

Intellectual Merit Criterion

Overall Assessment of Intellectual Merit

Excellent

Explanation to Applicant

Adam's application describes a novel approach to simulate the frequency of heat waves, and to include the impact of climate change on this frequency. While Adam has already made substantial contributions to the modeling effort, he is also interested in being able to test the models with real data to help determine the adequacy, or shortcomings, of the models, and then to adjust the models. Adam's interest in having physics-based parameters to adjust, shows insight into how the model will need to evolve with climate change. Adam already has several publications, which is rather unique for someone at this stage of their career.

Broader Impacts Criterion

Overall Assessment of Broader Impacts

Excellent

Explanation to Applicant

Adam's decision to change from astrophysics to climate change modeling points to his wide range of skills to tackle many different problems. Most of us do not consider career changes like this until later in life. It is admirable that Adam had the confidence and passion to do this early in his graduate career, especially after a successful start in astrophysics. Adam is also passionate about teaching and mentoring. Adam specifically points out how the GRF will provide the resources needed to carry out the work as efficiently as possible. Adam's letters of support are all ver

Summary Comments

Overall, this is an excellent application. Adam will bring his significant skills to work on a very important problem.

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Explanation to Applicant

This application describes a novel, interesting, and important application of physics and modeling to a very important topic--the modeling of the occurrence of heat waves. The application argues effectively that understanding and predicting the severity and frequency of heat waves as the earth's climate changes is in its infancy and is sorely needed. The application advocates the use of "Conceptual models" as an effective approach, since fully realized dynamic, 3D non-linear models of general circulation (GCM) can probably not treat these problems at this time. The advocated approach has merit in making progress on a very difficult problem. In some sense, a different language for this approach is that it is a "phenomenological approach" that identifies and relates physical interactions between state variables. This seems like an innovative way to make progress on this difficult problem. I can imagine that it might lead back to better interpretation of the features of GCM models that are relevant, improving their applicability as well. The proposal lays out a pathway that makes sense--starting with moments of moisture and temperature, proceeding through comparison to observation and GCM, and then to sensitivity studies. There is high merit--the application might be improved with an example of a specific observation and how the applicant imagines using it with the technique (kind of a thought result).

Broader Impacts Criterion

Overall Assessment of Broader Impacts

Excellent

Explanation to Applicant

The applicant describes being highly motivated by observations of the effects of extreme weather events. Understanding how heat-waves occur and improving our ability to predict their likelihood would certainly be a dramatic broader impact. Such development could also lead to other similar studies for extreme events like drought, etc. There is nice cross-over here that is good for both physics and for atmospheric science. The applicant describes how the ideas and preparation from astrophysics is influencing the work. This kind of cross-over may be a blueprint for a future of physics. The applicant also describes interesting work in mentoring and outreach. These kinds of interdisciplinary problems may hold broad appeal and be very effective as mentoring tools.

Summary Comments

This application is a novel and powerful approach to an important problem. Understanding extreme weather events is interesting, broadly important, and broadly appealing. The described methodology is a good step in research in its infancy. There are powerful mentoring opportunities. An observational example that imagines how the technique could work would be interesting and strengthen the proposal.

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Explanation to Applicant

A very well articulated proposal on numerical models of climate

Broader Impacts Criterion

Overall Assessment of Broader Impacts

Excellent

Explanation to Applicant

Impressive array of BI activities, well conceived and planned

Summary Comments

An excellent proposal, with a compelling motivation, a well documented portrayal of existing work and an outstanding broader impact component