

Introduction to SPOT Satellites and its application in Forest Monitoring  
(a case study)

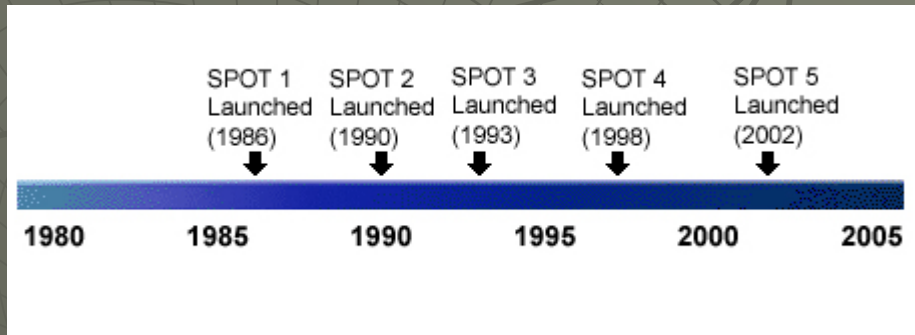
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## SPOT (Systeme Pour l'observation de la Terre)

- Owned and operated by the French Centre National d'Etudes Spatiales (CNES)
- First Commercial Satellite System
- Launching of Spot Satellites



- Spectral modes of acquisition : Panchromatic and Multispectral
- Oblique viewing capacity : + - 27 degrees relative to vertical
- Cycle duration : 26 days
- One area on the earth can be viewed : Every 3 days

Sensors	Electromagnetic Spectrum	Pixels Size	Spectral bands
SPOT 5	Panchromatic	2.5 m or 5 m	0.48 - 0.71 $\mu\text{m}$
	B1 : green	10 m	0.50 - 0.59 $\mu\text{m}$
	B2 : red	10 m	0.61 - 0.68 $\mu\text{m}$
	B3 : near-infra-red	10 m	0.78 - 0.89 $\mu\text{m}$
	B4 : short-wave infrared (SWIR)	20 m	1.58 - 1.75 $\mu\text{m}$
SPOT 4	Monospectral	10 m	0.61 - 0.68 $\mu\text{m}$
	B1 : green	20 m	0.50 - 0.59 $\mu\text{m}$
	B2 : red	20 m	0.61 - 0.68 $\mu\text{m}$
	B3 : near-infra-red	20 m	0.78 - 0.89 $\mu\text{m}$
	B4 : short-wave infrared (SWIR)	20 m	1.58 - 1.75 $\mu\text{m}$
SPOT 1	Panchromatic	10 m	0.50 - 0.73 $\mu\text{m}$
SPOT 2	B1 : green	20 m	0.50 - 0.59 $\mu\text{m}$
SPOT 3	B2 : red	20 m	0.61 - 0.68 $\mu\text{m}$
	B3 : near-infra-red	20 m	0.78 - 0.89 $\mu\text{m}$

## Some applications of SPOT Satellites

- Agriculture:
- Energy, Mines:
- Hazard management and mitigation :
- Maritime applications :
- Cartography, cadastral mapping :
- Land planning and management :

**Study : Multiresolution SPOT 5 data for Boreal Forest Monitoring  
conducted by M.G. Rosengren and E. Willen**

Objective: Evaluating the improved data quality from SPOT-5 in comparison and combination with SPOT-4 and Landsat-7 data, for information concerning forest cuttings and factors of importance for the establishment of new forest stands by using multiresolution satellite data.

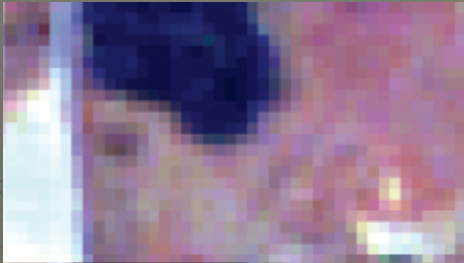
Study Area: Southern part of Sweden in forestry district of Nassjo

Forest : Private Owners and average size of the mapped clear cuts is between 1.5 to 2 hectares

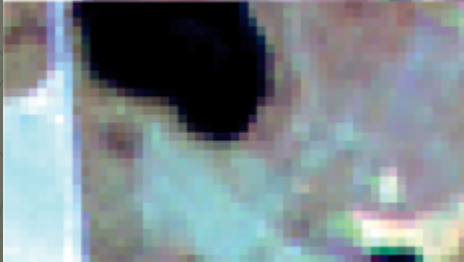
Satellite data used for changed detection analysis, primarily to map and monitor forest cuttings as required in the Swedish Forestry Act for mapping areas of different forestry activity needs.

