OPEN SCIENCE

RESEARCH DATA MANAGEMENT PLAN (DMP)[1]

Project number	152120
Funder	National Research, Development and Innovation Office
Project title	Paleotemperature signals and “bioarchitecture” in ammonite mandibles
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Beneficiary institute	Institute for Geological and Geochemical Research, HUN-REN Research Centre for Astronomy and Earth Sciences
Project starting date	01.01. 2026
Project end date	31.12.2028
Project duration	36 months
Data manager/contact	Attila Demény / demeny.attila@csfk.hun-ren.hu
DMP 1st version/date	04.03.2025
DMP last update[2]/date	11.03.2026

SUMMARY *(dataset[3] reference and name; origin and expected size of the data generated/collected; data types and formats)*

Provide a summary of the data addressing the following aspects:

- State the purpose of the data collection/generation
- Explain the relation to the objectives of the project
- Specify the types and formats of data generated/collected
- Specify if existing data is being re-used (if any)
- Specify the origin of the data
- State the expected size of the data (if known)
- Outline the data utility: to whom will it be useful

The Data Management Plan will be revised regularly during the project in order to include management of new data types.

The purpose of data collection to provide stable isotope based paleotemperature data for Mesozoic calcitic fossils (aptychi, rhyncholites, belemnites, brachiopods).

Objectives: the data will provide the major information for the estimation of Mesozoic seawater temperatures.

Types and formats.The data will be numeric values listed in tables in tabulated text files (*.csv or *.txt) (measured values and corresponding metadata).

[1] Template for the Open Science Research Data Management Plan (DMP). The sections should describe how you plan to make the project data Findable, Accessible, Interoperable and Reusable (FAIR).

[2] DMP is to be regularly updated.

[3] Several datasets may be included into a single DMP.

Existing data is being re-used. Published data will be used for comparison with the new data obtained within the project.
Origin of the data. The stable isotope compositions will be determined at the Institute for Geological and Geochemical Research, HUN-REN Research Centre for Astronomy and Earth Sciences, Budapest, and the HUN-REN Institute for Nuclear Research, Debrecen.
The expected size of data will not exceed several MBytes. Image producing methods may yield 100 Gbyte sizes, these will be specified in the revisions during the project.
The stable isotope and paleotemperature data will be useful for international researchers who deal with climate conditions and oceanographic situations in the Mesozoic.

Each of the following six issues should be addressed with a level of detail appropriate to the project. Some guiding expressions with explaining guidance help in elaboration. Please note that not all guiding thoughts are to be taken into consideration, depending on the project.

1. MAKING DATA FINDABLE *(dataset description: metadata, persistent and unique identifiers e.g., DOI)*

Making data findable, including provisions for metadata:
- Outline the discoverability of data (metadata provision)
- Outline the identifiability of data and refer to standard identification mechanism. Do you make use of persistent and unique identifiers such as Digital Object Identifiers?
- Outline naming conventions used
- Outline the approach towards search keyword
- Outline the approach for clear versioning
- Specify standards for metadata creation (if any). If there are no standards in your discipline describe what metadata will be created and how

Guidance:
The Research Data Alliance provides a Metadata Standards Directory that can be searched for discipline-specific standards and associated tools.

Discoverability of data. The data will be findable though the publisher of the given research papers via digital object identifier.
Identifiability of data and refer to standard identification mechanism. Sub-discipline (geosciences) specific naming will be used to make the data most findable. The question of metadata standards is irrelevant to the data published in supplement to the research papers, however metadata related to the research-data placed in data repositories (e.g. HUN-REN ARP) will follow the Dublin Core Metadata Element Set.

2. MAKING DATA OPENLY ACCESSIBLE *(which data will be made openly available and if some datasets remain closed, the reasons for not giving access; where the data and associated metadata, documentation and code are deposited (repository?); how the data can be accessed (are relevant software tools/methods provided?)*

Making data openly accessible:

Specify which data will be made openly available? If some data is kept closed provide rationale for doing so
Specify how the data will be made available
Specify what methods or software tools are needed to access the data? Is documentation about the software needed to access the data included? Is it possible to include the relevant software (e.g. in open source code)?
Specify where the data and associated metadata, documentation and code are deposited
Specify how access will be provided in case there are any restrictions

Guidance:
Participating in the open research data management (ORDM) does not necessarily mean opening up all your research data. Rather, the ORDM follows the principle "**as open as possible, as closed as necessary**" and focuses on encouraging sound data management as an essential part of research best practice.
The NRDIO recognises that there are good reasons to keep some or even all research data generated in a project closed. Where data need to be shared under restrictions, explain why, clearly separating legal and contractual reasons from voluntary restrictions.
Note that in multi-beneficiary projects it is also possible for specific beneficiaries to keep their data closed if relevant provisions are made in the consortium agreement and are in line with the reasons for opting out.
The Registry of Research Data Repositories provides a useful listing of repositories that you can search to find a place of deposit.

Raw stable isotope and paleotemperature data will be uploaded in a fully open access data repository, such as the HUN-REN ARP or Zenodo, with appropriate handles or digital object identifiers. However, it will be made available only after the data in question will be published in articles. The research data in repositories will be referenced to in articles with handles or DOI. Selected derived data will also be published in Supplementary Tables of journal articles, which can be downloaded from the journal's sites. The access depends on the actual journal policy. Elsevier, Springer and Wiley journals have agreements with the Hungarian Research Network to make papers open access, hence the data will be freely available.
The data tables will be readable with general office software tools. If image producing methods provide data, the DMP will be revised.

