



CRYOSPHERE DATABASE

CHARTER Deliverable D4.3

Grant Agreement Number: 869471

Project Acronym: CHARTER

Project title: Drivers and Feedbacks of Changes in
Arctic Terrestrial Biodiversity

Starting Date: 01/08/2020

Project Duration: 54 months

Project Officer: Alberto Zocchi

Project Coordinator: Bruce Forbes / LAY

Leading Author: Marc Macias-Fauria / UOXF

Contributing partners: UOXF, AU



Co-financed by the Connecting Europe
Facility of the European Union



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Holocene Climate and Cryosphere Database

CHARTER Deliverable 4.3

Version 2 (revised after the 36-month review)

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Authors: Marc Macias-Fauria / UOXF, and WP4 team members from UOXF and AU

Due Submission Date: 31/01/2023

Actual Submission Date: 31/01/2023 (original submission data was month 24 (July 2023) but a 6-month postponed was agreed)

Revised version submitted: 14/12/2023

Status	
Draft	
Final	x

Type		
R	Document, report	x
DEM	Demonstrator, pilot, prototype	
DEC	Websites, patent fillings, videos, etc.	
OTHER		

Dissemination level		
PU	Public	x
CO	Confidential, only for members of the consortium (incl. the Commission services)	



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Revision history

Date(s)	Lead author(s)	Comments
30/07/2022	Marc Macias-Fauria	Draft progress report to date prepared in line with superseded submission date.
21/01/2023	Marc Macias-Fauria	Revised to include new code and outputs made by Jakob Assmann
31/01/2023	Marc Macias-Fauria	Final version, submitted
14/12/2023	Marc Macias-Fauria	Final version (v2), revised according the comments given during the 36-month review, submitted



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1 Introduction

WP4 is entitled *Biodiversity Changes at Centennial Timescales* and is led by the University of Oxford (UOXF). The objective of this report is to present the outputs of Work Package 4 (WP4) Deliverable 4.3 until January 2023 (= month 30) and to assess the progress made. Outputs (software, publications etc.) are underlined throughout the report, and listed again at the end. All software outputs are available in [the CHARTER Zenodo community](#).

D4.3 (“Holocene Climate and the Cryosphere”) is part of Objective 4.1 (“Determine the variability of key biodiversity and ecosystem state variables across the terrestrial Arctic ecosystems during the Holocene”; **Figure 1**). This Objective is achieved through first a systematic mapping exercise that identifies all possible biological data from the Holocene (last ~11.400 years; T4.1, D4.1). From this, a Pan-Arctic Palaeo-ecological database (T4.2, D4.2) is built, which is the basis for extracting Key Biodiversity/Ecosystem state variables (T4.6; D4.4) and, by analysing these over the last millennia, their temporal dynamics (T4.7; D4.5). Objective 4.2 (“Study the relationships between these variables and changes in climate, cryospheric processes, and human agency”), requires first to build a dataset on Climate and the Cryosphere which spans the Holocene (T4.3, **D4.3, presented herein**), so that the biodiversity/ecosystem state variables can be compared against coeval changes in the environment (T4.8; D4.6). Both Objectives 4.1 and 4.2 can be informed by newly collected – and existing but not yet published – palaeo-ecological data from CHARTER Focal Sites (Fennoscandia). These represent centennial and multi-centennial dendrochronological material and millennial palaeo-ecological information obtained from two newly collected peat cores (T4.4; T4.5; D4.7). Finally, Objective 4.3 (“Analyse the temporal stability of these responses, and whether they are in agreement with the more recent observational record (WPs1&2) and state-of-the-art process-understanding of the Arctic System (WP5)”) represents the last stage of WP4, and consists of comparing the long-term relationships and dynamics obtained from this work package with those obtained from the observational record (WP2; D4.8) and those embedded and obtained in the modelling work package (WP5, D4.9).

