



The Earth Proxy System (EPS) Signal Framework

“A Conceptual Observational Framework of Distributed Proxy Variability in the Coupled Earth System”

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The Earth Proxy System (EPS) framework proposes that variability within the coupled Earth system may manifest through distributed proxy observations appearing across multiple environmental domains. EPS therefore provides a conceptual observational structure for interpreting relationships between environmental observations and Earth-system variability.

The Earth Proxy System (EPS) Signal Framework is introduced as a conceptual observational perspective on relationships between distributed environmental proxy indicators and variability within the coupled Earth system. (MA Jones, 2026).



Abstract

The Earth Proxy System (EPS) Signal Framework proposes that variability within the coupled Earth system may be reflected through distributed proxy observations across multiple environmental domains. EPS is presented as a conceptual observational framework for interpreting possible relationships between planetary influences, coupled Earth-system interactions, observable proxy signals, and large-scale Earth-system variability.

EPS is an interpretive framework, not a disclosed analytical method, predictive model, or computational forecasting system. It provides a structured conceptual language for discussing how observations across atmospheric, oceanic, hydrological, geophysical, cryospheric, biospheric, and related domains may correspond with broader system behaviour. By treating proxy indicators as potentially linked expressions of coupled Earth-system processes, EPS supports interdisciplinary discussion of climate regimes, environmental cycles, geophysical variability, and regime transitions while preserving confidentiality over undisclosed implementation details.

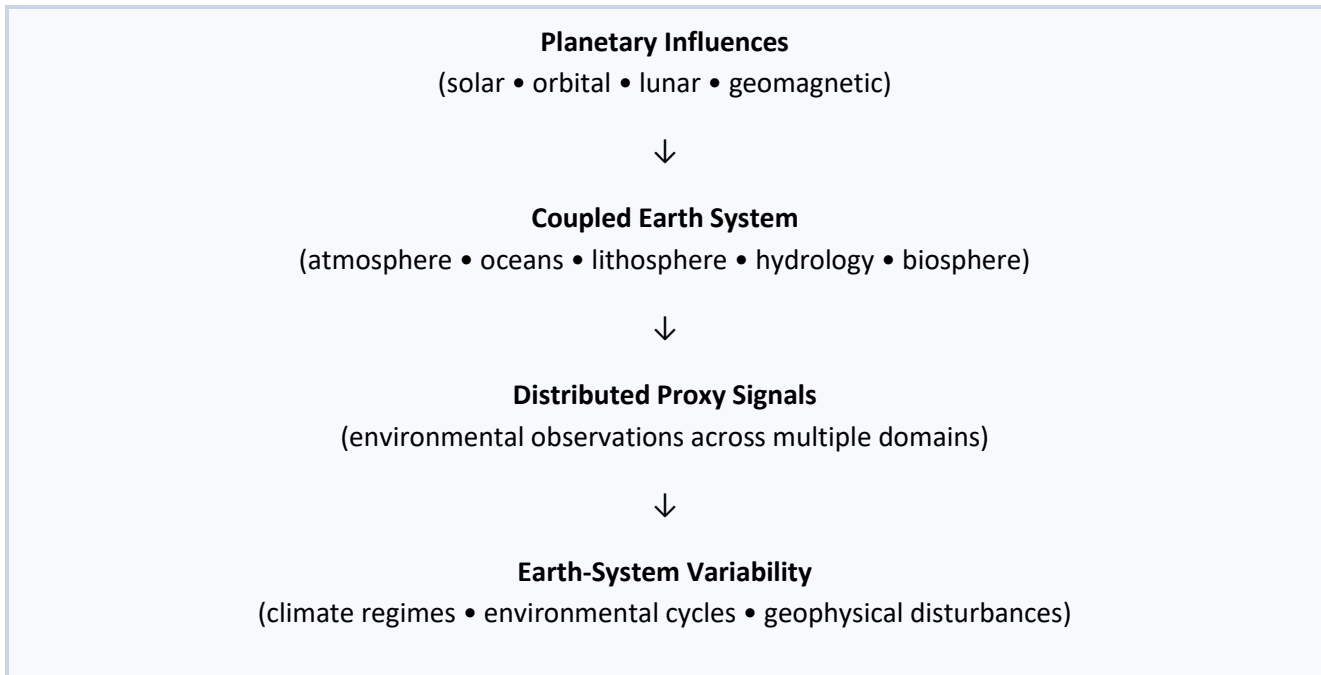
EPS Summary

Concept	A conceptual observational framework for discussing how distributed proxy observations may correspond with variability in the coupled Earth system.
Core idea	Planetary influences and coupled Earth-system dynamics may be expressed through distributed environmental observations across multiple domains.
Out of scope	Specific algorithms, feature-engineering methods, predictive thresholds, software logic, code, calibration routines, and operational implementation details.
Publication role	Anchor document for the EPS publication series and associated observational notes.



