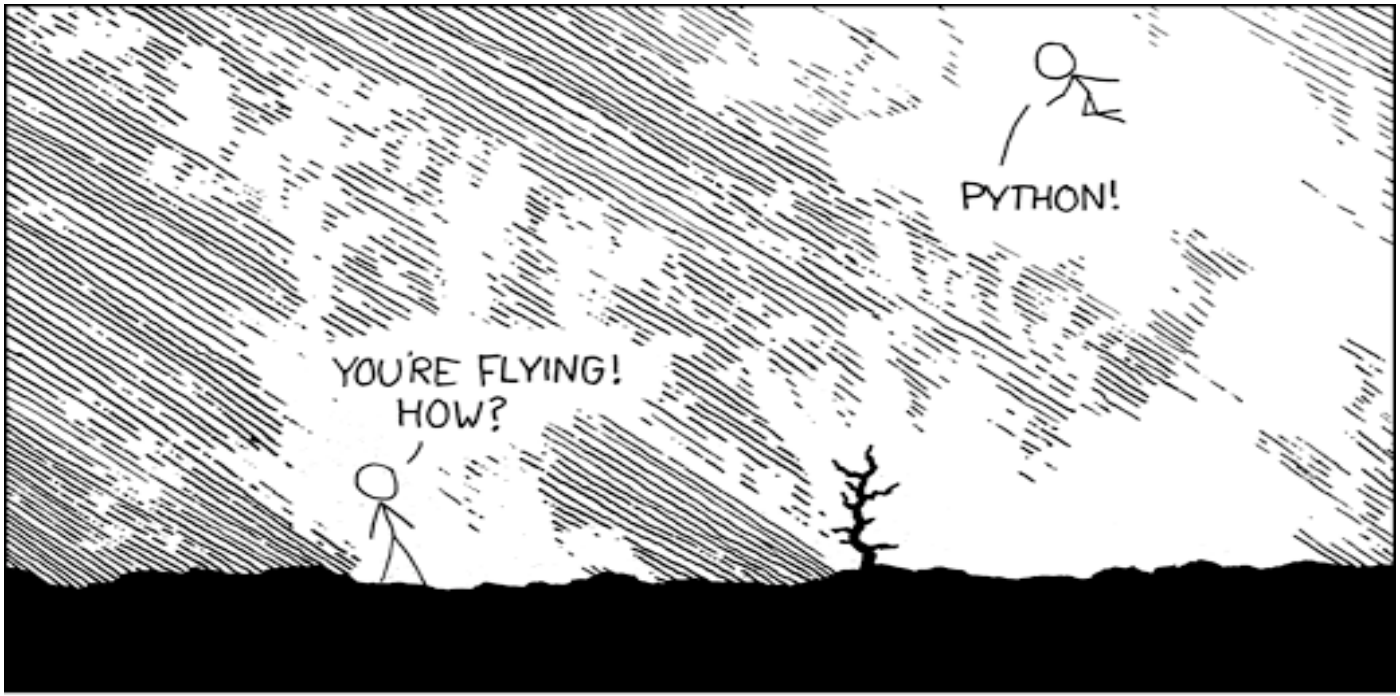
# SIVO-PyD or SSSO-PyD or spd

## A Python Distribution for Scientific Data Analysis

**Jules Kouatchou**

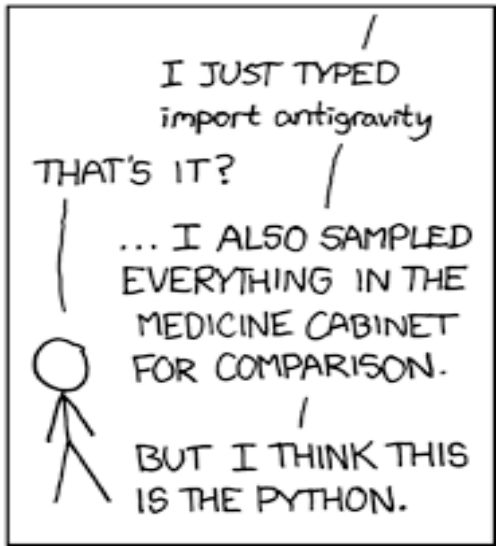
**SSAI - Code 610.3**

Jules.Kouatchou-1@nasa.gov


PYTHON!
YOU'RE FLYING! HOW?


I LEARNED IT LAST NIGHT! EVERYTHING IS SO SIMPLE!
HELLO WORLD IS JUST print "Hello, world!"


I DUNNO... DYNAMIC TYPING? WHITESPACE?
COME JOIN US! PROGRAMMING IS FUN AGAIN! IT'S A WHOLE NEW WORLD UP HERE!
BUT HOW ARE YOU FLYING?


I JUST TYPED import antigravity
THAT'S IT?
... I ALSO SAMPLED EVERYTHING IN THE MEDICINE CABINET FOR COMPARISON.
BUT I THINK THIS IS THE PYTHON.

