

## PHOTOGRAMMETRIC NEWS: Doctoral Dissertation

Mr. **Hadi** made his doctoral dissertation on the 30<sup>th</sup> of November 2018 at the Aalto University School of Engineering, Finland, supervised by Professor **Miina Rautiainen**. Professor **Christiaan van der Tol**, University of Twente, the Netherlands, appeared as opponent. The title of the thesis was “Satellite optical remote sensing of forest canopy cover in boreal and tropical biomes”.



### Abstract of the thesis

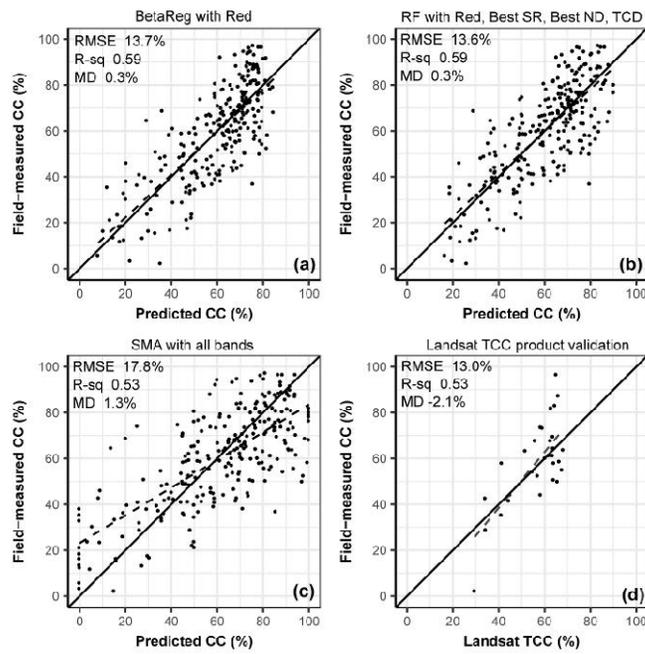
Forests protection and restoration is increasingly acknowledged as a crucial bridge in the ongoing world's economy transition towards a low-fossil-fuel future, to help achieving the global emission reduction target, and thus avoiding the predicted devastating impacts of unmitigated climate change. The long-operational optical Earth-observing satellites, together with recent developments in optical satellite data quality and availability, as well as in computational power, have brought new, unprecedented capabilities in using the freely available satellite data for the urgent task of monitoring the world's forest cover.

The findings of this dissertation show that, the current freely-available satellite data from the Landsat missions can be feasibly utilized for, firstly, large-area monitoring of forests canopy cover in the managed Northern European boreal forests, and secondly, deforestation monitoring in the tropical insular South East Asia at a sub-annual time scale. Further, the findings suggest that the detection of subtler forest degradation activities can be best performed by detecting the forest cover loss immediately as it happens. This in turn will soon be possible by harmonizing data from Landsat satellites and the newly-fully-operational Sentinel-2 satellites.

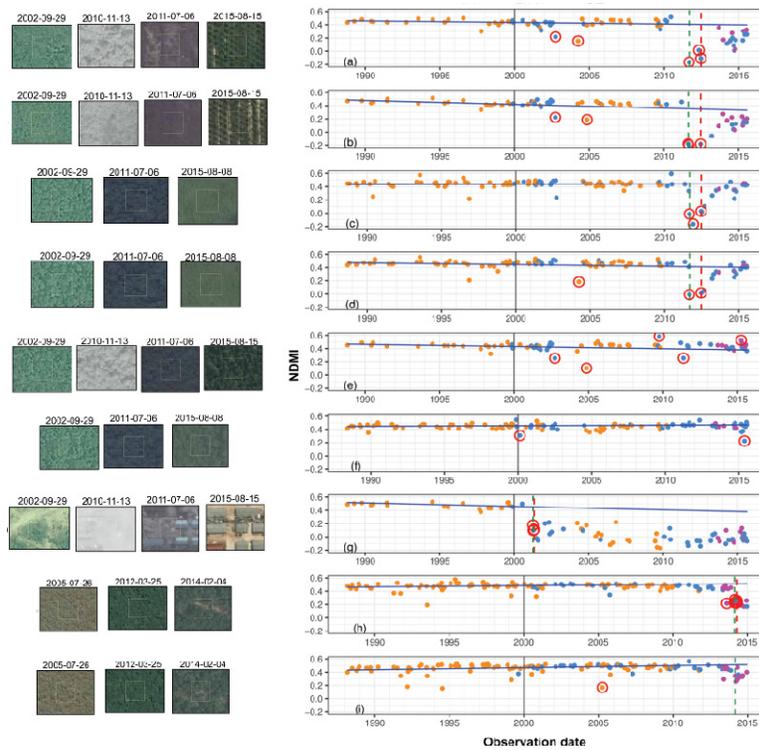
Overall, this dissertation provides the physically sound, and thus more generalizable, future optimization pathways, for the task of continuous monitoring of forests canopy cover using freely-available satellite data, in both the boreal and tropical biomes. Such physical insights are especially valuable in guiding the developments and interpretations of data-driven, machine learning methods in satellite data mining that are presently proliferating with the ongoing big data and computing revolutions.

**Keywords:** Canopy cover; boreal; tropical; Landsat; Sentinel-2; spectral vegetation index; reflectance model; photon recollision probability; deforestation; monitoring

## Highlighted figures from the thesis



*Landsat-based prediction of canopy cover in boreal forests in Finland.*



*Landsat-based deforestation detection in tropical rainforests in Indonesia.*