Class summary/homework 9 – Due Friday May 2nd, 2014 9:00am

This homework is about statistical hypothesis testing using data from time series.

1. Download from the web page one of the two programs: The first one works with global mean temperatures, the second one works with the El Nino – Southern Oscillation index (NINO3.4 tropical Pacific Sea Surface Temperature data)

   http://www.atmos.albany.edu/facstaff/timm/ATM315spring14/R/scripts/t-test_example_globaltemp.R
   http://www.atmos.albany.edu/facstaff/timm/ATM315spring14/R/scripts/t-test_example_ENSO.R
   Then find the missing data files that you need to get the scripts running (they are online in the data-subfolder). Test early that the scripts are running, once you have all data files. We can assist you with getting the scripts running.
2. The scripts are showing the time series in one plot. You can choose two different time periods that you want to compare. The scripts will calculate the mean values of two time periods and perform a statistical t-test for the differences in the mean.
   a. Explain why it is important to apply a statistical test procedure when comparing estimated sample means.
   b. Formulate an appropriate Null-Hypothesis (H0) for this statistical test problem and a proper alternative hypothesis (Ha).
   c. Choose two at least two different test scenarios (different periods, different lengths are okay, too; in case of global mean temp. you can switch from monthly to yearly samples). Try to find two time periods where the t-test will result in a rejection of the H0 and acceptance of Ha. Then try to find one where H0 cannot be rejected. (Note you may choose from typical significance levels 0.1% 1%, 5%, 10% (e.g. p-values 0.001, 0.01, 0.05, 0.1)
   d. Summarize your statistical test. Also if you have questions about the concept of the statistical test, critical comments, doubts about the significance, you can report them.
   e. Do you see useful applications for the t-test in current or coming courses/ lab exercises/ or at work?
3. Are there any questions, comments for us?

Suggested reading:
Collaborative Statistics: Sections 9.1-9.5 9.7-9.10 and 10.1-10.2
http://www.atmos.albany.edu/facstaff/timm/ATM315spring14/introductory_course_statistics.pdf