# Abstract

Removal of atmospheric effects (atmospheric correction) is an essential step in a pre-processing chain of all remotely sensed image data used for any quantitative or semi-quantitative analysis. Although there are many robust computing techniques allowing quantitative estimation of various parameters of the Earth's surface, the influence of atmospheric correction on the accuracy of such estimation is usually not taken into account at all.

The main focus of this thesis is to assess the influence of the use of different atmospheric correction techniques on the Norway spruce (*Picea abies*) canopy chlorophyll content estimation accuracy. Canopy chlorophyll content was estimated using values of chlorophyll sensitive vegetation indices ($ANCB_{650-720}$, MSR, $N_{718}$, TCARI/OSAVI and $D_{718}/D_{704}$) simulated by a coupling of PROSPECT and DART radiative transfer models and validated by a ground-truth dataset. A new spectral similarity index called normalized Area Under Difference Curve (nAUDC) was developed to allow mutual comparison of two spectra originating from hyperspectral datasets corrected by different atmospheric correction methods.

Potential substitutability of the standard physically-based ATCOR-4 atmospheric correction by the empirical correction based on the data acquired by the downwelling irradiance sensor FODIS was tested on the AISA-Eagle datasets acquired over Šumava National Park. Influence of flight line geometry on the performance of both ATCOR-4 and FODIS based atmospheric corrections was evaluated on the three AISA-Eagle datasets acquired over the Bílý Kříž test site in N–S, W–E and NW–SE directions. On top of that effects of topographic correction and cross-track illumination (BRDF) correction were also studied using the HyMap dataset acquired over the Sokolov lignite basin.

The absolute accuracy of the canopy chlorophyll content estimation was higher in case of the ATCOR-4 corrected dataset in comparison with the FODIS corrected data ($RMSE_{ATCOR-4}$ = 9.71µg/cm$^2$ $RMSE_{FODIS}$ = 14.26 µg/cm$^2$). The canopy chlorophyll content values retrieved from the FODIS corrected dataset were generally underestimated, however, the observed differences had character of a systematic offset. Therefore it seems that the FODIS-based atmospheric correction might be used in case we are interested in relative differences and spatial patterns of canopy chlorophyll content rather than in its absolute values. No significant influence of a flight line direction was detected both in case of the ATCOR-4 and the FODIS correction. The effect of topographic correction included into the chlorophyll content retrieval models was found to be ambiguous as the only significant improvement of the final chlorophyll content product accuracy was observed only in case of the model based on the topography-sensitive vegetation index MSR. The improvement of the estimation RMSE was negligible in case of other models. On the other hand the application of the BRDF correction resulted in significant improvement of the estimation RMSE in case of the all tested retrieval models.

**Key words:** chlorophyll content, hyperspectral data, atmospheric correction, Norway spruce, radiative transfer