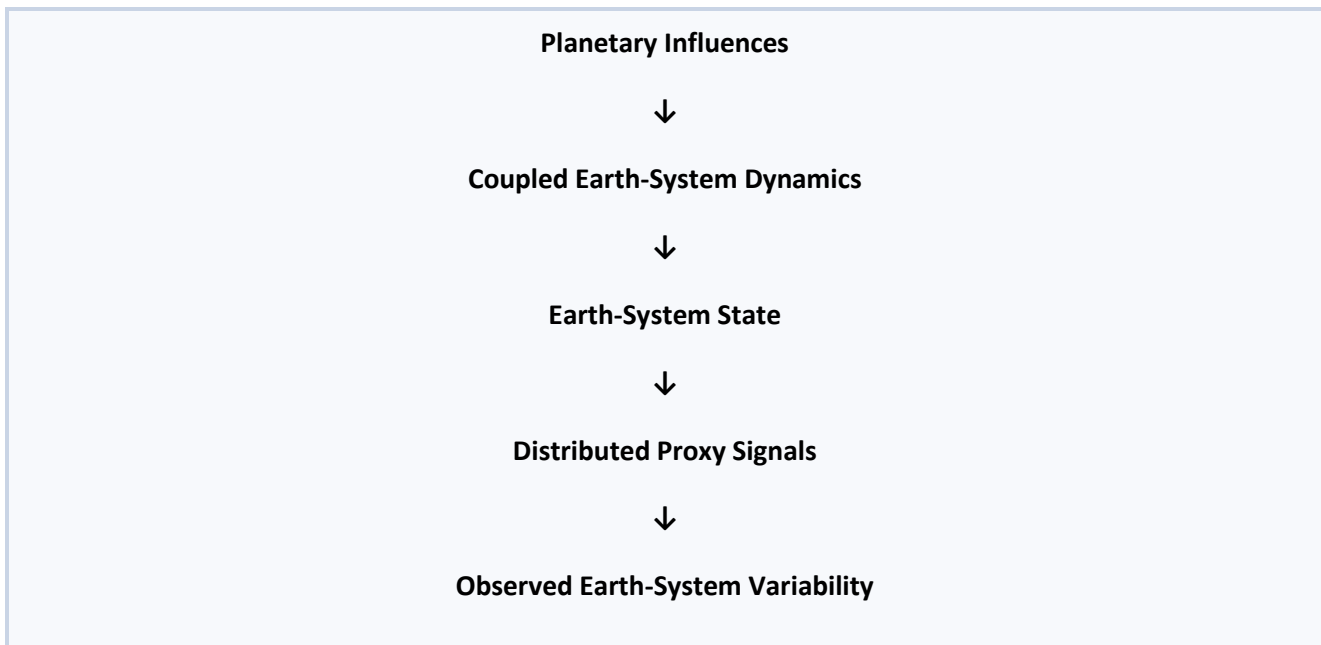
EPS Conceptual Framework Model (EPS-M1)

Planetary influences interact with Earth-system components to produce variability that may manifest through distributed proxy signals.



Above: EPS-M1 presents the high-level conceptual chain; Below: EPS-M2 adds an explicit state layer.

EPS State Model (EPS-M2)



M2 is a conceptual state representation, not a disclosed computational state model.



1. Introduction

The Earth operates as a coupled and dynamic system in which atmospheric, oceanic, hydrological, lithospheric, cryospheric, biospheric, and broader planetary influences interact across multiple spatial and temporal scales. Variability within this system is observable through many environmental indicators, yet the interpretation of relationships among these distributed signals remains challenging when observations are treated within isolated disciplinary frames.

The Earth Proxy System (EPS) Signal Framework is introduced as a conceptual observational framework proposing that Earth-system variability may be interpreted, in part, through distributed proxy signals arising across the coupled Earth system. Within this framework, environmental observations are viewed not merely as isolated indicators but as potentially related expressions of interacting Earth-system processes.

2. Motivation for the EPS framework

Observational records across climate, oceanic, rainfall, environmental, and geophysical domains often display patterns that appear related in timing, structure, or regime behaviour. These observations, however, are commonly analysed within disciplinary silos, which can limit interpretation of cross-domain relationships, coupled dynamics, and lead-lag structure.