3. MAKING DATA INTEROPERABLE *(which standard or field-specific data and metadata vocabularies and methods will be used)*

Making data interoperable:

Assess the interoperability of your data. Specify what data and metadata vocabularies, standards or methodologies you will follow to facilitate interoperability.
Specify whether you will be using standard vocabulary for all data types present in your data set, to allow inter-disciplinary interoperability? If not, will you provide mapping to more commonly used ontologies?

Guidance:
Interoperability means allowing data exchange and re-use between researchers, institutions, organisations, countries, etc. (i.e. adhering to standards for formats, as much as possible compliant with available (open) software applications, and in particular facilitating re-combinations with different datasets from different origins).

Interoperability. Data generation will follow the general procedures established by the International Atomic Energy Agency.
Generated data will be provided in interoperable tabulated text formats as well. If image-

related software tool are to be applied, it will be included in the revised version of DMP.

4. INCREASE DATA RE-USE *(what data will remain re-usable and for how long, is embargo foreseen; how the data is licensed; data quality assurance procedures)*

Increase data re-use (through clarifying licenses):

Specify how the data will be licenced to permit the widest reuse possible

Specify when the data will be made available for re-use. If applicable, specify why and for what period a data embargo is needed

Specify whether the data produced and/or used in the project is useable by third parties, in particular after the end of the project? If the re-use of some data is restricted, explain why

Describe data quality assurance processes

Specify the length of time for which the data will remain re-usable

Guidance:

The EUDAT B2SHARE tool includes a built-in license wizard that facilitates the selection of an adequate license for research data.

Reasons for embargoes may include time to publish or seek patents. If an embargo is sought, specify why and for how long, bearing in mind that research data should be made available as soon as possible.

Licensing will follow the Creative Commons standards, e.g. CC BY-NC-ND The data will be available in Supplementary Tables related to journal articles and can be read by usual office software tools. Embargo will depend on the actual journal policy.

Re-use. Any third party reader will be able to use the data after their publication.

Quality assurance is based on measurements of international standards and on the reports of their measured compositions. Data generation will follow the general procedures established by the International Atomic Energy Agency. Full descriptions of methodologies will be provided in the journal papers.

The data will remain re-usable until the journal provide the Supplementary Tables and the authors can provide the tables upon request.

5. ALLOCATION OF RESOURCES and DATA SECURITY *(estimated costs for making the project data open access and potential value of long-term data preservation; procedures for data backup and recovery; transfer of sensitive data and secure storage in repositories for long term preservation and curation)*

Explain the allocation of resources, addressing the following aspects:

- Estimate the costs for making your data FAIR. Describe how you intend to cover these costs
- Clearly identify responsibilities for data management in your project
- Describe costs and potential value of long term preservation

Guidance:

Note that costs related to open access to research data are eligible as part of the grant (if compliant with the Grant Agreement conditions).

Costs are eligible for reimbursement during the duration of the project under the conditions defined in the Grant Agreement.

Address data recovery as well as secure storage and transfer of sensitive data.

Also consider whether the data is safely stored in certified repositories for long term preservation and curation.

Costs. Data will be stored on the institutional NAS, in institutional data repositories, on the researcher's personal computer, and on external storage devices. The current volume of data does not necessitate the purchase of additional storage, as the institute covers storage costs within the overhead budget.

The costs associated with making the data FAIR (DMP, use of metadata standards, placing the data in a repository / supplement of a published paper) are covered by the institute's overhead budget, or the article processing charge.

Data management responsibilities.

Overall data security-responsibility lies with the PI for data management, ensuring compliance with institutional and funding body requirements.

The long-term preservation of data is ensured by storing it in certified repositories, which offer secure, reliable storage solutions.

6. DATA COMPLIANCE *(data compliance is the formal governance structure in place to ensure an organization complies with laws, regulations, and standards around its data)*

Explain legal compliance of the beneficiary institute:

Data policy and/or strategy

Data governance

Describe what legal items (national and EU) and how they are followed concerning data protection

Guidance:

Data policy sets broad, high level principles that governs data management, data interoperability and standards, data quality, data protection and information security.

Data governance entails defining, implementing and monitoring strategies, policies and sharing the management and use of data assets.

Main legal items include, e.g., laws on the protection and management of personal data at the national level, and GDPR at the EU level

To what extent the personal data management of the project and/or institute fulfil the requirements prescribed by GDPR?

Data policy and/or strategy. The data derived, used, and presented in this research is non-personal in nature, thus rendering the question of personal data protection irrelevant. As our research involves natural sciences data, specifically measurements of inorganic material, there are no surveys, human, or animal trials involved.

However, we adhere to relevant data protection regulations, including:

-Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation, GDPR)

-The HUN-REN RCAES Data Protection Regulation concerning the management of personal data.

We also use the Data Management plan of our institute (developed within the HUN-REN ARP ambassador program) to make the data presentation comply with discipline standards.

DISCLAIMER

It is the responsibility of the Principal Investigator to inform the NRDIO of any ethics issues/concerns regarding the collection, processing, sharing and storage of data in relation to the project.