

Future Research Careers

Taken for Granted: Stormy Weather - Science Careers - Biotech, Pharmaceutical, Faculty, Postdoc jobs on Science Careers - Mozilla Firefox

File Edit View History Bookmarks Tools Help

sciencecareers.sciencemag.org/career_magazine/previous_issues/articles/2011_01_07/credit.a1100001

Taken for Granted: Stormy Weather ...

ADVERTISEMEN

STAY PLUGGE


Mut
Sexu
Role
Orna
and

with Science POD

ADVERTISEMEN

DENMA
Better. Faster. Stre

Leading the Way in
Translational Medicin
Webinar



CREDIT: NOAA's National Weather Service Collection, U.S. Department of Commerce

Search Articles [Advanced Article Search](#) Search

Issues & Perspectives

Taken for Granted: Stormy Weather

By Beryl Lieff Benderly
January 07, 2011

What lies ahead for American science and, especially, for young scientists? Financial constraints and rising foreign competition contribute to a general forecast that looks mixed at best and threatening at worst; those are the conclusions of a pair of reports recently released by the National Academies. Another academies study, scheduled for release later this year, is examining the prospects of [America's research universities](#).

The concerns of early-career scientists got considerable attention at public sessions that the [committee](#) working on the forthcoming universities report held in Washington, D.C., in November. A focus group on human capital aired a wide range of informed opinions on doctoral, postdoctoral, and career issues. A plenary presentation on postdoc

If labor costs that are higher than corporations wish to pay indicate a labor shortage, then "de facto there can no longer be domestic shortages of scientists and engineers," the report says, because those corporations will export the work.

Email Article
Email Editor
Discuss in Forum
Related Articles
Print this page
Free Newsletter

BOOKMARK

Penguins

Band of bothers : Nature News - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www.nature.com/news/2011/110112/full/news.2011.15.html

Band of bothers : Nature News

[comments on this story](#)

Published online 12 January 2011 | Nature | doi:10.1038/news.2011.15

News

Band of bothers

Researchers' flipper bands can seriously dent penguin survival, and also skew the results of research.

[Daniel Cressey](#)

Attaching bands to penguins' flippers makes them easier for scientists to study, but may also up the birds' death rates and lower their chances of reproducing.



Flipper banding has been found to hurt penguins.

Benoît Gineste

A team studying king penguins (*Aptenodytes patagonicus*) has rekindled this debate, which has been running for more than 30 years, and thrown up an additional concern. Not only do bands placed around the birds' flippers make life more difficult for them, but their effect on the birds' survival and reproduction is also

Stories by subject

- [Ecology](#)
- [Technology](#)

Stories by keywords

- [animal tracking](#)
- [flipper bands](#)
- [tags](#)
- [penguins](#)
- [climate change](#)

This article elsewhere

[Blogs linking to this article](#)

[Add to Connotea](#)

[Add to Digg](#)

most recent

- [Future of food could be bright](#)
12 January 2011
- [Near-action shots of vital proteins](#)
12 January 2011
- [People prove impervious to anxiety from genetic tests](#)
12 January 2011
- [Neuroscience: Thought experiment](#)
12 January 2011
- [Conservation biology: The end of the wild](#)
12 January 2011

commented

Related stories

- [Emperor penguin's old clothes are unveiled](#)
30 September 2010
- [Q&A: Sylvia Earle on protecting our seas](#)
12 May 2010
- [US science academy report calls for 'bipolar' research](#)
12 January 2011

2010


NOAA: 2010 Tied For Warmest Year on Record - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www.noaanews.noaa.gov/stories2011/20110112_globalstats.html

ATMOS 1010-1 U/U Spring 2011 NOAA: 2010 Tied For Warmest Ye...

NOAA HOME WEATHER OCEANS FISHERIES CHARTING SATELLITES CLIMATE RESEARCH COASTS CAREERS

 **NOAA** NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
UNITED STATES DEPARTMENT OF COMMERCE

[About NOAA](#) [Contacts](#) [Staff Directory](#) [Help](#) [SEARCH](#)

Weather.gov Forecast
City, ST [GO](#)

[Active Weather Alerts](#)

[NOAA Organizations](#)

[Working With NOAA](#)

[Media & Constituents](#)

[NOAA In Your State](#)

[Emergency Information for NOAA Employees](#)

NOAA: 2010 Tied For Warmest Year on Record

January 12, 2011

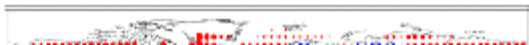
According to NOAA scientists, 2010 tied with 2005 as the warmest year of the global surface temperature record, beginning in 1880. This was the 34th consecutive year with global temperatures above the 20th century average. For the contiguous United States alone, the 2010 average annual temperature was above normal, resulting in the 23rd warmest year on record.

