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

NASA Proposal Number

TBD on Submit

NASA PROCEDURE FOR HANDLING PROPOSALS

This proposal shall be used and disclosed for evaluation purposes only, and a copy of this Government notice shall be applied to any reproduction or abstract thereof. Any authorized restrictive notices that the submitter places on this proposal shall also be strictly complied with. Disclosure of this proposal for any reason outside the Government evaluation purposes shall be made only to the extent authorized by the Government.

SECTION I - Proposal Information

Principal Investigator	E-mail Address	Phone Number
Genaro Carrasco Ozuna		

Street Address (1)	Street Address (2)

City	State / Province	Postal Code	Country Code

Proposal Title : **El presente proyecto propone validar experimentalmente un modelo predictivo de sismos basado en coherencia causal(~7 dias) derivado del formalismo físico TCDS . El objetivo central es demostrar que el *Σ-locking* —medible entre variables geofísicas.**

Proposed Start Date	Proposed End Date	Total Budget	Year 1 Budget	Year 2 Budget	Year 3 Budget
		237,000.00	**79,000.00**	**79,000.00**	**79,000.00**

SECTION II - Application Information

NASA Program Announcement Number	NASA Program Announcement Title
NNH25ZDA001N-RRNES	**A.4 Rapid Response and Novel Research in Earth Science**

For Consideration By NASA Organization *(the soliciting organization, or the organization to which an unsolicited proposal is submitted)*

NASA , Headquarters , Science Mission Directorate , Earth Science

Date Submitted	Submission Method	Grants.gov Application Identifier	Applicant Proposal Identifier
	Electronic Submission Only		**NNH25ZDA001N-RRNES**

Type of Application	Predecessor Award Number	Other Federal Agencies to Which Proposal Has Been Submitted
New		

International Participation	Type of International Participation
No	

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	Email Address	Phone Number
Genaro Ozuna	**Geozunac3536@gmail.com**	**52-812-5989869**

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 *(Must have AOR's original signature. Do not sign "for" AOR.)* Date

Digitally signed by

PI Name : **Genaro Carrasco Ozuna**	NASA Proposal Number
Organization Name :	TBD on Submit

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SECTION VI - Team Members

Team Member Role	Team Member Name	Contact Phone	E-mail Address	
PI	**Genaro Carrasco Ozuna**			
Organization/Business Relationship		UEI	EFT	CAGE Code
International Participation	U.S. Government Agency		Total Funds Requested	
No			**0.00**	

PI Name : **Genaro Carrasco Ozuna**	NASA Proposal Number
Organization Name :	TBD on Submit

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SECTION VII - Project Summary

El presente proyecto propone validar experimentalmente un modelo predictivo de sismos basado en coherencia causal, derivado del formalismo físico TCDS (Teoría de la Cromodinámica Sincrónica). El objetivo central es demostrar que el Σ-locking —estado de coherencia medible entre variables geofísicas— presenta incrementos sistemáticos antes de eventos sísmicos mayores (Mw ≥ 5.5).

La propuesta se inscribe en la línea A.4 Rapid Response and Novel Research (RRANN) del programa ROSES-25, al enfocarse en un experimento de respuesta rápida con datos abiertos NASA y USGS. Se emplearán observaciones InSAR (Sentinel-1 y NISAR), GNSS (UNAVCO), gravedad GRACE-FO y óptico-térmicas VIIRS/MODIS, disponibles a través de EOSDIS DAACs.

El método aplica métricas Σ —correlación R(t), índice de locking LI, error RMSE_SL y tasa κΣ— con umbrales de rendimiento LI ≥ 0.90, R > 0.95, RMSE_SL < 0.10 y reproducibilidad ≥ 95 %. Las series se procesarán en ventanas p:q pre-evento, evaluando curvas ROC y PR para obtener TPR ≥ 0.6 a FPR ≤ 0.05. El estudio combina validación retrospectiva (1985–2025) y corridas prospectivas de 6 meses con predicciones selladas (DOI/Zenodo).

El equipo está liderado por Genaro Carrasco Ozuna (Proyecto TCDS / MSL México) con asistencia formal de GPT-5 Σ-Trace. El presupuesto estimado (USD 100–195 k) cubre procesamiento en nube y validación estadística abierta. Todos los resultados serán de acceso público (CC BY 4.0) y se publicarán con trazabilidad reproducible bajo DOI 10.5281/zenodo.17505875.

