

## **Response to the Request for Information: NASA Public Access Plan for Increasing Access to the Results of NASA-Supported Research.**

This response is related to the following key issue called out by the RFI:

*5. Suggestions on sharing and archiving of software. Sites like GitHub and Zenodo offer ways to distribute and manage software. NASA is seeking suggestions on improving the archiving, sharing, and maintenance of software for reuse.*

I am writing as one of several core developers of a widely-used planetary atmospheric numerical model, [planetWRF](#), which is a modification of the widely-used Earth-based [WRF](#) model and has been applied to global, mesoscale, and Large Eddy Simulation of the atmospheres of Mars, Titan, Venus, Pluto, paleo Earth, and Uranus.

**We have major concerns that the new NASA public access requirements place a large burden on us that we may be expected to meet without sufficient additional funding being available.**

**IN SHORT: It seems that NASA is requiring us to make the code public if we receive funding for research involving it, but is only giving us the opportunity to get funded to do it properly.**

**THE PROBLEM:** There is clearly a huge difference between making public a few lines of python code used for some simple diagnostics calculations, and making public a complex atmospheric numerical model consisting of tens or hundreds of thousands of lines of code.

**Four key requirements for usefully and valuably making publicly available a large software package (e.g., a complex atmospheric model such as planetWRF) are detailed below:**

### **1. Documentation and verification products for running planetWRF:**

Documentation for understanding and using a simple diagnostics code might be a single paragraph. However, documentation for a code such as planetWRF involves:

- (i) Describing how to obtain and install the code (which consists of hundreds of subroutines) on different systems;
- (ii) Describing the numerous planetary-specific routines within the code, which are not part of the original Earth-based WRF release.
- (iii) Describing how to set up the code for multiple applications (e.g., global Mars, global Titan, nested mesoscale Mars, Large Eddy Simulation, and so on), which includes providing setup/initialization files (“namelists”) and data files (e.g. surface conditions such as topography, albedo, etc.) for each application;
- (iv) Providing examples of how the output should appear for each application provided with the model release, so that users can verify they have installed things properly.

### **2. Process of making the planetWRF code (and subsequent updates) public:**

The original WRF model is publicly available via github, an effort that is government funded via NCAR and supported by many salaried NCAR employees dedicated to finding and incorporating

bug fixes and improvements, testing updates to make sure no inadvertent new bugs have been introduced, and updating the github WRF releases along with full documentation of changes.

By comparison, the planetWRF developers are funded only to do science research using the model. This sometimes comes with explicit funding for model *development*, but to date there has been zero provision for the more tedious and time-consuming process of testing updates, documenting changes, and releasing model updates publicly.

ALSO: Note that, if the idea of “sharing science” is to enable the wider user community to contribute back to such models, then that involves a great deal of effort by developers to verify that the new code does not break the existing model functionality, and involves guiding the merge-in and update of code versions on github. This is NOT a speedy or simple process.

### **3. User tutorials and workshops:**

NCAR currently funds at least one WRF user tutorial and one WRF workshop per year. The tutorial involves multiple NCAR employees delivering detailed presentations on all aspects of the model, and includes practical labs in which attendees are able to run the model in real time and learn the complexities of it. Tutorial materials are later made available online.

The workshops involve WRF users meeting to discuss results and to learn about improvements and additions to the model that have been introduced by NCAR over the past year.

At a minimum, an online tutorial for planetWRF users, which can be followed asynchronously, should be developed if the model is made public. Ideally, an annual real-time tutorial - even if held virtually - would be far superior to this.

### **4. Ongoing user support:**

Our experience, from briefly making an earlier version of planetWRF publicly available over a decade ago, is that users will regularly contact the core development team with requests for help in getting the model installed, for doing specific simulations, for interpreting results, and for issues that may or may not turn out to be bugs. Other requests include users who want to do something new with the model or develop new functionality, but need help with this.

While it is of course helpful to learn about bugs, the vast majority of help requests fall into the other categories, and require that we put aside our funded research work to address them.

### **ARE ROSES PROGRAMS F.8 & F.7 THE SOLUTION?**

**We are aware of ROSES program F.8 ‘Supplements for Open-Source Science,’ under which support for the public code release process (at least, points 1 through 3 above) may be applied for once a related science proposal has been selected for funding.**

**However, if we are eligible to apply for such funding but our proposal to F.8 is declined, it seems as if we would still have to make planetWRF public, but without any explicit funding to**

**help do so. We would then either have to put in all of that effort in our personal time, or else comply with NASA's public access rules by simply putting planetWRF out there in tarball form and hoping that users can 'figure it out.'**

Clearly, there is a huge difference between putting a complex software product into some random archive in tarball form and saying "we met the requirements of releasing it" and putting in the effort to make sure that the software is accessible, useable, understandable, valuable, and supported. NOT making this effort results in a public release of software that risks going unused or being downloaded by users who have no guidance on how to operate or modify it, or in how to test whether their results look reasonable or not.

In our experience, such users often end up wasting their own time by being unable to run the model successfully or by inadvertently producing erroneous and misleading results. The latter also wastes the time of the wider user community, who often end up reviewing and correcting publications in which the model was used incorrectly.

**We are also aware of ROSES program F.7 'Support for Open-Source Tools, Frameworks, and Libraries' which may be able to address item (4) above - specifically, sustained support, and support that does not disappear when a particular research proposal finishes.**

**Here, we are concerned that this funding may be very restricted to supporting highly generic tools (such as python astronomy libraries) with none available for software with a smaller (yet still numerous) user base.**

**OVERALL COMMENT:** NASA currently funds the Ames Mars Climate Modeling Center (MCMC) to the level of five Civil Servants working part-time and four Research Associates, totaling ~5.5 FTEs on MCMC activities. While many of their activities are science-focused, they spend a significant fraction of these FTEs on publicly releasing and supporting their Mars Climate model, including releasing it via github, writing documentation, and running regular user tutorials.

By contrast, the planetWRF developers - who have developed and already share with numerous collaborators the Mars versions of the model - receive no direct NASA funding for releasing and supporting this model. We will thus be entirely dependent on ROSES F.8 and F.7 for this.

**Under the new rules, we are worried that - if we are not lucky with F.8 and F.7 funding - we will be forced to spend a large fraction of our spare time, unfunded, in providing (1) through (4) above, simply to ensure that the publicly released model is useable by and valuable to those who download it, and to ensure that the model is used correctly.**

Sincerely,

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