The effect of elevated CO2 concentration (EC CO2) on photosynthesis has been observed on many hierarchical levels. There was a significant increase in the rate of photosynthesis of examined trees observed in previous studies thus I hypothesised these changes are accompanied by changes of chloroplast ultrastructure and photosystem content and function and the main aim of this study is to evaluate these adjustments.

In this study 13 – 14 years old seedlings of Norway spruce (Picea abies L. Karst.) grown in glass domes with adjustable windows – one with ambient CO2 concentration as a control, the other one with simulated EC CO2 (700 ppm) – during the vegetative season were examined. Pigment content, fluorescence and reflectance indexes, activity of photosystem 1 (PS1) and 2 (PS 2) of isolated chloroplasts, size of cross-sectional area of chloroplast and proportion of stromal to granal thylakoids under EC CO2 treatment were investigated.

Although there was a significant increase in the maximum rate of photosynthetic assimilation of trees from EC CO2 (observed by other researchers of our team), decreased chlorophyll and carotenoid content as well as the activity of both photosystems were observed, which is usually atributed to photosynthetic acclimation. As the rate of decrease of photosystem 1 and photosystem 2 was similar there is probably no alteration in linear and cyclic electron transport ratio under EC CO2. Quantum yield (QY) and maxium quantum yield (FV/FM) of photosystem 2 were slightly but significantly decreased by EC CO2, NDVI (normalized difference vegetation index) and PRI (photochemical reflectance index) were not significantly affected by the treatment. Under elevated CO2 concentration chloroplast cross-sectional area was higher but no significant ultrastructural changes in terms of thylakoid membrane stacking were observed.