Bootstrapping an Open Source Library: How MetPy Got Up and Running with Lazy Developers

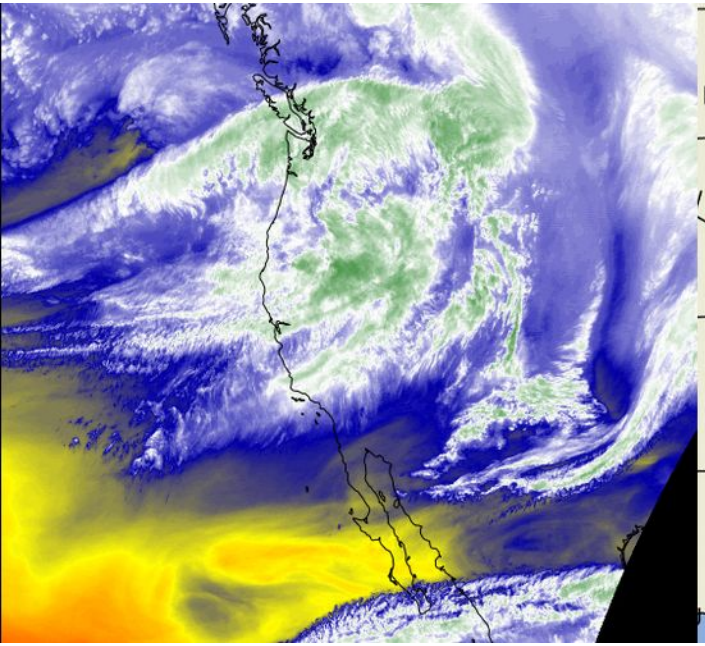
Ryan May

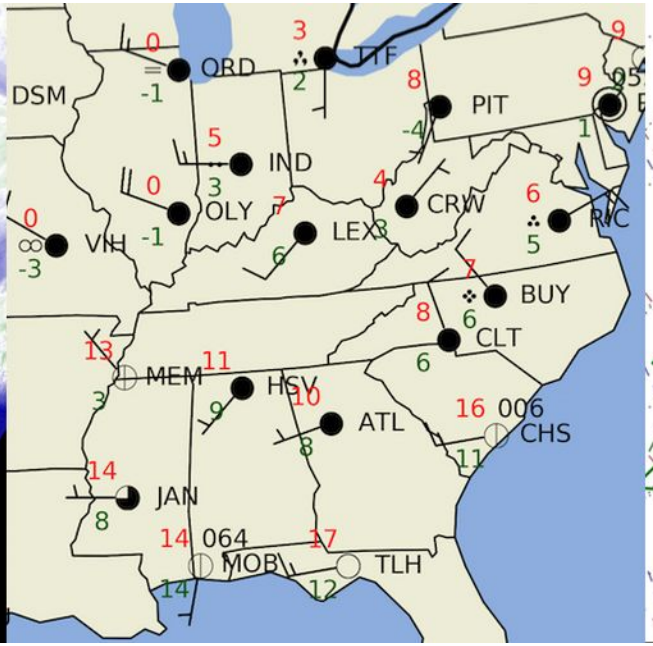
@dopplershift

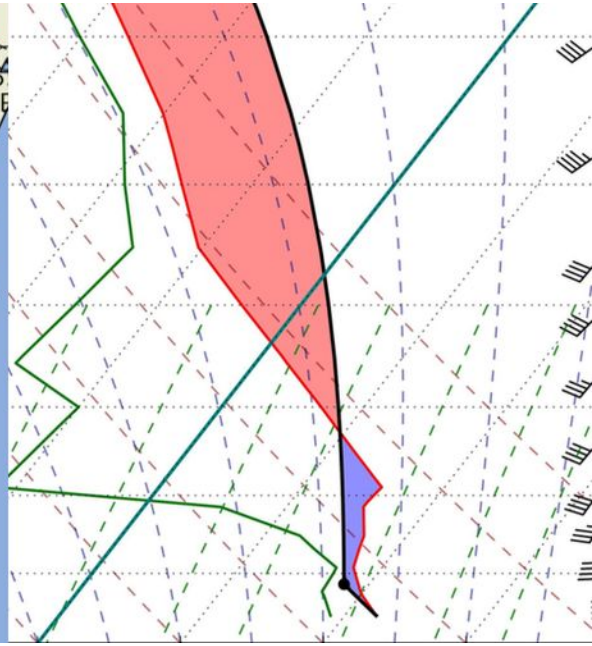
UCAR/Unidata

13 July 2016

What is MetPy?



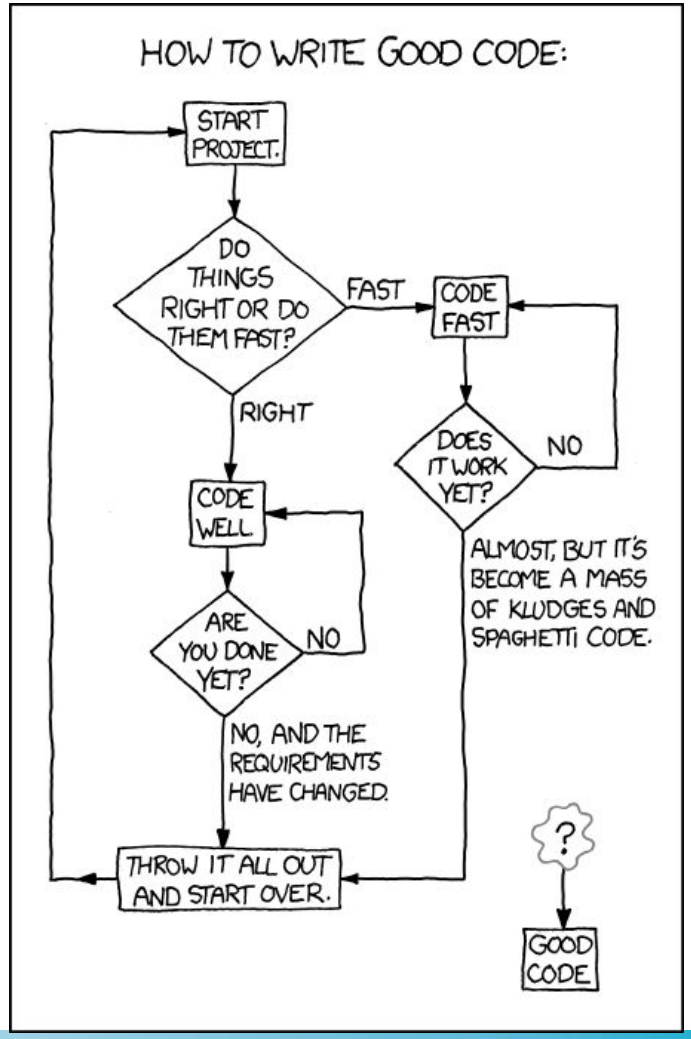




MetPy is a collection of tools for reading, calculating, and plotting meteorology data.

