

QUAVIDA
Carbon isotope Compilation
Users Handbook

Version 1 (January 2007)

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The Excel workbook contains 5 worksheets:

- 1) **Site Metadata**
- 2) **Entity Metadata**
- 3) **Sample Metadata**
- 4) **Site Dating Information**
- 5) **$\delta^{13}\text{C}$ Sample data**

N.B. There is an additional worksheet named Lists that contains information corresponding to the pull-down lists. This Lists worksheet **MUST NOT BE ALTERED** in any way.

Note 1: In the descriptions below the term *free form field* means that you can enter what you want to by way of description, but fields where you have to choose from a set of pre-designated options are indicated as having a *drop-down list*. Some drop-down lists have the option to choose 'Other' if there is nothing appropriate in the list. After the text 'Other' you can type your own brief description if you wish, for example 'Other: submerged cave'.

Note 2: Some fields are linked in the workbook; you enter them on the first worksheet and they will appear automatically where they are required on the subsequent worksheets. Please do not alter the excel formulae that link these fields.

Note 3: If the number of Sites exceeds 1000 or the total number of Samples exceeds 1000, make a copy of the workbook, call it other name and continue adding samples in the second workbook.

Note 4: The isotope workbook contains some examples, in blue text, which have been made up to illustrate different possibilities for data entries. Please use these as guides only and add your own data in the next rows.

1) Site Metadata Worksheet Fields (i.e. information about the Site)

Site name

Free form field

This field should give the site name, preferably as given in the original publication.

Latitude

Free form fields

Please provide the latitude in either degrees/minutes/seconds or decimal degrees expressed as deg.deg, to the highest accuracy possible. If you are unable to provide e.g. seconds, please enter this part of the field as 00. Data expressed in degrees/minutes/seconds will be converted to decimal degrees in the final database if you can not provide it here.

N/S

Drop-down list

Choose N for North, or S for South, as appropriate.

Longitude

Free form fields

Please provide the longitude in either degrees/minutes/seconds or decimal degrees expressed as deg.deg, to the highest accuracy possible. If you are unable to provide e.g. seconds, please enter this

part of the field as 00. Data expressed in degrees/minutes/seconds will be converted to decimal degrees in the final database if you can not provide it here.

E/W

Drop-down list

Choose E for east, or W for West, as appropriate.

Elevation

Free form field

This is the elevation at the sampling site, given in meters to the nearest whole meter.

Country

Drop-down list

A drop-down list of countries and distinct locations found within a broadly defined Australasian region has been provided for you to choose from. Please select the appropriate location for your study site.

Modern Site Type

Drop-down list

This field describes the modern site type (e.g. lake, bog, fluvial valley). Please choose the description that most closely fits the site from the drop-down list. We have included the following site types (listed in the table below), however, if you are unable to match your site, please enter a short descriptions after “Other”.

Aeolian, sand	Lacustrine, natural open-water, thermokarst lake
Aeolian, loess	Lacustrine, playa
Cave	Lacustrine, pro-glacial lake
Coastal	Lacustrine, volcanic lake
Coastal, estuarine	Marine
Coastal, salt marsh	Other
Colluvial	Periglacial
Fluvial	Rock shelter
Glacial	Small hollow
Glaciomarine	Terrestrial
Lacustrine	Terrestrial, exposed stumps or logs
Lacustrine, artificial open-water	Terrestrial, glacial till
Lacustrine, artificial open-water, reservoir	Terrestrial, loess
Lacustrine, artificial open-water, stock pond	Terrestrial, marsh
Lacustrine, drained lake	Terrestrial, mire, bog
Lacustrine, natural open-water	Terrestrial, mire, fen
Lacustrine, natural open-water, glacial origin	Terrestrial, mire, fen
Lacustrine, natural open-water, glacial origin, cirque lake	Terrestrial, mire,swamp (forested wetland or peatland)
Lacustrine, natural open-water, glacial origin, kettle lake	Terrestrial, organic detritus
Lacustrine, natural open-water, glacial origin, morainally dammed lake	Terrestrial, soil
Lacustrine, natural open-water, periglacial lake	Terrestrial, soil, buried soil
Lacustrine, natural open-water, solution hollow	Terrestrial, soil, litter
Lacustrine, natural open-water, tectonic lake	Terrestrial, soil, litter, mor humus
Lacustrine, natural open-water, thermokarst lake	Terrestrial, soil,litter, litter trap
	Unknown