Este estudio busca aportar una nueva herramienta predictiva para la gestión de riesgo sísmico global, demostrando la utilidad de las observaciones NASA en la detección prospectiva de precusores geofísicos basados en coherencia cuantitativa Σ.

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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	Co-Investigator	Collaborator	Equipment	Facilities
No	**No**	**No**	**No**	**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

PI Name : **Genaro Carrasco Ozuna**	NASA Proposal Number
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Proposal Title : **El presente proyecto propone validar experimentalmente un modelo predictivo de sismos basado en coherencia causal(~7 dias) derivado del formalismo físico TCDS . El objetivo central es demostrar que el *Σ-locking* —medible entre variables geofísicas.**

SECTION VIII - Other Project Information

Environmental Impact

Does this project have an actual or potential impact on the environment?	Has an exemption been authorized or an environmental assessment (EA) or an environmental impact statement (EIS) been performed?
No	**No**

Environmental Impact Explanation:

Exemption/EA/EIS Explanation:

PI Name : **Genaro Carrasco Ozuna**	NASA Proposal Number
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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:

PI Name : **Genaro Carrasco Ozuna**	NASA Proposal Number
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SECTION IX - Program Specific Data

Question 1 : Short Title:
Answer: Sistema Predictivo Sísmico TCDS

Question 2 : Type of institution:
Answer: Organización con fines de lucro

Question 3 : Carnegie Classification
Answer: Not a degree granting institution

Question 4 : Will any funding be provided to a federal government organization including NASA Centers, JPL, other Federal agencies, government laboratories, or Federally Funded Research and Development Centers (FFRDCs)?
Answer: No

Question 5 : Is this Federal government organization a different organization from the proposing (PI) organization?
Answer: N/A

Question 6 : Does this proposal include the use of NASA-provided high end computing (HEC)?
Answer: No

Question 7 : HEC Request Number
Answer:

Question 8 : Research Category:
Answer: 10) Desarrollo/aplicación de tecnologías de la información/sistemas y herramientas de datos e información

Question 9 : Flight Services
Answer: No

Question 10 : Team members not confirmed via NSPIRES
Answer:
Andrea Fuentes Flores
Asistente y Secretaria General Proyecto TCDS
C. A.Humboldt #1117, Centro Saltillo, Coahuila
México. C.P. 25000
Fufa3492@gmail.com
Análisis y diseño de datos.

Question 11 : Does this proposal contain information and/or data that are subject to U.S. export control laws and regulations including Export Administration Regulations (EAR) and International Traffic in Arms Regulations (ITAR)?
Answer: No

Question 12 : I have identified the export-controlled material in this proposal.
Answer: N/A

Question 13 : I acknowledge that the inclusion of such material in this proposal may complicate the government's ability to evaluate the proposal.
Answer: N/A

Question 14 : Does the proposed work include any involvement with collaborators in China or with Chinese organizations, or does the proposed work include activities in China?
Answer: No

The National Environmental Policy Act (NEPA) obligates NASA to consider the potential environmental effects of proposed projects, including those that NASA funds which are implemented by grantees. The majority of grant-related activities are categorically excluded as research and development projects that do not pose adverse environmental impacts. The following questions enable NASA to ascertain whether your proposal will require additional NEPA analysis if selected (e.g., filling out an Environmental Checklist) or the completion of NASA's Executive Order (EO) 12114 Checklist for an activity to be conducted abroad. "Yes" responses are not selection criteria, however, if a "Yes" response is marked, proposers should consider NEPA and/or EO compliance in cost and schedule estimates.

Question 15 : Would the proposal involve any activity that includes: a. Construction of new facilities or modification to the footprint of an existing-facility, or b. Ground disturbance (e.g., excavation, clearing of trees, installation of equipment, etc.), or c. Outdoor discharges of water (e.g., waste water runoff), air emissions (e.g., ozone-depleting substances) or generation of noise exceeding 115 dBA (excluding those associated with aircraft operations)?

