



Fall coloring monitoring using MODIS data

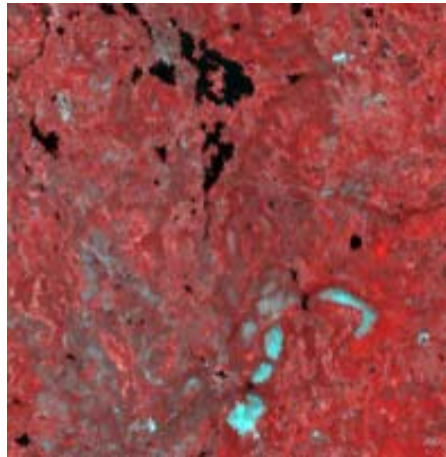
Jussi Ahola

Introduction

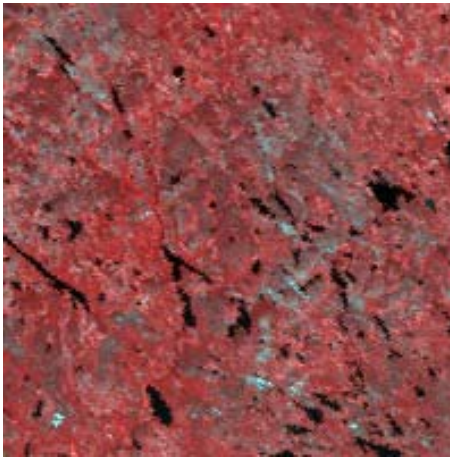
- The general objective of the Season Application
 - To develop and implement a pilot version of a system for monitoring tourist seasons related phenomena, i.e., fall coloring, spring foliation, and snow and ice conditions. The system should use earth observation and other relevant data.
- This presentation concentrates on the development of an operative method for fall coloring detection and monitoring.
- The main data used in the work involves 65 MODIS images (with 250m resolution) of Northern Finland from this fall (August-September).
- The selected approach is based on the different behavior of the red and nir reflectance of the conifer and deciduous trees in the fall coloring season.

Test areas

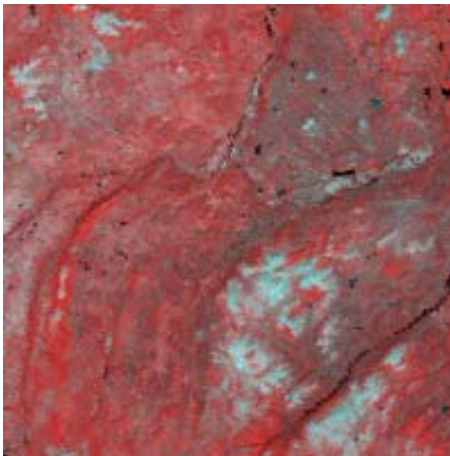
Ylläs-Aakenus



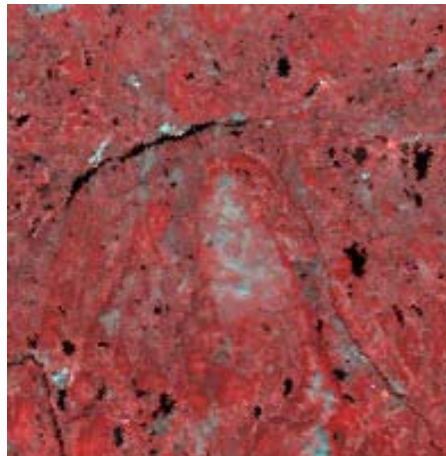
Napapiiri



Lemmenjoki



Ounastunturi



Pseudocoloring:

