squares fitting, and plot your results. You've already done this work in FORTRAN in earlier assignments; here, we shall repeat using either Python or IDL.

Earlier in class we analyzed the global temperature record. We wrote code that calculated the 5 year running mean of data in a file named global_temperature_record.dat and we conducted a least squares fits of this 5 year running mean. You should have resident, somewhere in your account, a file containing the global temperature record as well as the 5 year running mean. This assignment uses either Python or IDLto repeat the analysis that had been conducted earlier using FORTRAN.

You may find these codes useful for completing this assignment:

~rjs/aosc652/week_08/plot_temperature_assign8_python_shell.py

~rjs/aosc652/week_08/plot_temperature_assign8_idl_shell.pro

You will need to update the file to read in the global temperature anomaly time series and its 5 year running mean. Portions of the code that have a ? need to be changed appropriately, and some lines of code may need to be uncommented.

As shown in class on Wednesday, there are Python and IDL commands that will calculate least squares coefficients for a given data set. Use the appropriate command to:

i) Calculate the linear and quadratic least squares coefficients for the 5 year running mean of the global temperature anomaly time series and write down the values of the coefficients in the table below:

Method	Linear Coeff #1	Linear Coeff #2	Quad Coeff #1	Quad Coeff #2	Quad Coeff #3
FORTRAN					
Python or IDL					

ii) Discuss how the coefficients found using FORTRAN compare to those found using Python or IDL: i.e. do they differ? If so, why? And if they differ, do the differences "matter"?

iii) Construct a plot in either Python or IDL, with your x-axis beginning at **1880** and ending at **2060,** that shows:

a) the 5 year running mean of the global average temperature anomaly

b) the linear, least squares fit to the anomaly found using either Python or IDL

c) the quadratic least squares fit to this anomaly found using Python or IDL

Please extend the fits to year **2060**.

iv) Either in the same *.py or *.pro file or on a new file, add code that constructs a second plot, starting at **1880** and ending at **2060,** for your station temperature anomaly time series that was analyzed in Assignment #4b. The plot should be an analog of the plot constructed for the global temperature time series: it should show the 5 year running mean of the anomaly of the station data relative to a 1951 to 1980 baseline, as well as linear and quadratic least squares fits that run from **1880** to **2060**.

v) Comment on the similarity, or lack thereof, of the projection of the global temperature anomaly out to 2060 compared to the projection of the station temperature anomaly. Please identify, in your reply, which of the four projections (i.e., linear fit to global, quadratic fit to global, linear fit to station, or quadratic fit to station) you think is most likely to lie closer to reality in year 2060, and comment on why this is likely to be the case.

vi) Congratulations, you have conducted a least squares fit to data in FORTRAN, having written code to carry out a matrix inversion (yes, you each did this!) as well as conducted a least squares fit of the same data using either Python or IDL. Compare and contrast these two approaches, and let us know which approach you prefer?

Please note there is no correct answer for the last question, but we are eager to know your thoughts.

As always, please also turn in a hard copy of your two plots, the Python or IDL code printer using using enscript with full pathname, and either a typed of hand written response to these questions.