Getting Things Started...

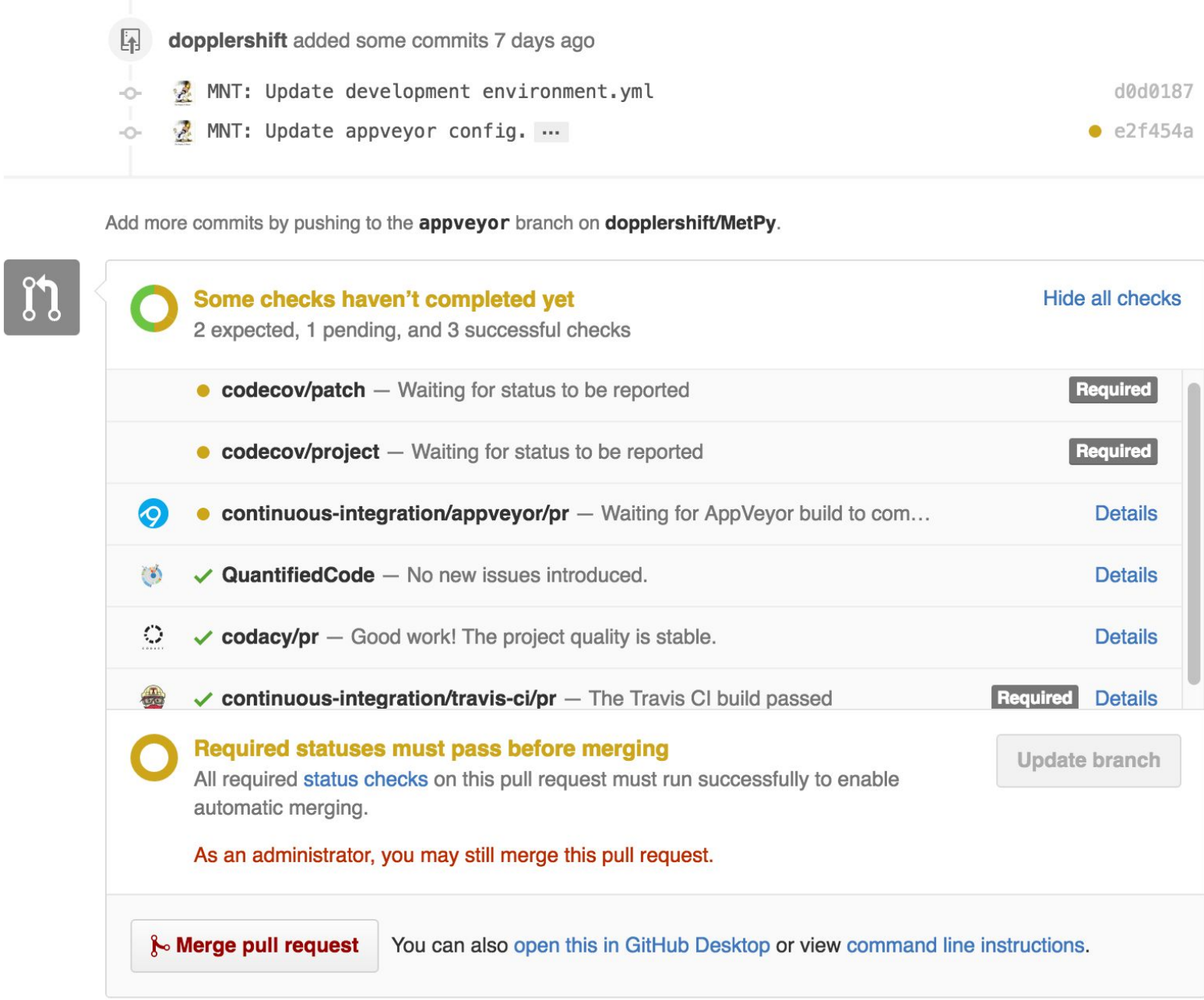
- Resurrecting grad school code with the chance to do things “right”
- Needed to maximize what was achieved for development effort