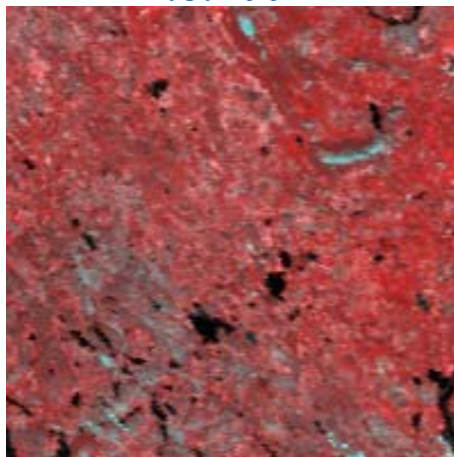
red = near-infrared channel

green = red channel

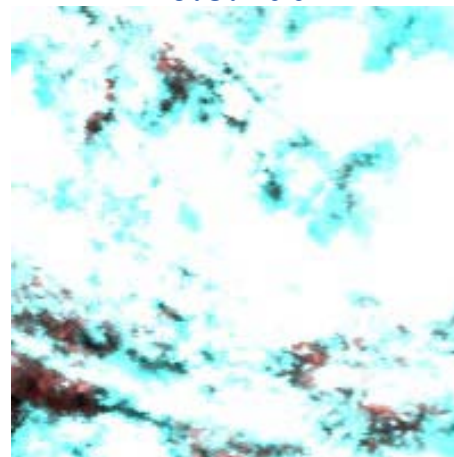
blue = red channel

Example area: Pyhätunturi

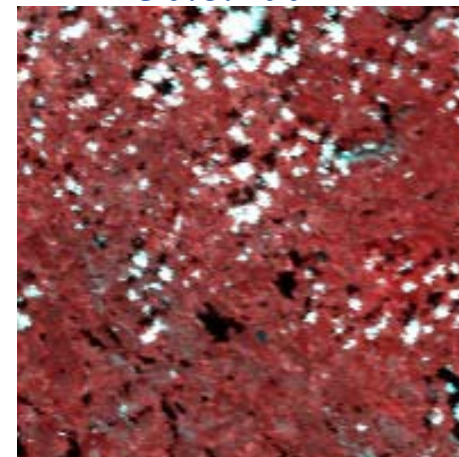