This preliminary analysis is prepared by scientists at [NOAA's National Climatic Data Center](#) in Asheville, N.C., and is part of the suite of climate services NOAA provides government, business and community leaders so they can make informed decisions.

2010 Global Climate Highlights:

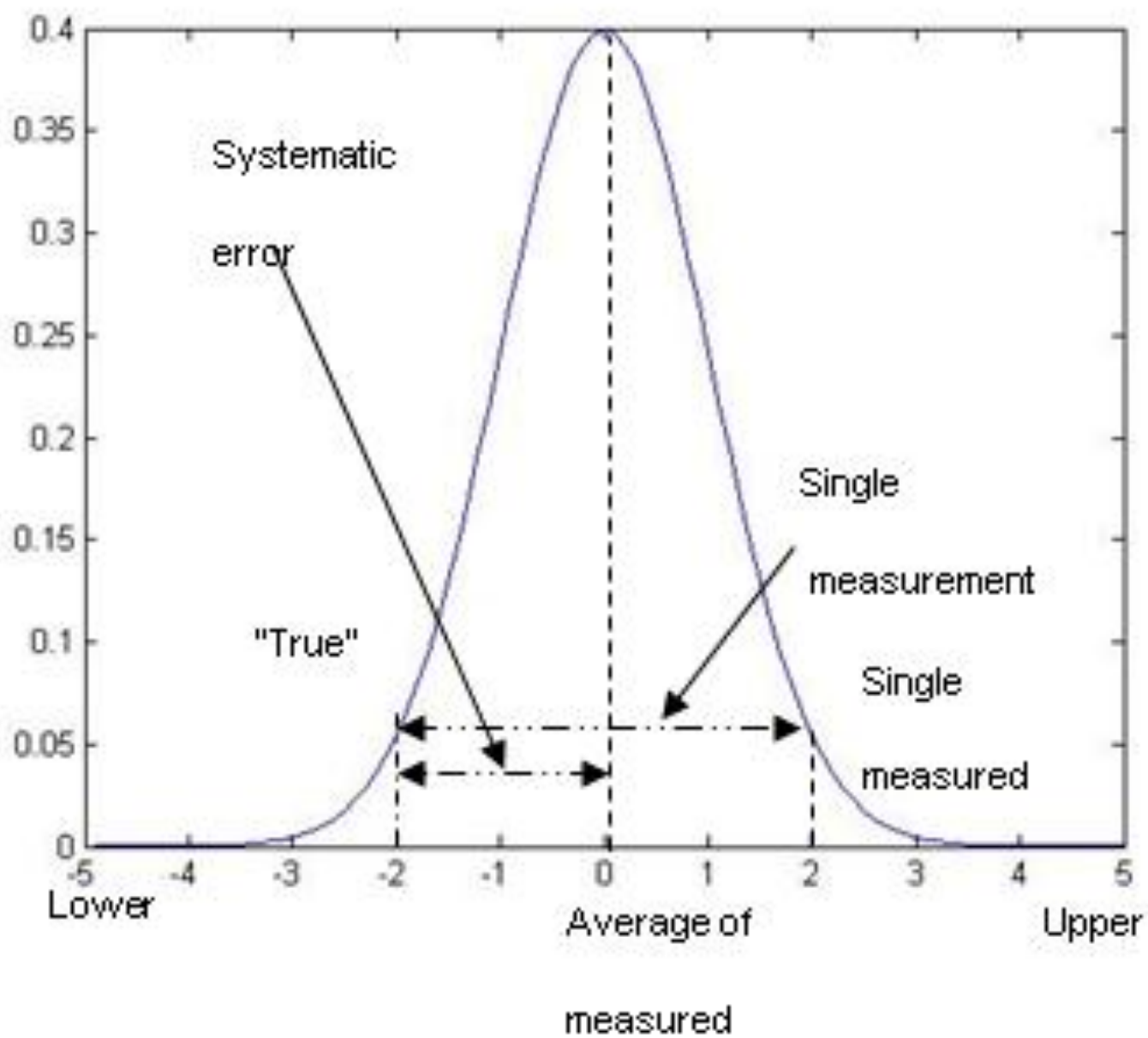
- Combined global land and ocean annual surface temperatures for 2010 tied with 2005 as the warmest such period on record at 1.12 F (0.62 C) above the 20th century average. The range of confidence