AUTOMATE
ALL THE THINGS
memegenerator.net

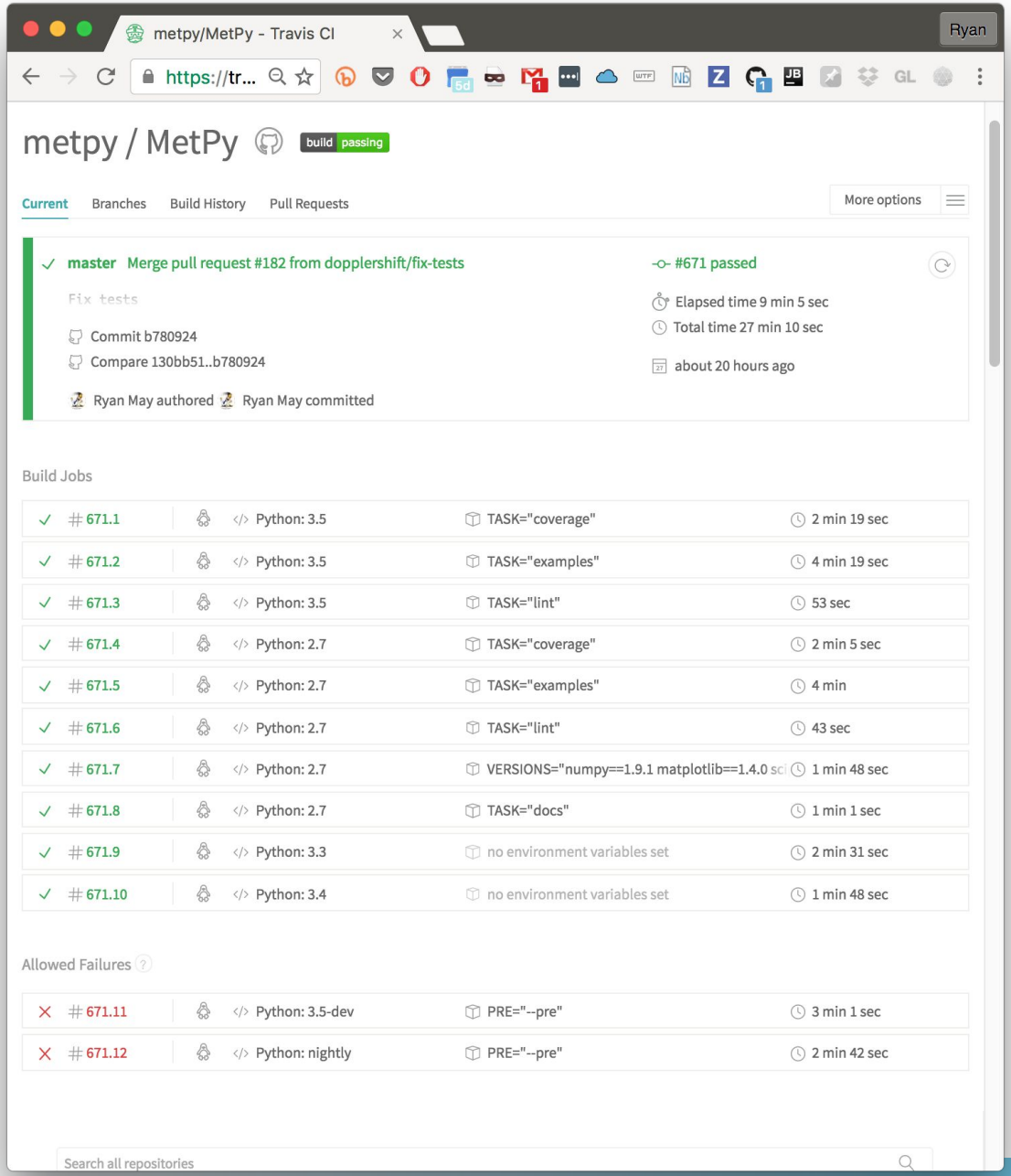
Workflow

- Everything goes through a GitHub Pull Request
- Continuous Integration
  - Tests
  - Consistent style
- Static Analysis
- Documentation rebuilt on merge


dopplershift added some commits 7 days ago
MNT: Update development environment.yml
d0d0187
MNT: Update appveyor config. ...
e2f454a
Add more commits by pushing to the appveyor branch on dopplershift/MetPy.
Some checks haven't completed yet
2 expected, 1 pending, and 3 successful checks
Hide all checks
codecov/patch — Waiting for status to be reported
Required
codecov/project — Waiting for status to be reported
Required
continuous-integration/appveyor/pr — Waiting for AppVeyor build to com…
Details
QuantifiedCode — No new issues introduced.
Details
codacy/pr — Good work! The project quality is stable.
Details
continuous-integration/travis-ci/pr — The Travis CI build passed
Required
Details
Required statuses must pass before merging
All required status checks on this pull request must run successfully to enable automatic merging.
Update branch
As an administrator, you may still merge this pull request.
Merge pull request
You can also open this in GitHub Desktop or view command line instructions.

Continuous Integration

- New code continuously checked
- Travis CI
  - Linux 64-bit
  - Possible for OS X
  - Built in support for multiple Python versions
- AppVeyor
  - Windows 32- and 64-bit
- Really useful for the automation of pretty much anything