2.8.2004



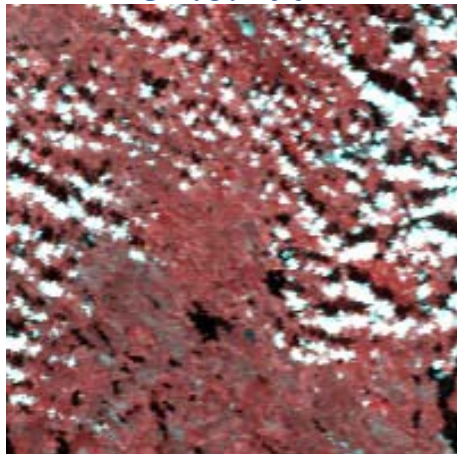
16.8.2004



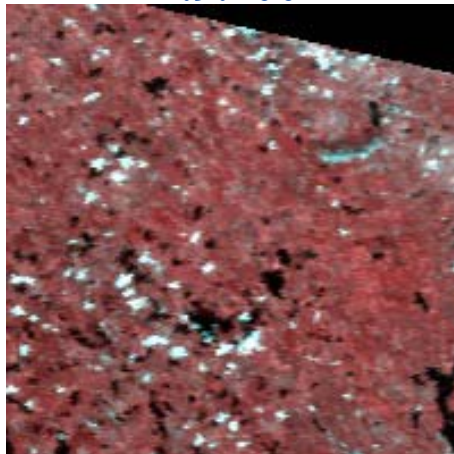
30.8.2004



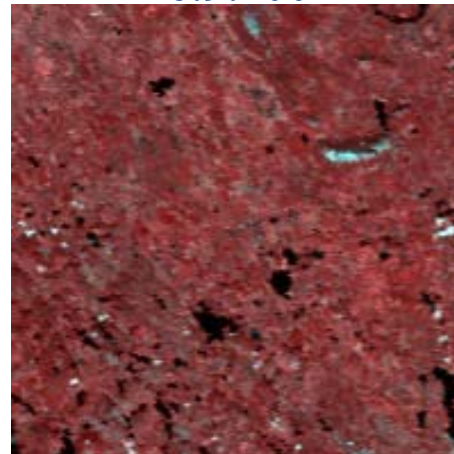
31.8.2004