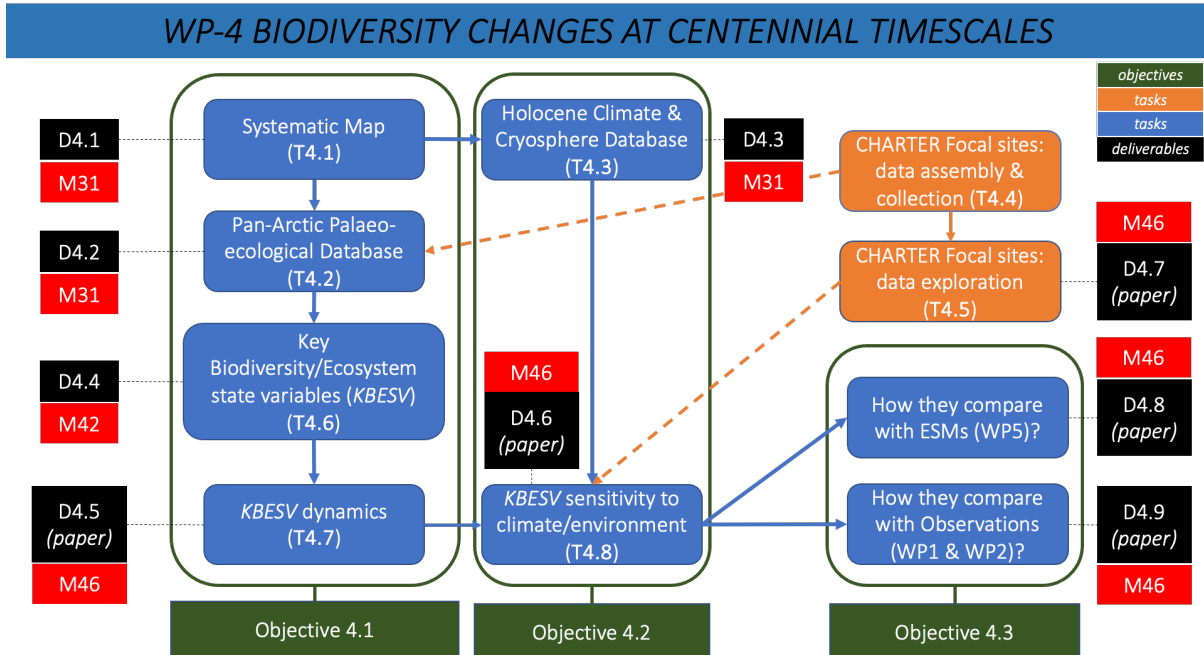


Figure 1. Relationships between the different components of Work Package 4 (WP4). **Blue** (existing data) or **orange** (production of new data) boxes represent *Tasks* within WP4; **black** boxes are the *Deliverables* linked to each task; **red** boxes are *Project Month* in which the *Deliverables* are planned; large boxes outlined in **green** with a green label are the *Objectives* linked to each task. Arrows connecting tasks represent the workflow of the project (see *text*).

2 Progress Report

This deliverable has been led by the University of Aarhus (Denmark). The team has completed the development of a spatial-temporal database (raster-based). The database has been linked into the *Arctic Holocene Biodiversity Database* (see Deliverable 4.2) such that the records in the AHBD may be sliced and filtered based on temporal variability in key cryosphere metrics. The database is ready to be queried by the sites identified in D4.2 for further analysis in later deliverables. R code has been provided to UOXF to complete this step.

The Holocene Climate and Cryosphere Database is based on Based on CHELSA-TraCE21k (Karger, Nobis, Normand, Graham, & Zimmermann, 2021). It contains orography and ice cover from interpolations of dynamic ice sheet model ICE6G and downscaled climate from paleoclimate model CCSM3-TraCE21k. The covered period spans from the Last glacial maximum until the present, at 100-year time steps, and has a spatial resolution of 30 arc sec resolution (~ 1 km at Equator). It consists of variables on Temperature, Precipitation, Distance to land ice, Height above sea level, Date last glaciated, and Date last covered by sea.



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3 Summary of Outputs

Title	License	Location
Spatial-temporal cryosphere database	MIT License	https://github.com/jakobjassmann/cryo_db_v2
Holocene Arctic Biodiversity Indicators Database Website (this work is incorporated with this output of D4.2).	Open Data Commons Open Database License v1.0	https://acm.im/holocene-arctic-biodiversity-map/ahbdb/

References

Karger, D., Nobis, M., Normand, S., Graham, C., & Zimmermann, N. (2021). CHELSA-TraCE21k v1.0. Downscaled transient temperature and precipitation data since the last glacial maximum. *Climate of the Past Discussions*, 1–27. doi:10.5194/cp-2021-30