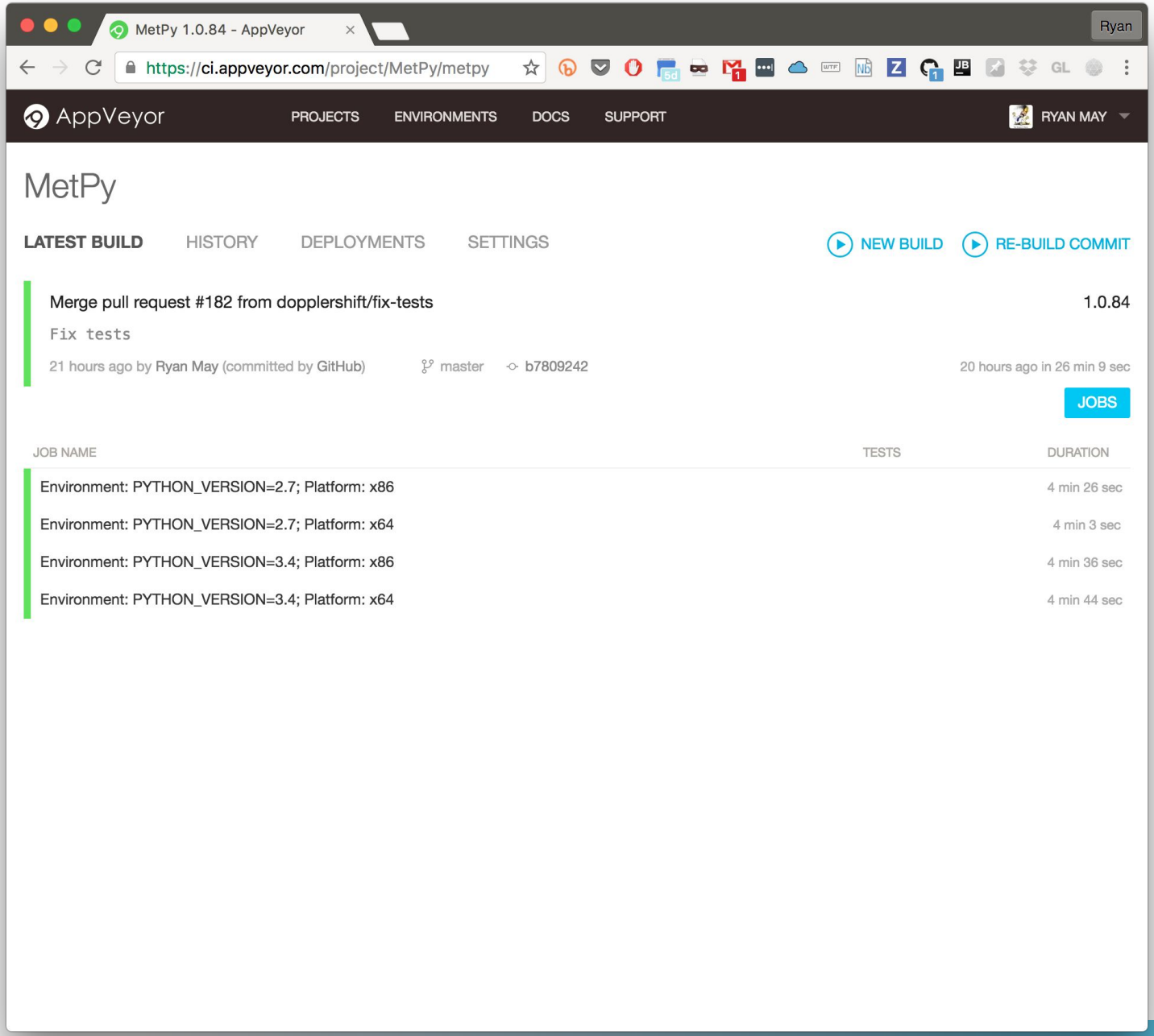

metpy/MetPy - Travis CI
Ryan
https://tr...
metpy / MetPy
build passing
Current
Branches
Build History
Pull Requests
More options
master Merge pull request #182 from dopplershift/fix-tests
Fix tests
Commit b780924
Compare 130bb51..b780924
Ryan May authored Ryan May committed
#671 passed
Elapsed time 9 min 5 sec
Total time 27 min 10 sec
about 20 hours ago
Build Jobs
671.1 Python: 3.5 TASK="coverage" 2 min 19 sec
671.2 Python: 3.5 TASK="examples" 4 min 19 sec
671.3 Python: 3.5 TASK="lint" 53 sec
671.4 Python: 2.7 TASK="coverage" 2 min 5 sec
671.5 Python: 2.7 TASK="examples" 4 min
671.6 Python: 2.7 TASK="lint" 43 sec
671.7 Python: 2.7 VERSIONS="numpy==1.9.1 matplotlib==1.4.0 sc 1 min 48 sec
671.8 Python: 2.7 TASK="docs" 1 min 1 sec
671.9 Python: 3.3 no environment variables set 2 min 31 sec
671.10 Python: 3.4 no environment variables set 1 min 48 sec
Allowed Failures
671.11 Python: 3.5-dev PRE="--pre" 3 min 1 sec
671.12 Python: nightly PRE="--pre" 2 min 42 sec
Search all repositories

Build Jobs

✓	#671.1	Python: 3.5	TASK="coverage"	2 min 19 sec
✓	#671.2	Python: 3.5	TASK="examples"	4 min 19 sec
✓	#671.3	Python: 3.5	TASK="lint"	53 sec
✓	#671.4	Python: 2.7	TASK="coverage"	2 min 5 sec
✓	#671.5	Python: 2.7	TASK="examples"	4 min
✓	#671.6	Python: 2.7	TASK="lint"	43 sec
✓	#671.7	Python: 2.7	VERSIONS="numpy==1.9.1 matplotlib==1.4.0 s	1 min 48 sec
✓	#671.8	Python: 2.7	TASK="docs"	1 min 1 sec
✓	#671.9	Python: 3.3	no environment variables set	2 min 31 sec
✓	#671.10	Python: 3.4	no environment variables set	1 min 48 sec

Allowed Failures ?

✗	#671.11	Python: 3.5-dev	PRE="--pre"	3 min 1 sec
✗	#671.12	Python: nightly	PRE="--pre"	2 min 42 sec


MetPy 1.0.84 - AppVeyor
Ryan
https://ci.appveyor.com/project/MetPy/metpy
AppVeyor
PROJECTS
ENVIRONMENTS
DOCS
SUPPORT
RYAN MAY
MetPy
LATEST BUILD
HISTORY
DEPLOYMENTS
SETTINGS
NEW BUILD
RE-BUILD COMMIT
Merge pull request #182 from dopplershift/fix-tests
1.0.84
Fix tests
21 hours ago by Ryan May (committed by GitHub)
master
b7809242
20 hours ago in 26 min 9 sec
JOBS
JOB NAME
TESTS
DURATION
Environment: PYTHON_VERSION=2.7; Platform: x86
4 min 26 sec
Environment: PYTHON_VERSION=2.7; Platform: x64
4 min 3 sec
Environment: PYTHON_VERSION=3.4; Platform: x86
4 min 36 sec
Environment: PYTHON_VERSION=3.4; Platform: x64
4 min 44 sec

Tests

- pytest
- Codecov.io: 94% coverage
- Run example notebooks with `nbconvert`
- pytest-mpl for image comparison tests (for plots)
- Run on Python 2.7, 3.3, 3.4, 3.5, and with minimum dependencies
- Travis “nightly” Python versions

Dashboard · metpy/MetPy

Ryan

https://codecov.io/gh/metpy/MetPy

Merge pull request #182 from dopplershift/fix-tests

master at 94.09%

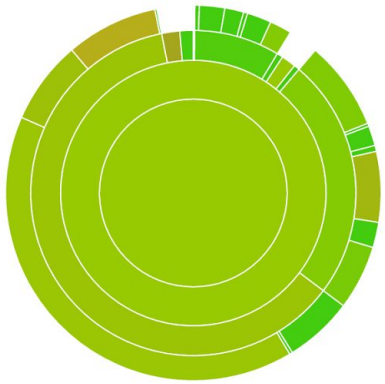
Fix tests

dopplershift 21 hours ago

b780924 master

Overview | Commits | Branches | Pulls | Compare | Settings

COVERAGE SUNBURST



RECENT COMMITS

Merge pull request #182 from dopplershift/fix-tests
dopplershift 21 hours ago master b780924

Added newline to end of file.
ahaberlie 21 hours ago #185 b8b9061

MNT: NumPy 1.9.0 -> 1.9.1
dopplershift 21 hours ago master 4c12301

MNT: Disable running examples on AppVeyor
dopplershift a day ago master 6345f2d

Merge pull request #173 from kpozsonyi/geo
dopplershift a day ago master 130bb51

Fix 180 degree offset in wind direction calculation
deeplycloudy 6 days ago #179 556b328