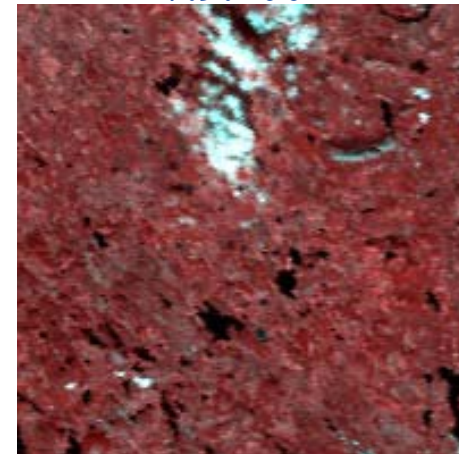
11.9.2004



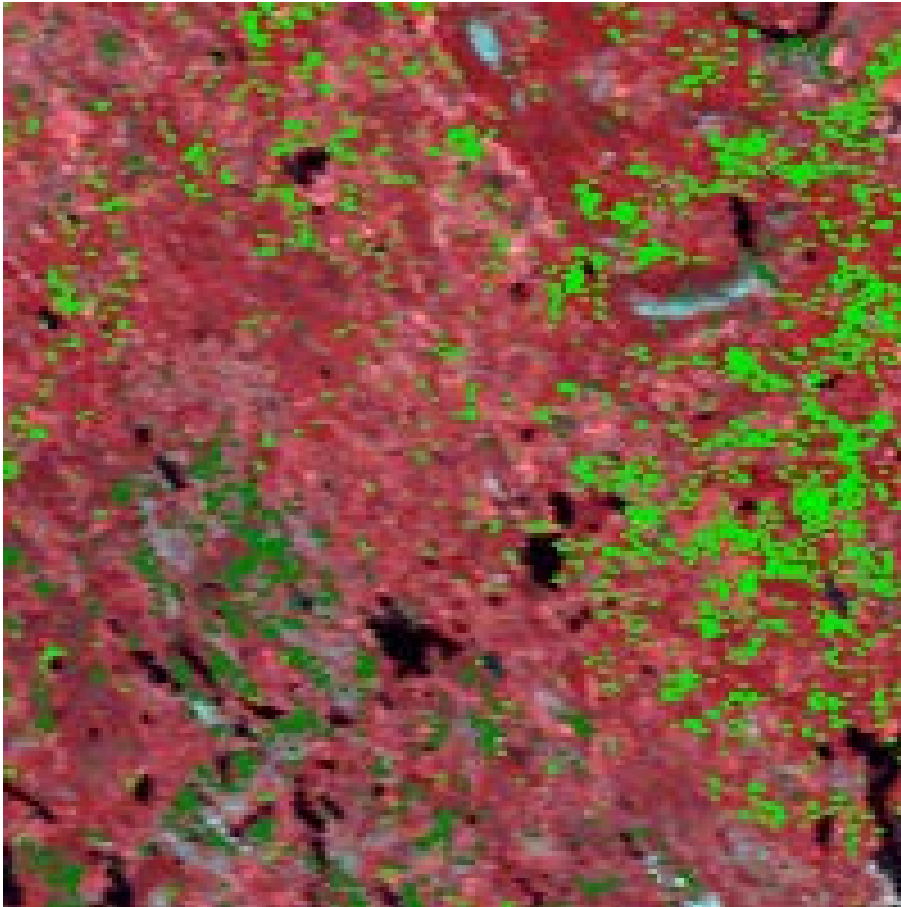
16.9.2004



17.9.2004



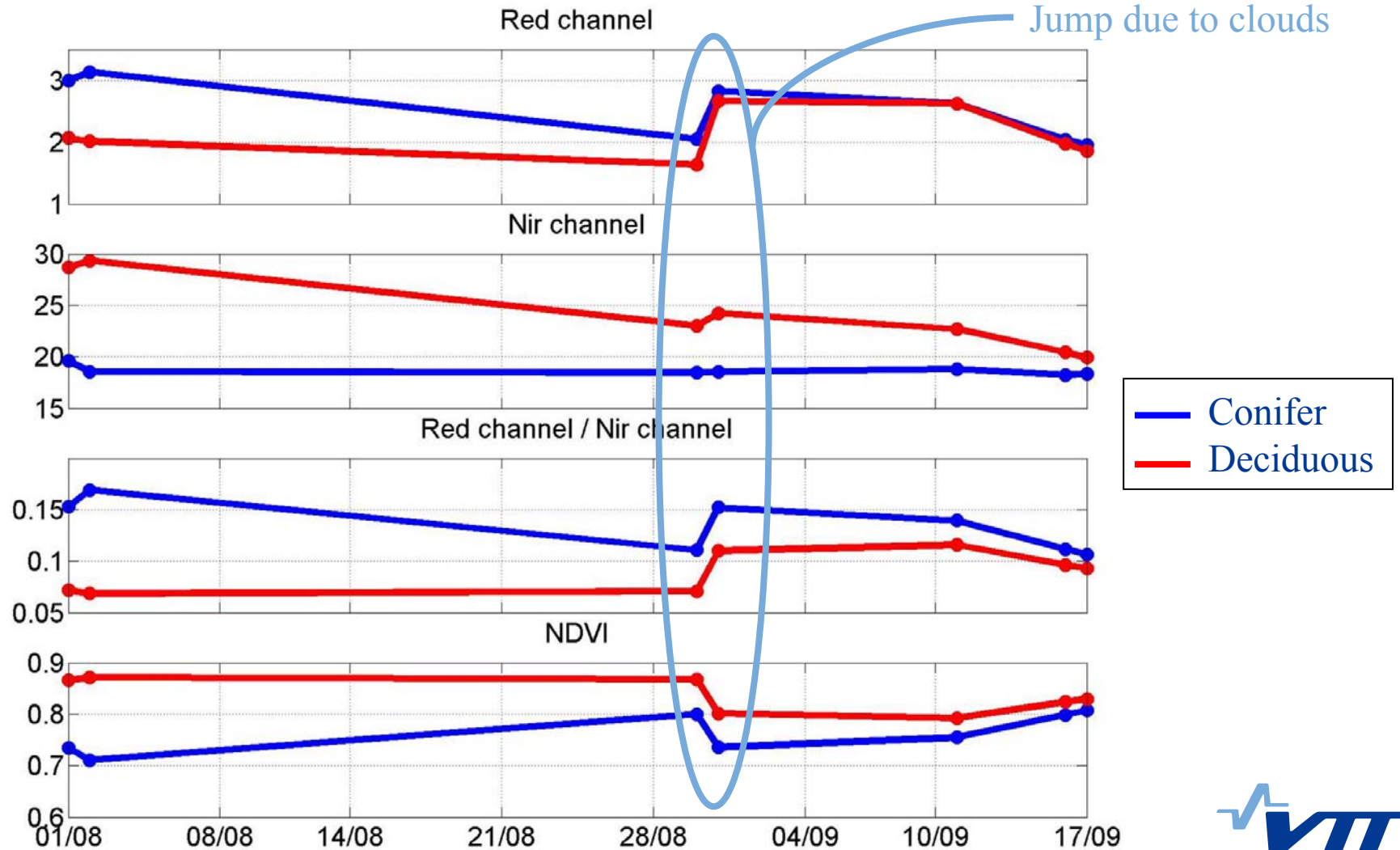
Pyhätunturi: conifer and deciduous masks