Temperature Anomalies Jan-Dec 2010
(with respect to a 1971-2000 base period)
National Climatic Data Center/NOAA



Review

- Truth text will be available from library
- Truth
- Systematic vs. random errors
- Population vs. sample
- Reducing dimensionality



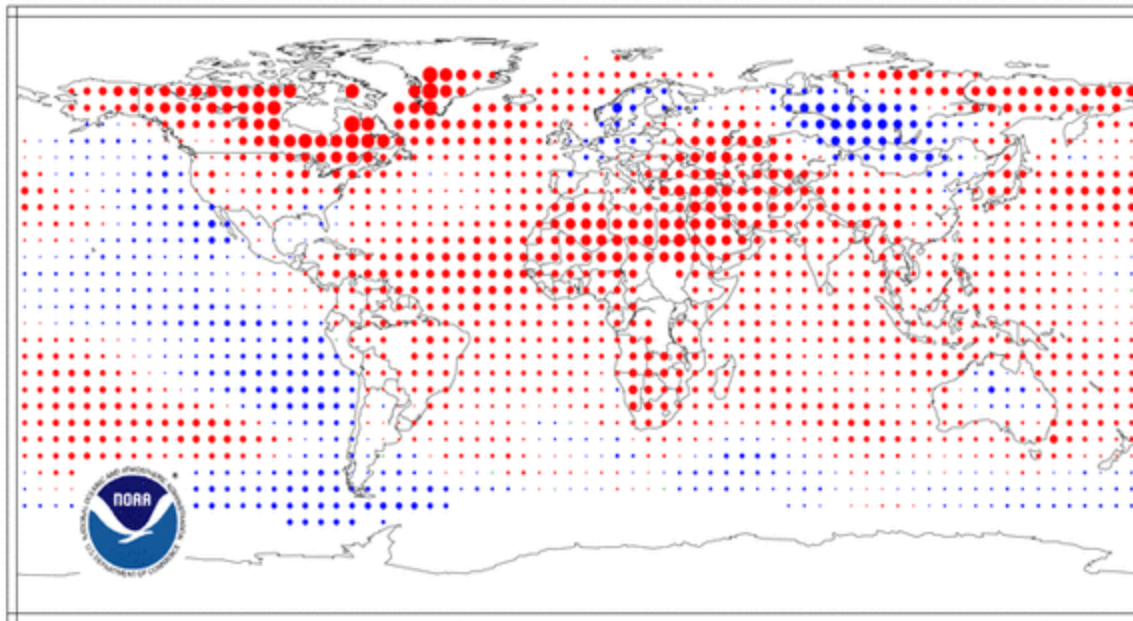
Climate

- Statistics often misinterpreted as bookkeeping.
 - What is the warmest temperature on record at Salt Lake City?
 - What is the biggest snow storm at Alta?
- weather and climate:
 - weather- state of the environment
 - climate- aggregate summary of the environment
 - Climate normal: arbitrarily defined reference state: many use 1971-2000; soon will shift to 1981-2010

Temperature Anomalies Jan-Dec 2010

(with respect to a 1971-2000 base period)

National Climatic Data Center/NESDIS/NOAA



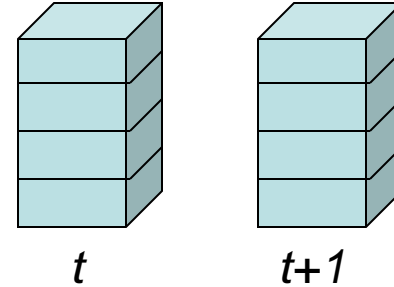
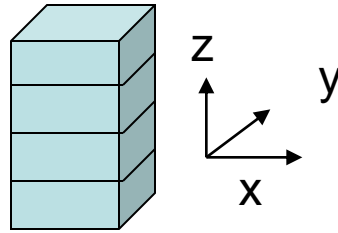
Degrees Celsius

Why use statistics to describe the environment?

