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SIMONA

SIMONA – SAMPLING

IUGS – FOREGS - GEMAS

Sediment sampling protocols

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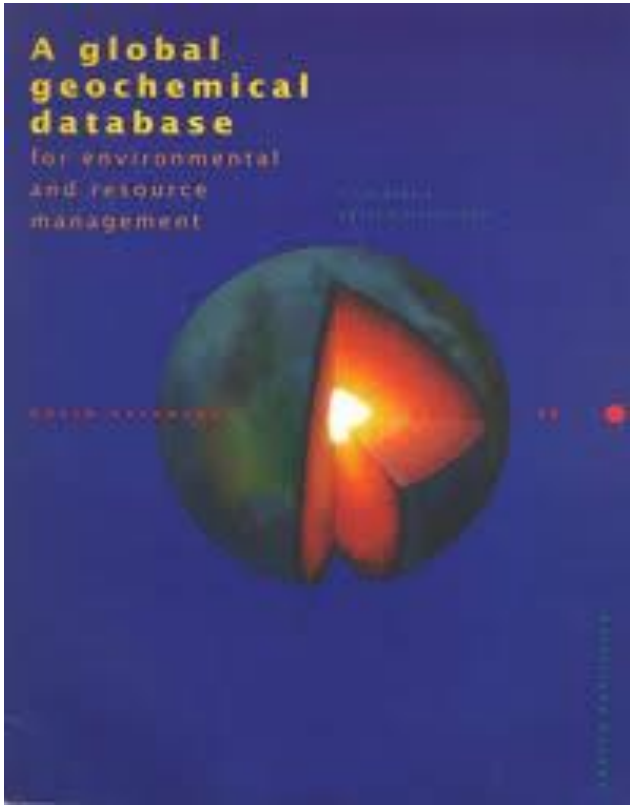
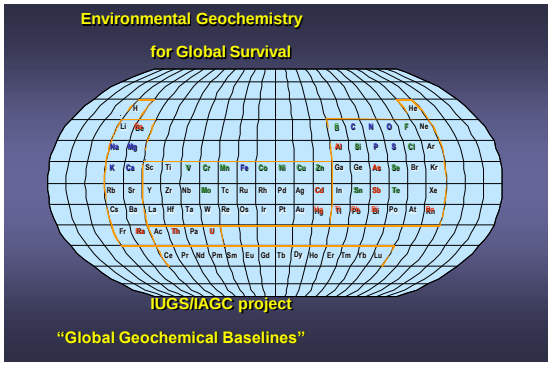
IUGS - Global Geochemical Mapping





IUGS

International Association of GeoChemistry
IAGC
Est.1967

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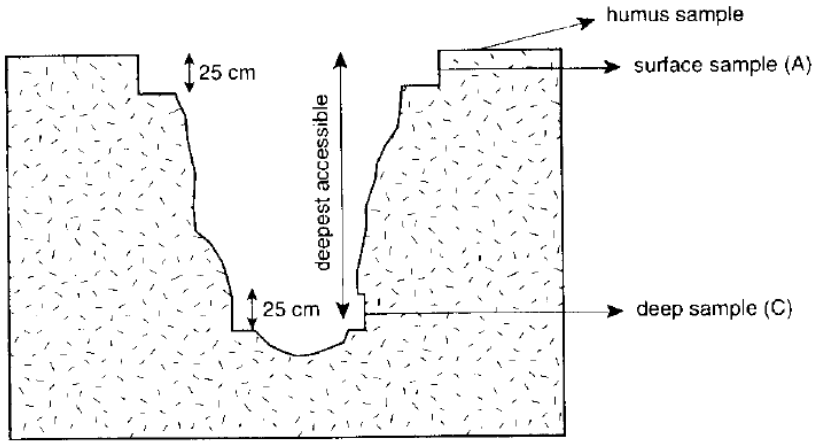

Figure 4-4 *Schematic outline of sampling pattern and sampling pit for Geochemical Reference Network. The site distribution in A is greatly preferable to B. The sample pit applies to all residual soil locations. Collection of the lower sample is optional in overbank and floodplain situations.*

4.5.2.1 Stream sediment

Samples should be collected at the outflow of basins, preferably not exceeding 100 km^2 in area. Basin size is the prime consideration in site selection for drainage samples and all types of sample should be collected in the same vicinity. The basins to be sampled will be from within the 20 (or 40) km sub-cells selected as indicated in Section 4.4 above. It is acceptable to sample basins which extend into adjoining subcells.

Samples should be collected from the inorganic fine-grained silt and clay fraction of the stream bed load. *In situ* precipitates should be avoided. Active sediment is the preferred material. A minimum of 10 grab samples should be collected in each stream from different parts of the stream bed over a minimum distance of 500 m. Collectively these constitute one site.