EPS is motivated by the need for a high-level conceptual framework capable of organising such observations within a coupled Earth-system context. It is intended to support disciplined discussion of distributed signal behaviour across domains while preserving confidentiality over undisclosed analytical pathways, feature engineering, signal transforms, predictive logic, and implementation methods.

3. Multi-timescale variability

Earth-system processes operate across a wide range of temporal scales. Within the EPS framework, variability may arise through interactions between processes that respond rapidly and those that integrate, persist, or propagate over longer horizons.

Atmospheric circulation can adjust relatively quickly to changes in energy distribution, pressure gradients, and teleconnection structure. Oceanic processes often evolve over longer timescales due to thermal inertia, heat storage, and slower circulation pathways. Hydrological, cryospheric, biospheric, and geophysical responses may occur across additional timescales depending on the processes involved.

Proxy signals observed across environmental domains may therefore reflect multiple timescales at once. EPS accordingly treats distributed proxy variability as potentially multi-scale, lagged, and state-dependent rather than as a single-timescale process.



4. Alignment with Earth-system science and teleconnection concepts

Modern Earth-system science recognises that the planet functions as an interconnected system in which atmosphere, oceans, land, cryosphere, biosphere, and geophysical processes interact across scales. Large-scale climate variability is often expressed through teleconnections and coupled modes, including ocean-atmosphere interactions, circulation shifts, hydrological responses, and longer-term forcing relationships.

EPS is conceptually aligned with this systems view. It does not replace existing Earth-system science, proxy science, or teleconnection theory. Rather, it provides an interpretive overlay through which distributed observations may be considered as possible expressions of coupled system behaviour. Within this perspective, proxy indicators may correspond with variability across climate regimes, environmental cycles, and geophysical disturbances without implying a single deterministic pathway.

5. Core EPS propositions

EPS Core Proposition (EPS-L1)

Earth-system variability manifests through distributed proxy signals arising across the coupled Earth system.

EPS Conceptual Principle (EPS-P1)

Climate regimes, environmental cycles, and geophysical variability within the coupled Earth system may correspond with patterns of distributed proxy variability observable across multiple environmental domains.

EPS Conceptual Relationship (EPS-R1)

The observational relationship within the EPS framework can be expressed conceptually as:

$$V_{ES} \leftrightarrow S_d \mid \{I_p, C_{es}\}$$

V_{ES} = Earth-system variability

S_d = distributed proxy signals

I_p = planetary influences

C_{es} = coupled Earth-system interactions

EPS Conceptual State Proposition (EPS-S1)

Within the EPS framework, variability within the Earth system may be interpreted as occurring within a conceptual **Earth-system state space**. A simplified conceptual expression for the system state may be written as:

$$S_{ES} = f \{I_p, C_{es}\}$$

S_{ES} = Earth-system state

I_p = planetary influences

C_{es} = coupled Earth-system interactions



Distributed proxy variability

Within EPS, distributed proxy variability refers to patterns of environmental observations arising across multiple domains that may correspond with broader Earth-system behaviour. Relevant proxy domains may include atmospheric observations, oceanographic indicators, hydrological measurements, geophysical signals, isotopic records, cryospheric indicators, biospheric observations, and related environmental datasets.

The framework does not claim that all proxy observations are equivalent or that any single proxy offers a complete description of system state. Instead, EPS proposes that meaningful interpretation may emerge when distributed observations are considered in relation to one another, in time, and within the broader context of coupled system dynamics.

7. Conceptual framework models

EPS-M1 presents the high-level conceptual chain within EPS: planetary influences interact with coupled Earth-system components, generating variability that may be reflected through distributed proxy signals and broader observed Earth-system behaviour.

Planetary influences (*solar, orbital, lunar, geomagnetic*)

→ **Coupled Earth system** (*atmosphere, oceans, lithosphere, hydrology, cryosphere, biosphere*)

→ **Distributed proxy signals** (*environmental observations across multiple domains*)

→ **Observed Earth-system variability** (*climate regimes, environmental cycles, geophysical disturbances*)

EPS-M2 extends this chain by adding an explicit conceptual state layer.

Planetary influences

→ **Coupled Earth-system dynamics**

→ **Conceptual Earth-system state**

→ **Distributed proxy signals**

→ **Observed Earth-system variability**

M1 describes the broad interaction pathway. M2 clarifies that proxy observations are interpreted as possible expressions of system state rather than as direct one-to-one measures of a single process. This state layer is conceptual and interpretive, not a disclosed computational state model or operational analytical method. Accordingly, EPS is presented as a conceptual observational structure for exploring possible relationships between environmental proxy signals and broader Earth-system variability across climate science, geophysics, hydrology, and related Earth-system disciplines.