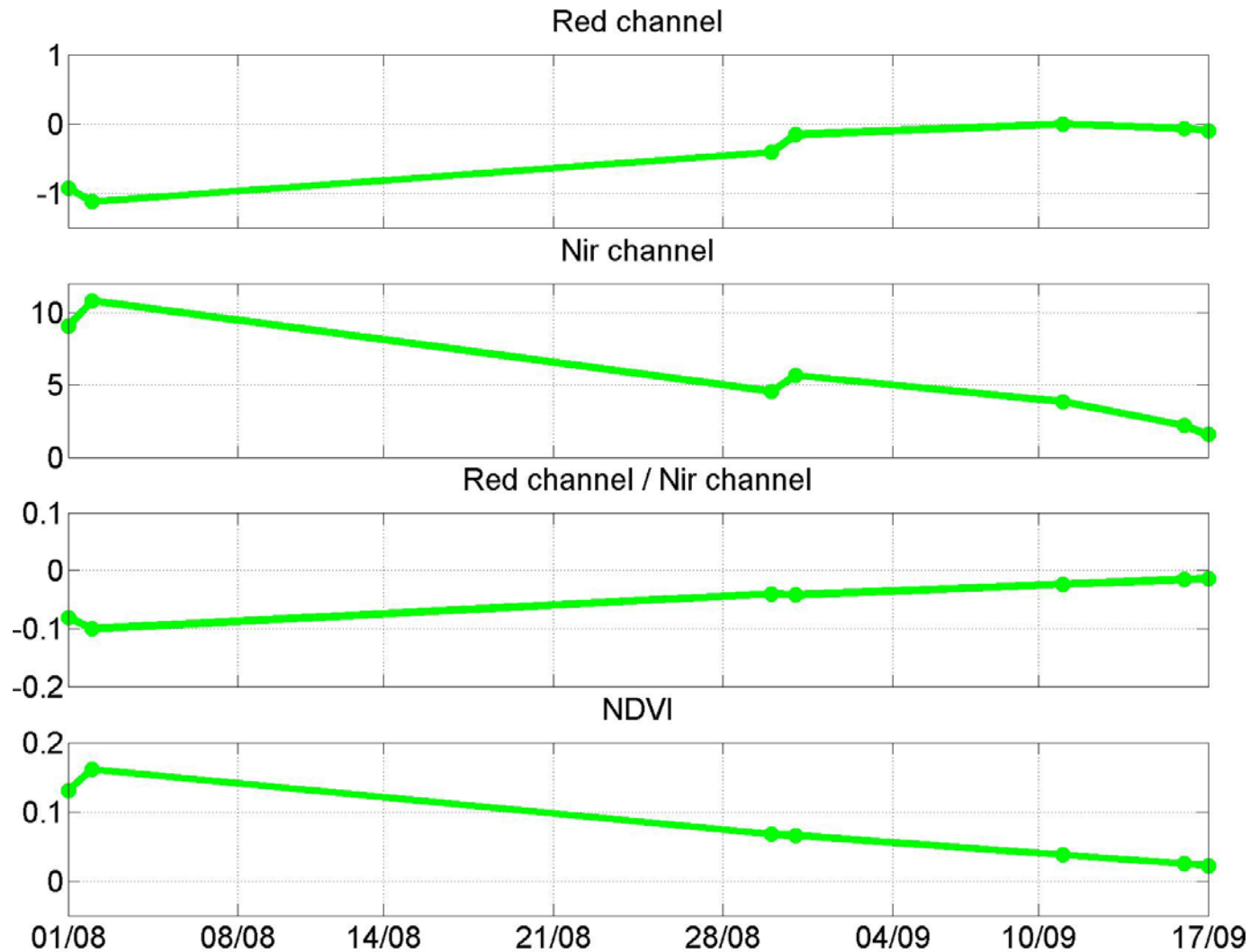
Conifer trees = dark green

Deciduous trees = light green

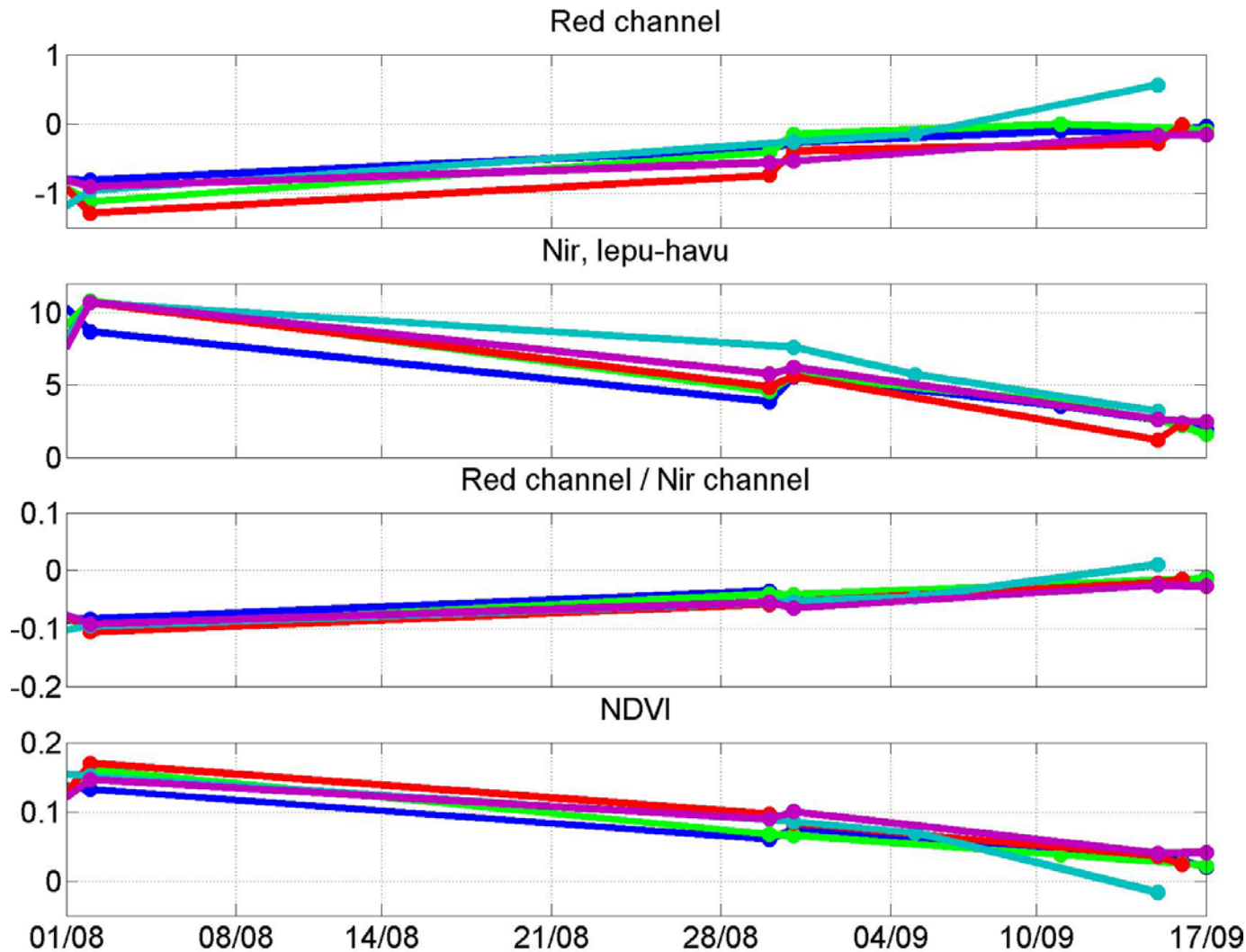