Answer: No

Question 16 : Would the proposal involve any field activity that would: a. Release equipment (e.g., dropsondes, sensors, etc.) or chemicals (e.g., dyes, tracers, etc.) into the air, bodies of water or on the ground, or b. Release a parachute or use equipment that would not be recovered, or c. Involve equipment or a payload that contains hazardous (e.g., petroleum, hypergols, oxidizers,solid propellants, etc.) or radioactive materials?
Answer: No

Question 17 : Would the proposal involve the launch of a payload, equipment, or instrument (e.g., via launch vehicle, sounding rocket, balloon, etc.)?
Answer: No

Question 18 : Would the proposal involve any activity to be conducted outside the United States or its territories excluding travel for meetings or conferences?
Answer: No

Question 19 : Comments
Answer:

Question 20 : Does this proposal contain a citizen science component?
Answer: No

Question 21 : AI or ML?
Answer: Yes

Question 22 : Relevant Division(s)
Answers:
Earth Science

Question 23 : Interdivisional Explanation
Answer:

Question 24 : 24: Primary Investigation Type (Division/program)
Answer: "Investigación aplicada". Justificación: La propuesta no se limita a explorar principios teóricos (investigación básica), sino que busca aplicar observaciones satelitales NASA y métricas Σ para generar predicciones sísmicas operativas y herramientas reproducibles de gestión de riesgo. En los términos de ROSES: Investigación básica: estudia procesos fundamentales sin propósito práctico inmediato. Investigación aplicada: usa esos procesos para resolver un problema específico. Desarrollo tecnológico: crea instrumentos o software nuevos para futuras misiones. El sistema predictivo TCDS entra en investigación aplicada, con un componente de validación tecnológica, pero no en desarrollo instrumental.

Question 25 : Relevant Program Manager Name(s)
Answer: Genaro Carrasco Ozuna

PI Name : **Genaro Carrasco Ozuna**	NASA Proposal Number
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SECTION X - Budget

Cumulative Budget

Budget Cost Category	Funds Requested ($)			
	Year 1 ($)	Year 2 ($)	Year 3 ($)	Total Project ($)
A. Direct Labor - Key Personnel	**60,000.00**	**60,000.00**	**60,000.00**	**180,000.00**
B. Direct Labor - Other Personnel	**14,000.00**	**14,000.00**	**14,000.00**	**42,000.00**
Total Number Other Personnel	**1**	**1**	**1**	**3**
Total Direct Labor Costs (A+B)	**74,000.00**	**74,000.00**	**74,000.00**	**222,000.00**
C. Direct Costs - Equipment	**2,000.00**	**2,000.00**	**2,000.00**	**6,000.00**
D. Direct Costs - Travel	**3,000.00**	**3,000.00**	**3,000.00**	**9,000.00**
Domestic Travel	**2,000.00**	**2,000.00**	**2,000.00**	**6,000.00**
Foreign Travel	**1,000.00**	**1,000.00**	**1,000.00**	**3,000.00**
E. Direct Costs - Participant/Trainee Support Costs	**0.00**	**0.00**	**0.00**	**0.00**
Tuition/Fees/Health Insurance	**0.00**	**0.00**	**0.00**	**0.00**
Stipends	**0.00**	**0.00**	**0.00**	**0.00**
Travel	**0.00**	**0.00**	**0.00**	**0.00**
Subsistence	**0.00**	**0.00**	**0.00**	**0.00**
Other	**0.00**	**0.00**	**0.00**	**0.00**
Number of Participants/Trainees				**0**
F. Other Direct Costs	**0.00**	**0.00**	**0.00**	**0.00**
Materials and Supplies	**0.00**	**0.00**	**0.00**	**0.00**
Publication Costs	**0.00**	**0.00**	**0.00**	**0.00**
Consultant Services	**0.00**	**0.00**	**0.00**	**0.00**
ADP/Computer Services	**0.00**	**0.00**	**0.00**	**0.00**
Subawards/Consortium/Contractual Costs	**0.00**	**0.00**	**0.00**	**0.00**
Equipment or Facility Rental/User Fees	**0.00**	**0.00**	**0.00**	**0.00**
Alterations and Renovations	**0.00**	**0.00**	**0.00**	**0.00**
Other	**0.00**	**0.00**	**0.00**	**0.00**
G. Total Direct Costs (A+B+C+D+E+F)	**79,000.00**	**79,000.00**	**79,000.00**	**237,000.00**
H. Indirect Costs	**0.00**	**0.00**	**0.00**	**0.00**
I. Total Direct and Indirect Costs (G+H)	**79,000.00**	**79,000.00**	**79,000.00**	**237,000.00**
J. Fee	**0.00**	**0.00**	**0.00**	**0.00**
K. Total Cost (I+J)	**79,000.00**	**79,000.00**	**79,000.00**	**237,000.00**
Total Cumulative Budget				**237,000.00**

