SYNTHESIS – CONCLUSIONS:

This thesis combines two methodical approaches at different hierarchical levels of plant ecophysiology, which both are applied in field research and bring new valuable information for comprehension of several aspects of carbon cycle in forest ecosystem, particularly coniferous.

The quantitative anatomy represents the first approach. At the leaf level application of confocal microscopy on fresh and frozen-stored needles and subsequent stereological estimation of mesophyll geometrical parameters proved to be suitable and sensitive enough for estimation of changes in mesophyll after simulated acid rain or differentiation of sun and shade needle ecotype. Application of systematic uniform random sampling of sections along the needle axis revealed insight to heterogeneity of mesophyll geometrical parameters within the needle and confirmed representativeness of the sampling from the middle region of the spruce needles.

The second approach, laboratory measurement of shoot reflectance, represents important step in verification of relationships between leaf biochemical and optical properties, which can be subsequently used for monitoring of forest health, foliar or soil chemistry using remote sensing techniques. At the level of Norway spruce crown, samples of even-aged needles from the upper sunlit crown part proved to be representative irrespective of branch azimuth orientation regarding biochemical, structural and spectral parameters. And selected chlorophyll content related spectral indices revealed to be potential indicators of forest floor dissolved organic carbon and nitrogen pools in mixed coniferous forest.