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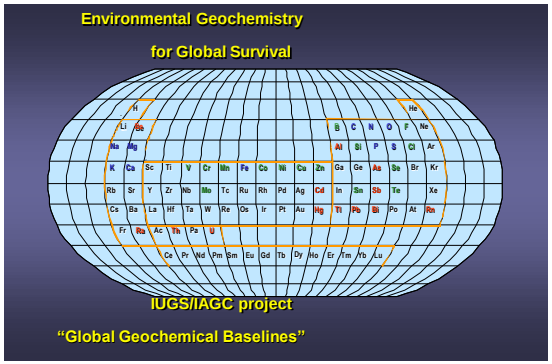

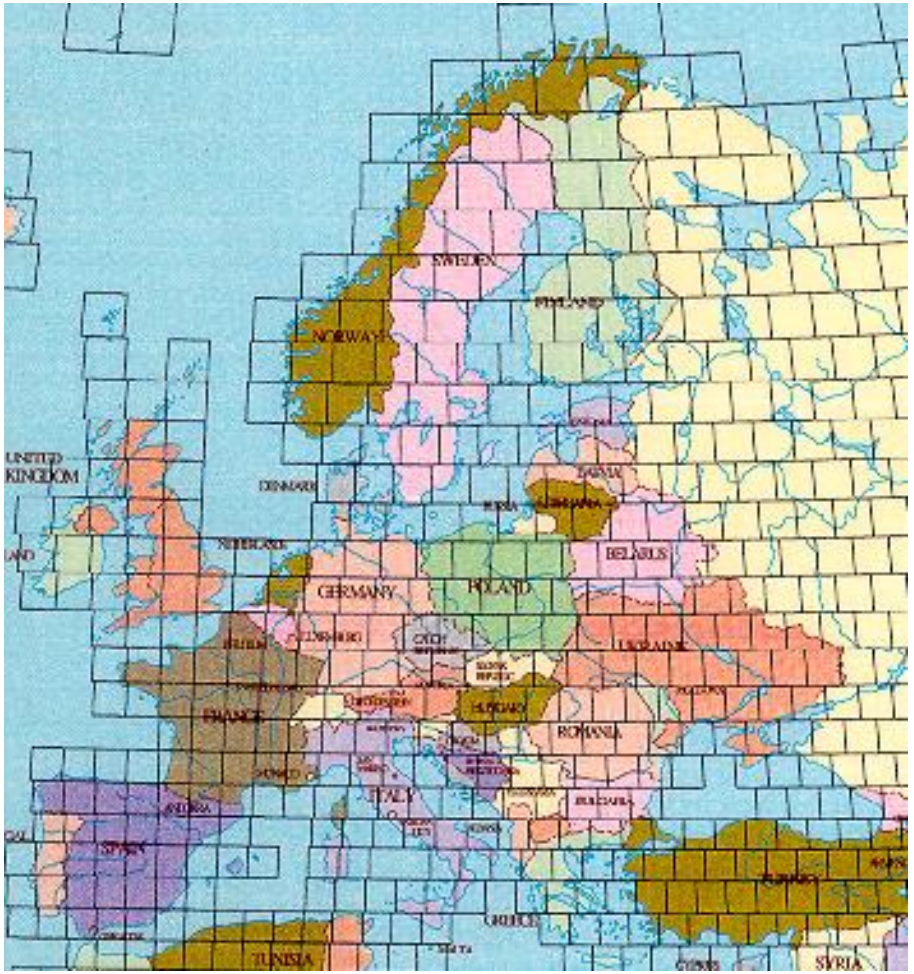

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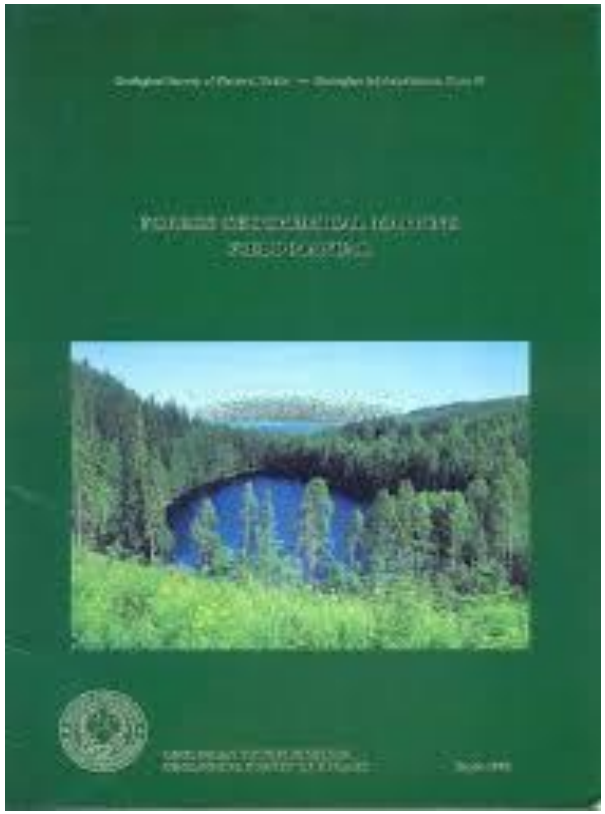

