Analysis Methods in Atmospheric and Oceanic Science

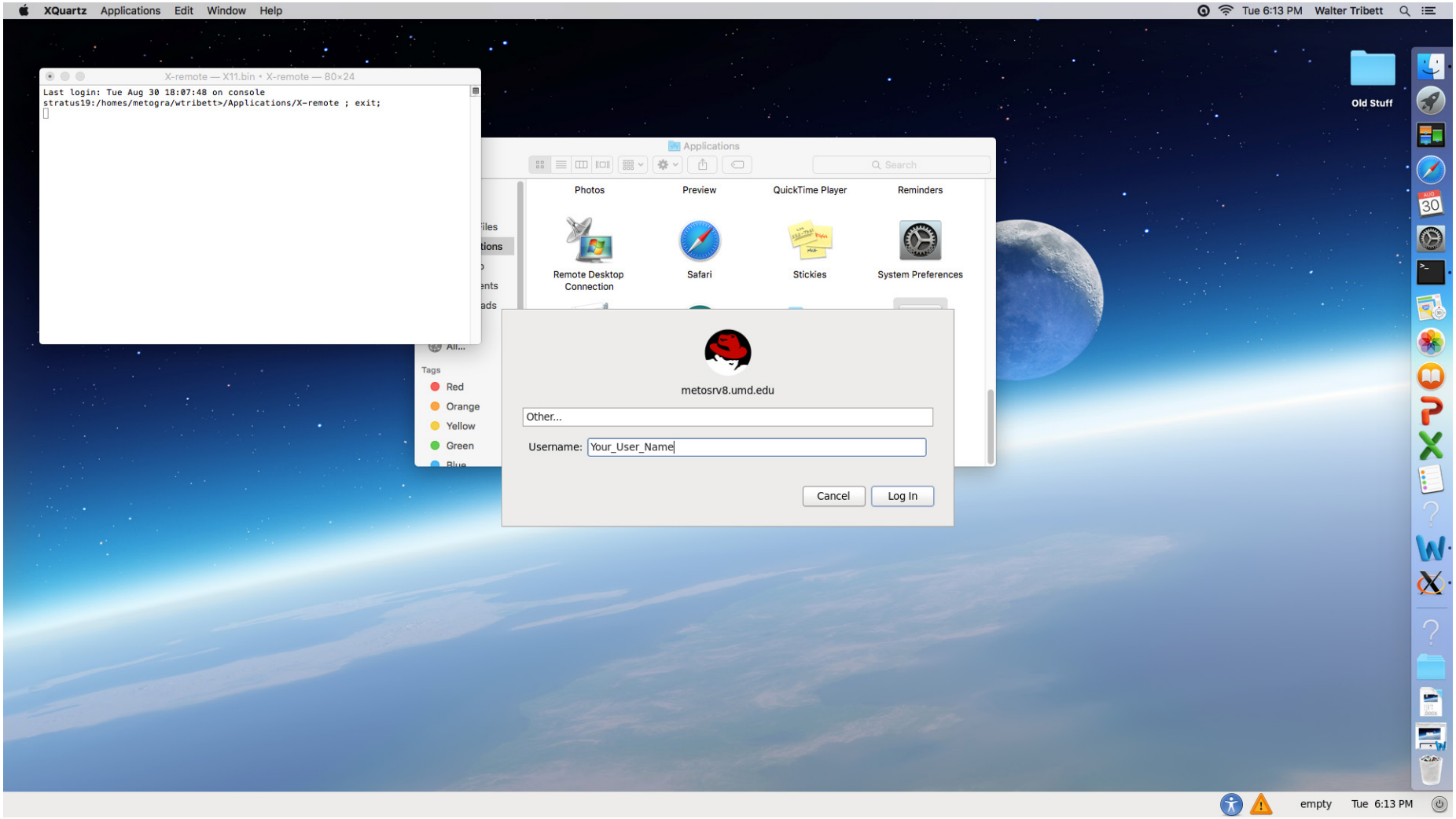
AOSC 652

Intro to FORTRAN and Simple Computations: Day 1

Web Site: http://www.atmos.umd.edu/~rjs/class/fall2016/

2 Sep 2016

Linux KDE Environment



For more info, see http://www.kde.org or http://en.wikipedia.org/wiki/KDE

AOSC 652: Student Editor Preferences

- vi: Alex, Angie, Chu-Chun, Dylan, Greg, Kanishk, Laura, Nikita, Patty, Sai
- emacs: Matt, Kelsey
- gedit: Agniv, Doug, Sai
- nano: Doug, Keenan

Printing

- Black & White printer in corner: instlab
- Color printer in CSS 3408: color

To print a text file to the B & W printer:

```
metosrv8{rjs} enscript –fCourier9 –dinstlab filename.f
```

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To print a text file to the B & W printer:

metosrv8{rjs} enscript –fCourier9 –dinstlab filename.f

What is an easier way to execute the same command?

