Thurs 1-24-19

1. Matlab syntax wrap-up
2. Matlab point & click tools
3. Even-sampling a time series
4. Submitting assignments
5. Trial run of geosa1

Read appendixb.pdf

A1 due Tues, Jan 29

Bring laptop on Tuesdays

Matlab syntax:
simple inventory commands

- cd – change directories, or get name of current working directory (cwd)
- dir -- list files in the current working directory
- which – find path to any m-file in the cwd or on the Matlab path
- what – list any m-files (scripts or functions) in the cwed
- who -- list names of all variables in the workspace
- whos – list those variables with info on size and class

Matlab syntax:
Variable names and assignment

x=257 …. Assign number to variable

y=x ….. Assign one variable same value as another

- Names are case-sensitive
- Names must follow certain rules. For example, cannot begin with a number; best begin with letter
- Avoid giving a variable same name as some existing function

Matlab syntax:
Computation

$y = x * 0.05$ *scalar multiplication*

$$x = \begin{bmatrix} 0.2 \\ 0.4 \\ 0.7 \end{bmatrix}, \qquad y = \begin{bmatrix} 0.2 \\ 0.4 \\ 0.7 \end{bmatrix}$$ ← *column vectors*

$z = x' * y$ *matrix multiplication*

$z = x .* y$ *element-by-element multiplication*

Matlab syntax:
Logical operators

x==y → 1 (true) if x equals y; 0 (false) if x does not equal y;

x>y → 1 (true) if x exceeds y; 0 otherwise

isnan(x) → 1 (true) is x is “NaN” (missing data); 0 otherwise

~isnan(x) → 1(true) if x is not “NaN”; 0 otherwise

- Apply to x , y whether scalar, vector or matrix
- Useful in pulling subsets of time series
- For more on syntax, see Matlab help “Getting Started”
  Top menu: ? →Explore MATLAB →Gettinng Started

Matlab point & click tools

- “PLOT” and “APP” tabs at top menu offer easy access to much exploratory and statistical analysis
- Can use some simple Matlab commands in command window to try these on your class data
- Example for time plot of first series in V1 data…

Even-sampling a time series

- Geophysical series sometimes have an uneven sampling interval, while many time series methods assume a constant, or even, sampling interval
- One option is to resample the time series at some desired even sampling interval
- A couple resampling alternatives
    1. Cubic interpolating spline
    2. Linear interpolation

Function evensi1 (even sampling interval)

1. User-written function that that evenly resamples an unevenly spaced time series
2. Options for cubic interpolating spline or linear interpolation
3. Click on an xlsx file with the unevenly sampled series and get an xlsx file with the evenly sampled series
4. Function also optionally reversed time axis for input data (e.g., from lake cores) that has time decreasing (getting older) downward in matrix.

Data for the example

WDC PALEO CONTRIBUTION SERIES CITATION:
Tierney, J.E., et al. 2010.
Lake Tanganyika 1500 Year TEX86 LST, BSi, and Charcoal Data.
IGBP PAGES/World Data Center for Paleoclimatology
Data Contribution Series # 2010-043.
NOAA/NCDC Paleoclimatology Program, Boulder CO, USA.

3b. Core KH1 charcoal, Charred particles/g sediment

Depth-cm	YearAD	Charred/g	normalized
15	1956	185	-0.91
16	1946	170	-0.92
17	1937	143	-0.94
18	1927	139	-0.95
19	1918	442	-0.69
20	1908	736	-0.44
21	1898	958	-0.25
22	1889	344	-0.77
23	1879	212	-0.88
24	1872	1598	0.29
25	1865	2678	1.20