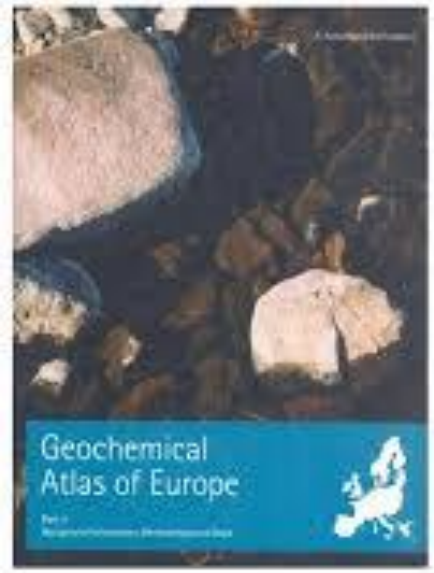

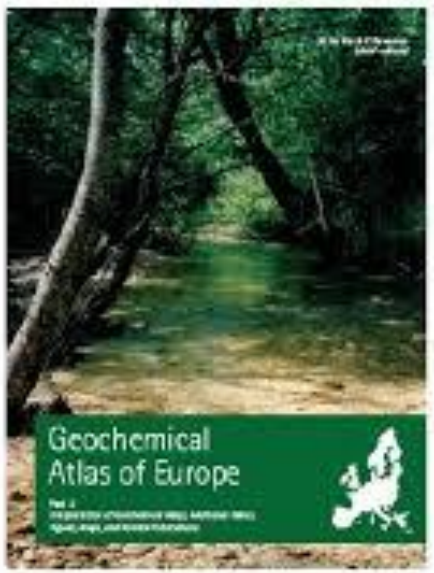

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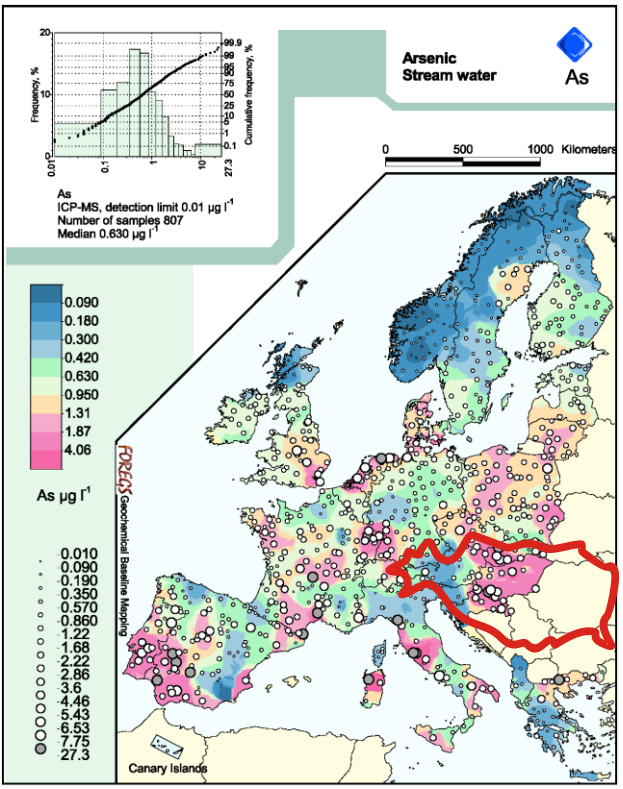