Printing

- Black & White printer in corner: instlab
- Color printer in CSS 3408: color

To print a text file to the B & W printer:

metosrv8{rjs} lw filename.f

What is an easier way to execute the same command?

Printing

- Black & White printer in corner: instlab
- Color printer in CSS 3408: color

To print a text file to the B & W printer:

metosrv8{rjs} lw filename.f

How would we print with full path name?

Printing

- Black & White printer in corner: instlab
- Color printer in CSS 3408: color

To print a text file to the B & W printer:

```
metosrv8{rjs} lw /homes/rjs/aosc652/week_01/filename.f
```

Printing

- Black & White printer in corner: instlab
- Color printer in CSS 3408: color

To print a text file to the B & W printer:

metosrv8{rjs} lw /homes/rjs/aosc652/week_01/filename.f

How would we learn more about the enscript command?

Printing

- Black & White printer in corner: instlab
- Color printer in CSS 3408: color

To print a text file to the B & W printer:

metosrv8{rjs} man enscript

How would we learn more about the enscript command?

Printing

- Black & White printer in corner: instlab
- Color printer in CSS 3408: color

To print a text file to the B & W printer:

metosrv8{rjs} man enscript

How would we print an ASCII file on the color printer?

Printing

- Black & White printer in corner: instlab
- Color printer in CSS 3408: color

To print a text file to the color printer:

metosrv8{rjs} enscript –fCourier9 –dcolor filename.f

How would we print an ASCII file on the color printer?

Printing

- Black & White printer in corner: instlab
- Color printer in CSS 3408: color

To print a postscript file to the color printer:

metosrv8{rjs} enscript –fCourier9 –dcolor filename.f

How would we print a postscript file (non-ASCII file) on the color printer?

Printing

- Black & White printer in corner: instlab
- Color printer in CSS 3408: color

To print a postscript file to the color printer:

metosrv8{rjs} lpr –Pcolor filename.ps

– or –

metosrv8{rjs} lpr_color filename.ps

Printing

- Black & White printer in corner: instlab
- Color printer in CSS 3408: color

To print a postscript file to the color printer:

metosrv8{rjs} lpr –Pcolor filename.ps

– or –

metosrv8{rjs} lpr_color filename.ps

How would we learn more about the lpr command?

Printing

- Black & White printer in corner: instlab
- Color printer in CSS 3408: color

To print a postscript file to the color printer:

metosrv8{rjs} man lpr

Printing

- Black & White printer in corner: instlab
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To print a postscript file to the color printer:

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Visit https://www.atmos.umd.edu/~helper to learn more about system resources; tabs on right hand side of page contain useful information such as …

Printing

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Visit https://www.atmos.umd.edu/~helper to learn more about system resources; tabs on right hand side of page contain useful information such as names and locations of printers:

Printer Locations

There are a total of 5 public access printers on the 2nd and 3rd floors of the CSS building and one in Jull Hall.

name	Brand/Type	Locations	hostname
mp1	HP LaserJet P3015 (b/w)	2nd Floor Copy Room (room 2408)	metoprint1.umd.edu
mp2	HP Laserjet 600 M601 (b/w)	Lab 1 (room 3408)	metoprint2.umd.edu
instlab	HP Laserjet 600 M601 (b/w)	Instructional Lab (room 3426)	metoprint9.umd.edu
color	HP Color Laserjet M553	Lab 1 (room 3408)	metoprint6.umd.edu
color2	HP Color Laserjet 4700dn	2nd Floor (room 2408)	metoprint5.umd.edu
jullprint	HP Laserjet 400 M401dne	Student Lounge 3rd Floor Jull Hall	jullprint.umd.edu

