
Title:
NASA science centers need to support and lead open source development or become obsolete

Authors:
T. Jaffe, T. Barclay, and P. Boyd, TESS Science Support Center¹, NASA/GSFC

Summary:
The scientific community is already adopting an open source model and reaping major rewards such as faster results and closer collaborations. If NASA does not join and lead, we will be left behind, and the science will suffer. The current rules restrict our ability to collaborate, and should be revised.

Background:
The astronomical community is increasingly relying on open source software development for scientific data analysis. For example:

- The astronomy python package astropy² is widely used and has over 200 contributors working together since 2011. NASA should be able to contribute and even lead parts of this development relevant to its space-based missions.
- The STScI maintains its own project³ for open source tools and utilities for HST and JWST data analysis with 15 community contributors.
- The JWST calibration pipeline⁴ is on GitHub and has 20 contributors working actively together for over two years on software run at STScI.
- The Open MCT project⁵ is an example of a successful open source collaboration from NASA Ames (that cannot be replicated at other centers due to restrictions).

The Guest Observer office of the Kepler/K2 mission maintains a software repository⁶ that is licensed and citable. They encourage community input and pull in changes suggested by external scientists. This has enabled them to rapidly develop software and documentation that encouraged strong collaborative links between the mission team and the community.

¹ https://heasarc.gsfc.nasa.gov/docs/tess/
² https://github.com/astropy/astropy
³ http://astroconda.readthedocs.io/en/latest/
⁴ https://github.com/STScI-JWST/jwst
⁵ https://nasa.github.io/openmct/
⁶ https://github.com/KeplerGO/
The soon-to-be-launched TESS project is already jump-starting its open source development of scientific analysis software outside of NASA\(^7\). Obviously, we’d like to help lead this effort to ensure interoperability of tools and data for the maximum scientific exploitation. An open source approach would lead to errors being identified and corrected more quickly.

The current policy requires NASA teams to go through an onerous approval process before releasing code to the community. (See contributed white paper by J. Rigby.) It was developed for a time when such active open source collaboration was not feasible. It is the opposite of an open source requirement. The policy was undoubtedly developed for a different context in which it may well be needed, but no exceptions have been defined for scientific collaboration, where it clearly is not appropriate. This process takes months to complete and therefore places us significantly behind the times in the fast moving research world.

Further legal hurdles make it impossible for GSFC scientists to lead the collaborative development efforts that made projects like Kepler and K2 so successful. For the MCT project, the legal team at Ames drew up a Contributor License Agreement\(^8\), but there is no such document for NASA as a whole or for GSFC, where many astrophysics missions are supported, including the TESS project. If the NASA experts on TESS cannot contribute to or even guide the community software effort, the results will obviously suffer.

**Recommendation:** We do not comment on the idea of a *mandatory* open source policy. But a step toward a more agile open source development policy is already urgently needed at NASA.

The status quo will lead to the NASA science support centers becoming obsolete as the community looks to other, more nimble and more collaborative, sources for their data analysis needs. Collaborative platforms like GitHub are used extensively, precisely because the community can instantly and efficiently share and reuse their own codes. If we cannot join this open source community and respond quickly to the community’s needs, then we will have no ability to vet or improve the analysis tools being shared. This will undoubtedly lead to problems that could be avoided by allowing the NASA experts to lead rather than passively observe the collaborative segment of their scientific community. We need a policy change to allow NASA to leverage its own and the community’s expertise together for the best possible science.

\(^7\) [http://tess.ninja/](http://tess.ninja/)

\(^8\) [https://nasa.github.io/openmct/contributing/ind-cla-open-mct.pdf](https://nasa.github.io/openmct/contributing/ind-cla-open-mct.pdf)