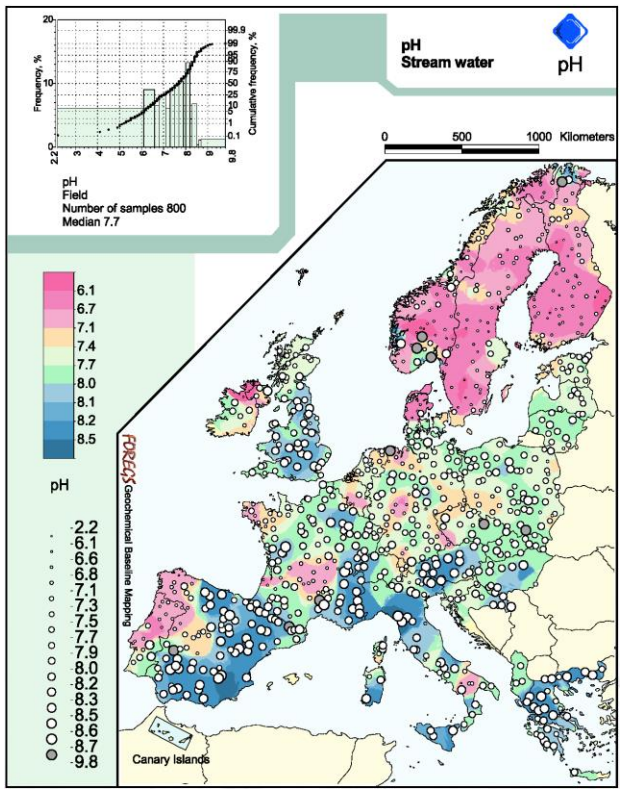

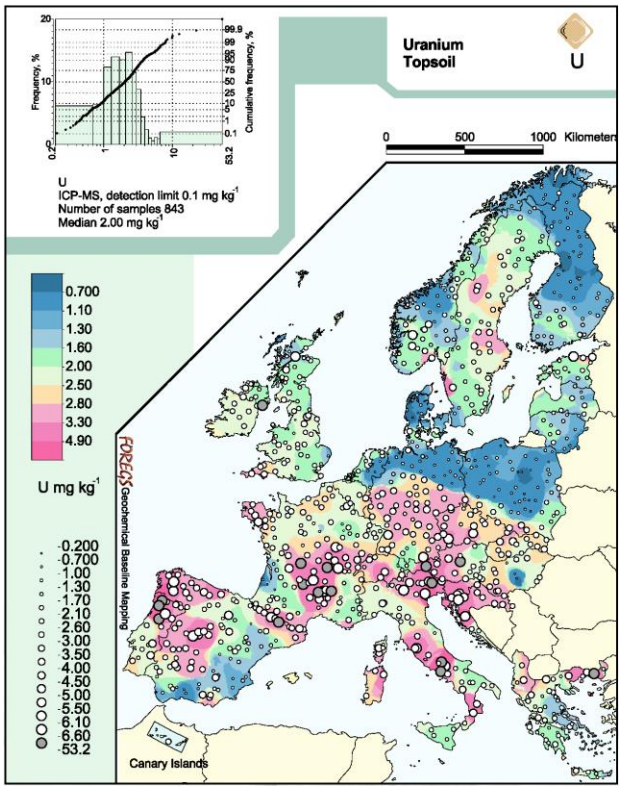

- **Multi-media**
  stream water, stream and floodplain sediment, soil (A and C horizons)
- **Multi-element**
- **Composite (elements, parameters: pH, OM, etc.)**
- **Catchment-based**
- **Continental**

Geochemical maps - European Union - Cd

topsoil

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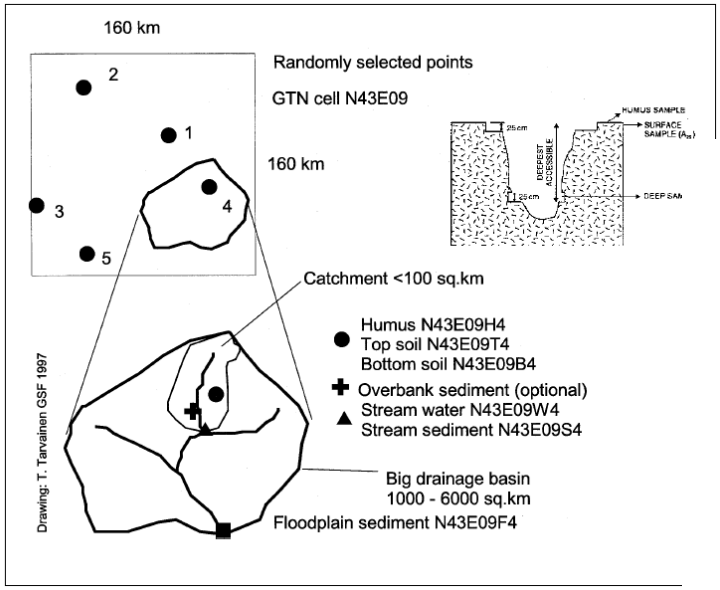

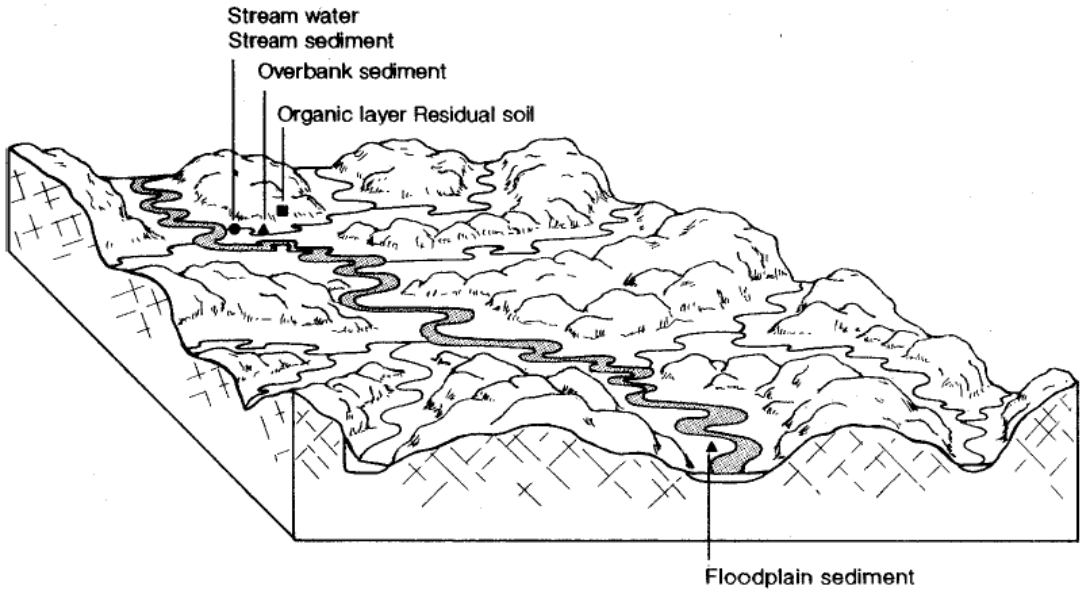

diagram showing possible sampling sites of GTN sampling media (modified after Strahler 1969).