- Environment controlled by innumerable factors, which we hope to segregate into a few critical factors from the rest that, for the most part, simply contribute to background noise
- the characteristics of the system include linearly unstable processes such as baroclinic waves that cause growth of small features into larger ones
- the characteristics of the system (dynamics, thermodynamics) are nonlinear and include discrete step functions (i.e., rain/no rain) that can lead to the amplification of small errors into large ones
- the system is dissipative, which guarantees “stationarity”, i.e., the climate system will remain stable and not run away from the current state

Large Dimensionality of Geophysical Data Sets

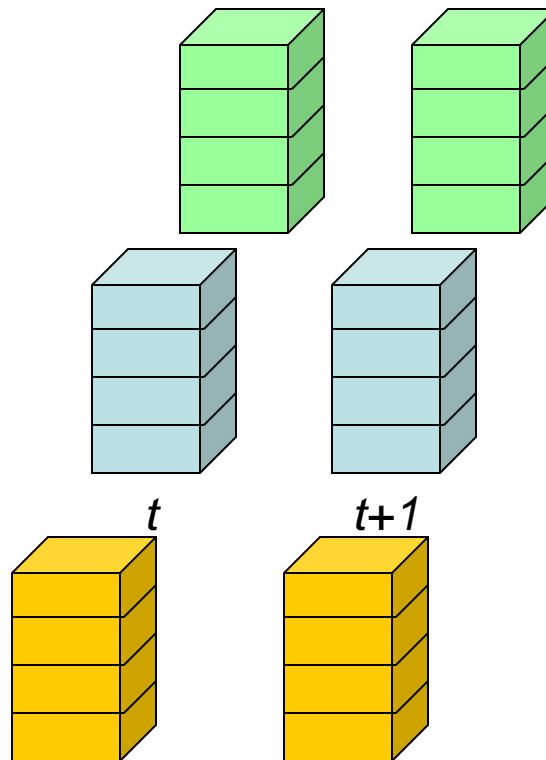
- Space: x, y, z



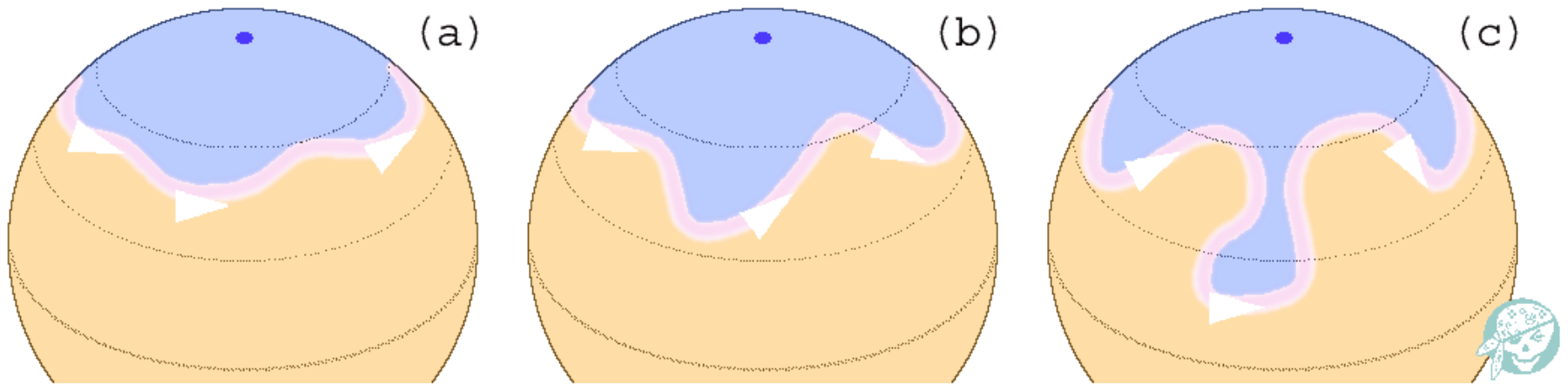
- Time: time (t) and forecast time (t_f)

