

Evidence essay · Observation and data

Metadata that outlives an instrument

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Fictional author and institute · Editorial demonstration, not peer reviewed

ABSTRACT

Measurements can survive while the context needed to interpret them disappears. This essay identifies metadata that preserves comparability, reproducibility, and permission to use a record. A fictional temperature-logger replacement illustrates how altered sampling intervals can change an analysis unless deployment and aggregation choices remain explicit. Climate and Forecast conventions provide an existing language for quantities, coordinates, units, and history, complemented by separate deployment and processing logs. NOAA's observing-network assessment supplies wider context for sensor transitions and recalibration. The discussion recommends retaining original observations, versioned products, documented corrections, access conditions, and an institutional stewardship role. Complete documentation is not equated with unrestricted publication. A practical handover exercise asks whether an unfamiliar reader can explain one published value using the archive alone, without relying on someone's memory.

Keywords: metadata · instrument continuity · versioning · data stewardship · processing history

Adapted from the Still North field journal. Original article. A source-based editorial text, not a report of original Still North research. Examples and imagery are illustrative.

A temperature column can survive for decades while the knowledge needed to interpret it disappears in a staff handover. Was the probe in air or water? Did its clock use UTC? Was the value an instantaneous reading or an average? Metadata is the part of an observation that answers a future reader who cannot telephone the person holding the instrument.

This is not an argument for documenting everything with equal intensity. It is an argument for preserving the decisions that change meaning. A useful record lets someone decide whether two values can be compared, whether a result can be reproduced, and whether they have permission to use it. Those are different questions, and each deserves an explicit answer.

Start with the stranger opening the file

Imagine a fictional water-temperature logger replaced after a winter deployment. Its successor stores a reading every minute rather than every hour. A future analyst could mistake the denser file for a better-observed period and give it more weight in an annual average. The essential note is not that a new instrument arrived. It is that the sampling interval changed, when it changed, and how the published hourly product was constructed.

Record the measured quantity and unit, the instrument identifier, deployment dates, and the position relevant to that quantity. For water, depth and the reference used for depth can matter as much as coordinates. Describe time stamps, averaging intervals, and whether a time labels the beginning, middle, or end of an interval. A tidy date column is not evidence that these choices are obvious.

The [Climate and Forecast Metadata Conventions](#) provide established ways to describe variables, coordinates, units, and processing history in netCDF files. Reusing a recognised convention makes interpretation less depen-

dent on a private glossary. It does not remove the need for a plain-language account of what a project actually did.

Give change its own record

A deployment log and a processing log do different jobs. The first explains that a mount moved, a cable failed, or a sensor was cleaned. The second explains that a clock correction was applied, a quality rule changed, or an aggregation method was revised. Keep both connected to the affected observations. A general annual report saying that equipment was maintained cannot explain which readings need attention.

Preserve the original observation separately from corrected and published products. Give a released dataset a version, explain the changes between releases, and retain the inputs and method needed to recreate it. A correction should make the record more useful without making an earlier published chart inexplicable. CF's history attribute offers an audit-trail convention, but a machine-generated list of software commands may still need a short explanation of why a correction was justified.

This matters at network scale. The [NOAA observing-network assessment](#) describes satellite transitions that require expertise and recalibration to maintain consistency with long records. Continuity is not guaranteed by connecting the last value from one sensor to the first value from another. The relationship between them has to be investigated and preserved.

An archive needs an owner, not a hero

A personal email address is a fragile preservation plan. Name the responsible institution and role, where corrections should go, and what happens if the programme closes. Keep documentation with the data rather than only on a project website whose hosting may expire. Include a readable inventory, so a successor can distinguish

raw observations, provisional exports, and the release used in a publication.

- Explain missing values, quality flags, and any detection or reporting limits.
- Link the deployment, calibration, and processing records by stable identifiers.
- State citation and access terms, including restrictions on sensitive information.
- Record a review date and the route for transferring stewardship.

Do not confuse complete documentation with unrestricted publication. A record may need precise coordinates for authorised analysis while its public catalogue describes only a broader area. Consent records themselves can contain private information. Describe the access conditions without exposing the material those conditions protect. Our [Communities and livelihoods](#) page explains why governance belongs beside technical stewardship.

The most revealing handover exercise is simple: ask someone unfamiliar with the project to explain one published value using the archive alone. Every necessary answer trapped in another person's memory identifies a repair to make. [Open observations](#) sets out the wider record. The instrument will eventually stop. Its context should not stop with it.

References

1. [Climate and Forecast Metadata Conventions](https://cfconventions.org) (cfconventions.org)
2. [NOAA observing-network assessment](https://arctic.noaa.gov) (arctic.noaa.gov)