Remote Access

- In class environment
  - metosrv8 (this room only)
- Remote access
  - ssh halo-vm.umd.edu (this environment)
  - Can set up a Linux KDE environment if accessing from a Mac
  - Should install UMd Virtual Private Network (VPN) on your remote computer for access to be more functional

    https://umd.service-now.com/cf/kb_find.do?sysparm_search=virtual%20private%20network
  - We'll describe Remote Access in more detail next week
  - **For first 2 weeks of class, students strongly encouraged to complete assignments in this room to gain familiarity with this environment!**

Everyone should have keycard access to this room:
please see June Sherer, CSS 3407, if you do not have access

FORTRAN Rules

- FORTRAN programs are typed in lines of up to ___ characters

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- First ___ lines are reserved for special purposes

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- FORTRAN programs are typed in lines of up to ___ characters
- First ___ lines are reserved for special purposes
- First statement should be PROGRAM statement (not ironclad)
- Last statement should be END statement (ironclad)

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  - HINT: any text that appears after "**!**" is also treated as a comment

  Question: why might you see something like

  x = y+z ! rjs, 160902

  in my FORTRAN code?

FORTRAN Rules

- In which column does the continuation character appear?

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- What does continuation character mean: i.e., ***what utility does it serve?***

FORTRAN Rules

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- What does continuation character mean: i.e., ***what utility does it serve?***
  - Note: although any character can appear in line 6 to denote "continuation", I find it pleasing to always use "+" to denote continuation

Important Programming Concepts

- Object oriented:

  Suppose A is a vector, B is a matrix, and C is a vector

  Can write: A = B * C

  What "provisions" have to be met?

- FORTRAN:

  Must write:

```
dimension a(365,114),b(365),c(114)

do i=1,365
   do j=1,114
         a(i,j)=b(i)*c(j)
   enddo
enddo
```

Important Programming Concepts

- Object oriented:

  Suppose A is a vector, B is a matrix, and C is a vector

  Can write: A = B * C

  What “provisions” have to be met?

- FORTRAN:

  Could also write:

```
      dimension a(nday_max,nyear_max),b(nday_max),
     +          c(nyear_max)
      parameter (nday_max=365,nyear_max=114)

      do i=1,nday_max
         do j=1,nyear_max
            a(i,j)=b(i)*c(j)
         enddo
      enddo
```

Important Programming Concepts

- FORTRAN:

  An expression a mathematician would find non-sensical:

  j = j + 1

  has important meaning and appears throughout our FORTRAN codes

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  For example:

  iyear = iyear + 1

  xlat = xlat + 0.25

FORTRAN Nomenclature

- Files whose names end with **.f** are considered to be FORTRAN source files
  - ASCII file containing FORTRAN commands written according to prescribed syntax
  - The actual FORTRAN code
- Files whose names end with **.o** are taken as object files, and are passed directly to the compiler if compiling is requested.
  - Contains "machine language"
  - See http://en.wikipedia.org/wiki/Object_code for more info
  - If you were a Computer Sciences major, you might be exposed to machine language: not for the "faint of heart"
- Common convention: files whose names end with **.e** are "executable" files
  - Multiple **.o** files can be compiled into a single **.e** executable
  - The actual FORTRAN program
  - See http://en.wikipedia.org/wiki/Executable for more info

FORTRAN Variable Types

- Integer
  - Variable name begins with letter i, j, k, l, m, n
- Floating point
  - Variable name begins with letter a – h or o – z
- Character
  - Variable name can begin with any letter
  - Length must be declared via character statement at top of code:
    - Example: character*80 char_example
- In general, variable names and all of FORTRAN is not case sensitive
  - Exceptions: file names or commands that interact with operating system

FORTRAN Precision

Floating-point

Default is single precision: 32 bits or 4 bytes

FORTRAN default is:

implicit single precision (a-h, o-z) or
implicit real*4 (a-h,o-z)

Can use double precision: 64 bits or 8 bytes

implicit double precision (a-h, o-z) or
implicit real*8 (a-h, o-z)

Note: the statements

double precision x
x = 0.0025

will lead to x being represented as something other than 2.500000000000000E-02 on many compilers

How do we need to alter the statement "x = …" for x to be evaluated as 2.500000000000000E-02 ?

AOSC 652: Analysis Methods in AOSC

Here are the steps that need to be taken to be able to use the Portland F77 compiler.

