



Cover Page for Proposal
Submitted to the
National Aeronautics and
Space Administration

NASA Proposal Number

TBD on Submit

NASA PROCEDURE FOR HANDLING PROPOSALS

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SECTION I - Proposal Information

Principal Investigator Genaro Carrasco Ozuna	E-mail Address	Phone Number	
Street Address (1)	Street Address (2)		
City	State / Province	Postal Code	Country Code

Proposal Title : **Coherence-Driven Validation and Entropy-Based Veto for Space Weather Prediction under the Living With a Star Program**

Proposed Start Date
01 / 13 / 2026

Proposed End Date
01 / 30 / 2027

Total Budget
No budget required

SECTION II - Application Information

NASA Program Announcement Number NNH25ZDA001N-LWS	NASA Program Announcement Title B.3 Living with a Star Science
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For Consideration By NASA Organization (*the soliciting organization, or the organization to which an unsolicited proposal is submitted*)

NASA , Headquarters , Science Mission Directorate , Heliophysics

Date Submitted	Submission Method Electronic Submission Only	Grants.gov Application Identifier	Applicant Proposal Identifier NNH25ZDA001N-LWS
Type of Application New	Predecessor Award Number	Other Federal Agencies to Which Proposal Has Been Submitted	
International Participation No	Type of International Participation		

SECTION III - Submitting Organization Information

UEI	EFT	CAGE Code	Employer Identification Number (EIN or TIN)	Organization Type
Organization Name (Standard/Legal Name)				Company Division
Organization DBA Name				Division Number
Street Address (1)		Street Address (2)		
City	State / Province		Postal Code	Country Code

SECTION IV - Proposal Point of Contact Information

Name Genaro Carrasco Ozuna	Email Address Geozunac3536@gmail.com	Phone Number 52-812-5989869
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SECTION V - Certification and Authorization

Certification of Compliance with Applicable Executive Orders and U.S. Code

By submitting the proposal identified in the Cover Sheet/Proposal Summary in response to this Research Announcement, the Authorizing Official of the proposing organization (or the individual proposer if there is no proposing organization) as identified below:

- certifies that the statements made in this proposal are true and complete to the best of their knowledge;
- agrees to accept the obligations to comply with NASA award terms and conditions if an award is made as a result of this proposal; and
- confirms compliance with all provisions, rules, and stipulations set forth in this solicitation.

Willful provision of false information in this proposal and/or its supporting documents, or in reports required under an ensuing award, is a criminal offense (U.S. Code, Title 18, Section 1001).

Authorized Organizational Representative (AOR) Name	AOR E-mail Address	Phone Number
AOR Signature (<i>Must have AOR's original signature. Do not sign "for" AOR.</i>)		Date
Digitally signed by		

PI Name : Genaro Carrasco Ozuna		NASA Proposal Number TBD on Submit	
Organization Name :			
Proposal Title : Coherence-Driven Validation and Entropy-Based Veto for Space Weather Prediction under the Living With a Star Program			
SECTION VI - Team Members			
Team Member Role PI	Team Member Name Genaro Carrasco Ozuna	Contact Phone	E-mail Address
Organization/Business Relationship		UEI	EFT
International Participation No	U.S. Government Agency	Total Funds Requested 0.00	

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Proposal Title : Coherence-Driven Validation and Entropy-Based Veto for Space Weather Prediction under the Living With a Star Program	
SECTION VII - Project Summary	
<p>This proposal addresses a critical challenge in the Living With a Star (LWS) program: the reliable interpretation and validation of space-weather predictions in the presence of heterogeneous, noisy, and sometimes contradictory solar data and models.</p> <p>Rather than developing new solar physics models, this work focuses on a meta-level framework that evaluates the internal coherence, stability, and entropy evolution of existing space-weather prediction pipelines.</p> <p>Scientific Motivation</p> <p>Solar variability affects technological and biological systems across space and Earth. While current models capture many physical mechanisms, operational challenges persist due to:</p> <ul style="list-style-type: none"> inconsistent predictions across models, false alarms and missed events, lack of formal veto mechanisms when model confidence is unjustified. <p>These issues represent not a lack of physics, but a lack of coherence-based validation.</p> <p>I propose to develop and test a framework that:</p> <ul style="list-style-type: none"> Quantifies coherence metrics across multi-source solar and heliospheric datasets. Tracks entropy evolution of prediction outputs to identify unstable or misleading alerts. Implements an entropy-based veto mechanism that prevents low-coherence predictions from propagating into operational decision layers. Identifies causal precursor windows associated with transitions in solar-terrestrial coupling. <p>Relevance to Living With a Star</p> <p>This work directly supports LWS objectives by improving:</p> <ul style="list-style-type: none"> reliability of space-weather alerts, interpretability of model disagreements, operational trust in prediction systems. <p>By focusing on validation and coherence rather than new physics, the framework is designed to integrate with existing NASA models and datasets.</p>	