Modern Landscape Description

Drop-down list

This field describes the modern surrounding landscape setting of the site. Please choose the description that most closely fits the site. We have included the following landscape types:

<u>Coastal plain</u> : low-lying setting along a marine coast, with very little relief and a gentle slope towards sea level.
<u>Lowland plain</u> : low-lying setting not associated with marine coast, with very little relief and a gentle slope over areas of the order of 500 km ² .
<u>Upland plain</u> : relatively flat upland (e.g. plateau) with a spatial extent of the order of 500 km ² .
<u>Rolling upland</u> : upland plain that has vertical relief on the order of 50-100 m but no abrupt topographic transitions. There may be topographically-controlled changes in the vegetation but they do not give rise to spatially-distinct vegetation types.
<u>Dissected upland</u> : upland plain that has been heavily dissected by e.g. rivers, such that there are abrupt topographic transitions. There is likely to be considerable vegetation heterogeneity within this landscape type, with radically different vegetation types on the remnant upland and within the dissecting valleys.
<u>Lowland river valley</u> : setting within the downstream part of a distinct river valley (i.e. that part of the river which occurs in a lowland setting before reaching the coastal plain). The degree of landscape heterogeneity measured at the site can be expected to vary depending on the size of the river valley, but riverine components are likely to be present;
<u>Mountains</u> : highly-dissected landscape within mountain ranges.
<u>Basin/range</u> : tectonically-created landscape, with distinct upland and basin elements, and sharp topographic transitions between these elements. The characteristic spatial scale is of the order of tens to hundreds of kilometers.
<u>Hummocky/dissected</u> : landscape with considerable vertical relief of the order of 100-500m, but with minimal spatial patterning in the changes of relief. May have been created by deposition (e.g. glacial till deposits) or through aeolian/fluvial erosion.
<u>Yedoma</u> : a landscape with small hills and steep-sided plateaus caused by repeated freezing and thawing of ice-rich sediments
<u>Marine</u> : the site is in a marine setting or the samples were derived from a marine core. Please note that this describes the current setting and may not reflect the depositional context of the samples.
<u>Other</u> : If you are unable to match your site, please enter "other".

Modern Natural Regional Vegetation

Drop-down list

This field contains a short ecophysiological description of the major modern vegetation of the region within approximately 50 kilometers the sampling site. Please select the description that best describes the natural, undisturbed vegetation type at the level of vegetation formation, major vegetation type or biome. We have included the following vegetation groupings (which are based on the 12 Plant Functional Types used in BIOME 4 modeling, and described in Kaplan, et. al. 2002 and Buchmann and Kaplan, 2001- references at end of this document), however, if you are unable to match your site, please enter a short description after "Other".

Tropical evergreen broadleaf forest.	Tropical xerophytic shrub land:
Tropical semi-evergreen forest.	Temperate xerophytic shrub land
Tropical deciduous broadleaf forest and woodland.	Temperate sclerophyll woodland and shrub land
Temperate deciduous broadleaf forest.	Temperate deciduous broadleaf savanna
Temperate evergreen needle leaf forest.	Temperate evergreen needle leaf open woodland
Warm-temperate evergreen broadleaf and mixed forest.	Tropical grassland
Cool mixed forest.	Temperate grassland
Cool evergreen needle leaf forest.	Desert
Cool evergreen needle leaf forest and mixed forest.	Graminoid and forb tundra
Cold evergreen forest.	Low- and high-shrub tundra
Cold deciduous forest.	Erect dwarf-shrub tundra
Cold parkland	Prostrate dwarf-shrub tundra
Tropical savanna.	Cushin-forb, lichen, and moss tundra
	Other:

Modern Natural Local Vegetation

Free form field

Please enter a short description of the modern vegetation that occurs within approximately 1 kilometer of the sampling site. Include information on azonal/intrazonal vegetation, whether the

vegetation features natural and/or human disturbance possibly to the extent of being heavily anthropomorphized. This information will help us determine whether modern $\delta^{13}\text{C}$ values from samples at the sites are likely to reflect the isotopic composition of the “natural” vegetation.

Estimated C₄ Percentage of Modern Graminoids

Drop-down list

Please provide an estimation of the percentage abundance of C₄ graminoids (grasses and sedges) within the local area’s total graminoid biomass. Note this does not mean the percentage of C₄ graminoids within the total plant biomass, it refers to graminoids only. A drop-down list of ‘percentage categories’ (e.g. 10-19%) has been provided, however, if you are unable to provide this information, please select ‘Unknown’.

Estimated C₄ Percentage of Modern shrubs

Drop-down list

Please provide an estimation of the percentage abundance of C₄ shrubs within the local area’s total shrub biomass. Note this does not mean the percentage of C₄ shrubs within the total plant biomass, it refers to shrubs only. A drop-down list of ‘percentage categories’ (eg. 10-19%) has been provided, however, if you are unable to provide this information, please select ‘Unknown’.

Survey Type

Drop-down list

Please select a description of the main method used to estimate the percentage of C₄ graminoids at the study site. We have provided the following categories, however, if you are unable to match your site, please enter a short description after “Other”:

Field survey: quadrat counts: e.g. species, biomass, density.
Local plant species lists
Model output
Publications
Visual estimations
Other

The following three fields are mainly applicable to sites such as lakes and wetlands

Water Depth

Free form field

This field is applicable only for lakes and wetlands, and refers to the maximum water depth. The unit is meters.

Basin Size

Drop-down list or Free form field

This field describes the modern size of the collecting basin in which the sample material was found. It is therefore most appropriate for samples taken from lakes, wetlands and bogs.

Basin size should be specified in km², to the nearest 0.1km². In cases where it is impossible to specify the area accurately, please choose a size category from the *drop-down list*. Five size categories have provided:

Very small: >0.1 km ²
Small: 0.11-1 km ²
Medium: 1.1-50 km ²
Large: 50.1-500 km ²
Very large: >500 km ²

Catchment Size

Drop-down list

This field describes the modern size of the catchment in which the isotope sample is found, and it is predominantly appropriate for lakes, bogs and fluvial deposits. Catchment size should be specified in km², to the nearest 1 km². In cases where it is impossible to specify the area accurately, please choose a size category from the *drop-down list*. Three size categories have been provided:

Small: <10 km ²
Medium: 10.1-500 km ²
Large: >500 km ²

Reporting

Drop-down list

Please indicate if the data you are providing for the site has been reported or published. The drop-down list provides the following choices:

Journal article	Book
Published technical note	Not reported
Thesis	Other:
Report	

Site Publications details

Please provide full citation of the publication (s) used to derive site metadata (including all authors, with initials, year, title, journal, volume, page numbers; for books or chapters in books, please give place of publication). If the title is not in English, it could be helpful to give an English translation of the title. As far as possible, please use the following reference formats:

For journal articles:

CAPE Project Members (2001) Holocene paleoclimate data from the Arctic: testing models of global climate change. *Quaternary Science Reviews* 20: 1275-1287

For articles in books:

Joussaume S, Taylor KE (2000) The Paleoclimate Modeling Intercomparison Project. In: Braconnot P (Editor), Paleoclimate Modelling Intercomparison Project (PMIP) Proceedings of the third PMIP workshop. WCRP, La Huardière, Canada, 4-8 October 1999, pp. 9-25

For books and reports

Wright HE, Kutzbach JE, Webb III T, Ruddiman WF, Street-Perrott FA, Bartlein PJ (Editors) *Global climates since the last glacial maximum*. University of Minnesota Press, Minneapolis, 569 pp

2) Entity Metadata Worksheet (i.e. information about the Entity within the Site)

Site Name

Free form field

Please enter site name identical to the entry in Site Metadata worksheet. Please enter the Site name for each entity that you are providing.