- Parameter & Source

(temperature, winds, different models, measuring systems, perturbations)



Baroclinic Wave Growth



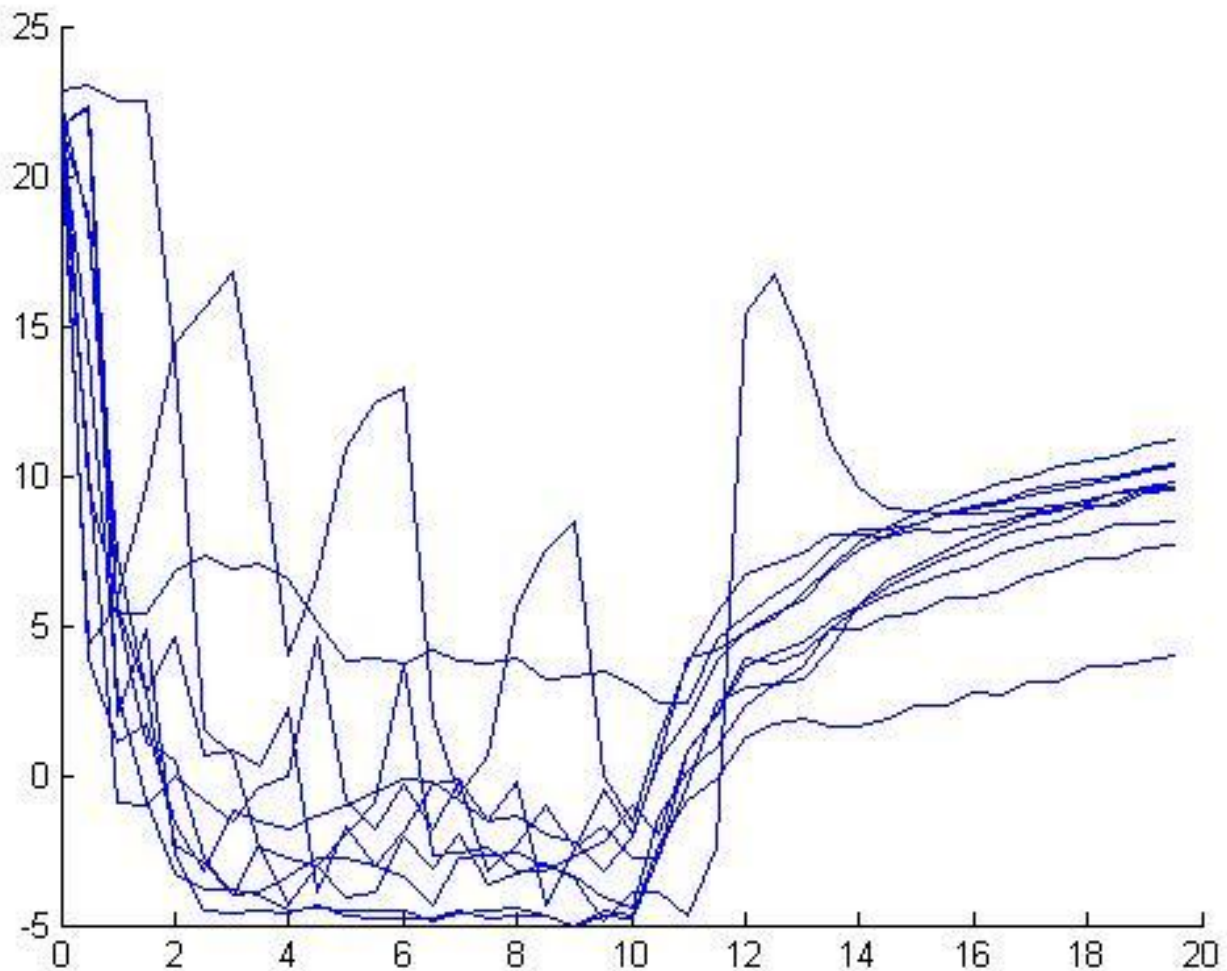
Matlab

- Get your account set up through CHPC
- Review basic matlab concepts in Chapter 2 of Matlab Recipes