Data as appears downloaded from NOAA

1. Sampling interval uneven
2. Time decreases downward

Data in charcoal1.txt, .xlsx

Cubic interpolating spline

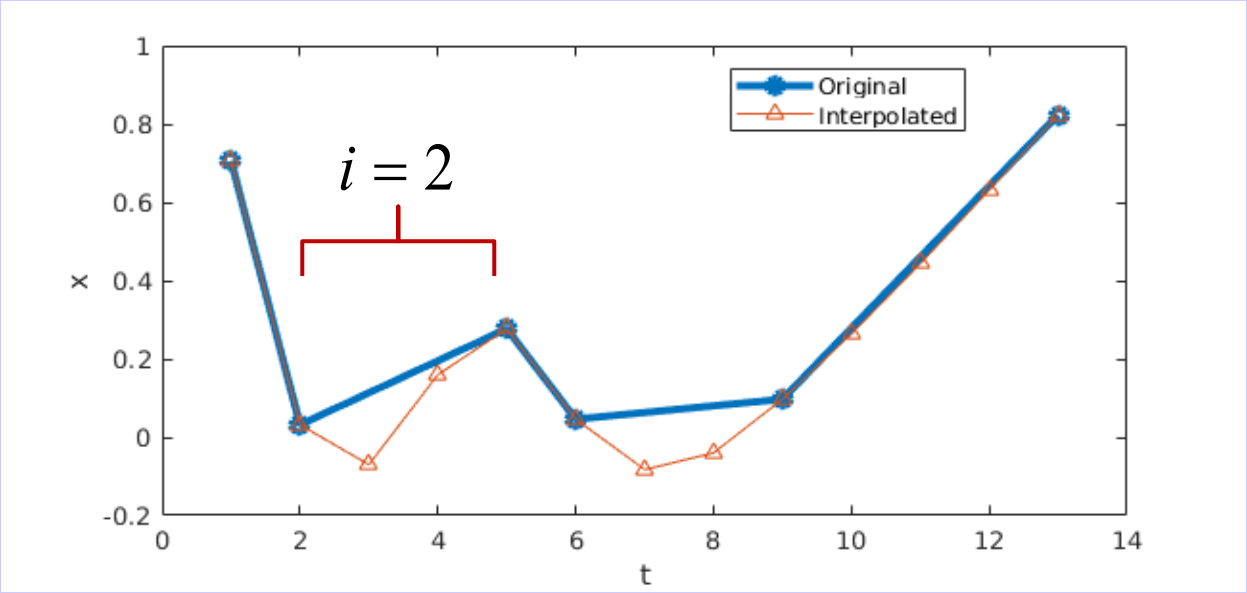
$n+1$ data points, unevenly spaced, at t_i, $i = 1, 2, \ldots, (n+1)$

$f_i(t) = a_i(t-t_i)^3 + b_i(t-t_i)^2 + c_i(t-t_i) + d_i$, cubic equation for each interval

$(4n-2)$ equations specifying that the fitted lines pass throught the points and that the first 2 deriviatives are continuous at the n points

2 equations specifying conditions at the endpoints

System of $4n$ unknowns and $4n$ equations, solved simultaneously



- Time series with 6 observations, unevenly spaced
- n=5 intervals
- Estimates wanted at 13 evenly spaced times