View all recent commits

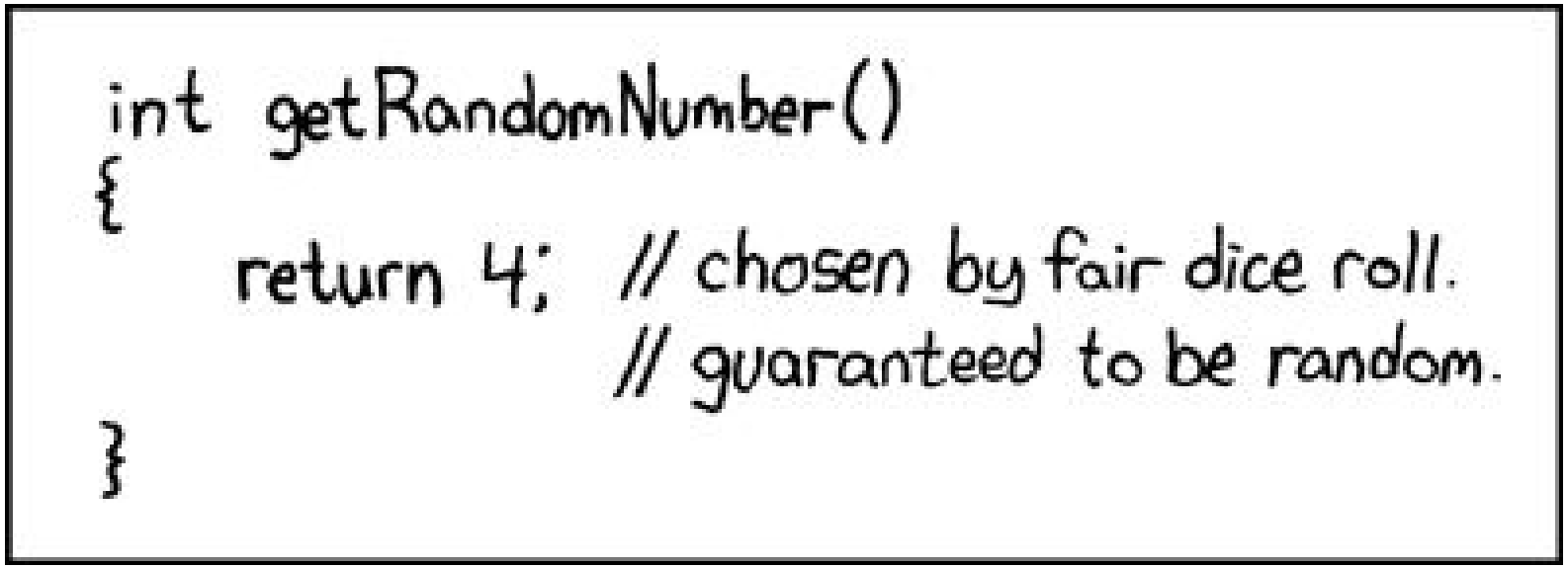
FILES

Files	•	•	•	•	Coverage
metpy	2,337	2,199	0	138	94.09%
Project Totals (26 files)	2,337	2,199	0	138	94.09%

unidata

UCAR

Code keeps working...what about documentation?



Documentation

- Sphinx used to build docs
- Read The Docs
  - Automatically builds on every commit to master
  - Keeps links for “stable” versions
  - http://metpy.rtfd.org
- Test run on Travis

MetPy — MetPy 0.3.1+10.gb7

Ryan

https://metpy.readthedocs.io/en/latest/

MetPy

latest

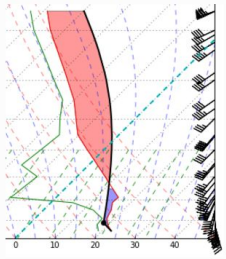
Search docs

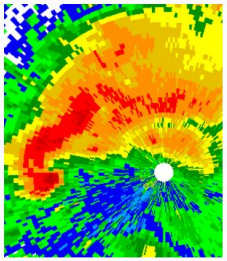
- Installation Guide
- Unit Support
- MetPy Examples
- The MetPy API
- Developer's Guide

Read the Docs v: latest

Docs » MetPy

Edit on GitHub





MetPy

MetPy is a collection of tools in Python for reading, visualizing, and performing calculations with weather data.

MetPy is still in an early stage of development, and as such **no APIs are considered stable.** While we won't break things just for fun, many things may still change as we work through design issues.

We support Python 2.7 as well as Python >= 3.3.

Documentation

- Installation Guide
- Unit Support
- MetPy Examples
- The MetPy API
- Developer's Guide

Contact Us

- For questions and discussion about MetPy, join Unidata's python-users mailing list
- The source code is available on GitHub
- Bug reports and feature requests should be directed to the GitHub issue tracker