PI Name : **Genaro Carrasco Ozuna**	NASA Proposal Number
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SECTION X - Budget

Start Date :	End Date :	Budget Type :	Budget Period :
01 / 05 / 2026	**07 / 31 / 2026**	**Project**	**1**

A. Direct Labor - Key Personnel

Name	Project Role	**Base Salary ($)**	Cal. Months	Acad. Months	Summ. Months	Requested Salary ($)	**Fringe Benefits ($)**	Funds Requested ($)
Ozuna, Genaro	**PI**	**30,000.00**				**30,000.00**	**30,000.00**	**60,000.00**
							Total Key Personnel Costs	**60,000.00**

B. Direct Labor - Other Personnel

Number of Personnel	Project Role	Cal. Months	Acad. Months	Summ. Months	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
1	**Secretarial / Clerical**				**7,000.00**	**7,000.00**	**14,000.00**
1	Total Number Other Personnel					Total Other Personnel Costs	**14,000.00**
						Total Direct Labor Costs (Salary, Wages, Fringe Benefits) (A+B)	**74,000.00**

PI Name : **Genaro Carrasco Ozuna**	NASA Proposal Number
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SECTION X - Budget

Start Date :	End Date :	Budget Type :	Budget Period :
01 / 05 / 2026	**07 / 31 / 2026**	**Project**	**1**

C. Direct Costs - Equipment

Item No.	Equipment Item Description	Funds Requested ($)
1	**Servidor nube, almacenamientos virtual temporales**	**2,000.00**
	Total Equipment Costs	**2,000.00**

D. Direct Costs - Travel

	Funds Requested ($)
1. Domestic Travel (Including U.S. Territories and Possessions)	**2,000.00**
2. Foreign Travel (Including Canada and Mexico)	**1,000.00**
Total Travel Costs	**3,000.00**

E. Direct Costs - Participant/Trainee Support Costs

		Funds Requested ($)
1. Tuition/Fees/Health Insurance		**0.00**
2. Stipends		**0.00**
3. Travel		**0.00**
4. Subsistence		**0.00**
Number of Participants/Trainees:	Total Participant/Trainee Support Costs	**0.00**

PI Name : **Genaro Carrasco Ozuna**	NASA Proposal Number
Organization Name :	TBD on Submit

Proposal Title : **El presente proyecto propone validar experimentalmente un modelo predictivo de sismos basado en coherencia causal(~7 dias) derivado del formalismo físico TCDS . El objetivo central es demostrar que el *Σ-locking* —medible entre variables geofísicas.**

SECTION X - Budget

Start Date :	End Date :	Budget Type :	Budget Period :
01 / 05 / 2026	**07 / 31 / 2026**	**Project**	**1**

F. Other Direct Costs

	Funds Requested ($)
1. Materials and Supplies	**0.00**
2. Publication Costs	**0.00**
3. Consultant Services	**0.00**
4. ADP/Computer Services	**0.00**
5. Subawards/Consortium/Contractual Costs	**0.00**
6. Equipment or Facility Rental/User Fees	**0.00**
7. Alterations and Renovations	**0.00**
8. Other:	**0.00**
9. Other:	**0.00**
10. Other:	**0.00**
11. Other:	**0.00**
12. Other:	**0.00**
13. Other:	**0.00**
14. Other:	**0.00**
15. Other:	**0.00**
16. Other:	**0.00**
17. Other:	**0.00**
Total Other Direct Costs	**0.00**

G. Total Direct Costs

	Funds Requested ($)
Total Direct Costs (A+B+C+D+E+F)	**79,000.00**

PI Name : **Genaro Carrasco Ozuna**	NASA Proposal Number
Organization Name :	TBD on Submit

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SECTION X - Budget

Start Date :	End Date :	Budget Type :	Budget Period :
01 / 05 / 2026	**07 / 31 / 2026**	**Project**	**1**

H. Indirect Costs

	Indirect Cost Rate (%)	**Indirect Cost Base ($)**	Funds Requested ($)
	0.00	**0.00**	**0.00**
	0.00	**0.00**	**0.00**
	0.00	**0.00**	**0.00**
	0.00	**0.00**	**0.00**
	0.00	**0.00**	**0.00**
	0.00	**0.00**	**0.00**
	0.00	**0.00**	**0.00**
	0.00	**0.00**	**0.00**
	0.00	**0.00**	**0.00**
	0.00	**0.00**	**0.00**
Cognizant Federal Agency:		Total Indirect Costs	**0.00**

I. Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Costs (G+H)	**79,000.00**

J. Fee

	Funds Requested ($)
Fee	**0.00**

K. Total Cost

	Funds Requested ($)
Total Cost with Fee (I+J)	**79,000.00**

PI Name : **Genaro Carrasco Ozuna**	NASA Proposal Number
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SECTION X - Budget

Start Date :	End Date :	Budget Type : **Project**	Budget Period : **2**

A. Direct Labor - Key Personnel

Name	Project Role	**Base Salary ($)**	Cal. Months	Acad. Months	Summ. Months	Requested Salary ($)	**Fringe Benefits ($)**	Funds Requested ($)
Ozuna, Genaro	**PI**	**30,000.00**				**30,000.00**	**30,000.00**	**60,000.00**
							Total Key Personnel Costs	**60,000.00**

B. Direct Labor - Other Personnel

Number of Personnel	Project Role	Cal. Months	Acad. Months	Summ. Months	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
1	**Secretarial / Clerical**				**7,000.00**	**7,000.00**	**14,000.00**
1	Total Number Other Personnel					Total Other Personnel Costs	**14,000.00**
						Total Direct Labor Costs (Salary, Wages, Fringe Benefits) (A+B)	**74,000.00**

PI Name : **Genaro Carrasco Ozuna**	NASA Proposal Number
Organization Name :	TBD on Submit

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SECTION X - Budget

Start Date :	End Date :	Budget Type :	Budget Period :
		Project	**2**

C. Direct Costs - Equipment

Item No.	Equipment Item Description	Funds Requested ($)
1	**Servidor nube, almacenamientos virtual temporales**	**2,000.00**
	Total Equipment Costs	**2,000.00**

D. Direct Costs - Travel

	Funds Requested ($)
1. Domestic Travel (Including U.S. Territories and Possessions)	**2,000.00**
2. Foreign Travel (Including Canada and Mexico)	**1,000.00**
Total Travel Costs	**3,000.00**

E. Direct Costs - Participant/Trainee Support Costs

		Funds Requested ($)
1. Tuition/Fees/Health Insurance		**0.00**
2. Stipends		**0.00**
3. Travel		**0.00**
4. Subsistence		**0.00**
Number of Participants/Trainees:	Total Participant/Trainee Support Costs	**0.00**

PI Name : **Genaro Carrasco Ozuna**	NASA Proposal Number
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Proposal Title : **El presente proyecto propone validar experimentalmente un modelo predictivo de sismos basado en coherencia causal(~7 dias) derivado del formalismo físico TCDS . El objetivo central es demostrar que el *Σ-locking* —medible entre variables geofísicas.**

SECTION X - Budget

Start Date :	End Date :	Budget Type :	Budget Period :
		Project	**2**

F. Other Direct Costs

	Funds Requested ($)
1. Materials and Supplies	**0.00**
2. Publication Costs	**0.00**
3. Consultant Services	**0.00**
4. ADP/Computer Services	**0.00**
5. Subawards/Consortium/Contractual Costs	**0.00**
6. Equipment or Facility Rental/User Fees	**0.00**
7. Alterations and Renovations	**0.00**
8. Other:	**0.00**
9. Other:	**0.00**
10. Other:	**0.00**
11. Other:	**0.00**
12. Other:	**0.00**
13. Other:	**0.00**
14. Other:	**0.00**
15. Other:	**0.00**
16. Other:	**0.00**
17. Other:	**0.00**
Total Other Direct Costs	**0.00**

G. Total Direct Costs

	Funds Requested ($)
Total Direct Costs (A+B+C+D+E+F)	**79,000.00**

PI Name : **Genaro Carrasco Ozuna**	NASA Proposal Number
Organization Name :	TBD on Submit

Proposal Title : **El presente proyecto propone validar experimentalmente un modelo predictivo de sismos basado en coherencia causal(~7 dias) derivado del formalismo físico TCDS . El objetivo central es demostrar que el *Σ-locking* —medible entre variables geofísicas.**