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SECTION VIII - Other Project Information					
Proprietary Information					
Is proprietary/privileged information included in this application?					
Yes					
International Collaboration					
Does this project involve activities outside the U.S. or partnership with International Collaborators?					
No					
Principal Investigator No	Co-Investigator No	Collaborator No	Equipment No		
Facilities No					
Explanation :					
NASA Civil Servant Project Personnel					
Are NASA civil servant personnel participating as team members on this project (include funded and unfunded)?					
No					
Fiscal Year	Fiscal Year	Fiscal Year	Fiscal Year	Fiscal Year	Fiscal Year
Number of FTEs	Number of FTEs	Number of FTEs	Number of FTEs	Number of FTEs	Number of FTEs

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SECTION VIII - Other Project Information	
Environmental Impact	
Does this project have an actual or potential impact on the environment? Yes	Has an exemption been authorized or an environmental assessment (EA) or an environmental impact statement (EIS) been performed? No
<p>Environmental Impact Explanation:</p> <p>Environmental and sustainability relevance arises through reduced satellite losses, avoided infrastructure damage, and minimized unnecessary operational actions, leading to lower lifecycle resource consumption</p>	
<p>Exemption/EA/EIS Explanation:</p>	

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SECTION VIII - Other Project Information	
Historical Site/Object Impact	
Does this project have the potential to affect historic, archeological, or traditional cultural sites (such as Native American burial or ceremonial grounds) or historic objects (such as an historic aircraft or spacecraft)?	
No	
Explanation:	

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SECTION IX - Program Specific Data	
Question 1 : Short Title:	
Answer: Coherence-Driven Validation and Entropy-Based Veto for Space Weather Prediction under the Living With a Star Program	
Question 2 : Team members not confirmed via NSPIRES	
Answer:	
While this work does not directly target environmental remediation, it has measurable indirect environmental benefits through improved reliability and efficiency of space-weather prediction and decision-support systems.	
Enhanced coherence-based validation of space-weather models can reduce false alarms and missed events, enabling more accurate and proportionate operational responses. This improvement can lead to fewer unnecessary satellite maneuvers, reduced fuel consumption, and extended operational lifetimes of space assets, thereby lowering the demand for replacement launches and associated material and energy expenditures.	
On Earth, more reliable interpretation of solar and geomagnetic activity supports better protection of electrical power infrastructure and other vulnerable technological systems. By enabling earlier and more trustworthy warnings, this work can help prevent damage to large-scale components such as transformers, whose replacement involves significant industrial processes and environmental cost.	
The proposed framework is software-centric and designed to integrate with existing datasets and models, resulting in a low direct environmental footprint. Computational methods emphasize lightweight metrics and validation layers rather than extensive retraining of large models, aligning with efficient use of computational resources.	
Overall, the environmental relevance of this work arises from risk reduction, asset longevity, and avoidance of unnecessary high-impact interventions, contributing to more sustainable operation of space-based and ground-based technological systems affected by solar variability.	
<i>Hidden for Dual Anonymous Peer Review</i>	
Question 3 : Focused-Science Topic	
Answer: FST3: Tormentas similares, efectos diferentes: comprensión del acoplamiento iónico neutro a través de escala que impulsa la respuesta temporal global a tormentas geomagnéticas	
Question 4 : Research Regime	
Answer: Sistema-Interdisciplinario	
Question 5 : Science Topic	
Answer: Clima espacial	
Question 6 : AI or ML?	
Answer: Yes	

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SECTION X - Budget	
Total Budget: No budget required	