8. Planetary influences in scope

Within EPS, planetary influences may include solar variability, orbital forcing associated with Milankovitch cycles, lunar gravitational effects, and geomagnetic or solar-terrestrial interactions. Within EPS, these influences are treated as part of the conceptual forcing context rather than as a claim of exclusive causation.

Their relevance may differ by timescale, domain, and application. EPS therefore uses planetary influences as a conceptual category that may interact with atmospheric, oceanic, hydrological, geophysical, cryospheric, and biospheric processes through multiple pathways.



9. Potential domains of application

Potential application domains for the EPS framework include climate regime variability, environmental and hydrological cycles, geophysical hazard variability, and regime-transition analysis. These domains are illustrative rather than exhaustive.

EPS is intended to support conceptual interpretation and structured discussion. It is not, in this document, a claim to a disclosed operational prediction engine, risk classification system, or automated decision platform.

10. EPS publication family and theory series

The EPS framework is intended to function as the anchor document for a broader publication family exploring distributed proxy variability across different Earth-system contexts.

EPS-000 – EPS Framework (Earth Proxy System Signal Framework)

EPS-001 – Climate Regimes

EPS-002 – Hazard Variability

EPS-003 – Environmental Variability

EPS-004 – Regime Transitions

EPS-005 – Distributed Proxy Variability

EPS-ONO-001 – Distributed Proxy Signals and Rainfall Variability in Southern Australia

EPS-ONO-002 – Distributed Environmental Proxy Signals and ENSO Regime Behaviour

EPS-ONO-003 – Temporal Lead–Lag Behaviour in Distributed Environmental Proxy Signals

EPS-ONO-004 – Planetary Influences and Distributed Environmental Variability in the Earth System

Additional notes may extend the series as needed.

11. Scope, limitations, and publication boundary

The EPS Signal Framework is presented here as a conceptual observational framework. It does not prescribe specific analytical algorithms, predictive models, feature-engineering methods, signal-extraction methodologies, thresholds, calibration logic, or computational forecasting systems.

This document is intended to place the disclosed EPS conceptual framework into the public record for defensive-publication purposes while preserving confidentiality over undisclosed implementation details. Copyright in the expression, layout, and branded presentation of this document is reserved. Specific analytical methods, algorithms, transforms, scoring logic, software, and implementation details remain confidential unless separately disclosed.

EPS should therefore be interpreted as a structured conceptual framework for discussing possible relationships between distributed environmental observations and Earth-system variability, not as a complete operational model or disclosed implementation pathway.



12. Future research directions

Future work may examine relationships among proxy indicators arising across atmospheric, oceanic, hydrological, geophysical, cryospheric, biospheric, and isotopic domains. It may also explore additional lead–lag structure across regimes and transitions, and assess how distributed proxy behaviour varies by timescale, region, and application context.

Further research may consider how EPS conceptual constructs interface with established Earth-system science, teleconnection analysis, proxy interpretation, hazard frameworks, and broader interdisciplinary observational studies.

13. Interdisciplinary relevance

EPS may be relevant to climate science, geophysics, hydrology, environmental science, palaeoclimate interpretation, and broader Earth-system science. Its principal value is as a common conceptual language for discussing distributed environmental observations in relation to coupled system behaviour.

By providing a structured interpretive framework rather than a narrow single-domain theory, EPS may help organise cross-disciplinary discussion of climate regimes, environmental variability, regime transitions, and geophysical or environmental disturbances.

14. Conclusion

The **Earth Proxy System (EPS) Signal Framework** provides a conceptual observational framework for interpreting how distributed proxy indicators may correspond with variability within the coupled Earth system. Its contribution lies not in disclosing a specific predictive method, but in establishing a structured conceptual language linking planetary influences, coupled Earth-system interactions, distributed proxy observations, and observed Earth-system variability.

As a **defensive publication**, this document places the disclosed EPS framework, terminology, and conceptual relationships into the public record while preserving confidentiality over specific analytical and implementation pathways.