Be sure the following lines appear in your .cshrc file:

```
set path = ($path /usr/local/pgi-9.0.2/linux86-64/9.0-2/bin)
setenv PGI /usr/local/pgi-9.0.2
setenv LM_LICENSE_FILE $PGI/license.dat
```

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```

Then, create file **.**pgif77 in your home directory containing:

```
pgf77 –c –Msave –Mbounds –traceback $1.f
pgf77 –o $1.e $1.o
```

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Then, create file **.**pgif77 in your home directory containing:

```
pgf77 –c –Msave –Mbounds –traceback $1.f
pgf77 –o $1.e $1.o
```

Finally, add:

```
alias pf '~/.pgif77'
```

to your .aliases file

AOSC 652: Analysis Methods in AOSC

Copy ~rjs/aosc652/week_02/my_first_pgm.f to your work area

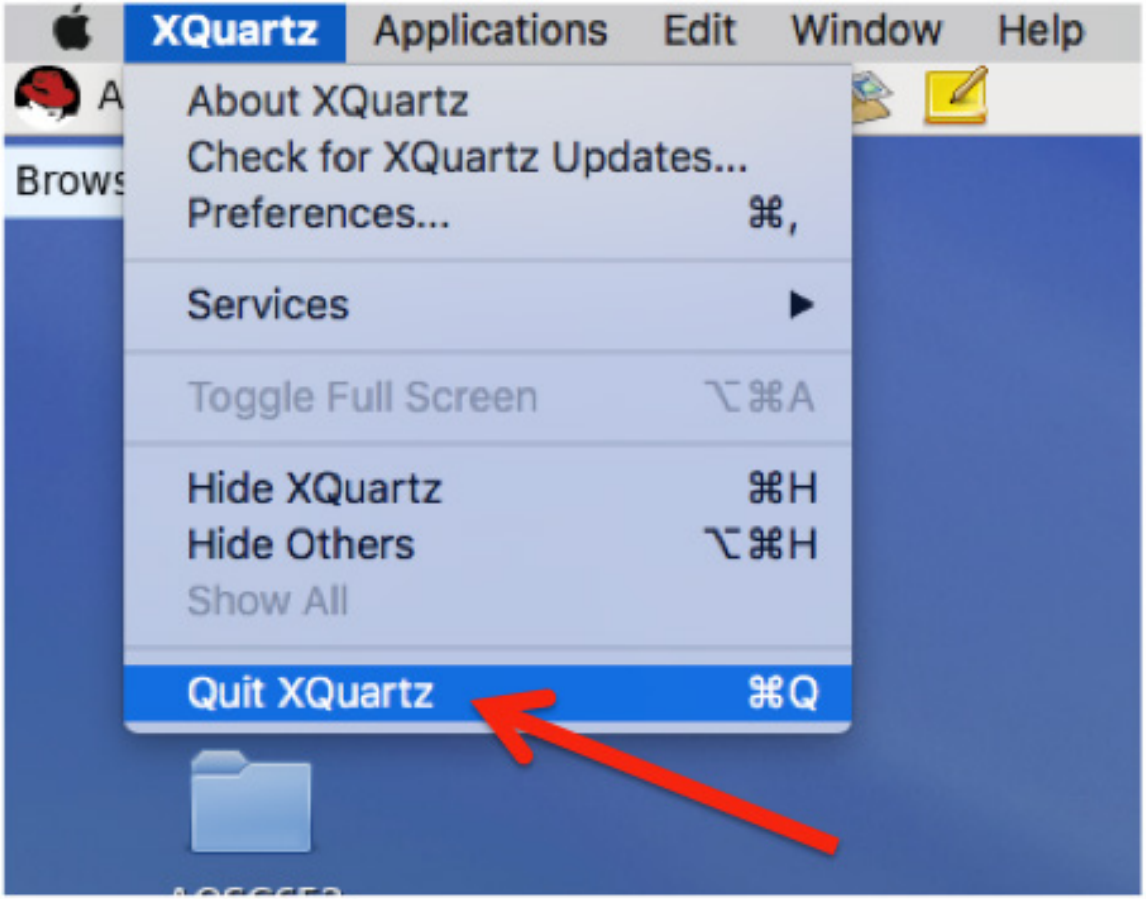
metosrv8{rjs} cp ~rjs/aosc652/week_02/my_first_pgm.f

metosrv8{rjs} pf my_first_pgm

AOSC 652: Logging out Properly Is Important

Log out Steps

1. To log out click the XQuartz on the top menu bar and select “Quit XQuartz”. (If you do not see XQuartz at the top try clicking the Linux wallpaper background on the screen)



AOSC 652: Logging out Properly Is Important

Log out Steps

2. Click the apple in the top left corner and select “Log Out”