

MEASURING AND MODELLING THE DYNAMIC RESPONSE
OF REMOTE MOUNTAIN LAKE ECOSYSTEMS TO
ENVIRONMENTAL CHANGE

A programme of **MO**untain **LA**ke **R**esearch

MOLAR

**PROTOCOL FOR SEDIMENT CORING & SUB-
SAMPLING**

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MOLAR Protocol for Sediment Coring & Sub-Sampling

Cores are to be taken for both WP2 and WP3 and Gossenköllesee, Øvre Neådalsvatn and Redo are to be cored for both. At these sites 5 cores will be needed as only one back-up will be needed to cover both WP's. One core from each site only will be dated and not all sites will be analysed for SCP. Please consult carefully with BOTH sections below and with the Site Operators sheets to determine exactly which cores and analyses are required.

1. Work Package 2

Laboratories responsible for coring

For MOLAR WP2, only the following sites will be cored:

Site	Laboratory
Jorisee	UZURICH
Gossenköllesee	ILIMNOL
Redo	FBG
Øvre Neådalsvatn	ECRC

Gossenköllesee, Øvre Neådalsvatn and Redo are also to be cored for WP3.

Techniques

Cores are needed to cover the last 150 years. In AL:PE, cores 30-40 cm in length were found to be sufficient for this purpose. Gravity corers (e.g. Glew) was found to be satisfactory. However, any corer that takes undisturbed cores of sufficient length (and gives enough sediment mass per 2 mm slice - see below) is suitable. It is important to stress the need for a good undisturbed sediment / water interface so that the surface layer(s) are known to be intact. Laboratories responsible for coring should check with Joan Grimalt about the suitability of their coring apparatus for taking cores for organics.

Two cores should be taken.

Extrusion

The cores should be extruded vertically, if possible in the field. Extrusion should be:

- 2 - 5 mm slices for 0 - 5cm
- 5 mm slices for 5cm - base of the core.

Core 1. The 'Master' core. This should be the less disturbed and longer core and will be used for all analyses if possible. ²¹⁰Pb and organics analysts will amalgamate received samples if necessary.

The core should be sub-divided for (i) organics, and (ii) the other analyses. Consequently, sectioning should be with stainless steel or teflon utensils previously rinsed with Milli-Q water and acetone. This rinsing should also be done between samples. Samples are best obtained from the centre of the tube to avoid 'smearing' and this is best achieved by using two sampling rings of differing sizes.

The samples for organics analysis should be double wrapped in aluminium foil. The foil should also be rinsed in Milli-Q water and acetone. A paper label should be placed between the two foil sheets and the samples frozen as soon as possible. Please refer to the 'Organics Protocol'.

The second half of the sediment should be stored in sealed, labelled plastic bags and kept

cool until further analysis can be undertaken. Dry weight (DW) and loss-on-ignition (LOI) analyses should be done by the laboratory responsible for the coring. The samples can then be dried before sub-sampling

for SCP (0.1 - 0.2g dry mass). The rest of the sample can then be sent for ^{210}Pb dating after which they will be passed on for metals analysis.

Core 2. This is a back-up core. It should also be extruded in 2mm intervals and stored cool, in sealed plastic bags. DW and LOI analyses should be undertaken on this core.

All samples should be clearly labelled with site name/code, core code and sediment level.

Sediment storage and transport

Sediment samples for organics analysis should be stored and transported frozen. This includes transport of the samples to the analytical laboratory (Joan Grimalt, CSIC, Barcelona).

Dry-weight and loss-on-ignition analyses on both sediment cores should be undertaken by the coring laboratories. Once these have been done satisfactorily, the remaining sediment can be dried (in a clean environment) and stored until needed.

The dried sediment should be sub-sampled and the required sediment weights (see above) sent for SCP analysis (Neil Rose, ECRC, London) ^{210}Pb dating and metals (Peter Appleby, ULIV, Liverpool).