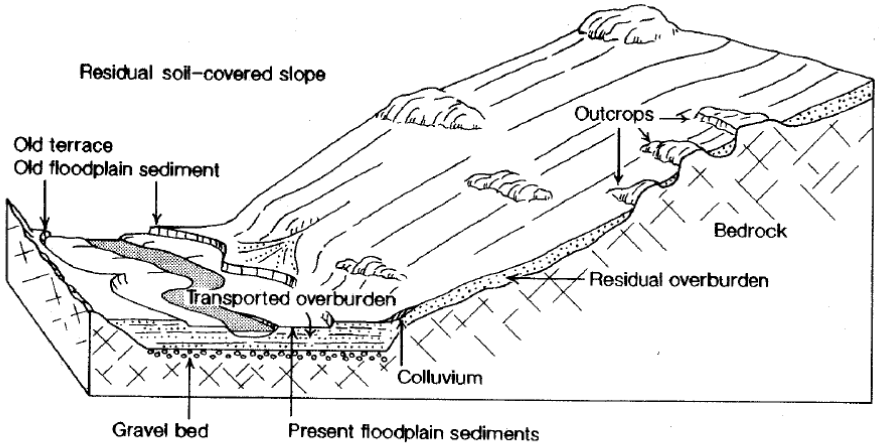

Fig. 5. Block diagram showing residual overburden (soil), colluvium, old and present day floodplain sediments (modified after Strahler 1969).

3. Place the bottles in a cool unit, e.g. refrigerator.
4. Send water samples to the laboratory soon after sampling.

3.2 Stream sediment

Active stream sediment represents the fine- to medium-grained bed load material (silty-clayey-sandy), which is transported by running water. The active stream sediment is collected from the small, second order, drainage basin (< 100 km^2) at a suitable site above its confluence point with the third order, channel of the large drainage basi

Studies into the distribution of trace eleme relation to the size fraction of stream sediment erally show that several elements including M Zn, Mn and Fe are concentrated in the finest tions of the sediment. The majority of stream ment surveys have, therefore, been based on th lection of <0.200 mm material. The IGCP 25 FOREGS standard sieve mesh is <0.150 mm a is fine enough to only include the very fine silt, clay and colloidal fractions, but is coarse e to yield sufficient fine material in the major

3.2.1 Stream sediment samples to be collected

Each stream sediment sample comprises material taken from 5-10 points over a stream stretch of 250 - 500 m. Prior to stream water and stream sediment collection, it is important to identify the 250 - 500 m stream stretch where obvious signs of contamination can be avoided and suitable sediment can be collected from 5-10 different locations. Sites should be located at least 100 m upstream of roads and settlements. Stream sediment sampling should start from the wa-

iment

situations.

Studies in the UK have shown the recovery of stream sediments by dry sieving methods is not quantitative owing to the agglomeration of fine material to form larger particles which are then screened out in varying amounts. A system of wet sieving stream sediments wherever possible is therefore recommended for IGCP 259/360 and FOREGS.

It is important to avoid metal contamination at every stage of sampling as follows;

No hand jewellery or medical dressings should be worn during sampling. If medical dressings are worn, heavy duty rubber gloves must be worn at all times to avoid contamination of the samples.
Metal free polyethylene or unpainted wooden spades/ scoops should be used.
Metal free nylon sieve-mesh housed in inert wooden or metal free plastic frames should be used.
Metal free funnels and sample collection containers should be used.

If it is not possible to use non-metal equipment (e.g. spades and sieve frames), unpainted steel equipment should be used. Aluminium and brass equipment should be avoided.

Sampling sites should be selected sufficiently upstream of confluences with higher order streams to avoid sampling sediment that may result from a mixing of material from the two channels during flood

3.2.2 Equipment

3.2.2.1 Equipment to be provided by regional laboratories:

-Kraft paper bags
-Polyethylene bags

3.2.2.2 Equipment to be purchased by each participant:

-Heavy duty elbow length rubber gloves
-Metal free polyethylene funnel
-Sieve set with 2 preferably wooden or plastic frames containing nylon 2.0 mm mesh and nylon 0.150 mm mesh screens
-Metal free gold pan or plastic bucket
-Metal free plastic crates
-Metal free plastic buckets or containers with lids
-Trenching tool - metal free, polyethylene (PE) or polypropylene (PP)
-Permanent drawing ink marker (preferably black or blue)
-Permanent ink pen
-Maps (topographical maps, preferred scale 1:50 000)
-Chisel-end geological hammer for dry areas (e.g. Mediterranean countries)
-Bristle brush (dry sediment samples)

Field observation sheets are included in this

3.2.3 Sampling procedure

Mark the sample identifier on the Kraft paper bag using permanent ink marker. Mark the exact site location of the first and last subsamples on the field map by means of a small lines perpendicular to the stream flow. Complete the details of the field observation sheet.

Wet sieving is recommended whenever it is possible. Instructions for sampling with wet sieving method are presented in section 3.2.3.1. If it is not possible to wet sieve the stream sediment sample in the field, the collected stream sediment material should be dry sieved. Instructions for sampling and dry sieving are given in section 3.2.3.2.

