# IDL Tutorials

# Day 1

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# What is IDL?

- Interactive Data Language that allows for "easy" manipulation of large datasets
- Many functions and abilities are already defined in a large library.
- Used by
  - ✓NASA
  - ✓Lockheed-Martin
  - ✓Medical imaging
- http://www.rsinc.com/ (IDL only)
- http://idlastro.gsfc.nasa.gov/other_url.html
- http://idlastro.gsfc.nasa.gov/homepage.html
- http://www.astro.washington.edu/deutsch/idl/htmlhelp/index.html
- http://www.ugastro.berkeley.edu/tutorials/tutorials.html
- http://www.lmsal.com/solarsoft/

# General Strategies for Mastering IDL

- Know the problem before you start programming
- Do searches to see if anyone else has already solved a similar problem (See help menu in IDL (> ? ) and xdoc in sswidl)
- DON'T MEMORIZE!!!!!
- Use help screen (Question mark at the command prompt)
- Keep notes on your work
- Test logic in small steps
- Learn by doing

# Using sswidlde and the Help Screens

- SSW stands for Solar Software and allows you access to many data analysis routines that are particular useful to solar physicists
- Calling sswidl or sswidlde from the unix prompt calls IDL with predefined paths to look for programs.
- To manually set paths talk to Alisdair or myself about editing your .idl_startup file or your .cshrc file
- By calling sswidlde you access the IDL developer. This is an "easy" to use graphical interface for writing IDL code. It is not necessary to write IDL code in the developer. Any text editor can be used to write IDL programs
- Help screens are the best feature of IDL (IMHO)

# Quick IDL tour

- Show ssw command interface
- Show sswidlde
  - Command line
  - Variable watch
  - Editor window
- Show help menu example using the HELP procedure
- Use journal,"journal.log" @ beginning and end with journal

# Basic Variable Types

- Strings
  - Text
  - Must be contained within “ ” or ‘ ‘
  - Cannot perform numerical operations
- Integers
  - You should know these by now
  - Often used for indexing
  - Only ranges from –32,768 to 32,767
- Longword integers
  - 64 bit integer
  - X=53l  or X=long(53)
- Floats
  - Most variables used for mathematical operations are of this type
- Double
  - A float with more memory assigned for accuracy

# Assigning a variable a value

- Variable assignment:
  - variable_name=value
    - Will automatically select variable type
  - variable_name=function_name(argument)
  - variable_name=string(value)
  - variable_name=long(value)
  - variable_name=fix(value)
  - variable_name=double(value)

# Naming Variables

- Variable names have to start with a letter
  - 6a="gamma"  a6="gamma"
- Variables cannot have the same name as IDL functions or procedures (Actually, now they can but it's poor form)
  - plot=16d
- Variable names cannot have spaces in them
  - A 6=5  A_6=5
- Some characters are illegal or have special meanings.
  - A@=5  a.b=5 (This is for structures) A+=5  A#=5

# Arrays

- Arrays are variables of any type that contain multiple values
- Array Indexing: IDL arrays start with an index of zero
  - Ex. A=[1, 2, 3, 4]  print, A[0]  1  print, A[1]  2
- Multiple ways to create arrays
  - intarr(), fltarr(), dblarr(), strarr()
  - indgen(), findgen(), dindgen()
  - Look these up using the IDL help
- Array Operations See help menu

# Structures

- Structures are variables that contain multiple variables (Scalars, arrays, or even other structures)
- Each variable contained within a structure is called a tag

Syntax: struct={[struct_type],Tag_Name1: Tag_Value1, ….}

Example:

```
Stars={star_struc,Name:”Alpha Centauri A”, $
      Spec_type:’G2 V’,Coords:[“14 38.0”, “-60 44”], $
      Distance:double(1.31)}
Stars=replicate(stars, 3)
stars.name=[:”Alpha Centauri A”, ”Alpha Centauri B”, $
      ”Alpha Centauri C” ]
print, stars.name
print, stars[0].name
```