## Resolution merge

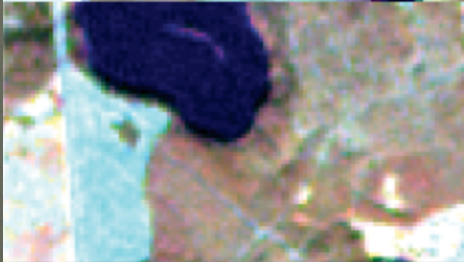
10/20 m resolution multispectral SPOT-5 data was merged with the 2.5 or 5 m resolution panchromatic band including SWIR band, which contains information correlated to the density, timber volume, and tree height of the conifer forest.



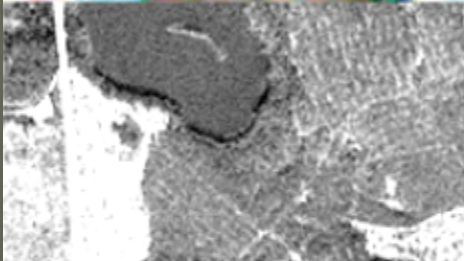
Landsat-7,  
1999-09-04 25m



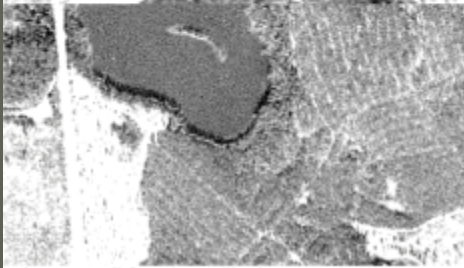
SPOT-4,  
1999-09-04 25m



SPOT-5,  
2002-08-19 10m

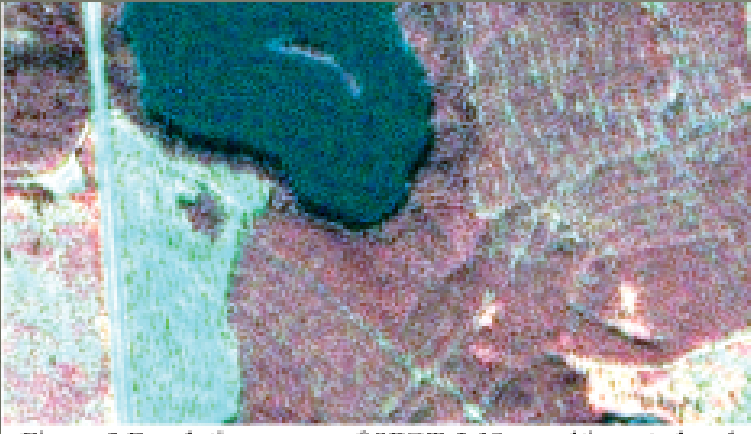


SPOT-5,  
2002-08-19 5m



SPOT-5,  
2002-08-19  
2.5m

## Results

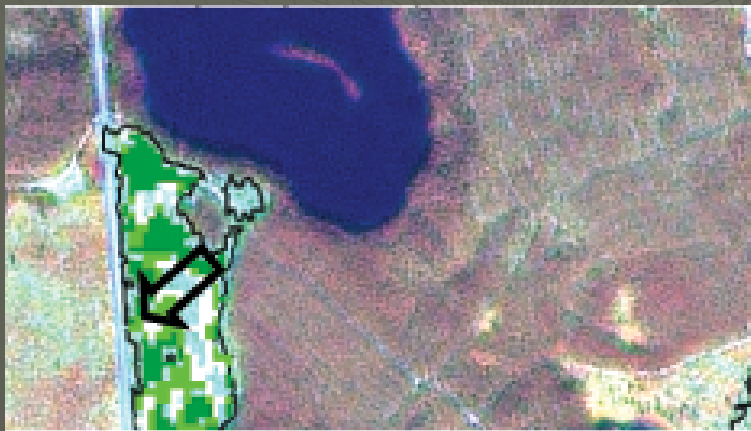


Resolution merge of SPOT-5 10m multispectral and 2.5m panchromatic data. ( Band 3=r, 2=g, 1=b )



SWIR single band difference image between 2.5m resolution merged SPOT-5 2002 and Landsat-7 ETM+ 1999 scenes

The black contour is mapped from 2.5m data and is compared to the area mapped with 10m pixels in purple



Density of seed trees left mapped in 3 classes

Arrow shows the look direction of the ground photo



## Conclusions

- Compared to Landsat-7 or SPOT-4, additional forestry features can be detected, identified and mapped in SPOT-5 data.
- Merging methods for utilizing both the high resolution panchromatic and the multispectral in combined manner is one way of improving the methods for change detection and monitoring of improving regeneration indicators on recently clear cut areas.