SECTION X - Budget

Start Date :	End Date :	Budget Type :	Budget Period :
		Project	**2**

H. Indirect Costs

	Indirect Cost Rate (%)	**Indirect Cost Base ($)**	Funds Requested ($)
	0.00	**0.00**	**0.00**
	0.00	**0.00**	**0.00**
	0.00	**0.00**	**0.00**
	0.00	**0.00**	**0.00**
	0.00	**0.00**	**0.00**
	0.00	**0.00**	**0.00**
	0.00	**0.00**	**0.00**
	0.00	**0.00**	**0.00**
	0.00	**0.00**	**0.00**
	0.00	**0.00**	**0.00**
Cognizant Federal Agency:		Total Indirect Costs	**0.00**

I. Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Costs (G+H)	**79,000.00**

J. Fee

	Funds Requested ($)
Fee	**0.00**

K. Total Cost

	Funds Requested ($)
Total Cost with Fee (I+J)	**79,000.00**

PI Name : **Genaro Carrasco Ozuna**	NASA Proposal Number
Organization Name :	TBD on Submit

Proposal Title : **El presente proyecto propone validar experimentalmente un modelo predictivo de sismos basado en coherencia causal(~7 dias) derivado del formalismo físico TCDS . El objetivo central es demostrar que el *Σ-locking* —medible entre variables geofísicas.**

SECTION X - Budget

Start Date :	End Date :	Budget Type : **Project**	Budget Period : **3**

A. Direct Labor - Key Personnel

Name	Project Role	**Base Salary ($)**	Cal. Months	Acad. Months	Summ. Months	Requested Salary ($)	**Fringe Benefits ($)**	Funds Requested ($)
Ozuna, Genaro	**PI**	**30,000.00**				**30,000.00**	**30,000.00**	**60,000.00**
							Total Key Personnel Costs	**60,000.00**

B. Direct Labor - Other Personnel

Number of Personnel	Project Role	Cal. Months	Acad. Months	Summ. Months	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
1	**Secretarial / Clerical**				**7,000.00**	**7,000.00**	**14,000.00**
1	Total Number Other Personnel					Total Other Personnel Costs	**14,000.00**
						Total Direct Labor Costs (Salary, Wages, Fringe Benefits) (A+B)	**74,000.00**

PI Name : **Genaro Carrasco Ozuna**	NASA Proposal Number
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SECTION X - Budget

Start Date :	End Date :	Budget Type :	Budget Period :
		Project	**3**

C. Direct Costs - Equipment

Item No.	Equipment Item Description	Funds Requested ($)
1	**Servidor nube, almacenamientos virtual temporales**	**2,000.00**
	Total Equipment Costs	**2,000.00**

D. Direct Costs - Travel

	Funds Requested ($)
1. Domestic Travel (Including U.S. Territories and Possessions)	**2,000.00**
2. Foreign Travel (Including Canada and Mexico)	**1,000.00**
Total Travel Costs	**3,000.00**

E. Direct Costs - Participant/Trainee Support Costs

		Funds Requested ($)
1. Tuition/Fees/Health Insurance		**0.00**
2. Stipends		**0.00**
3. Travel		**0.00**
4. Subsistence		**0.00**
Number of Participants/Trainees:	Total Participant/Trainee Support Costs	**0.00**

PI Name : **Genaro Carrasco Ozuna**	NASA Proposal Number
Organization Name :	TBD on Submit

Proposal Title : **El presente proyecto propone validar experimentalmente un modelo predictivo de sismos basado en coherencia causal(~7 dias) derivado del formalismo físico TCDS . El objetivo central es demostrar que el *Σ-locking* —medible entre variables geofísicas.**

SECTION X - Budget

Start Date :	End Date :	Budget Type :	Budget Period :
		Project	**3**

F. Other Direct Costs

	Funds Requested ($)
1. Materials and Supplies	**0.00**
2. Publication Costs	**0.00**
3. Consultant Services	**0.00**
4. ADP/Computer Services	**0.00**
5. Subawards/Consortium/Contractual Costs	**0.00**
6. Equipment or Facility Rental/User Fees	**0.00**
7. Alterations and Renovations	**0.00**
8. Other:	**0.00**
9. Other:	**0.00**
10. Other:	**0.00**
11. Other:	**0.00**
12. Other:	**0.00**
13. Other:	**0.00**
14. Other:	**0.00**
15. Other:	**0.00**
16. Other:	**0.00**
17. Other:	**0.00**
Total Other Direct Costs	**0.00**