Entity Name

Free form field

Enter the name or code of the core, soil profile, archaeological dig, surface sample or similar collected/sampled entity. Please enter this for each sample that you will be providing.

Entity Latitude and Longitude

Free form fields

This field provides the location of the actual entity, to distinguish it from Site location. Please provide the latitude and longitude in either degrees/minutes/seconds or decimal degrees expressed as deg.deg, to the highest accuracy possible. If you are unable to provide e.g. seconds, please enter this part of the field as 00. Data expressed in degrees/minutes/seconds will be converted to decimal degrees in the final database if you can not provide it here

Entity Elevation

Free form field

This is the elevation of the entity, not the sampling site. Please give it in meters above sea level to the nearest whole meter.

Entity Type

Drop-down list

Please select from the entity type from the *drop-down list*. The drop-down list provides the following choices:

Alluvial profile	Marsh/bog sediment
Alluvium surface	Marine core
Archaeological profile	Marine sediment
Archaeological site	Moss polster
Bog sediment	Near-shore mud
Buried surface/organic bed	Nests
Cave profile	Organism (e.g. Digestive tract)
Coastal mud	Palaeosol
Core	Peat core
Core top	Peat core top
Deltaic core	Peat exposure
Deltaic core top	Peat horizon & palaeosol
Deltaic sediment	Peat profile
Desert surface	Peat profile top
Dust flux	Peat surface
Dust surface sample	Pond
Estuary sample	Pond sediment
Fen sediment	Profile top
Fluvial core	Section
Fluvial core top	Sediment
Fluvial profile	Soil sample
Fluvial sediment	Soil top
Fluvial soil	Surficial salt crust
Forest hollow	Surface moss
Forest soil	Surface mud
In situ remains	Surface sample
Lacustrine core	Surface soil

Lacustrine core top	Swamp sediment
Lacustrine surface sample	Swamp surface
Lake core	Terrestrial section
Lake mud	Terrestrial section top
Lake profile	Terrestrial surface
Lake sediment	Trap
Lake terrace profile	Terrestrial soil and/or surface sediment
Loess profile	Wood
Loess profile top	Unknown
Marsh/bog core	Other:

Water Depth at Entity (m)

Free form field

This field is applicable only for lakes and refers to water depth at the entity collection point (not the deepest lake measurement). The unit is meters.

Entity Data Synthesis Contact

Free form field

Please provide name and initials of the person(s) responsible for compiling the data and contributing the data to this synthesis. This information is needed so we can determine who to contact if there are queries about specific entries. In the final database, we will add a table with contact details for each contributor, based on our mailing lists.

Entity Collector

Free form field

Please give name, initials and institutional affiliation of the person(s) who collected the material subjected to isotopic analysis from the field entity/site.

Entity Publication details

Free-form field

Please enter the publication(s) detailing site chronology in the same format used for the publications entered in the Site Metadata Worksheet. Please make sure to reference both the source of the isotope data at the site and entity level, if these differ.

3) Sample Metadata Worksheet (i.e. information about the Sample)

Site Name

Free form field

Please enter the site name identical to the entry name used in the Site Metadata worksheet. Please enter the Site name for each sample you are providing.

Entity Name

Free form field

Please enter the corresponding entity name identical to the entry name used in the Entity Metadata worksheet. Please enter this for each sample you are providing.

Sample Name

Free form field

Please enter a unique name for each sample, or wherever possible, use the same sample codes/name used in the original publication(s). If this is not available, a suitable sample name could be a site code plus depth measurement or some other designation.

