

National Aeronautics and Space Administration

Headquarters

Washington, DC 20546-0001



April 15, 2008

Reply to Attn of: SMD/Heliophysics Division

Prof. Paul Withers
Center for Space Physics
Boston University
725 Commonwealth Avenue
Boston, MA 2215

Dear Prof. Withers:

We have completed the review and evaluation of proposals submitted in response to the NASA Research Announcement (NRA) for the Living With a Star Targeted Research and Technology program, NNH07DA001N. We are pleased to inform you that your proposal entitled "Simulations of the Effects of Extreme Solar Fares on Technological Systems at Mars" (NASA proposal number 07-LWSTR07-0014) has been selected for funding. The enclosed "Proposal Status Summary" provides more details.

The scientific and technical merit of the proposals submitted to this program was evaluated by a panel of knowledgeable scientists aided by extensive input from external reviewers. Their assessment of your proposal is summarized in the enclosed "Consensus Evaluation" form. The scientific merit of your proposal placed it in the competitive range for selection. The proposal's high scientific merit, in combination with a consideration of the available funding, program balance, and program goals, led to a recommendation for selection by discipline personnel, which was accepted by Dr. Richard Fisher, Director of the Heliophysics Division.

Of the 161 investigations submitted to the LWS TRT program, 50 proposals were funded for periods of one to three years. Annual funding ranged from about \$32 K to \$189 K, with an average grant size of about \$109 K. All awards concerning this investigation will be to your institution. NASA will hold you and your institution responsible for carrying out the investigation. If you proposed to, or were assigned to, one of the LWS TR&T focus areas, you will have the additional responsibilities of a team member or leader. These responsibilities are described in the enclosed letter and posted on the LWS TR&T WWW site at <http://lws-trt.gsfc.nasa.gov>. Some of your other responsibilities were described in the NRA.

The LWS program has high visibility within NASA and the broader scientific community. To maintain this visibility, we request that you supply us with scientific 'nuggets' on a regular basis. Nuggets should contain recent results and illustrations that are suitable for presentation to non-specialists. Examples from previously funded research projects may be found at <http://lws-trt.gsfc.nasa.gov/>

All publication of any material based on or developed under NASA sponsored projects should conclude with an appropriate acknowledgement. Please see the Guidebook for Proposers, Section F.14 on how NASA is to be acknowledged in publications. **Please send a note to the LWS program officers when a paper is accepted in a refereed scientific journal under the TR&T sponsorship.**

Again, we would like to extend our personal congratulations to you on the selection of your proposal. If you have any questions, please contact us at (202) 358-1992 or (202) 358 0064.

Cordially,



Madhulika Guhathakurta
Lead Program Scientist, Living With a Star
Heliophysics Division
Science Mission Directorate



Ramona Kessel
Deputy Program Scientist, Living With a Star
Heliophysics Division
Science Mission Directorate

Enclosures: Proposal Status Summary
Consensus Review

PROPOSAL STATUS SUMMARY

Proposal Number: 07-LWSTRT07-0014

Principal Investigator: Withers, Paul
Boston University

Proposal Title: Simulations of the Effects of Extreme Solar Fares on Technological Systems at Mars

Program: Living With a Star Targeted Research and Technology

Proposal Status: Accept

Tentative Funding Levels:

FY 2008: \$114,675 **FY 2009:** \$118,266 **FY 2010:** \$124,278

Note: For all tentative funding, the Fiscal Year (FY) 2008 amount constitutes commitment by NASA, while amounts for FY 2009 and FY 2010 (if applicable) are projections for planning purposes.

If this award amount differs from your requested budget level **by more than 20%**, please forward a revised budget to Drs. Madhulika Guhathakurta, and Ramona Kessel, LWS TR&T Discipline Scientists, as soon as possible to enable processing of your award. Any such revised budget must be accompanied by original signatures of the PI and responsible officer at your institution.

Award Period:

The award period is 3 year(s). In order to provide timely renewal of multi-year awards, an e-mail version of the progress report giving the most important results of the past year's effort, a summary of the progress made, and a short description of the tasks to be carried out during the upcoming year should be sent to the person named below at least 60 days prior to the award anniversary. Note that the performance period starts at the time that you receive your first funding increment. The NASA Shared Services Center will prompt you to submit this report 10 days before it is due. Your award will include a Point of Contact document which includes address information for all report recipients. Copies of this documentation will go to your Program Scientist.

