



Høgskolen i Telemark

EXAM

9000 / **4502 ALPINE BIODIVERSITY AND CLIMATIC CHANGE**

16.12.2013

Time : 4 hours

Language: english

Numbers of pages: 4 including the front page

Aid: dictionary

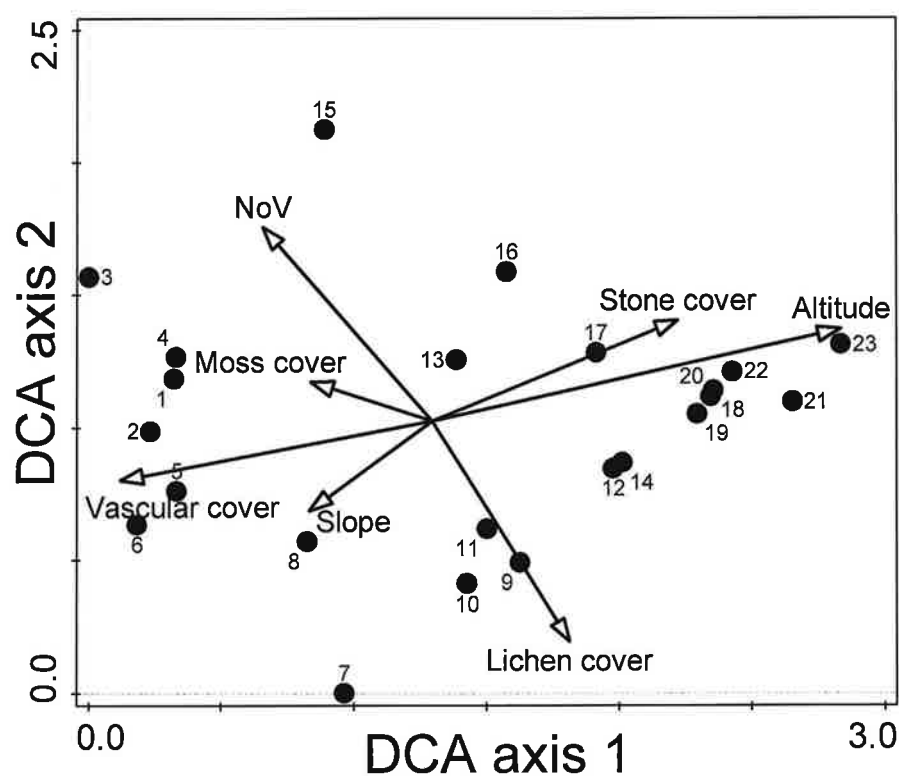
Exam result will be available on Studentweb

1.)

In an ecological study, 23 vegetation plots (5x5 m) were systematically sampled in a south facing valley slope in central southern Norway. In total 100 vascular plant species were recorded, and their cover degrees in percentage were estimated.

The data were analyzed by Detrended Correspondence Analysis (DCA).

Some environmental and explanatory variables were included and their trends of variation in relation to DCA axes 1 and 2 are shown in the ordination diagram:



NoV	Number of vascular plant species in the plots
Vascular cover	Sum cover of all plants in the plots
Slope	Slope degree of the plots
Stone cover	Cover of stones in the plots
Moss cover	Cover of mosses in the plots
Lichen cover	Cover of lichens in the plots
Altitude	Altitude of the plots

The main results are given in the table below:

Summary Table:

DCA axes	Axis 1	Axis 2	Axis 3	Axis 4
Eigenvalues	0.43	0.18	0.08	0.07
Gradient length	2.83	2.12	1.26	1.29

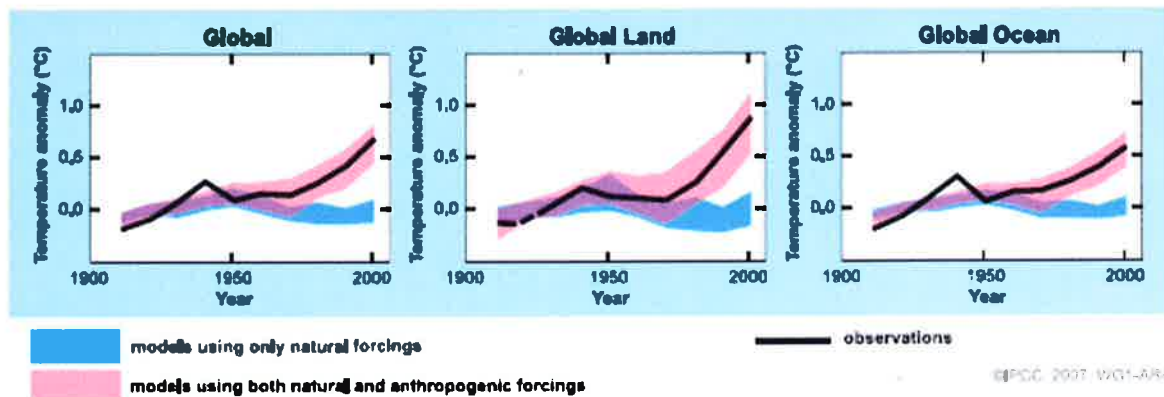
The positions of the plots are indicated by numbers from 1 to 23.
The environmental and explanatory variables are given by arrows (vectors) indicating their direction of change.
The species plots are not shown.