2. Work Package 3

Laboratories responsible for coring

Site	Laboratory
Gossenköllesee ^{1,2}	ILIMNOL
Jezero Ledvici ²	NIB / ECRC
Terianske Pleso	ECRC
Saanajärvi ²	UHEL
Hagelsee ²	EWAG
Øvre Neådalsvatn ^{1,2}	ECRC
Redo ^{1,2}	FBG

¹ - Also WP2.

² - For SCP

Techniques

As for WP2 gravity corers will be used as only records covering the last 200 years are needed. 4 cores need to be taken at every site so that there is sufficient material for all analyses. Cores will be cross-correlated using dry weight and loss-on-ignition profiles.

Extrusion

Cores should be extruded in 2 mm intervals, this can be done by transporting to a laboratory if necessary.

Core 1

DW/LOI analysis should be done. The rest of the wet sediment should be weighed into labelled plastic bags (also label the bag with the sediment weight), sealed and sent for chironomid analysis.

Core 2

Wet sediment sufficient for DW and LOI analysis (0.5g) and grain-size analysis (0.5g) should be sub-sampled. The rest of the sample should be weighed into a labelled plastic bag (also label the bag with the sediment weight), sealed and frozen as soon as possible and sent for

pigment analysis after which it will be sent on for cladocera analysis.

Core 3

0.5g of wet sediment should be sub-sampled for diatom and chrysophyte analysis (check to see whether this is by 2 separate laboratories!). DW and LOI should then be undertaken on the sediment after which the sediment can be dried in a clean environment. 0.1 - 0.2g of the dried sediment should then be sent for SCP analysis (check list to see which sites) and the remainder can be sent for ²¹⁰Pb dating. After dating the sediment will be passed on for magnetism analysis.

Core 4

This core should be extruded in 2mm intervals and stored wet in a cool place as a back-up.

Sediment storage and transport

Sediment samples for pigments analysis should be stored and transported frozen. This includes transport of the samples to the analytical laboratory (Andrea Lami, CNR, Pallanza).

Dry-weight and loss-on-ignition analyses on all sediment cores should be undertaken by the coring laboratories (ILIMNOL, ECRC, UHEL, EWAG, FBG). Sub-samples of the appropriate amount (see above and confirm with analytical protocol sheets) of wet or dry sediment should be sent to the responsible laboratories for the analyses (see site sheets for details):

Analysis	Site							
	Gossenkollersee	Jezero Ledvici	Terianske Pleso	Saanajavi	Hagelsee	Øvre Neådalsvatn	Redo	Cimera
Dry Weight	ILIMNOL	ECRC / NIB	ECRC	UHEL	EWAG	ECRC	FBG	MADRID
Loss-on-ignition	ILIMNOL	ECRC / NIB	ECRC	UHEL	EWAG	ECRC	FBG	MADRID
Grain Size	ILIMNOL	ECRC	FSCU	UHEL	EWAG	ECRC	FBG	/
Magnetics	ULIV	ULIV	ULIV	ULIV	ULIV	ULIV	ULIV	ULIV
Diatoms	ILIMNOL	NIB	IZSAS	UHEL	EWAG	ECRC	FBG	MADRID
Chironomids	PLÖN	ECRC (NHM)	IZSAS	UHEL	ECRC	UIBZI	FBG	MADRID
Chrysophytes	ILIMNOL	ILIMNOL	ILIMNOL	ECRC	ILIMNOL	ECRC	FBG	MADRID
Cladocera	FSCU	NIB	FSCU	UHEL	FSCU	FSCU	NIB	NIB
Dating	ULIV	ULIV	ULIV	ULIV	ULIV	ULIV	ULIV	ULIV
SCP	ECRC	ECRC	/	ECRC	ECRC	ECRC	ECRC	/

Contact	ILIMNOL	Roland Schmidt
	UHEL	Atte Korhola
	EWAG	Andy Lotter
	ECRC - (SCP)	Neil Rose
	- (The rest!)	Nigel Cameron
	FBG	Jordi Catalan
	ULIV	Peter Appleby
	NIB	Anton Brancelj
	IZSAS	Ferdinand Sporka
	UIBZI	Gunnar Raddam
	FSCU	Jan Fott
	PLÖN	Wolfgang Hoffmann
	MADRID	Manuel Toro Velasco