Award Process:

All awards concerning this investigation will be to your institution. The funding for this effort will be provided via a grant originating at the NASA Shared Services Center, and your institution will be contacted shortly by this office regarding the actual grant award. You may determine the status of grant processing by checking the Grant Status Query Page (<http://www.nssc.nasa.gov/grantstatus/>), telephoning the NSSC at 1-877-NSSC123, or e-mailing the NSSC Contact Center (nssc-contactcenter@nasa.gov). (Interagency transfers will still be processed by the NASA Goddard Space Flight Center Procurement Office). You cannot incur any obligations against potential funding until the grant is in place.

Comments:

For further information, please contact:

Dr. Madhulika Guhathakurta Phone: 202-358-1992 E-mail: Madhulika.Guhathakurta@nasa.gov

Dr. Ramona Kessel Phone: 202-358-0064 E-mail: Ramona.I.Kessel@nasa.gov

Heliophysics Division
Science Mission Directorate
NASA Headquarters
Washington DC 20546

I. Instructions for the FY07 TR&T Team Members and Leaders

Congratulations on winning a TR&T focused science topic (FST) award! Your proposal, along with several others, was selected on the basis of its scientific excellence **and** its relevance to a team effort addressing the FST. You have won a unique and exciting opportunity to participate in a peer-selected, cross-disciplinary team that will attack a major problem in LWS science. Information concerning the members of your team and its leader will be posted on the WWW site at lws-trt.gsfc.nasa.gov.

Member Responsibilities:

1. The primary responsibility of team members is to achieve the science in their TR&T proposals. However, since each member's proposal addresses only one aspect of the FST, complete success requires a successful team program. Consequently, all team members are expected to participate fully in the joint activities defined by the team. Continuing funding for each team member will be contingent, in part, on this participation.
2. Every FST team is expected to generate an integrated three-year research plan that is to be received by NASA HQ within 3 months after funding commences. The Team 3-Year Plan should: (A) briefly summarize the current state of the FST; (B) briefly summarize the contributions proposed by each team member and identify areas of potential cooperation (useful contributions from other researchers currently funded by the TR&T program should be included, see lws-trt.gsfc.nasa.gov for a list of ongoing proposals); (C) describe an integrated research program with **schedule**, **milestones**, and **deliverables** (as applicable); and (D) briefly discuss the anticipated state of the FST at the conclusion of this plan.
3. In addition to the standard annual reports from all Principal Investigators, NASA expects an Annual Team Report. This report will describe the progress toward the Team 3-Year Plan, including the performance on achieving the deliverables and milestones. The Annual Team Report will identify successes and emerging opportunities. The TR&T Program/Project Office will work with the teams to publicize their results at domestic and international meetings, and to advertise their successes on the dedicated LWS TR&T website. The Annual Team Report will also identify areas in which progress is lacking and suggest ways to correct the situation.
4. Every FST team is expected to meet in person on a regular basis so that the members can inform each other of their research plans and progress and develop an integrated team program. The first meeting is especially important for these purposes, and should be held as soon as possible after funding commences. Team members will make their own travel arrangements to the team meetings and cover the costs from their individual grants. Each team is responsible for determining its

strategy for regular meetings and communications, (such as instituting a web-based forum, for example), but it is expected that teams will meet at least twice a year. One of these could be held in conjunction with a general community meeting, such as at the AGU, but one meeting per year must be a dedicated FST meeting which all team members attend. It is anticipated that a representative of the LWS TR&T Program Office will participate in each dedicated meeting.

5. Each team is expected to develop its own internal reporting procedures and requirements, but it is recommended that team members be required to submit brief informal reports to the Team Leader at regular intervals (every 3 – 6 months), who will in turn prepare an informal team progress report for use within the team and for inspection by the TR&T Program/Project Office. The Annual Team Report will serve as one of these progress reports. Given that the FST team approach is new to both NASA and the community, it is important that the progress reports contain good documentation not only on the scientific progress, but also on the team process itself.

Team Leader Responsibilities:

The Team Leader is expected to act as the Principal Investigator for the team program. To a large extent, the success of the team will depend on the enthusiasm and the energy that the Team Leader brings to this task.