Explain which conclusions you can draw from this ordination diagram.

2.)

According to the IPCC 2007, technical summary:

- a. In connection with global climate: What do we mean by “radiative forcing”? How does increased greenhouse effect influence the global mean radiative forcing?
- b. The figures below show some comparisons between observed and modelled temperature anomalies. How do you interpret these figures?



- c. Describe briefly the projected changes in precipitation at high latitudes, in the sub-tropics, and tropical regions towards the end of this century, if the amounts of greenhouse gases in the atmosphere continue to increase.

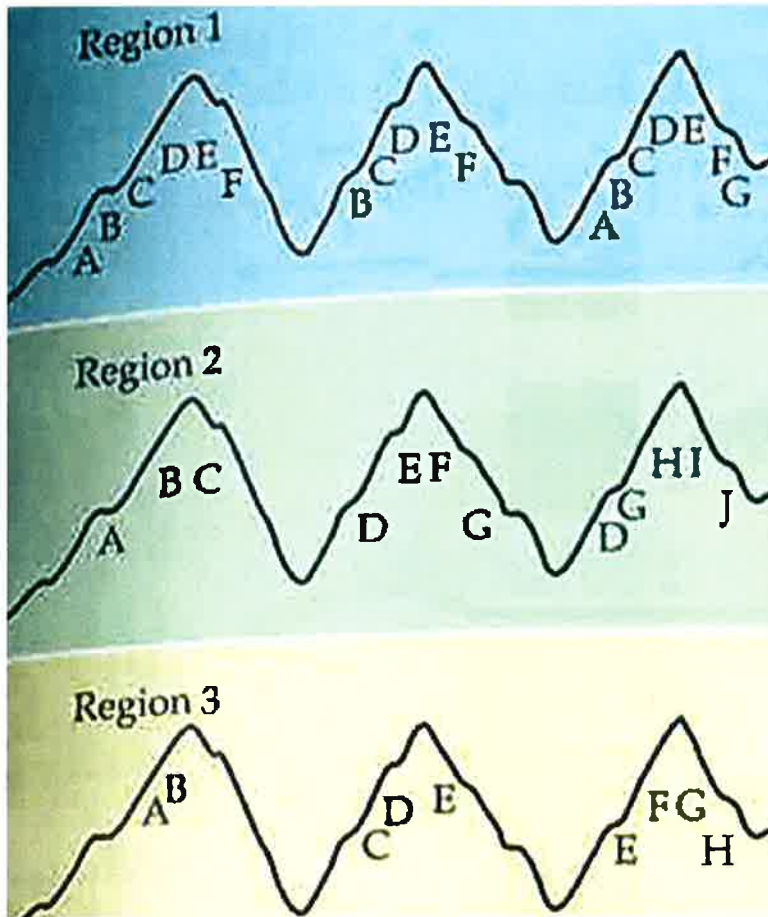
3.)

- a) “Migratory bird species are likely to be more negatively affected by climate change than resident species. Explain why?”
- b) Why are the Arctic fox populations in Northern Europe so fragmented (name four reasons)?

4.)

a) What is biodiversity? Describe the three levels of biodiversity.

b)



Each letter represents a population of a species, some species are only found on one mountain, while other species are found on two or three mountains.

If funds were available to protect only one mountain range, which region would you protect?

However if only one mountain could be protected, which mountain should be selected?

What would be the argumentation to protect region three?

Explain your answers by discussing alpha, beta, and gamma diversity.

c) What are biodiversity hotspots? Name two of the criteria that must be fulfilled to qualify an area for a biodiversity hotspot.

5.)

a) Why do mountain areas have a high biodiversity?

b) Which vegetation changes would you expect in mountain areas due to climate change?

c) Name two other factors besides climate change that may result in changes in vegetation composition in mountain areas.