3.2.3.1 Sampling and wet sieving

Once the site for sampling has been selected, mark the exact location of the first and last sampling points on the field map by means of a small line perpendicular to the stream flow using the ink pen. Mark the sample identifier number on map next to the sampling location. Complete the details on the field observation sheet. Write the sample identifier on the collection bucket and lid using the permanent drawing ink marker.

Rubber gloves are recommended for protection throughout sampling.

-Enough coarse grained material should be collected to yield a minimum of 0.5 kg <0.150 mm material (dry weight).

The amount of coarse material required will vary substantially depending on the underlying geology and terrain. Geochemists should use their knowledge and judgement to assess how much coarse material will be required.

-Mix the buckets of the coarse sediment thoroughly with the plastic stirring rod and carry them to the sieving location

-Load sediment into the top sieve with the spade. If more than one bucket of coarse sediment has been collected, equal amounts of sediment should be loaded into the sieve from each bucket in turn.

-Rub the material through the top sieve wearing rubber gloves for protection.

-Take care to remove large stones from the sediment by hand.

-Once the bottom sieve contains a reasonable quantity of <2 mm sediment, remove the top sieve and discard the >2 mm material.

-The <2 mm sediment in the bottom sieve is washed and rubbed through the sieve with the aid of water and shaken down.

-It is very important at this stage that coarse material which would bias the sample does not enter the collection bucket. This may be avoided by carefully washing the outside of the bottom sieve prior to shaking.

-In order to enhance the trace element signature, it is

recorded on the field sheet and on a sample check-list sheet.

-Once the sample has been homogenized, carefully transfer the sample into the Kraft bags using a clean plastic funnel.

-The Kraft bags should be hung out to air dry at the field base for as long as possible.

-When moving the samples, place each Kraft bag in a 15 x 40 cm polythene bag and secure the top of the bag with a knot to prevent loss or cross contamination of samples during transport.

-The samples should be secured upright in a plastic crate or box and transported carefully to the next location or to the Survey base for further drying.

-At the Survey base or laboratory, the samples should be completely dried at < 40°C. Freeze drying is a recommended as this helps to disaggregate the samples. Dried samples should be sent to LAB I.

All sampling equipment must be thoroughly cleaned between each site to avoid cross contamination.

3.2.3.2 Sampling and dry sieving

The procedure for the selection of sample sites, recording their location on the field map, completion of field observation sheets, wearing of rubber

be a field composite sample from 3 - 5 subsamples in the field. Minimum distance between any two subsamples should be 5 m. Avoid sampling adjacent to roads (minimum distance 10 m) or ditches (minimum distance 5 m), but you are free to use your discretion depending on the traffic density and prevailing local conditions.

Living surface vegetation, fresh litter, big roots and rock fragments (stones) are removed.

In case the whole soil profile does not reach a depth of 75 cm, the lower sample should be taken from a depth, that can be undoubtely identified as the BC- or C-horizon (do not forget to note this down under remarks on the field observation sheet!). If this is not possible another sample site should be selected.

The subsoil sample is taken first, and then the topsoil sample. This procedure avoids cleaning the surface of the subsoil from fallen top soil, if the latter is taken first.

After collection of each sample clean thoroughly the sampling equipment.

OPTIONAL:

From one sampling site of a duplicate cell 2 kg of bottom floodplain sediment + 2 kg of bottom floodplain sediment (duplicate sample) and from all other sampling sites 2 kg of bottom floodplain sediment.

from the same site, the close-up photo can show both the character of organic layer and mineral soil horizons (see below). In this case, separate photographs for the soil sample site will not be needed.

At each soil sample site two photographs should be taken; the first to show the general view about the sampling site (Fig. 9), and the second a close-up of one of the soil sample pits (Fig. 10). Before taking

3.4 Floodplain sediments

A floodplain sediment, representing the alluvium of the whole drainage basin will be collected from the alluvial plain at the lowermost point (near to the mouth) of the large catchment basin (1000 - 6000 km^2).

Both floodplain and overbank sediments are fine-grained (silty-clay, clayey-silt) alluvial soils of large and small floodplains respectively, according to the size distinction made by Darnley *et al.* (1995). Floodplain and overbank sediments are deposited during flood events in low energy environments (Ottesen *et al.*, 1989); they should, therefore, be devoid of pebbles, which indicate medium energy environments. The surficial floodplain and overbank sediments are normally affected by recent anthropogenic activities, and may be contaminated. Deeper samples, which are optional sample media, normally show the natural background variation.

3.4.1 Floodplain sediment samples to be taken

From the first sampling site of a duplicate cell (one in each country) collect:

- 2 kg of top floodplain sediment + 2 kg of top floodplain sediment (duplicate sample)

From all other sampling sites collect:

- 2 kg of top floodplain sediment

Enough material must be taken to yield minimum 0.5 kg of <2 mm grain size sediment. Larger sample quantities can be taken and stored separately in each country.

Fig. 11. Floodplain sampling in southwestern Finland (Photo: Reijo Salminen, GSF).