Sample Type

Drop-down list

Please indicate the type of material the $\delta^{13}\text{C}$ value was measured on. The drop-down list provides the following choices:

Bone collagen	Pollen
Bone carbonate	Soil, bulk
Charcoal	Soil, carbonate
Eggshell	Soil, organic matter
Enamel carbonate	Soil, Other:
Dentine collagen	Lake sediment, bulk
Keratin (eg, hair or horn)	Lake sediment, biomarker
Animal remains, Other:	Lake sediment, other:
Plant macrofossil	Wood
Phytolith	Other:

Sample Biological Group

Drop-down list

If the sample is from a biological source, please indicate the main plant or animal group. The drop-down list provides the following choices:

Avian	Plant, graminoid
Mammalian	Plant, macrophytes
Plant	Plant, shrub, tree
Plant, epiphytes	Other:
Plant, forb	Not applicable

Sample Species

Free form field

If the sample was from a biological source please indicate the plant or animal species; at least to the level of genera, if possible. If your sample was a terrestrial biomarker please include the type in this field.

Depositional Context

Drop-down list

This field describes the specific depositional context of the sample within a core or profile. We currently recognize the following depositional contexts, however, if you are unable to match your context, please enter a short description after "other".

Archaeological, hearth	Soil, aeolian sand
Archaeological, burial	Soil, organic rich horizon
Archaeological, midden	Soil, palaeosol
Archaeological, Other:	Soil, loess
Animal nest / burrow in soil	Soil, buried surface
Animal nest, rockshelter or cave	Volcanic, ash or tuff layer
Cave, sediment	Fluvial, sands
Cave, breccia	Fluvial, gravel
Cave, speleothem encapsulated	Fluvial, fine grained sediments &/or muds
Rock shelter sediment	Lake sediment, shallow water
Rock shelter, archaeological associated	Lake sediment, deep water
Wetland, bog sediment	Unknown
Wetland, fen sediment	Other:
Wetland, swamp or marsh sediment	

Sample Depth

Free form field

Sample depth in centimeters measured from the top of the section or core.

Estimated Age*Free form field*

If the age of a particular sample has been estimated in the literature, please give this value. This may be in the form of a radiometric age on a specific sample, in which case give the radiometric age, or it may be in the form of an interpolated age in radiocarbon years. Please do not attempt to give a calibrated age for any sample. Note: these ages are for our guidance only (e.g. to allow quick selection of samples for tests, or to cross-check our age models) and we intend to recalculate age models using a common calibration and methodology. There is therefore no need to enter estimated ages for all samples; only give estimated ages if they are readily available in the literature. If they are not readily available, please leave this column blank.

Isotope Sample Analyst*Free form field*

Please give full name, initials and institutional affiliation of the person(s) who undertook the isotopic analysis.

4) Dating Information Worksheet

Please give all the dates available for a given site, including dates not used in the construction of age models, and those that came from individually dated $\delta^{13}\text{C}$ samples.

Site Name*Free form field*

Please enter the site name identical to the entry name used in the Site Metadata worksheet. Please enter the Site name for each sample you are providing.

Entity Name*Free form field*

Please enter the corresponding entity name identical to the entry name used in the Entity Metadata worksheet. Please enter this for each sample you are providing

Sample Depth*Free form field*

For all depth entries please provide what you can or what is most appropriate. Give the depth of the dated sample in meters from the top of the core or section. Average depth may be given as a specific point (a point will be more appropriate for an AMS date on a single charcoal fragment, shell or macrofossil) or as an average or a range (a range is appropriate for e.g. a bulk radiocarbon date on core sediment).

Upper Depth / Lower Depth*Free form field*

Where sample depth includes a range, please provide the upper and lower parameters of the sample, in meters.

Sample Thickness*Free-form field*

Where the depth has been given as a range, please specify the sample thickness in meters.

Lab Number

Free form field

Please give the laboratory number where the dating was undertaken. Use standard codes for radiometric dates: for example, Pb dates, which do not have a standard analysis laboratory code, give sample code from original publication. For tephra, please give tephra name from original publication, e.g. Mazama Ash.