Pyhätunturi: channel and index averages



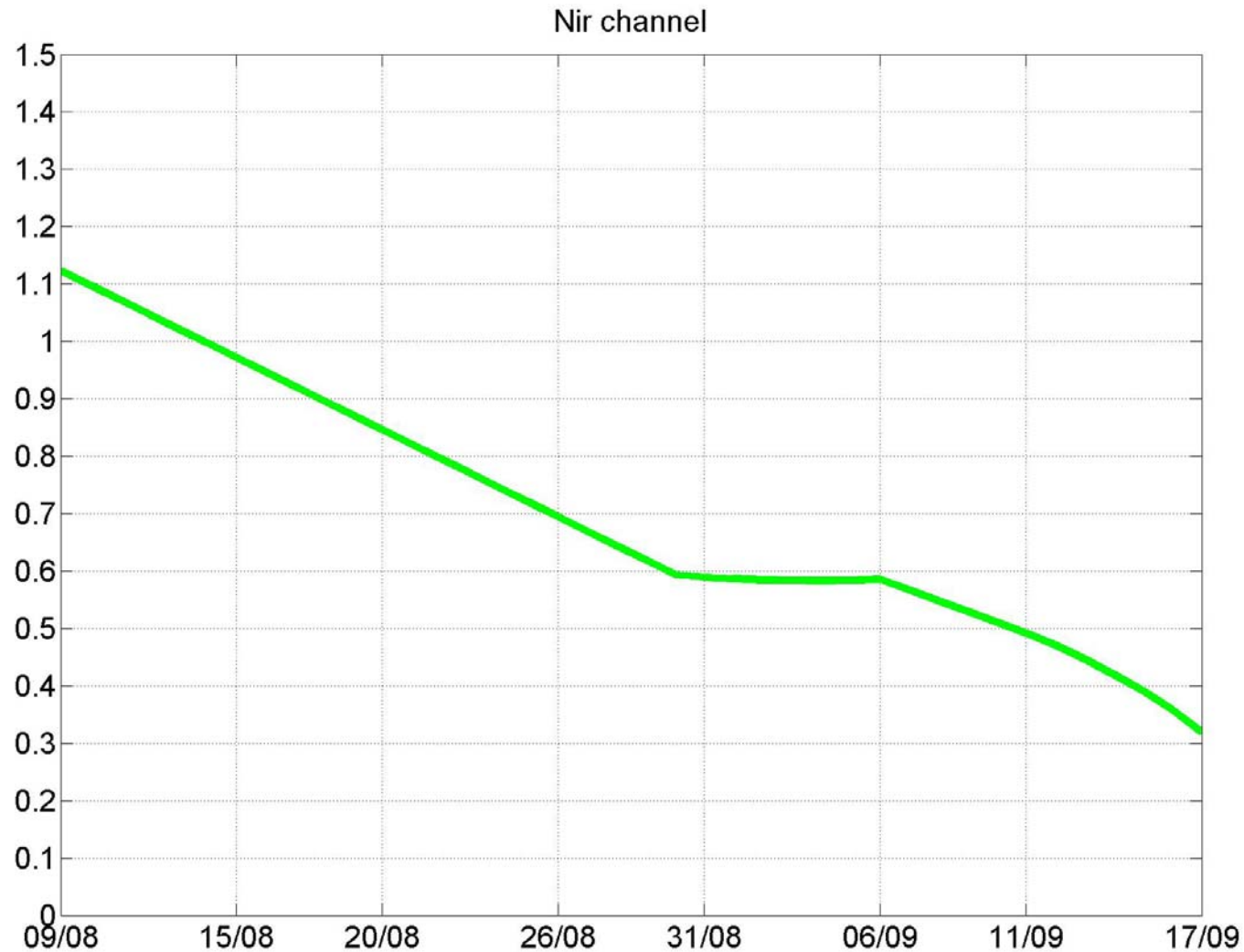
Pyhätunturi: difference deciduous-conifer