10 Kestrel Temperature Sensors over 25 minutes



Kestrel.m



Matlab terminology

- Scalar: 1×1
- Vector: $m \times 1$ (m rows); $1 \times n$ (n columns)
 - Transpose (`'`) flips vectors;
- Matrix: $m \times n$
- Cell arrays: numerically indexed aggregates of info

Important commands

See [matlabcommands.pdf](#)

- whos
- control-c
- Arithmetic operators
 - + Plus
 - Minus
 - Matrix multiply
 - .* Array multiply
 - ^ Matrix power
 - .^ Array power
 - / Right matrix divide
 - ./ Right array divide

Boolean and Logical operators

== Equal

~= Not equal

< Less than

> Greater than

& Logical AND

| Logical OR

~ Logical NOT

Other Commands

- : Span operator [1:5] = [1 2 3 4 5]
- () Operation grouping
- [] Vector and matrix delimiter
- { } Cell delimiter
- . Decimal point
- .. Parent directory
- ... Continuation of command to next line
- , Separator
- ; End line or row
- % Comment
- = Assignment operator
- ' - String delimiter
- .' - Transpose
- ' - Complex conjugate transpose

Syntax

if - Conditionally execute statements.

else - IF statement condition.

elseif - IF statement condition.

end - Terminate scope of FOR, WHILE, SWITCH, TRY and IF statements.

for - Repeat statements a specific number of times.

while - Repeat statements an indefinite number of times.

break - Terminate execution of WHILE or FOR loop.

continue - Pass control to the next iteration of FOR or WHILE loop.

function - Add new function.

return - Return to invoking function.

error - Display error message and abort function.

disp - Display an array.

feval - Execute function specified by string.

Math

sin - Sine.

asin - Inverse sine.

cos - Cosine.

acos - Inverse cosine.

tan - Tangent.

atan - Inverse tangent.

atan2 - Four quadrant inverse tangent.

sqrt - Square root.

exp - Exponential.

log - Natural logarithm.

log10 - Common (base 10) logarithm.

factorial - Factorial function.

abs - Absolute value.

conj - Complex conjugate.

real - Complex real part.

imag - Complex imaginary part.

floor - Round towards minus infinity.

ceil - Round towards plus infinity.

round - Round towards nearest integer.

mod - Modulus.

norm - Matrix or vector norm.

det - Determinant.

inv - Matrix inverse.

eig - Eigenvalues and eigenvectors.

cross - Vector cross product.

Dot – vector dot product

Plotting

- figure
 - plot - Linear plot.
 - subplot
 - loglog - Log-log scale plot.
 - semilogx - Semi-log scale plot.
 - semilogy - Semi-log scale plot.
 - axis - Control axis scaling and appearance.
 - hold - Hold current graph.
 - title - Graph title.
 - xlabel - X-axis label.
 - ylabel - Y-axis label.
 - get - Gets plot properties.
 - set - Sets plot properties.
 - grid
- Color Line Type Marker Type
 - y - yellow - - solid . - point
 - m - magenta : - dotted o - circle
 - c - cyan -. - dashdot x - x-mark
 - r - red -- - dashed + - plus
 - g - green * - star
 - b - blue s - square
 - w - white d - diamond
 - k - black v - triangle (down)
 - ^ - triangle (up)
 - < - triangle (left)
 - > - triangle (right)
 - p - pentagram
 - h - hexagram

Matlab File Names and Headers

- Every file you create or edit should contain your name, the date it was created or last edited and a brief description of what the file solves.
 - Remember that many assignments require several files. This guideline applies to all of them.
- Your output in the Command Window should contain your name, the date, course, assignment number, what it does, and what other routines and data files are required. This rule and the previous rule can be accomplished with a single set of commands.
 - `disp('')`
 - `disp('')`
 - `disp(' John Horel')`
 - `disp(' ATMOS 5040/ Spring 2011')`
 - `disp(' Chapter 2')`
 - `disp(' Reproducing code in notes')`
 - `Disp('Requires XXX data file')`

Comments

- Each program should include sufficient comments that the major steps can be followed by a user with a knowledge level equal to your own.
- This doesn't mean each line of code must be commented necessarily. Blocks of code that perform some operation can be commented together.
- Include info on units on numerical values in the code

Variable Names and Code Structure

- Effective use of variable names can minimize the need for comments.
- Variable names that are descriptive should be used whenever possible.
- Use spaces and indents to improve the readability of your code.
- When input is requested from the user, the units need to be included in the request on the screen, and the format of the input should be specified.