3.5 Overbank sediments

An overbank sediment, representing the alluvium of the small drainage basin will be collected from its alluvial plain near to the confluence point of the small, second order, stream (< 100 km^2) with the main, third order, river.

3.5.1 Overbank sediments to be taken

All overbank sediment samples are optional. FOREGS laboratories will not provide analyses of

Fig. 12. Floodplain sediment sequence with soil development in Greece. Meter: coloured sections 20 cm. Fine-grained clay and silt down to a depth of 75 cm (low energy floodplain sediment - good for sampling; soil has developed down to a depth of 25-29 cm). Coarse-grained sandy and bebbly unit between 75-100 cm (high energy environment). Sandy-clay unit between 100-134 cm (low-energy environment). Gravel bed below a depth of 134 cm. Photo: A. Demetriades, IGME.

Sample preparation

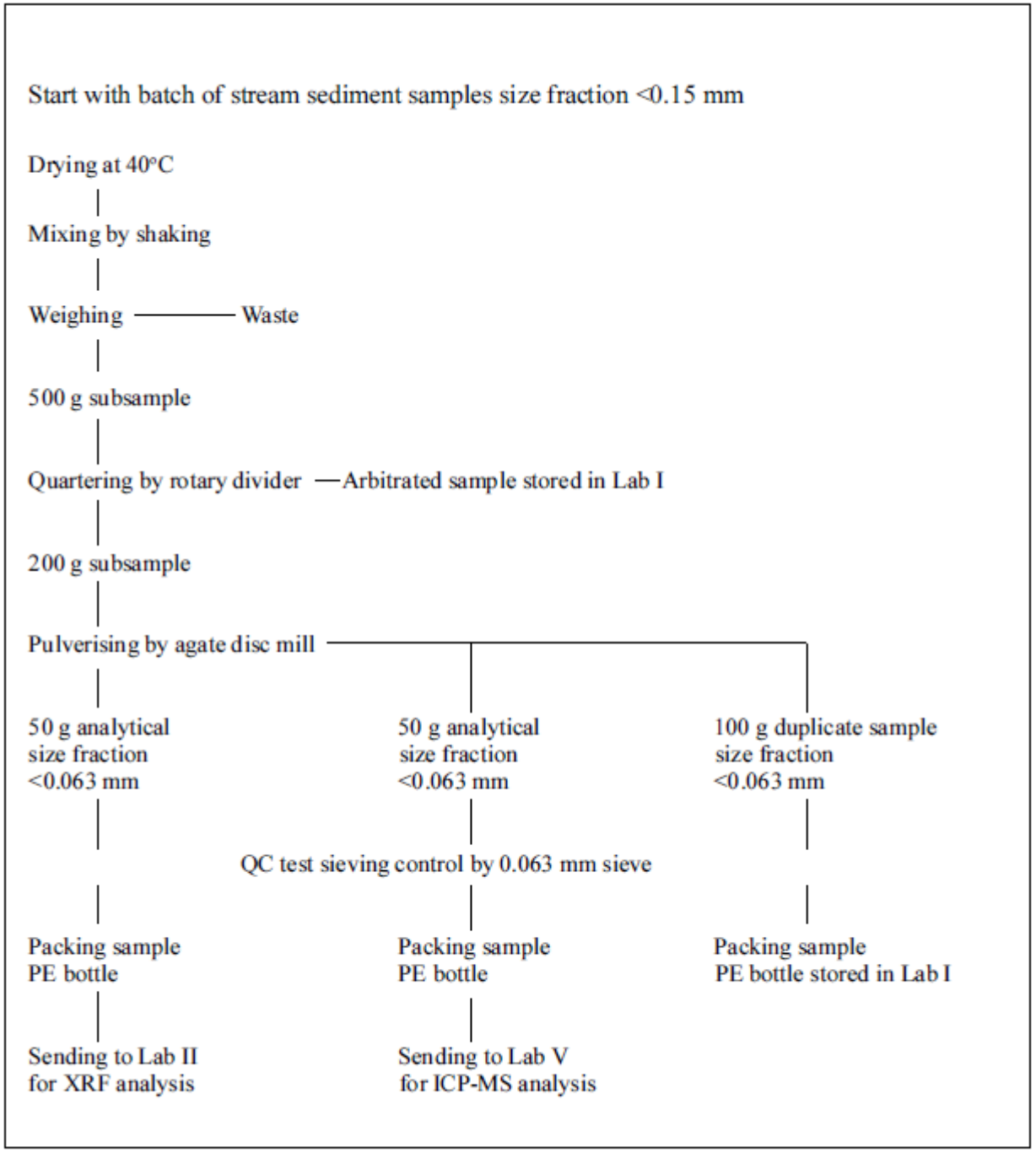

Fig. 13. Screening standard operating procedure for stream sediment samples.