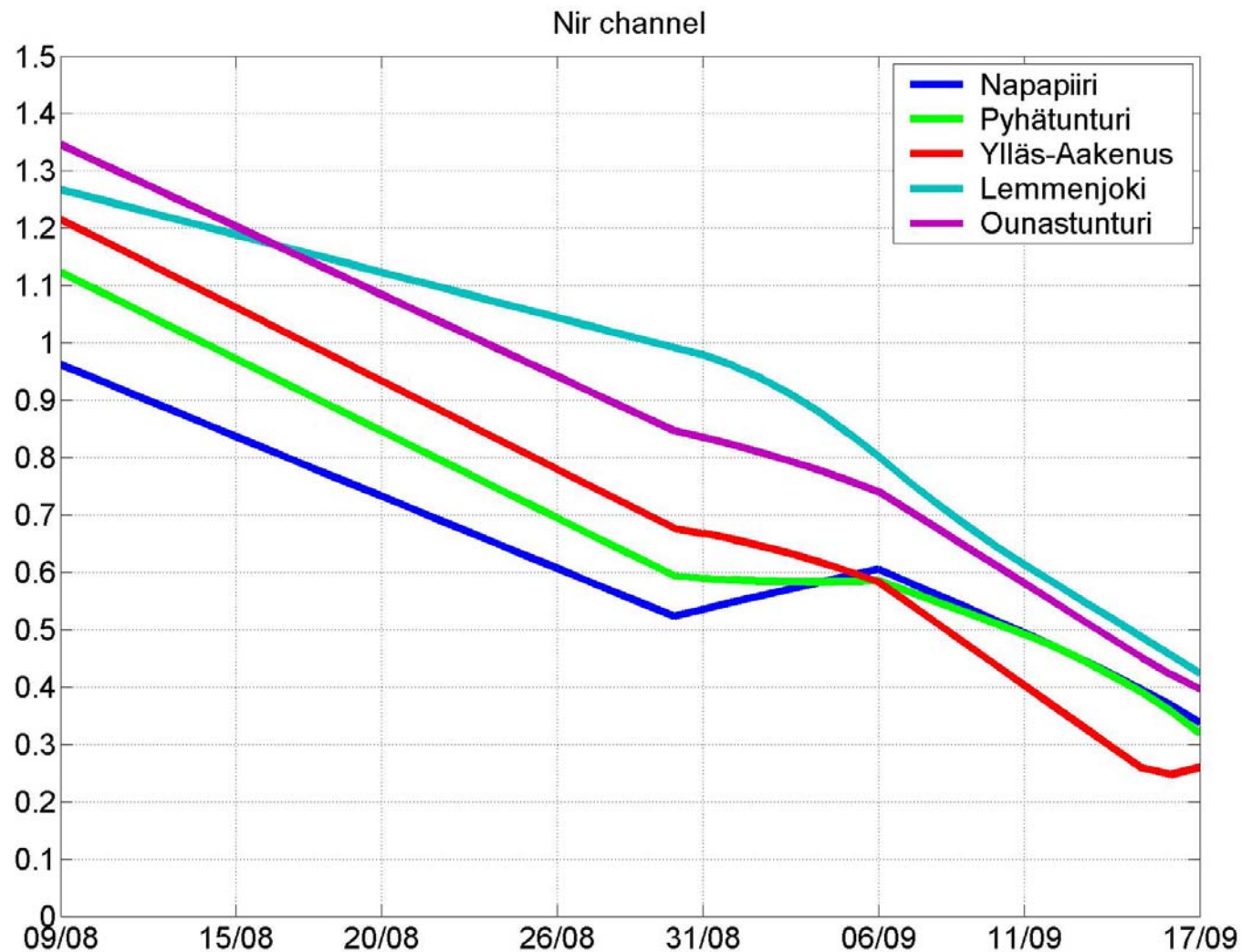
All test areas: difference deciduous-conifer



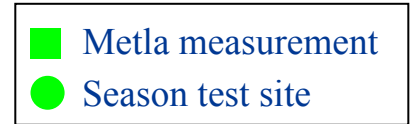
Pyhätunturi: NIR difference deciduous-conifer, filtered & normalized



All test areas: NIR difference deciduous-conifer, filtered & normalized



Fall coloring progress

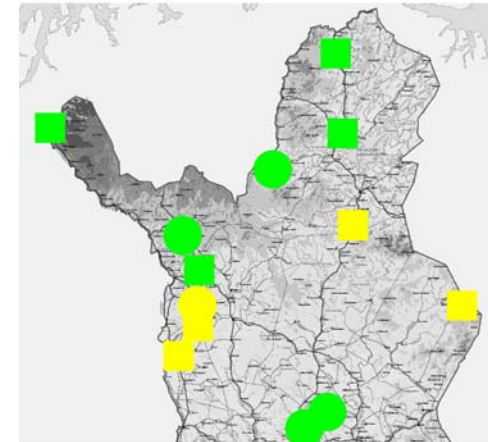
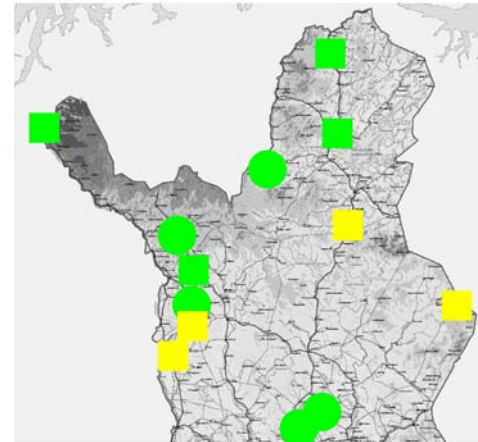
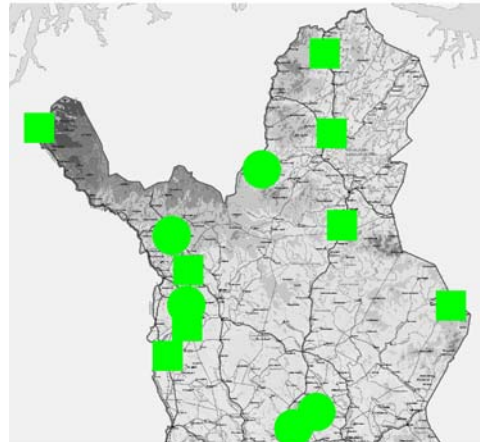
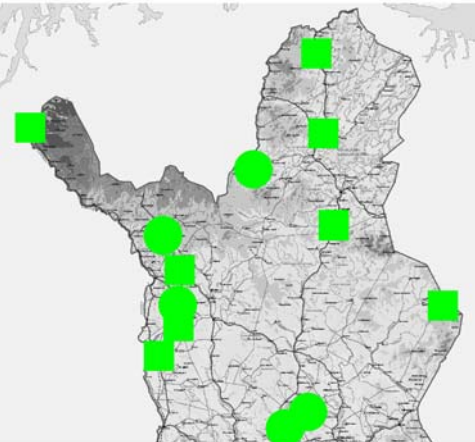