Output

- Output should be formatted as to be easily readable.
- Use tabular data when appropriate.
- Include units and report values to the proper number of significant figures.

Code Portability

- The code should be written such that it can be used for a modified problem with as few changes as possible.
 - The primary method of doing this is to size loops by using the ‘length’ command.
- The code must be written as to prevent the possibility of getting stuck in an infinite loop.
 - This is usually done by putting a maximum iteration number and an if-break structure in any “while” loop.

Graphs

- Basic guidelines of proper graphing (labels, symbol types, titles, legend, etc.) should be followed
- Save in a common format (jpg, png)
- Include your name, assignment number, etc. in any figures to be turned in

The zen of programming

- Understand what you are expected to do
- Don't start from scratch- use example codes or search for examples
- Read text, look online for techniques and tricks
- There is never only one way to do something- build on what you are comfortable with but seek simpler ways

Debugging

- Programming is iterative
- Start from what works.
 - Get example code working first
- What did you change?
- Have you looked at the underlying data file?
- Have you looked at the workspace variables?
- Did you display some intermediate values?
- Don't assume that if your code runs that it is correct. Does the output make sense?
- Don't expect others to debug your code for you
 - Programming can be like solving a puzzle- it appears hard while you're doing it, but you get some great "ah ha" moments once you've figured it out for yourself
- Being able to work independently and solve problems is critical

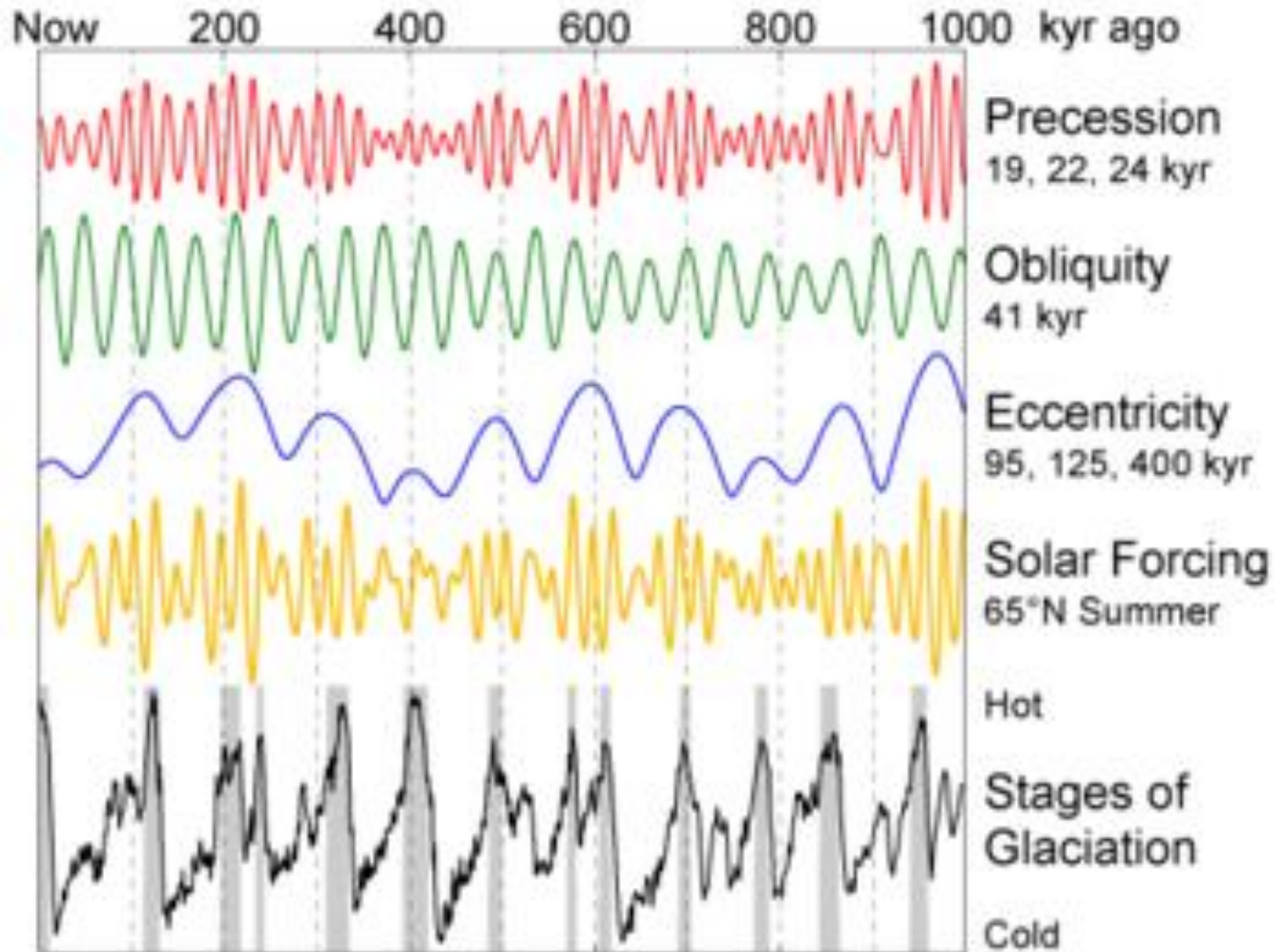
Sorting out the Kestrels: Assessing random vs. systematic errors

