Plan Overview

A Data Management Plan created using DMPonline

Title: Local stories of global climate change

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Project abstract:

Global models of climate and ecological change seldom reflect the changes people experience in their immediate environments, due to the slow progression of these changes and our lacking knowledge of their short-term expressions. The high-resolution environmental archives needed to solve these questions are contained within the growth lines of mollusc shells, revealing detailed insights into past and current climatic change, and the dynamic consequences on human and animal behaviour. Compared with alternative environmental proxies (of temperature, salinity and ocean productivity), mollusc shells present several key advantages: a) their abundance along modern and past shorelines providing local sources of information, b) their sub-annual resolution revealing extreme weather, storm events or periods of stability, and c) their 164k year long history as human food, providing unique insights into climates directly experienced by humans. Recently, I developed the rapid and inexpensive method Laser Induced Breakdown Spectroscopy (LIBS) to study environmental signals trapped in shells, causing a methodological breakthrough that decreased sampling time and cost, the two primary constraints of earlier studies, and thus increased sample sizes from 10 to over 1,000 shells. LIBS has the potential to act as a catalyst for multiple research areas that use carbonate records, including speleothems and sediment cores. To advance these fields, we urgently require better resolved data and larger sample numbers that accurately depict spatial and chronological climate diversity and that can generate models with previously unattainable levels of statistical robustness. Developing new toolkits that harness these transforming capabilities is the next crucial step and will be key to establishing my research group in multiple disciplines. For this step I have selected two research avenues, marine ecology and climatology, that are the key beneficiaries of large-scale and low-cost geochemical analysis. First, marine ecology studies focused on the North Sea will benefit from cost-effective assessments of shellfish productivity throughout their long history of human consumption, providing baselines for modern day fishery management. Second, climate studies in the Mediterranean Sea, will gain access to large archives of climate information with not only year-to-year variation but variation within one year, closing the gap between long-term climate change and the short-term extreme events that they cause and that humans are susceptible to.

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Local stories of global climate change

0. Proposal name

0. Enter the proposal name

Local stories of global climate change: overcoming financial limits in studying shell records to better understand changes in our environments.

1. Description of the data

1.1 Type of study

- **Geochemical data**: To compare elemental and isotopic variation of shell carbonate in context with climatic changes of the immediate environment
- **Biomolecular data**: To build shell chronologies based on d- and -l amino acid composition

1.2 Types of data

Qualitative: Element ratios (Mg/Ca, Sr/Ca), isotope ratios (δ13C, δ18O, δD), ratios of d- to l-amino acids
Quantitative: Existing datasets from zooarchaeological analyses of shell middens reporting species quantities.

1.3 Format and scale of the data

All data is provided as CSV files summarising datasets by sample (per shell) as well as by site (including 100s of individual records). Site level data will combine elemental, isotopic and biomolecular data as text files, following their analysis in the software R.

2. Data collection / generation

2.1 Methodologies for data collection / generation

LIBS-generated data on elemental ratios will take the form of csv files, as standard output of the custom software (LabView) produced for the LIBS-system. These files follow the standard of spatial coordinates + element intensities + calculated ratios. The files will be combined for each site and

build a larger database maintained in R. No standards exist as of yet for this type of data.

The data for isotope analysis will be collected and stored at the British Geological Survey in the form of excel spreadsheets, following their community standards. Once the data is communicated to the project members via email (PI+PDRA1), they will be part of the above database working on site level.

The data for amino acid racemisation will be collected by the NERC-recognised lab NEaar in the Department of Chemistry (York) using their data standards. After they are communicated to the project members (PI+T1) they will be part of the above database working on site level

2.2 Data quality and standards

Isotope and amino acid data quality and consistency will be guaranteed by the involvement of professional laboratories (BGS and NEaar).

Developing standards for LIBS-generated data will be part of the project proposal and we aim to keep them as simple and transparent as possible. Some of these standards are already available through the open-access database protocols.io.

3. Data management, documentation and curation

3.1 Managing, storing and curating data

On sampling by project personnel, or on arrival at York, all samples are logged into a project database stored on the digital University cloud storage , and this number (and its subdivisions) will be used to track the sample through the preparation and analysis process.

All geochemical and electron microscopy raw data are stored locally on the hard-drive of the controlling computers, as well as on external back-up hard-drives on a fortnightly basis. After data processing the results will be stored on the cloud storage. Data processing will be conducted by the PDRAs and TAs and quality checked by the PI.

All experiments are recorded in digital laboratory notebooks located on the cloud storage.

Funding has been requested to store the geochemical and biomolecular data, together with their meta-data on site level via the Archaeological Data Service (ADS) in York.

3.2 Metadata standards and data documentation

Metadata standards will follow the ADS guidelines on documentation, and will be including geographical coverage, temporal dates, methodology, monument and evidence type.

3.3 Data preservation strategy and standards

The Research Data Management Policy of the University of York requires that any research data selected for retention must be retained for 10 years from date of last requested access.

To meet this requirement we will deposit the final versions of the digital data that was selected for long term preservation with the ADS.

4. Data security and confidentiality of potentially disclosive information

4.1 Formal information/data security standards

The project's research data does not include any personal data relating to human participants.

4.2 Main risks to data security

5. Data sharing and access

5.1 Suitability for sharing

Data sharing is a principle aim of the project and it is expected that most data generated on the project will be public by default, and 'as open as possible'. To fulfil this commitment, we requested funding to use the ADS and its experience in open-source data sharing.

This is especially the case for stable isotope data, which has the most potential for comparative studies carried out by other researchers.

5.2 Discovery by potential users of the research/innovation data

At a technical level, the ADS allows global user access from anywhere any device capable of running a web-browser. This supports international collaboration and future growth of the project.

Academic users can find out about the project data by reading any publications that may arise from its synthesis.

We will aim to provide persistent identifiers (DOI) in our published outputs to direclty refer to the research data.

5.3 Governance of access

The PI is ultimately responsible for sharing the research data however, the PDRAs are free to create new collaborations for which data-sharing is inevitable. As such, they are also able to make the decision to share data.

5.4 The study team’s exclusive use of the data

Project data will be publicly accessible on the data of publication at the latest.

Some data of specific interest to the wider public or scientific community will be shared via the Project website or Twitter community as soon as possible.

Should some data not be public at through either of the above pathways, it will be part of the final long-term storage files deposited with the ADS

5.5 Restrictions or delays to sharing, with planned actions to limit such restrictions

Question not answered.

5.6 Regulation of responsibilities of users

External users will not be bound by specific data sharing agreements, but will ideally be using the DOI of the specific datasets that are being accessed.

6. Responsibilities

6. Responsibilities

The PI is solely responsible for:

- study-wide data management
- metadata creation
- data security
- quality assurance of data

7. Relevant policies

7. Relevant institutional, departmental or study policies on data sharing and data security

Policy	URL or Reference
Data Management Policy & Procedures	
Data Security Policy	
Data Sharing Policy	
Institutional Information Policy	
Other	
Other	

8. Author and contact details

8. Author of this Data Management Plan (Name) and, if different to that of the Principal Investigator, their telephone & email contact details

Niklas Hausmann