3.9.2004

5.9.2004

7.9.2004

9.9.2004

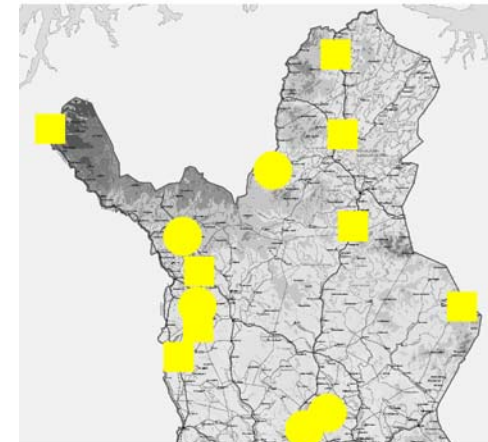
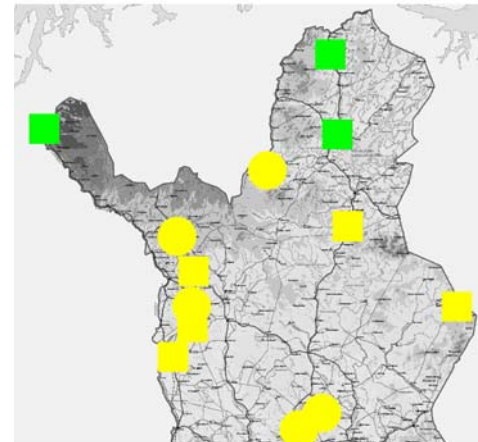
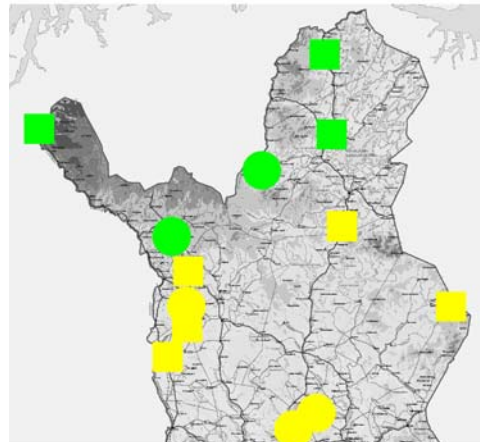
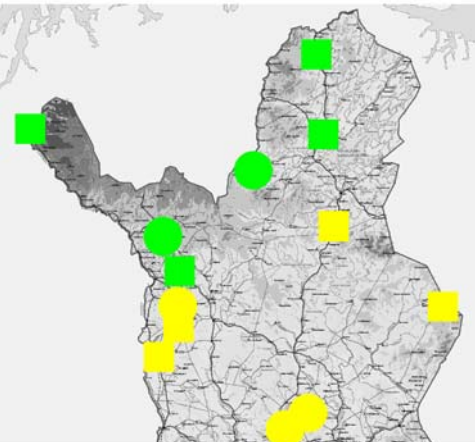


11.9.2004

13.9.2004

15.9.2004

17.9.2004



Conclusions and future work

- The selected approach seems viable and the used indicator promising.
- Clouds turned out to be a real problem from the operative point of view.
-> The selected approach is able to utilize all possible data available.
- In the future
 - the fall coloring detection method will be further developed and tested in order to get it robust enough in operational usage.
 - the operative prototype season monitoring system shall be designed and implemented.