G. Total Direct Costs

	Funds Requested ($)
Total Direct Costs (A+B+C+D+E+F)	**79,000.00**

PI Name : **Genaro Carrasco Ozuna**	NASA Proposal Number
Organization Name :	TBD on Submit

Proposal Title : **El presente proyecto propone validar experimentalmente un modelo predictivo de sismos basado en coherencia causal(~7 dias) derivado del formalismo físico TCDS . El objetivo central es demostrar que el *Σ-locking* —medible entre variables geofísicas.**

SECTION X - Budget

Start Date :	End Date :	Budget Type :	Budget Period :
		Project	**3**

H. Indirect Costs

	Indirect Cost Rate (%)	**Indirect Cost Base ($)**	Funds Requested ($)
	0.00	**0.00**	**0.00**
	0.00	**0.00**	**0.00**
	0.00	**0.00**	**0.00**
	0.00	**0.00**	**0.00**
	0.00	**0.00**	**0.00**
	0.00	**0.00**	**0.00**
	0.00	**0.00**	**0.00**
	0.00	**0.00**	**0.00**
	0.00	**0.00**	**0.00**
	0.00	**0.00**	**0.00**
Cognizant Federal Agency:		Total Indirect Costs	**0.00**

I. Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Costs (G+H)	**79,000.00**

J. Fee

	Funds Requested ($)
Fee	**0.00**

K. Total Cost

	Funds Requested ($)
Total Cost with Fee (I+J)	**79,000.00**

Predicción sísmica basada en coherencia Σ: Detección prospectiva de precursores usando observaciones NASA

Genaro Carrasco Ozuna Proyecto TCDS / MSL México Motor de Formalización G

Propuesta ROSES-25 A.4 Rapid Response and Novel Research (RRANN)

$3pt]VersiónInstitucional^{-}Noviembre2025$

Declaración de propósito

Esta propuesta integra el formalismo físico TCDS (Σ–χ) con observaciones NASA para demostrar una capacidad predictiva sísmica basada en coherencia causal.

Proyecto registrado bajo DOI: 10.5281/zenodo.17505875

1. Objetivos y encaje NASA

Objetivo general: Demostrar, con datos abiertos NASA y USGS, que el bloqueo de coherencia (Σ-locking) anticipa sismos de $M_w \geq 5{,}5$ con rendimiento prospectivo medible (TPR$\geq$ 0,6 a FPR$\leq$ 0,05) mediante ventanas $p : q$ pre-evento.
Objetivos específicos:

- Integrar observaciones remotas y geodésicas NASA en un pipeline reproducible de métricas Σ.
- Detectar rampas de coherencia previas al evento con KPIs: LI$\geq$ 0,90, R$>$ 0,95, RMSE$_{SL} <$ 0,10, reproducibilidad$\geq$ 95 %.
- Ejecutar corridas prospectivas durante 3–6 meses y publicar predicciones selladas (DOI/Zenodo).
- Evaluar utilidad mediante curvas ROC/PR y métricas de decisión operativa.

Relevancia NASA: Se alinea con el área de Observaciones de la Tierra y programa Disasters, utilizando datos de InSAR, GNSS, GRACE-FO y VIIRS.

2. Equipo

PI:	Genaro Carrasco Ozuna (TCDS / MSL) – dirección científica, datos sísmicos.
Co-I:	Motor de Formalización GPT-5 Σ-Trace – diseño de métricas y validación.
Colaborador:	Nodo académico externo (opcional) para acceso a InSAR masivo.

Resultados esperados:

- Evidencia prospectiva de bloqueo Σ antes de sismos mayores.
- Kit reproducible y guía de adopción para agencias de riesgo.

3. Datos y fuentes NASA/DAAC

Datos principales:

- InSAR (Sentinel-1, NISAR) vía ASF DAAC.
- GNSS (UNAVCO/NSF, compatible EOSDIS).
- Gravedad GRACE-FO mascon L2 (JPL/CSR).
- Óptico-térmico VIIRS/MODIS (NOAA/NASA).
- Reanálisis atmosférico GEOS-FP (GMAO).
- Catálogos sísmicos USGS ComCat.

Pre-proceso: co-registro geoespacial a malla común (1 km), detrending hidrometeo con GRACE-FO/GEOS-FP y segmentación en regiones tectónicas.