1. The primary responsibility of the Team Leader is to create the framework that will ensure that the outcome of the team's research is more than simply the sum of the pieces. To accomplish this, the Team Leader must become familiar with the proposed research of the other team members, and establish a close working relation with all the team members and with the TR&T Program/Project Office.
2. The Team Leader is responsible for organizing all team meetings. If requested, the TR&T Program/Project Office will assist in arranging logistics, such as location, for the meetings.
3. The Team Leader is responsible for the final preparation of all team reports and submission to the TR&T Program/Project Office. This includes the 3-Year Plan, the Annual Team Reports, and the informal progress reports.
4. The Team Leader is expected to act as the principal spokesman for the team, and play the lead role in communicating and publicizing the team's successes to NASA and to the outside community.
5. To compensate for the additional tasks, and the costs of meetings and publications, NASA HQ will augment awards to the team leaders.

**NASA HELIOPHYSICS
LIVING WITH A STAR (TR&T) PROGRAM
PROPOSAL SUBMITTED IN RESPONSE
TO NNH07ZDA001N
CONSENSUS REVIEW**

PI: Paul Withers

Proposal No.: 07-LWSTRT07-0014

Institution: Center for Space Physics

Title: Simulations of the Effects of Extreme Solar Fares on Technological Systems at Mars

Proposal Objectives and Relevance to LWS Goals

The aim of this proposal is to model the response of Mars' ionosphere to extreme solar events (solar flare produced X-rays), and evaluate the resulting impact on radio wave propagation, particularly surface-to-orbit communications and GPS-type systems.

This proposal is relevant to the issue of how extreme space weather will impact robotic and human operations in the environment of Mars. It relates to the understanding of space weather effects in the solar system and relates to VSE, in particular the Mars exploration program.

Proposal Summary

It is proposed to carry out a detailed exploration of the potential effects of a range of observed flares on radio wave attenuation and GPS-type range errors at Mars. Originally, the Mars ionospheric model was developed with separate NASA support.

The proposed effort is a straightforward task in which the P.I. and his collaborators plan to use a simple, tested and "operational" model of the Martian ionosphere to evaluate one-way range error and radio wave attenuation caused by electron density increases in the lower ionosphere associated with solar flares, meteoric impact and cosmic rays.

Intrinsic Merit

Intrinsic Strengths

Major Strengths:

- The proposal clearly describes the Mars ionosphere model used. It also clearly lays out the plans for applying it to explore its sensitivity to various assumptions, and its results for a number of known flare scenarios. The model exists and has been tested and used in published work. The proposer is thus well-poised to employ the model as described. This subject will be of significant interest to the Mars Exploration program and community.

Minor Strengths:

None

Intrinsic Weaknesses

Major Weaknesses:

None

Minor Weaknesses:

- The approach to including cosmic ray effects was not described.
- Instead of parameterizing the ionization rate R, quantitative calculations could be used.

Intrinsic Score:

EXCELLENT		VERY GOOD		GOOD		POOR
x						

Relevance

Relevance Strengths

Major Strengths:

- The proposed modeling application addresses extreme space weather conditions related to flare effects on the Martian ionosphere.
- The LWS program seeks to have an applied edge, and the proposed effort is geared towards applications (specifically use of GPS systems and use of radio communications at Mars, by both robotic and human missions).
- This proposal is completely responsive to the stated objectives of the NRA, namely to evaluate severe space weather effects of interest to NASA and the scientific community.

Minor Strengths:

None

Relevance Weaknesses

Major Weaknesses:

None

Minor Weaknesses:

- The proposed effort does not place sufficient emphasis on many scientifically interesting consequences of the largest flare effects, such as atmospheric chemistry, dust storm

development, weather/climate, atmosphere escape processes (e.g., from dissociative recombination).

Relevance Score:

EXCELLENT		VERY GOOD		GOOD		POOR
x						

Overall Evaluation

This proposal addresses a question relevant to the stated aim of this solicitation. The work uses an existing and well-tested model, and the tasks are clearly stated and very achievable. The expected results should have significant impact and use within the Mars Exploration program and the VSE as future missions using radio communications are planned. It will tie the LWS program more closely to those other NASA discipline areas. The work on flare radiative effects is certainly feasible, and it is well thought-out and planned. The proposal is timely given that the maximum in solar activity is approaching, and that there continue to be many missions at Mars and on the way.

Rationale for Rating

The excellent rating was given because (1) the approach to the work was well thought out and clearly stated, and (2) the work is highly relevant to the extreme space weather problem.

Overall Scientific and Technical Merit, or Unique and Innovative Methods, Approaches or Concepts Demonstrated by the Proposal

Overall Grade

EXCELLENT		VERY GOOD		GOOD		POOR
x						