# Background (1)

- Python is used in industry and academia for a wide variety of purposes
- There are more than 15,000 Python related packages
- Few attempts to regroup some of them in a distribution for scientific computing
- Available products are mainly commercial

# Background (2)

- GMAO adopted Python for model development and data analysis
- Other NCCS users rely on Python
- In 2009, we started the process of creating a Python distribution

# Background (3)

- Parts of the distribution were installed by different staff
- The distribution was static (not possible to change the version of Python for instance)
- Users' requests were not handled in a consistent way

New Approach: **SIVO-PyD**

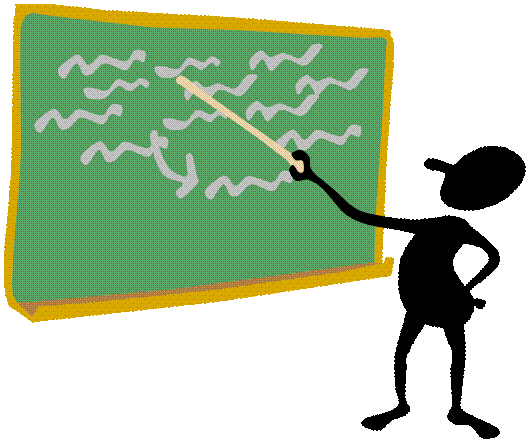
# What is SIVO-PyD?

- Collection of Python packages for scientific computing and visualization
- All the packages are accessible within the Python framework
- Self-contained distribution that mimics the commercial Enthought one.

# Design Philosophy

- Only use open-source packages
- Follows baselibs concepts
- Automatically installed on *discover* and on Mac
- Does not alter source codes
- New packages or new versions of existing ones are added with minimal effort
- Maintainable in a version control repository

# SIVO-PyD Main Packages



| | | |
|---|---|---|
| Python | | |
| Numpy | SciPy | |
| ipython | | |
| pygrads | | |
| pyhdf | h5py | netCDF4 |
| matplotlib | basemap | |

More than 33 packages are part of the distribution

# How to Use the Distribution

The distribution is available to any NCCS user on *discover/dali*.
You only need to load the modules:

**other/comp/gcc-4.5**
**lib/mkl-10.1.2.024**
**other/SIVO-PyD/spd_1.4.0**

other/SIVO-PyD/spd_1.0.0
other/SIVO-PyD/spd_1.1.2
other/SIVO-PyD/spd_1.1.2_un

# New Addition

- We recently built the distribution using ATLAS (instead of Intel MKL)
- We added more functionalities in SciPy
- With ATLAS, the distribution becomes more portable

*other/SIVO-PyD/spdAtlas*

# A Good Alternative

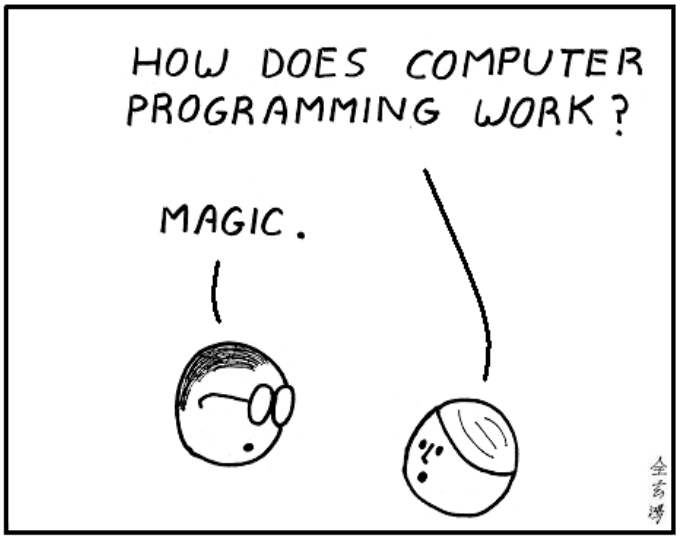
- Start with the free distribution (Python, Numpy, SciPy, Matplotlib) of Enthought


- Added more packages (using eggs file) as needed
- Installation is very quick
- Currently causing system problems

# Under the Hood

The distribution consists on three main components:

1. The source files
2. A GNUmakefile file
3. A set of Python scripts




All of them are kept in a Git repository.

# Source Files

- Directly obtained from the organizations that wrote them.
- Do not perform permanent alteration of any of them.
- Kept in their original form in the repository.

# GNUmakefile File

- Sets up build options for individual packages
- Determines dependencies among packages
- Sets up necessary environment variables
- Provides the structure of the installation directory

# Python Scripts

- Written to perform specific operations on front end source scripts
- Mainly edit files that need additional configuration options.
- Executed in the GNUmakefile file.

# Git Repository

- Easy to manipulate
- Unfortunately became “too large”
- May need to find ways to avoid keeping some of the packages in the repository
- Does not know yet how to use Git to overwrite an existing package with a new version.

# User Community

- Growing community of users: Codes 610.1, 610.3, 663.0, 587.0.
- Distribution is flexible enough to address specific needs.
- Might be asked to diverge from the initial requirements: what to do?
- How to meet individual user's requirements and still maintain SIVO-PyD integrity?

# Things to DO

- Install all the Matplotlib backend dependencies
- Install VTK, Mayavi
- Complete the installation procedures for Mac platform and the Cloud
- Avoid keeping source codes in the repository.

# Extension

Use the same strategy to install packages that have many dependencies:

- NCL
- R
- etc.

# Any Suggestion?

Is there anything you want us to add/remove in the distribution?

# More Information

https://modelingguru.nasa.gov/clearspace/docs/DOC-2109