→ Matlab to try function evensi.m
on the downloaded charcoal data …

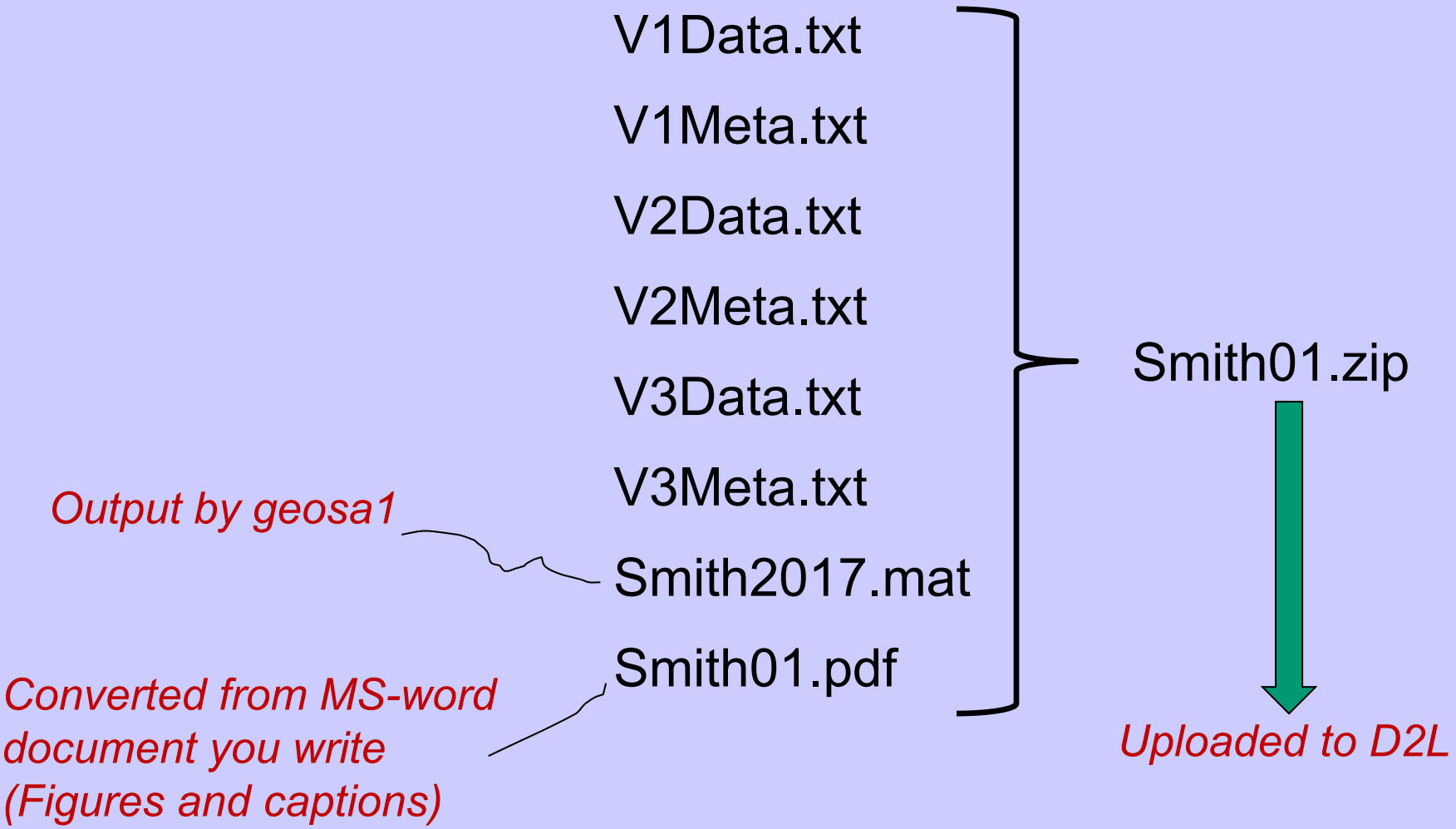
Submitting Assignments, A1-A12

- (Read appendixb.pdf for detailed instructions)
- You will upload assignments to D2L
- A2-A12 are uploaded as just a 1 pdf file
- A1 is uploaded as a zip file (see next slides)

