NESSF Proposal Review

Evaluation of New Proposals

Proposal Number:	17-HELIO17F-0006
Proposal Title:	Explosive Events Resolved
Institution:	Montana State University, Bozeman
Student:	Jacob Parker
Faculty Advisor:	Charles Kankelborg

Brief Description of Research:

The proposal would conduct an observational survey of magnetic reconnection in the transition region, a narrow layer of the sun with plasma ranging from 10^5 K to 10^6 K. To do this they would combine the data from three spectral instruments, the Interface Region Imaging Spectrograph (IRIS) as well as the Muti-Order Solar EUV Spectrograph (MOSES) and EUV Snapshot Imaging Spectrograph (ESIS) sounding rocket missions.

Scoring Guidelines
(Check Only One Box For Each Criteria)

Criterion Description: **Scientific and Technical Merit of the Proposed Research**
Criterion Score: ☒ Excellent = 5 ☐ **Very Good = 4** ☐ Good=3 ☐ Fair =2 ☐ Poor =1

Criterion Description: **Relevance of Proposed Research to NASA Earth or Space Science Objectives**
Criterion Score: ☒ **Excellent = 5** ☐ Very Good = 4 ☐ Good=3 ☐ Fair =2 ☐ Poor = 1

Criterion Description: **Academic Qualifications and Performance of the Student**
Criterion Score: ☒ Excellent = 5 ☐ **Very Good = 4** ☐ Good=3 ☐ Fair =2 ☐ Poor =1

Scoring Guidelines

Excellent: A comprehensive and thorough proposal of exceptional merit. One or more major strengths. No major weaknesses or only minor correctable weaknesses.
Very Good: Demonstrates overall competence. One or more major strength and strengths out balance any weaknesses. Any major weaknesses are correctable.
Good: Reasonable sound response. There may be strengths or weaknesses, or both. As a whole, weaknesses, not offset by strengths, do not significantly detract from the offeror's response. Major weaknesses are probably correctable.
Fair: One or more weaknesses. Weaknesses have been found that out balance strength. Major weaknesses can probably be improved, minimized, or corrected.
Poor: One or more major weaknesses which are expected to be difficult to correct, or are not correctable.

Narrative Evaluation Strengths:

The proposed research is based on a clever software package done by the student to select and examine many explosive events (EEs) occurring in IRIS data cubes. This seems to address a very fundamental goal of IRIS, to understand the physics of the solar transition region. Evaluating the statistics of EE sizes and numbers, especially in the context of surrounding coronal structures looks like an exciting new area for describing how magnetic reconnection occurs on the sun. There is a well developed plan to analyze the IRIS data while preparing the rocket spectrograph for the MOSES-III flight. The student has obvious proficiency at both, hands-on hardware and data analysis.

Weaknesses:

There was a lack of broader details in the description of the observations. What are the "sit and stare" observation formats, and what are the scale lengths of the Figures 2 and 3 axes? Why they would use the IRIS Si IV line for analysis? What is the temperature range of the line, and why this is the only available line to use? Why they selected the Ne IV and O V lines for the MOSES and ESIS observations? While the EE statistical analysis is valuable as a tool to understand when/how magnetic reconnection will occur, using Doppler profiles alone, such as Figure 5, will prove difficult to distinguish Petschek from tearing mode reconnection. The Doppler profiles alone without magnetic field measurements would also be a limitation in studying a complex process such as magnetic reconnection.

A minor, correctable weakness in the analysis portion of the proposal is the question of scale and bias: the existing IRIS EE database has approximately 100 events, which they hope to expand by a factor of 10 or so. Several times it is mentioned that a procedure can be done "quickly," and then it seems that the events of interest will be analyzed individually. It is not stated how many (roughly) events they plan to perform detailed analysis on, or what constitutes an "interesting" event. Will these interesting events be representative of transition region explosive events as a whole (and thus relevant to their main science questions), or will they be interesting because they are anomalous?

Overall Evaluation: ☐ Excellent = 5 ☒ **Very Good = 4** ☐ Good=3 ☐ Fair =2 ☐ Poor =1

Rationale for Overall Evaluation:

The student is obviously talented and accomplished at both instrumentation and software.

The proposal clearly demonstrates the difference between two models of magnetic reconnection, and how the existing and newly-collected data could be used to discriminate between them. The analysis plan is straightforward and well-scoped.

A more complete discussion of how the spectral diagnostics would give a better understanding of large eruptive events, the detailed description of how the IRIS data are taken and how the statistical results might give better insights in to the reconnection process are desired.

	Reviewed by the Heliophysics Division	