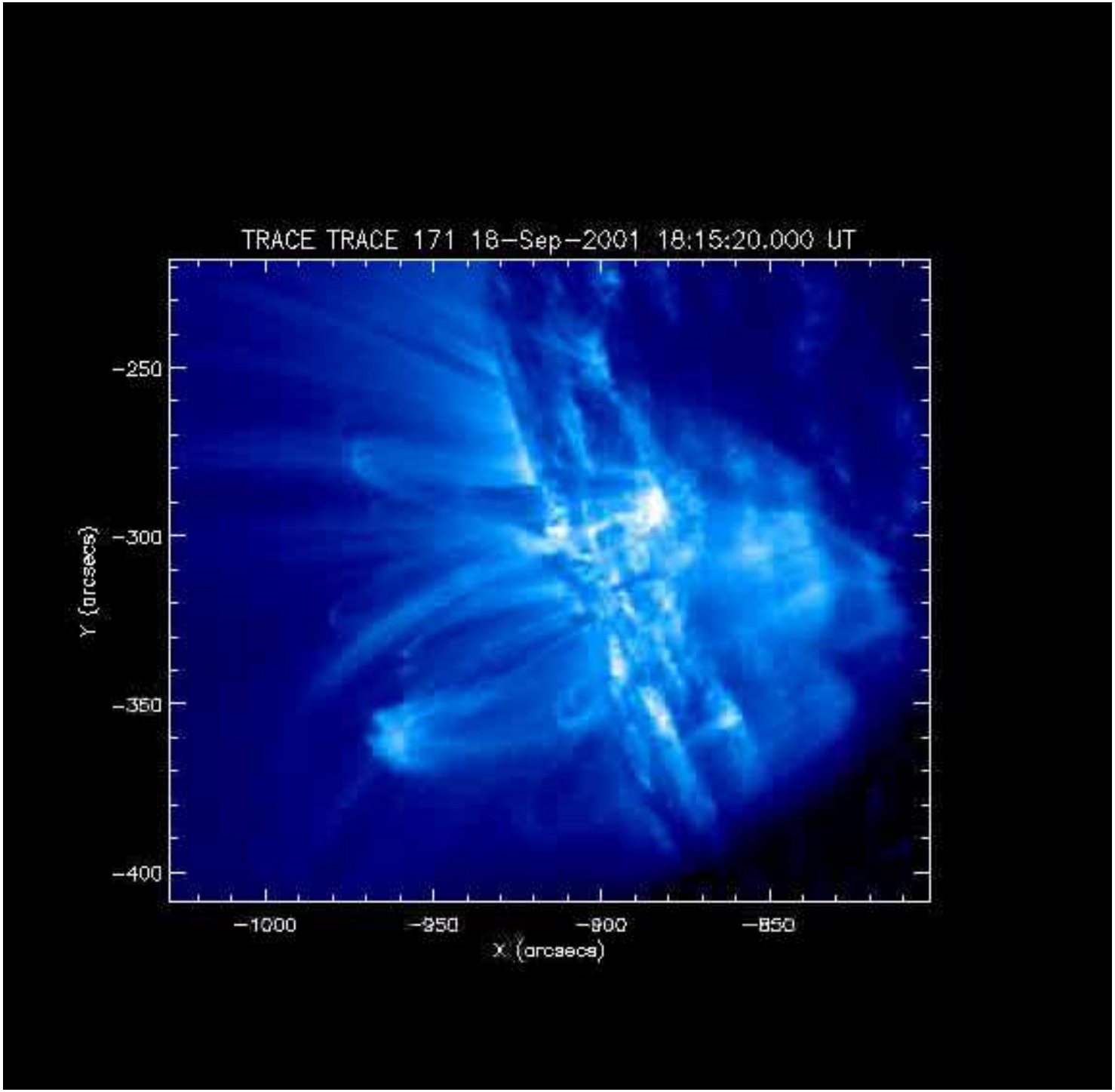
Note: I never name my structure type. I prefer to remain anonymous.

# Last minute items

- ? At the command prompt gives you a help menu
- ; Starts a comment line and is ignored by IDL
- $ Tells IDL to treat the next line as if it is part of the current line
- Help gives you information about variables
- IDL is case and space insensitive.  Unix is not!
- Most math operators work just the way you think they do

  X=5*3-16

  Print,x
- Remember to journal and show class what it did
- Show them WILMA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-250
-300
-350
-400
Y (arcsecs)
-1000
-950
-900
-850
X (arcsecs)