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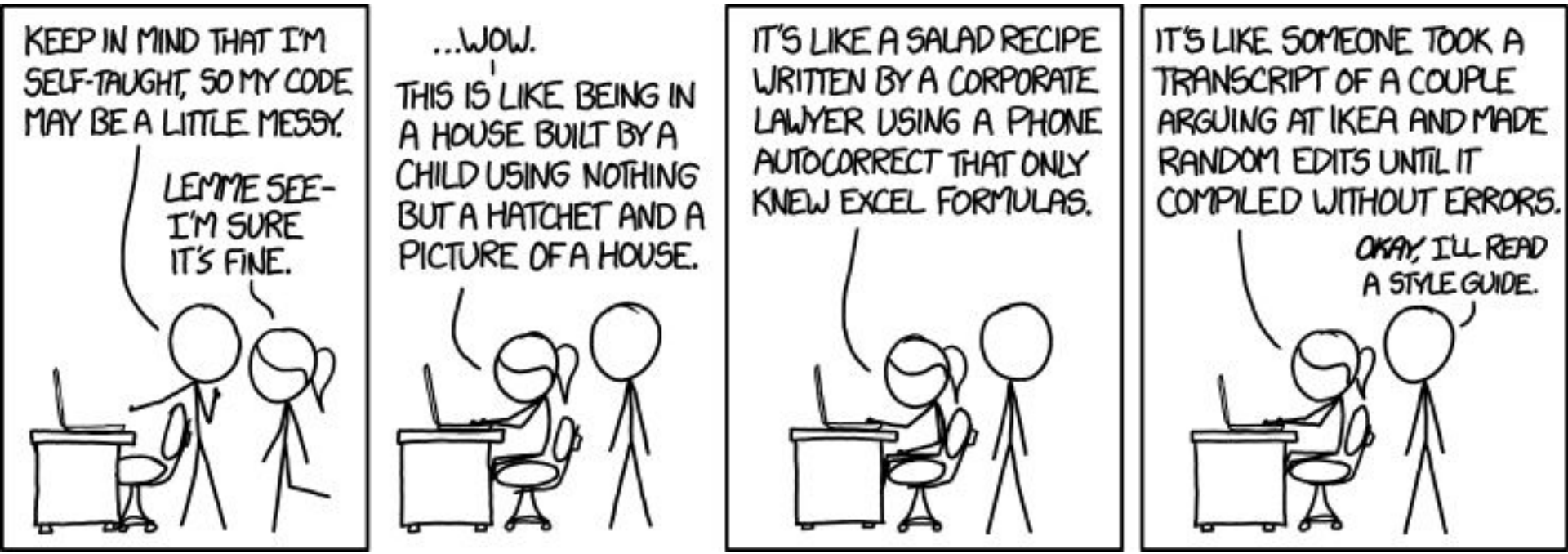
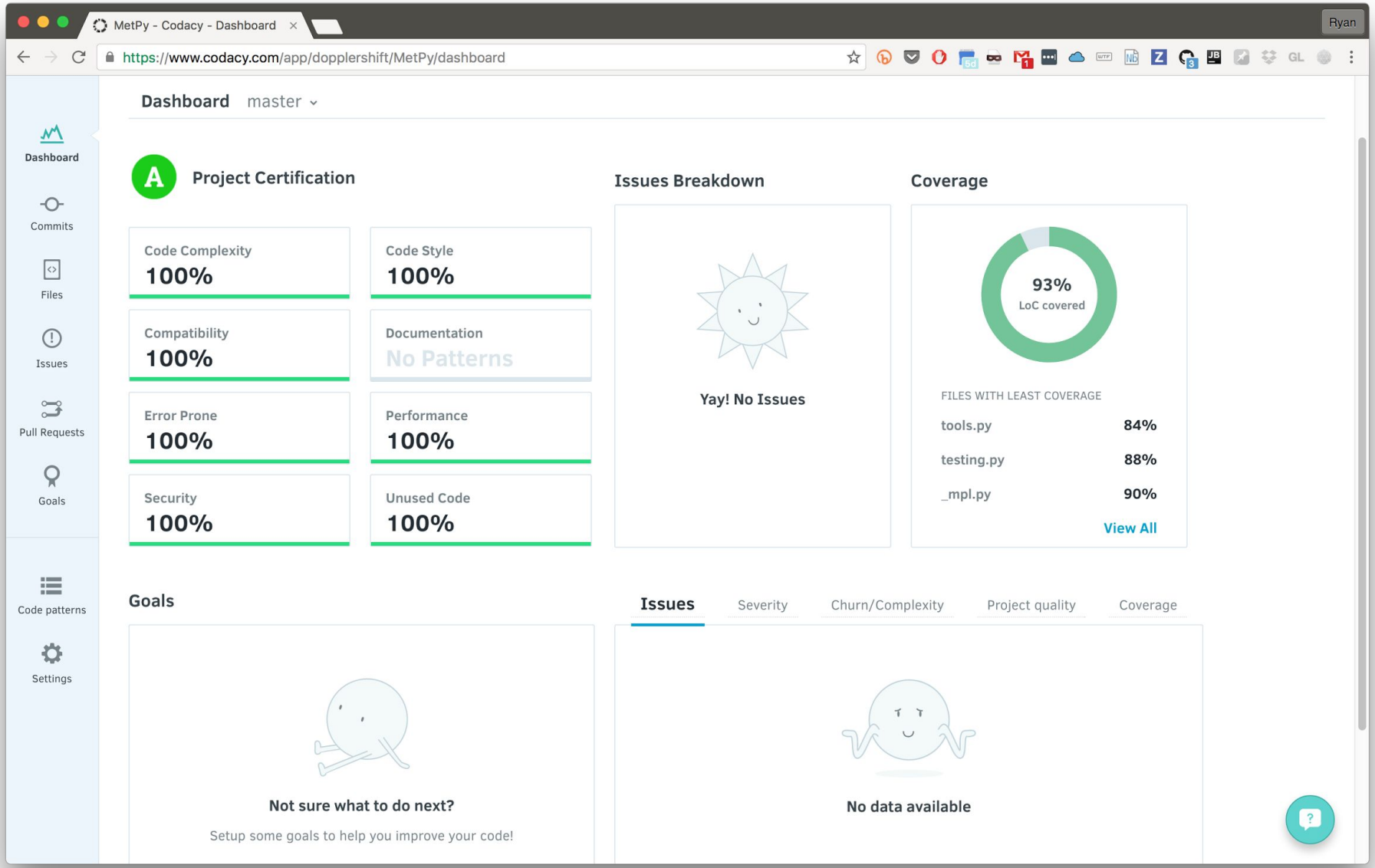
UCAR

