Abstract

Global warming and its influence on the environment has become a popular and widespread issue. Nowadays, an analogy of a high latitude ecosystem during the greenhouse type of climate does not exist. The Cretaceous polar ecosystem gave us a unique possibility of understanding these extreme ecosystems and the specific adaptations of organisms to these conditions. Such types of ecosystem are crucial for a better understanding of possible future climate changes.

This thesis focusses on the adaptation strategies of land plants during the Late Cretaceous in the Arctic peninsula. The land plants responded to these specific solar conditionals in two different ways: evergreen or deciduous. The fossil material for this study comes from Brandy Bay and Crame Col, James Ross Island, Antarctic. The material was collected in a continuous sequence from Kotic point to Santa Marta Formation (Cenomanian – Companian). A detailed and systematic analysis was performed on five out of fifty-five samples that well represented the studied region and age: *Agathoxylon kellerense*, *Agathoxylon antarcticus*, *Araucarioxylon chapmanae, Podocarpoxylon multiparenchymatosum and Phoroxylon* sp.

Based on the detailed study of *Agathoxylon kellerense* (sample number AN34) wood anatomy and growth rings structure, adaptation strategies were determined. *Agathoxylon kellerense* was determined as an evergreen plant with leaf retention times presumably between three and five years. The methods employed for determination of the growth strategy were: percentage diminution, percentage latewood, RMI and CSDM skewed. Further observations of growth rings show distinct fluctuations in year-to-year conditions, a sharp transition from polar day to polar night. Presence of false rings supports the hypothesis of the dryer conditions at the end of the vegetation period.

Based on this and earlier studies predominantly evergreen conifers during the Middle Cretaceous in the Antarctic peninsula region could be expected. This evergreen flora was partially replaced by deciduous forms due to the gradual radiation of angiosperms during the Late Cretaceous. By the end of the Late Cretaceous, a mixed polar forest in the Antarctic peninsula region can be expected. Both adaptation strategies to specific solar conditions have some advantages and disadvantages, and in certain circumstances is one more profitable than the other.

Keywords: Antarctica, Cretaceous, wood anatomy, grow rings, evergreen, deciduous, adaptation strategy