- What people did:
 1. Aspirate by vigorously swinging.
 2. Walking while vigorously swinging.
 3. Put in pocket at random intervals.
 4. Hold steady at arm's length.
 5. Aspirate by vigorously swinging.
 6. Put in pocket (for the duration).
 7. Place on rock for duration.
 8. Hold steady at arm's length.
 9. Aspirate by swinging slowly.
 10. Hang from a fence b/t two buildings.

In class assignment

- Randomly assigned letters A-J to 10 kestrels
- You need to determine which activity 1-10 led to which time series of data A-J
- Work together in groups of 2-3 people
- Since some activities are similar, you can group, for example, that A, C, and I may be 1, 2, or 5

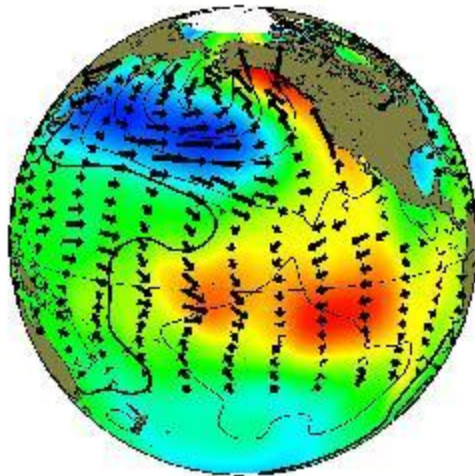
Milankovitch cycles



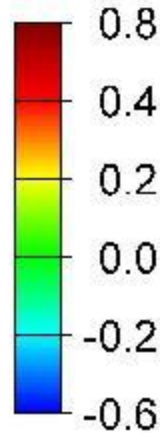
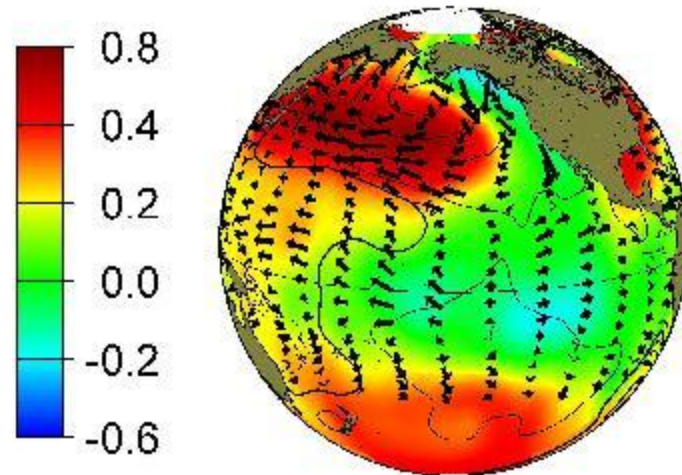
Pacific Decadal Oscillation

- PDO

Warm phase



Cool phase



Pacific Decadal Oscillation

monthly values for the PDO index: 1900-September 2009