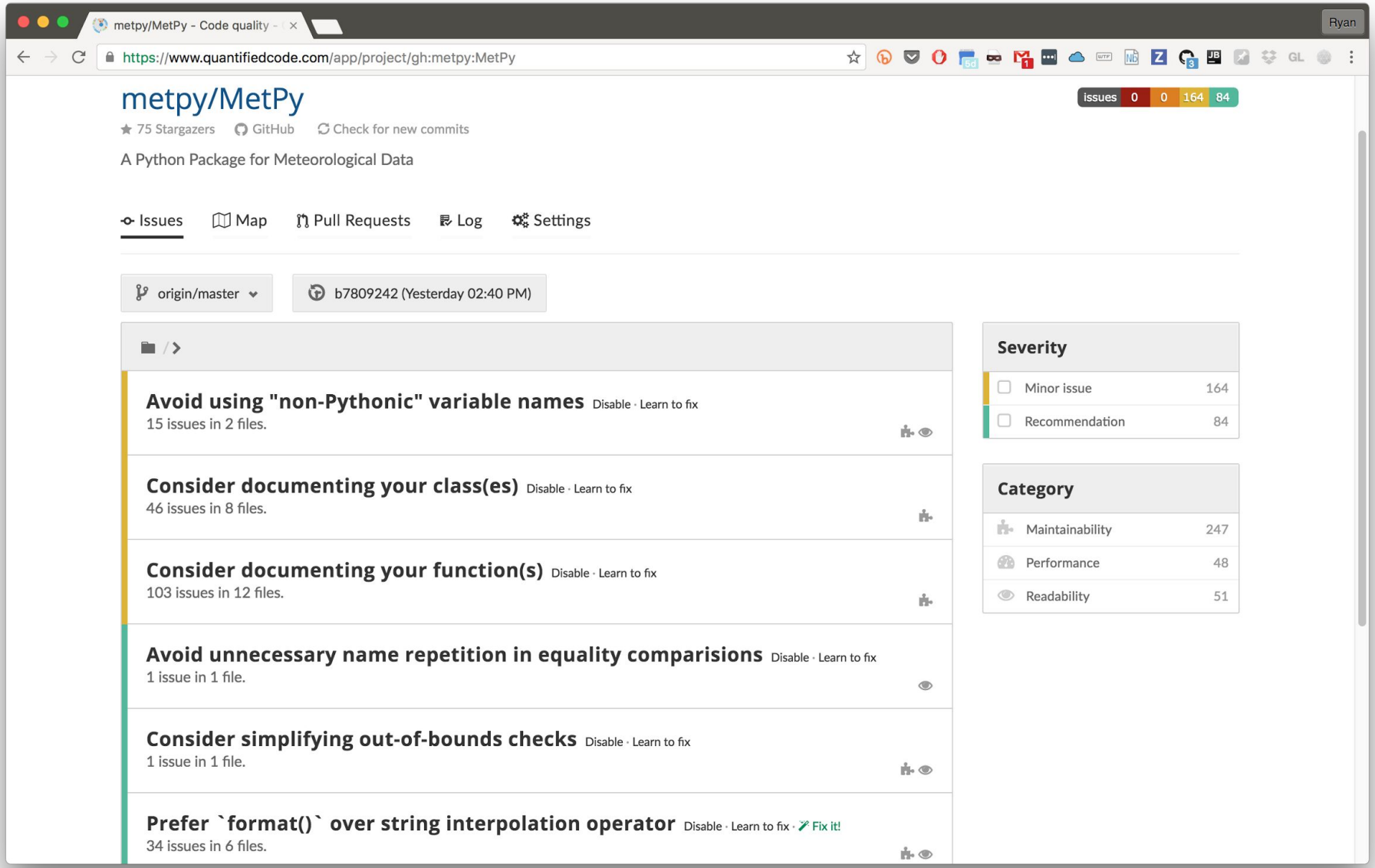
But does the code stay ….. ” good”?



Code "Quality" and Consistency

- Web services for Python static analysis
  - Quantified Code
  - Codacy
- flake8 run on Travis as well
  - PEP-8 is annoying...but far less annoying than inconsistent code
- Not exhaustive--catches some things


MetPy - Codacy - Dashboard
Ryan
https://www.codacy.com/app/dopplershift/MetPy/dashboard
Dashboard
master
Dashboard
Commits
Files
Issues
Pull Requests
Goals
Code patterns
Settings
A
Project Certification
Code Complexity
100%
Code Style
100%
Compatibility
100%
Documentation
No Patterns
Error Prone
100%
Performance
100%
Security
100%
Unused Code
100%
Issues Breakdown
Yay! No Issues
Coverage
93%
LoC covered
FILES WITH LEAST COVERAGE
tools.py 84%
testing.py 88%
_mpl.py 90%
View All
Goals
Not sure what to do next?
Setup some goals to help you improve your code!
Issues
Severity
Churn/Complexity
Project quality
Coverage
No data available


metpy/MetPy - Code quality -
Ryan
https://www.quantifiedcode.com/app/project/gh:metpy:MetPy
metpy/MetPy
issues 0 0 164 84
75 Stargazers
GitHub
Check for new commits
A Python Package for Meteorological Data
Issues
Map
Pull Requests
Log
Settings
origin/master
b7809242 (Yesterday 02:40 PM)
Avoid using "non-Pythonic" variable names Disable · Learn to fix
15 issues in 2 files.
Consider documenting your class(es) Disable · Learn to fix
46 issues in 8 files.
Consider documenting your function(s) Disable · Learn to fix
103 issues in 12 files.
Avoid unnecessary name repetition in equality comparisions Disable · Learn to fix
1 issue in 1 file.
Consider simplifying out-of-bounds checks Disable · Learn to fix
1 issue in 1 file.
Prefer `format()` over string interpolation operator Disable · Learn to fix · Fix it!
34 issues in 6 files.
Severity
Minor issue 164
Recommendation 84
Category
Maintainability 247
Performance 48
Readability 51