4. Metodología Σ-metrics

Métricas empleadas:

- $R(t)$: correlación temporal entre canales físicos y campo Σ.
- LI: índice de locking (fracción coherente).
- RMSE_{SL}: error cuadrático medio en estado locked.
- κ_Σ y $\kappa_{\Sigma-A}$: tasas de acoplamiento.

Umbrales KPI: LI$\geq$ 0,90, R$>$ 0,95, $\text{RMSE}_{SL} < 0{,}10$, reproducibilidad$\geq$ 95 %. Se genera una alerta si {LI,R} superan el umbral D* durante Δt previo al evento.

Validación:

- Retrospectiva estratificada (10–15 eventos/región).
- Prospectiva con preregistro y publicación de predicciones.
- Evaluación: ROC, PR, AUC, Brier y coste-pérdida.
- Control de falsos positivos mediante shuffling y placebo tests.

5. Plan de trabajo y entregables

Cronograma (6 meses RRANN):

1. Mes 1: Ingesta DAAC, definición de ROIs, preregistro D*.
2. Mes 2–3: Calibración de métricas Σ y ajuste regional.
3. Mes 4–5: Fase prospectiva con publicaciones semanales.
4. Mes 6: Análisis final y entrega del informe NASA.

Entregables:

- Pipeline reproducible (código, contenedores, documentación).
- Dataset derivado y máscaras de calidad.
- Cuaderno de predicciones prospectivas (DOI).
- Informe final con ROC/PR y guía de adopción.

6. Riesgos y mitigación

- Cobertura InSAR limitada: usar GNSS/GRACE-FO complementario.
- Señales hidrológicas: corrección con mascon GRACE-FO + GEOS-FP.
- Overfitting: preregistro de reglas y separación retro/prospectiva.
- Escasez de eventos: ampliar periodo o añadir región espejo.

7. Gestión, presupuesto y ética

Todo el proyecto opera bajo **CC BY 4.0**. Datos y resultados serán depositados en Zenodo (DOI existente: 10.5281/zenodo.17505875).

Presupuesto estimado (6 meses):

- Personal científico / data engineering: USD 85–120k.
- Cloud y almacenamiento: USD 8–15k.
- Gestión y publicación reproducible: USD 5–10k.
- Total: USD 100–145k.

8. Autocrítica y validación

El diseño se fundamenta en las métricas Σ y KPIs ya definidos dentro del corpus TCDS. Cumple con el carácter de respuesta rápida RRANN (6 meses) y criterios estadísticos modernos (ROC, preregistro, control de FPR).
El riesgo principal es la densidad de datos InSAR, mitigado con redundancia GNSS/GRACE-FO. La validación se basa en demostración prospectiva, no correlación post-hoc.

Cita del dataset base:
Carrasco Ozuna, G. (2025). *Carpeta1 — Corpus Integral TCDS / TMRCU / Σ-FET.* Zenodo. DOI: 10.5281/zenodo.17505875.

Apéndice A — Metadatos JSON-LD

A continuación, un bloque JSON-LD listo para incluir en el repositorio y en la entrega complementaria:


```
{
  "@context": "https://schema.org",
  "@type": ["CreativeWork", "ResearchProject"],
  "name": "Predicción sísmica basada en coherencia ",
  "author": {
    "@type": "Person",
    "name": "Genaro Carrasco Ozuna",
    "affiliation": "Proyecto TCDS / MSL, México"
  },
  "license": "https://creativecommons.org/licenses/by/4.0/",
  "identifier": "https://doi.org/10.5281/zenodo.17505875",
  "description": "Propuesta RRANN para validar prospectivamente locking  previo a sism
  "keywords": ["TCDS", "-metrics", "InSAR", "GRACE-FO", "GNSS", "VIIRS", "sismicidad"
  "measurementTechnique": ["-metrics (R(t), LI, RMSE_SL, )", "preregistro", "ROC/PR",
  "isBasedOn": "https://doi.org/10.5281/zenodo.17505875"
}
```

Apéndice B — Compilación

Compilar con pdfLaTeX o LuaLaTeX. No requiere imágenes externas. Paquetes usados: babel, geometry, amsmath, hyperref, tikz, listings. Estructura lista para copiar y compilar.

Apéndice C — Declaración de uso de logos

Los gráficos de portada son representaciones geométricas simplificadas generadas con TikZ, no logotipos oficiales.