

## Review of a thesis supervisor

Author of the thesis: Mgr. Jan Mišurec

Title of the thesis: *Influence of atmospheric and topographic correction on the accuracy of canopy chlorophyll content estimation of Norway spruce stands*

The subject of the thesis of Jan Mišurec is very topical and important. Because outcomes of atmospheric correction are usually inputs for data processing, correct removal of atmospheric effects is essential step in the pre-processing chain. Atmospheric correction can be basically done by two principally different ways. Hyperspectral (aerial) data are usually corrected using complex atmospheric models. The second way – use of rather simple empirical approaches is usually considered not to be precise enough for this type of the data. Moreover some additional corrections like cross-track illumination (BRDF) or topographic effects correction are usually used for hyperspectral data.

These correction methods are very time consuming because they demand extensive field campaigns and a lot of additional information. Therefore the main goal of the thesis was to assess the influence of the use of different atmospheric correction techniques on the Norway spruce (*Picea abies*) canopy chlorophyll content estimation accuracy. The main research questions were:

- 1) What is the effect of the use of different atmospheric correction methods on the final canopy chlorophyll content estimation accuracy?
- 2) Are the sophisticated physically-based methods of atmospheric correction substitutable by the simple empirical based methods as for the chlorophyll estimation accuracy?

Beside these questions the author aimed to answer some other detailed questions related to flight geometry, cross-track illumination (BRDF) and topographic effects corrections and to their influence on the final corrected image quality. Jan Mišurec stated very good hypothesis for each of his research questions mentioned in the thesis introduction (Chapter 1).

Second chapter – theoretical background – gives an appropriate attention to all theoretical aspects of the thesis theme, literature search is well done and used references are appropriate. It is evident that the author has deep theoretical background in the field of laboratory and image spectroscopy.

Study sites are described in chapter 3 and based on this chapter and the chapter 4 – Data – it is evident that the author had a possibility to work with really wide range of data sources acquired during three data acquisitions and pre-processed using different methods what is very good input for the mentioned thesis goals.

Experimental chapters 5 and 6 give an evidence about author's ability to apply different experimental methods and approaches but moreover chapter 6 introduces also original author's contribution. For the purpose of both relative and absolute atmospheric correction assessments a new spectral similarity assessment method called "*normalized Area Under Difference Curve*" (nAUDC) – was developed within the thesis and its performance was compared with the results obtained by SAM and SCM algorithms.

Results of the thesis are summarized in the chapter 7. The results are clearly described and sufficiently commented and provide very good input for Chapter 8 – Discussion. The discussion has undergone some development during the thesis finalization and finally has very good quality. The author discusses each part of results related to particular research questions, factors that could affect the obtained results and though the influence of atmospheric correction on the canopy

chlorophyll content estimation accuracy is currently not widely studied topic and there is lack of the literature to be used as a reference author compared the obtained absolute accuracy of the canopy chlorophyll content estimations performed within this thesis with the results obtained by other authors. The Discussion and also the final chapter 9 – Synthesis and conclusions – are the most valuable parts of the thesis. These parts give clear answers for the research questions and hypothesis and show author's professional quality and ability to provide valuable research outputs. Jan Mišurec has accomplished the goals of the thesis and provided to the professional's community valuable and important answers for original questions.

I recommend to accept the thesis for the defence and after a successful defence to award Jan Mišurec the title Rerum Naturalium Doctor (RNDr.).

Líbeznice, 22<sup>nd</sup> September, 2014

A handwritten signature in cursive script, reading "Lucie Kupková".

RNDr. Lucie Kupková, Ph.D.