Material Dated

Drop-down list

Please specify the material dated from the following drop-down list:

Animal, bone collagen or carbonate	Soil, bulk sediment
Animal, tooth enamel	Soil, peat
Animal, dentine collagen	Soil, calcareous crust
Archaeological artefact	Sediment, carbonate
Archaeological, human bone or tooth	Sediment, bulk organic lake deposits
Charcoal	Wood
Isotope sample	Shell carbonate
Plant macrofossil	Speleothem
Pollen concentrate	Stromatolite
Soil, sand/quartz	Other:

Radiocarbon Age

Free form field

Enter the reported radiocarbon age.

Positive / Negative Errors

Free form fields

For radiometric dates, enter the reported positive and negative errors. This field can be left empty for non-radiometric dates, e.g. fossil-type correlation dates.

Type of Date

Drop-down list

Specify the type of date from the following drop-down list.

Ambrosia rise	Orbital Tuning Method
Amino Acid Racemisation	OSL
AMS	Pb 210
Annual laminations	Pollen correlation
Archaeological	Sediment stratigraphy
Biostratigraphy	Tephra
Bottom of core	Thermoluminescence
C14 date corrected but not calibrated	Top of core
C14 date uncorrected	Top of core estimated (1950 AD = 0)
Conventional ¹⁴ C	Top of core known
ESR	Top of core unknown
European settlement horizon	Tsuga decline
Interpolated date	U-series
Magnetic stratigraphy	Other:

Sample name if date obtained from a $\delta^{13}\text{C}$ sample

Free-form field

If the date was obtained from analysing the same material as the $\delta^{13}\text{C}$ sample (e.g. a piece of eggshell sampled for an amino acid racemisation date and a $\delta^{13}\text{C}$ value) please provide the $\delta^{13}\text{C}$ sample name, which would also have been entered in the Sample Metadata Worksheet.

Comments

Drop-down list

Please select a comment about the date using the *drop-down list*. This field should be left empty if there is no specific comment to be made about the date.

Dating Publication details

Free-form field

Please enter the publication detailing site chronology (see description in Site Metadata Worksheet for format). Please make sure to reference both the source of the macrofossil data and the source of the chronological information, if these differ.

5) Sample $\delta^{13}\text{C}$ Data Worksheet (i.e. $\delta^{13}\text{C}$ results)

The Site, Entity and Sample names will automatically fill in the first three fields of the Sample $\delta^{13}\text{C}$ Data Worksheet (this occurs once they are entered in the corresponding fields in the Sample Metadata Worksheet).

Mean Sample $\delta^{13}\text{C}$ Value

Free-form field

Enter the carbon isotope measurement as a $\delta^{13}\text{C}$ value in the units of ‰ (to a maximum of two decimal places). If replicates were measured on the same sample enter the mean of the different $\delta^{13}\text{C}$ values.

Standard deviation of replicate samples

Free-form field

Enter the standard deviation calculated from the replicate analyses on the same sample.

Number of replicate analyses per sample

Free-form field

Enter the number of analyses undertaken on each sample.

C:N Ratio

Free-form field

If your $\delta^{13}\text{C}$ samples were measured on organic remains please provide the C:N ratio if it is available (to only one decimal place).

Stable Isotope Laboratory Name

Free-form field

Please enter the name and affiliation of the laboratory where the samples were analysed.

References

Buchmann, N., Kaplan, J, (2001) Carbon isotope discrimination of terrestrial ecosystems: How well do observed and modelled results match?, in *Global Biogeochemical Cycles in the Climate System*, Ed. E.D. Schulze et. al., pp. 253-266 Academic, San Diego California.

Kaplan, J. O., I. C. Prentice, et al. (2002). "The stable carbon isotope composition of the terrestrial biosphere: Modelling at scales from the leaf to the globe." *Global Biogeochemical Cycles* **16**(4).