Field sheet

FOREGS GEOCHEMICAL BASELINE PROGRAMME **FLOODPLAIN SEDIMENT**

TOP ID _____ Date _____ Sampler _____

BOTTOM ID_____ Country _____

(Bottom floodplain sample is optional) Organisation _____

GTN cell coordinator if different from above _____

SAMPLE SITE LOCATION REGION _____ MAP SHEET _____

COORDINATES **(Decimal degrees mandatory)**

National grid Easting _____ Northing _____

Decimal degrees Longitude _____ Latitude _____ Datum _____

Altitude (m) _____

DESCRIPTION OF CATCHMENT BASIN

Approximate size of catchment basin _____ km^2

Landscape / topography _____

Land use

- ☐ Agriculture
- ☐ Pasture, grassland, fallow field
- ☐ Forest:
- ☐ Wetland
- ☐ Non-cultivated, moorland etc.
- ☐ Other, specify _____

Predominant bedrock lithology within catchment basin _____

SITE DESCRIPTION

River width _____ m, depth _____ m

Grain size range at sample site ☐ sand - silt ☐ silt - clay

Abundance of clasts > 2 mm in %: _____

Depth of observed groundwater table (cm) _____

Sampling interval from surface ☐ 0 - 25 cm ☐ other, specify: _____ cm

Possible sources of contamination, specify _____

PHOTOS Film and photo ID

Landscape _____

Site _____

GAMMA-RADIATION Total _____ Th _____ U _____ K _____

Instrument _____

REMARKS

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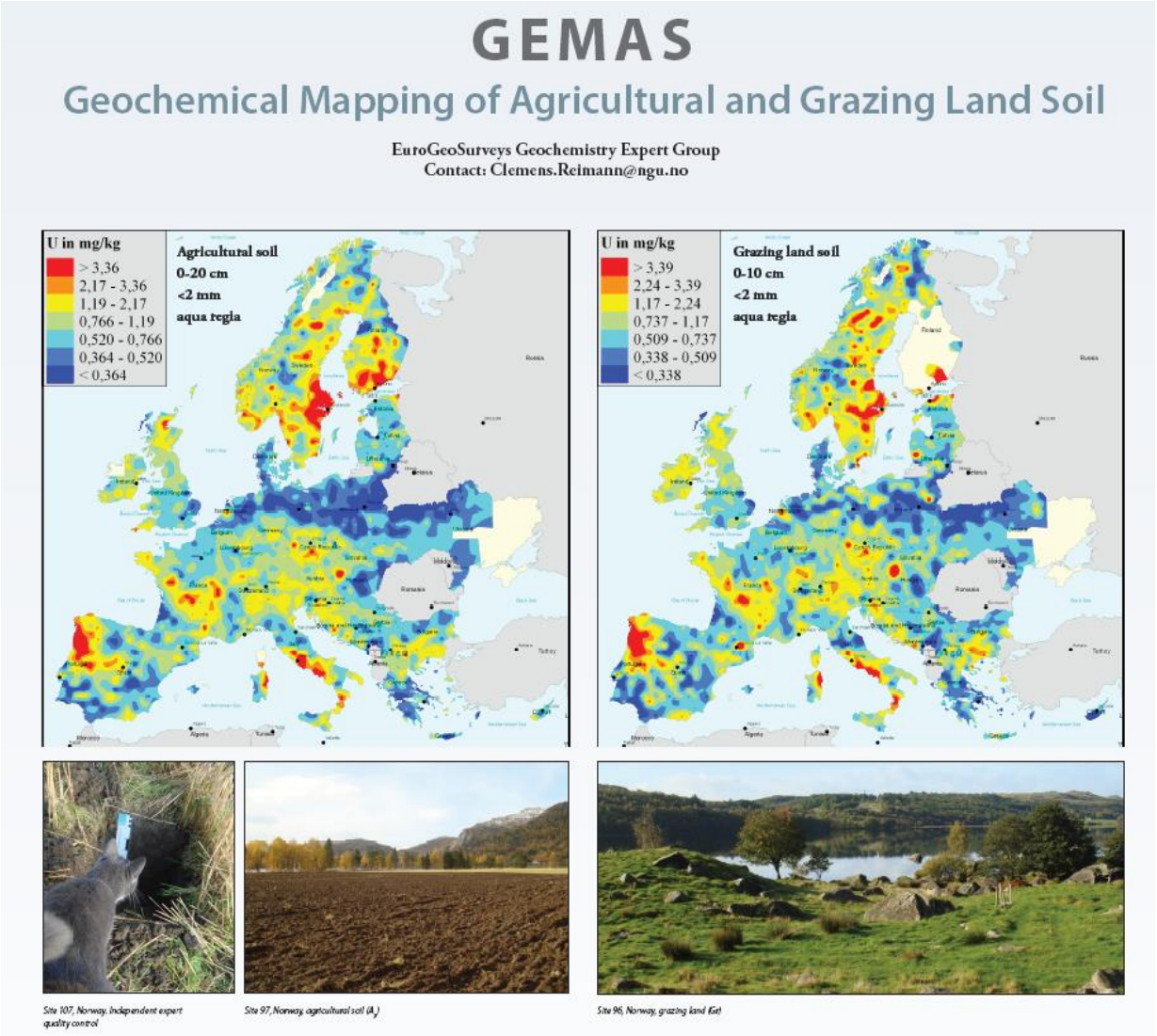
GEMAS – European Soil Chemistry Atlas

Quality Control



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