Releases

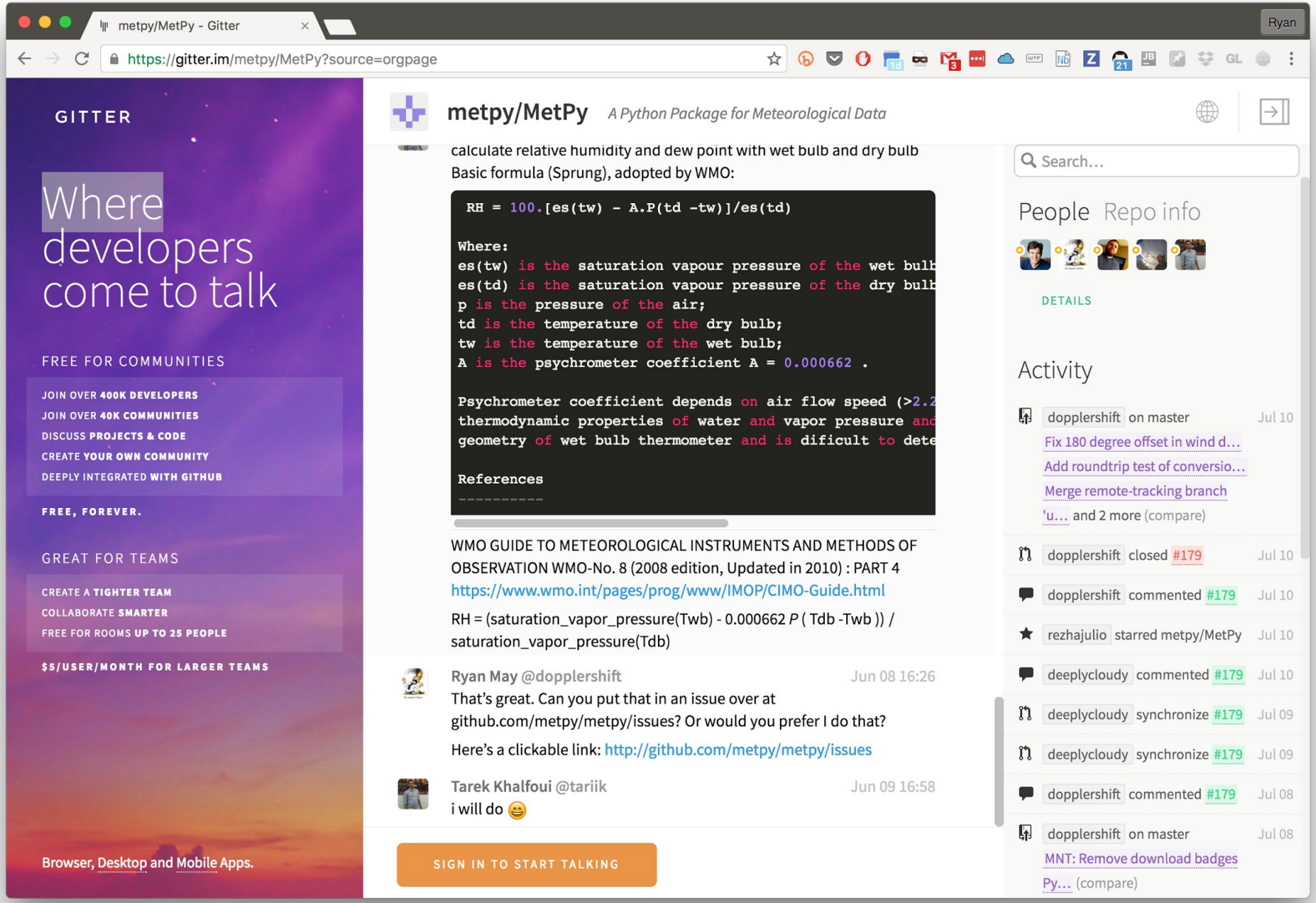
- Versioneer used to automatically determine version from git
- GitHub used to create new release
  - Git tag
  - Release notes
- Travis builds and deploys from tag to PyPI
  - Source package
  - Wheels

Conda Packages

- Conda-forge used for automatic conda packages
- Conda recipe maintained in its own repo
- Platforms
  - osx
  - win32/64
  - linux64

What about people?

- Gitter.im
  - IRC-like chat room tied into GitHub
  - Good for real-time communications
  - Rooms associated with repositories
- Twitter
  - @metpy
  - Release announcements
  - Showing off examples


metpy/MetPy - Gitter
Ryan
https://gitter.im/metpy/MetPy?source=orgpage
GITTER
Where developers come to talk
FREE FOR COMMUNITIES
JOIN OVER 400K DEVELOPERS
JOIN OVER 40K COMMUNITIES
DISCUSS PROJECTS & CODE
CREATE YOUR OWN COMMUNITY
DEEPLY INTEGRATED WITH GITHUB
FREE, FOREVER.
GREAT FOR TEAMS
CREATE A TIGHTER TEAM
COLLABORATE SMARTER
FREE FOR ROOMS UP TO 25 PEOPLE
$5/USER/MONTH FOR LARGER TEAMS
Browser, Desktop and Mobile Apps.
metpy/MetPy
A Python Package for Meteorological Data
calculate relative humidity and dew point with wet bulb and dry bulb
Basic formula (Sprung), adopted by WMO:
RH = 100.[es(tw) - A.P(td -tw)]/es(td)
Where:
es(tw) is the saturation vapour pressure of the wet bulb
es(td) is the saturation vapour pressure of the dry bulb
p is the pressure of the air;
td is the temperature of the dry bulb;
tw is the temperature of the wet bulb;
A is the psychrometer coefficient A = 0.000662 .
Psychrometer coefficient depends on air flow speed (>2.2
thermodynamic properties of water and vapor pressure and
geometry of wet bulb thermometer and is dificult to dete
References
WMO GUIDE TO METEOROLOGICAL INSTRUMENTS AND METHODS OF OBSERVATION WMO-No. 8 (2008 edition, Updated in 2010) : PART 4
https://www.wmo.int/pages/prog/www/IMOP/CIMO-Guide.html
RH = (saturation_vapor_pressure(Twb) - 0.000662 P (Tdb -Twb)) / saturation_vapor_pressure(Tdb)
Ryan May @dopplershift Jun 08 16:26
That's great. Can you put that in an issue over at github.com/metpy/metpy/issues? Or would you prefer I do that?
Here's a clickable link: http://github.com/metpy/metpy/issues
Tarek Khalfoui @tariik Jun 09 16:58
i will do
SIGN IN TO START TALKING
Search...
People Repo info
DETAILS
Activity
dopplershift on master Jul 10
Fix 180 degree offset in wind d...
Add roundtrip test of conversio...
Merge remote-tracking branch 'u... and 2 more (compare)
dopplershift closed #179 Jul 10
dopplershift commented #179 Jul 10
rezhajulio starred metpy/MetPy Jul 10
deeplycloudy commented #179 Jul 10
deeplycloudy synchronize #179 Jul 09
deeplycloudy synchronize #179 Jul 09
dopplershift commented #179 Jul 08
dopplershift on master Jul 08
MNT: Remove download badges Py... (compare)

Has this worked?

- Automated checks are very freeing
- Sanity check my own development
- Documentation “good” and up to date
- Maintaining the automation is not free
- Checks prompt contributors to improve their code
- I really hate PEP-8

Useful Resources

- http://travis-ci.org
- http://readthedocs.io
- http://appveyor.com
- http://codecov.io
- http://quantifiedcode.com
- http://codacy.com

Interested in working on MetPy? Unidata is hiring a Scientific Python Developer: http://ucarcareers.silkroad.com