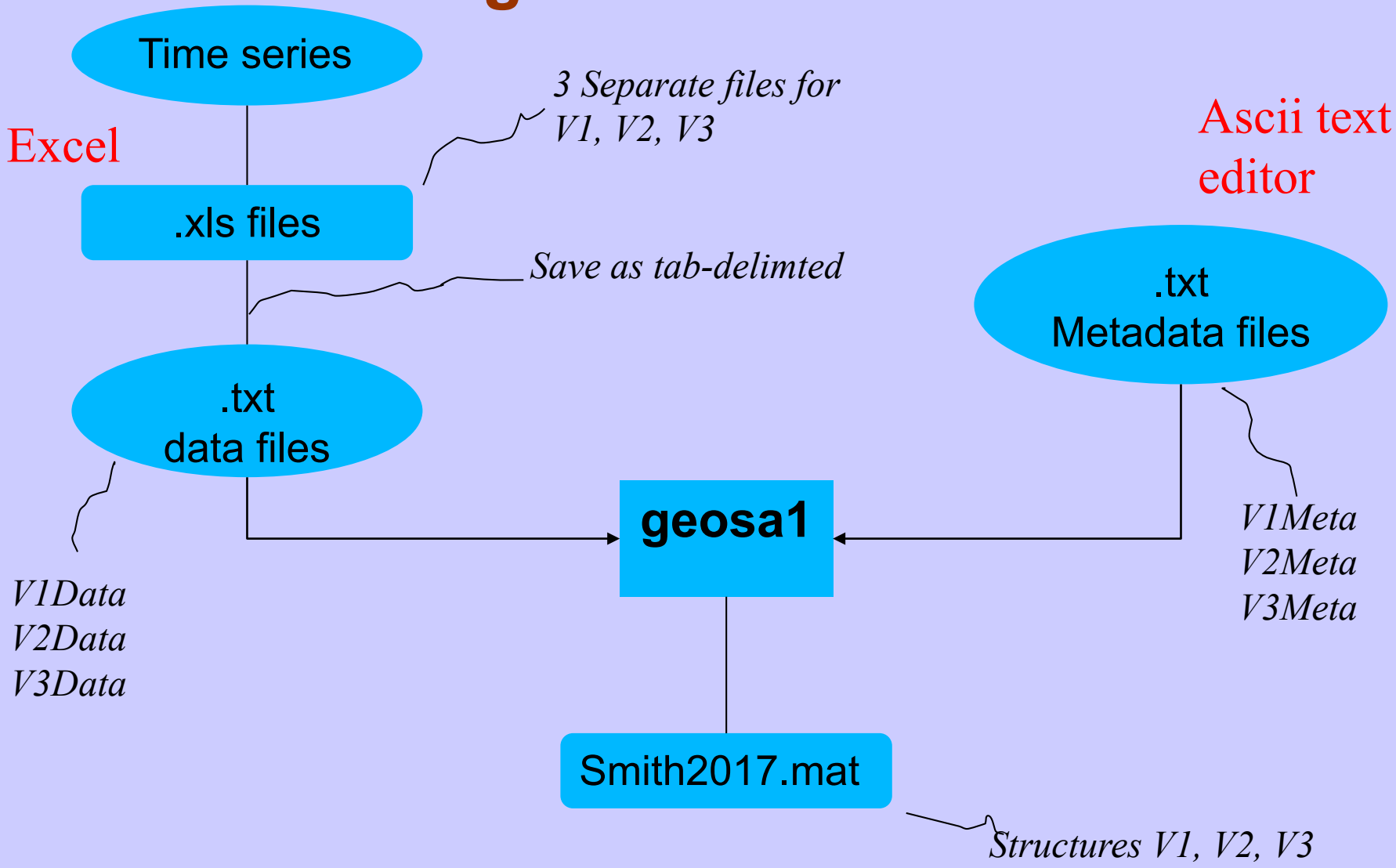
Submitting A1

- Assignment 1 is submitted as a zip containing 8 separate files
- A1.pdf– the assignment (in D2L)

Contents of the zip for A1



geosa1 --- flow


Time series
Excel
3 Separate files for
V1, V2, V3
.xls files
Save as tab-delimted
Ascii text
editor
.txt
Metadata files
.txt
data files
geosa1
V1Meta
V2Meta
V3Meta
V1Data
V2Data
V3Data
Smith2017.mat
Structures V1, V2, V3