

Examination Reconstructing Quaternary Environments (GEO4-4409)
January 27, 2009

**Answers may be given in English or Dutch,
in any case: please answer concise and readable !**

For every sub-question you can earn 5 points.

- 1) Give a short and to-the-point description of the following subjects:
 - a) OSL
 - b) Heavy mineral analysis
 - c) Equilibrium Line Altitude
 - d) Palynology

- 2) Dating
 - a) Which dating technique can be used for deposits from the Eemian, and what material can you date with these techniques
 - b) What is AMS-dating, and how can it be applied in dating past fluvial activity?
 - c) How would you date the glacial deposits that can be found in the Netherlands, and what will be the approximate age (in kyrs BP).
 - d) In a lake in Northern Sweden a tree trunk has been found with 250 countable rings, in the deeper part of the lake, varves have been formed over a period of 8000 years. How would you date and correlate these two records?

- 3) Proxies
 - a) Give 3 proxies that can be used to reconstruct past summer and 3 proxies for winter temperatures.
 - b) How can you use the Loss on Ignition method for the reconstruction of environmental changes?
 - c) What can be reconstructed with fossil periglacial phenomena? Give at least 5 different palaeoenvironmental implications.
 - d) Compare the indicator values of pollen and macro fossils.

- 4) Events
 - a) When was the onset of the Quaternary, and how is it defined?
 - b) When was the Little Ice-age, what were the consequences for NW Europe?
 - c) Give at least 3 interstadials that occurred before the Last Glacial Maximum and describe how they can be recognised in terrestrial environments in comparison with stadials that occurred during the same time-interval.
 - d) What was causing mega-faunal extinctions in the Late Quaternary, give 3 examples of extinct species.

- 5) Synthesis
 - a) Sketch the Greenland oxygen isotope record for the Last Glacial-Interglacial Transition, give the approximate ages on the vertical axis;
 - b) make a comparison with the vegetation development in the Netherlands;
 - c) which methods can you use to correlate these records ?
 - d) what were the causes for the rapid climate changes in the North Atlantic ?

The results will be available within 2 weeks and published on WebCT,
Good-luck !