15. References

- **NOAA Climate Prediction Center (CPC).** Climate Weather Linkage: Teleconnections. NOAA. National Oceanic and Atmospheric Administration viewed March 2026.
- **NOAA National Centers for Environmental Information (NCEI) 2016,** *What Are Proxy Data?* NOAA. National Oceanic and Atmospheric Administration viewed March 2026.
- **NASA Earth Science Division (2025)** Earth Science Researchers. NASA. Available at: <https://science.nasa.gov/earth-science/> (accessed March 2026).
- **NASA Earth Science Research (2026)** Earth System Science Research. NASA. Available at: NASA. <https://science.nasa.gov/earth-science/research/> (accessed March 2026).
- **IPCC (2021)** Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press / IPCC. Available at: <https://www.ipcc.ch/report/ar6/wg1/> (accessed March 2026).
- **IPCC (2019)** The Ocean and Cryosphere in a Changing Climate. IPCC. Available at: <https://www.ipcc.ch/srocc/> (accessed March 2026).
- **IPCC (2019)** Climate Change and Land. IPCC. Available at: <https://www.ipcc.ch/srccl/> (accessed March 2026).
- **NOAA Ocean Service (2024)** What are tides? NOAA. Available at: <https://oceanservice.noaa.gov/facts/tides.html> (accessed March 2026).
- **NOAA Ocean Service (2024)** What Causes Tides? NOAA. Available at: https://oceanservice.noaa.gov/education/tutorial_tides/tides02_cause.html (accessed March 2026).
- **NOAA Space Weather Prediction Center (2026)** Geomagnetic Storms. NOAA. Available at: <https://www.swpc.noaa.gov/phenomena/geomagnetic-storms> (accessed March 2026).
- **NASA Earth Science (2020)** Milankovitch (Orbital) Cycles and Their Role in Earth's Climate. NASA. Available at: <https://science.nasa.gov/science-research/earth-science/milankovitch-orbital-cycles-and-their-role-in-earths-climate/> (accessed March 2026).



16. Glossary of key terms

Term	Definition
Earth Proxy System (EPS) Signal Framework	A conceptual observational framework proposing that distributed environmental proxy indicators may correspond with variability within the coupled Earth system.
Distributed proxy variability	Patterns of proxy observations appearing across multiple environmental domains that may correspond with broader Earth-system behaviour.
Proxy signal	An observable environmental indicator that may reflect processes occurring within the Earth system. Proxy signals may arise across atmospheric, oceanic, hydrological, geophysical, cryospheric, biospheric, isotopic, or related domains.
Environmental proxy indicator	An indirect observation of Earth-system processes derived from measurable environmental variables, natural archives, or observational datasets.
Coupled Earth system	The interconnected Earth system formed through interactions among atmospheric, oceanic, lithospheric, hydrological, cryospheric, biospheric, and related processes.
Planetary influences	External or large-scale physical influences that may affect Earth-system dynamics, including solar variability, orbital forcing, lunar gravitational interactions, and geomagnetic or solar-terrestrial processes.
Earth-system variability	Observable changes in environmental conditions arising from interactions within the coupled Earth system, including climate regimes, environmental cycles, regime shifts, and geophysical disturbances.
Earth-system state	A conceptual description of the condition of the coupled Earth system at a given time, arising from interacting planetary influences and Earth-system dynamics.
Teleconnection	A climatic or environmental linkage in which anomalies or variability in one region are associated with correlated changes in another region or domain.
Climate regime	A large-scale pattern of atmospheric and oceanic behaviour influencing regional or global climate variability, such as ENSO or the Southern Annular Mode.
Environmental variability	Changes in environmental conditions, such as rainfall patterns, drought cycles, hydrological behaviour, or ecological responses, occurring across time and space.



Term	Definition
Hazard variability	Variability associated with geophysical or atmospheric disturbances, including earthquakes, volcanic activity, storms, or other hazard-related behaviour.
Regime transition	A shift from one dominant climate or environmental state to another, potentially involving staged or lagged adjustment across multiple domains.
Observational perspective	An interpretive approach that examines environmental indicators as observable expressions of Earth-system processes rather than as outputs of a single disclosed analytical method.
Core proposition	Within this document, a named conceptual proposition used to summarise the core EPS claim. It is not asserted as a universal physical law in the strict scientific sense.
Conceptual Principle	A named conceptual proposition describing how distributed proxy variability may correspond with broader Earth-system behaviour across multiple domains.
Conceptual relationship	A symbolic or verbal expression used to describe a proposed relationship among Earth-system variability, distributed proxy signals, planetary influences, and coupled Earth-system interactions.
Conceptual State Proposition	A conceptual representation of the range of possible Earth-system states arising from interacting processes and forcings.
Proxy domain	A category of observations or measurements, such as atmospheric, oceanic, hydrological, geophysical, cryospheric, biospheric, or isotopic data.
Coupled dynamics	Interacting processes across Earth-system components that influence one another through feedbacks, lags, and shared forcing contexts.