

# Mapping forest cover change in two Bulgarian test sites using SPOT and Landsat data

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## Study background

Important resource for Bulgaria - forests represent 37.1% of the total country area

Causes for forest cover change in the last 30 years:

- Political and economic changes in Bulgaria
- Abandonment of mountain pastures – forest succession
- Illegal logging
- Wildfires – on average 10 000 ha are affected yearly (1991-2008)

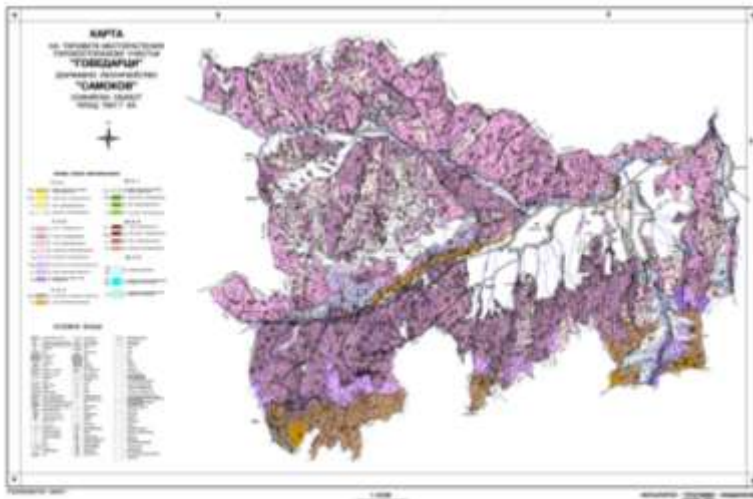


## Study background

### Mapping forest cover change in Bulgaria - experience

National level:

- National Forest Inventory (NFI) – data not used for change mapping; issues: analogue maps, positioning errors, archive data not available, centralised database at national level is missing



NFI dataset overlaid  
on a QuickBird image



## Study background

### Mapping forest cover change in Bulgaria - experience

Local level (RS&GIS Department activities):

- Selected areas of interest
- Archive aerial photographs from 1940 (or 1960s) to present
- High resolution satellite imagery (QuickBird, WorldView2)
- The typical approach is visual interpretation and post classification comparison



1982

2012



## Study background

### **Mapping forest cover change in Bulgaria - perspectives**

Unexplored potential for application of satellite imagery for creation of high resolution national level forest cover change map

#### Possibilities:

Available archive data from Landsat TM and SPOT, 20 m and 30 m spatial resolution

#### Challenges:

Scene selection – cloud cover and seasons

Images procurement – SPOT data are not for free

Scene by scene analysis or mosaicing – SPOT scenes do not always match between acquisitions

High resolution reference data – aerial photographs over the whole forest area would represent a huge dataset

Accuracy assessment

**Significant effort and funding needed. Future Projects...**

## Objectives

Before that – a preliminary study



**Small project** initiated in 2016 and funded by the Program for support of young scientists in the Bulgarian Academy of Sciences

Objective:

to evaluate the possibilities of using **SPOT** and **Landsat TM** imagery to detect forest cover changes in Bulgaria.

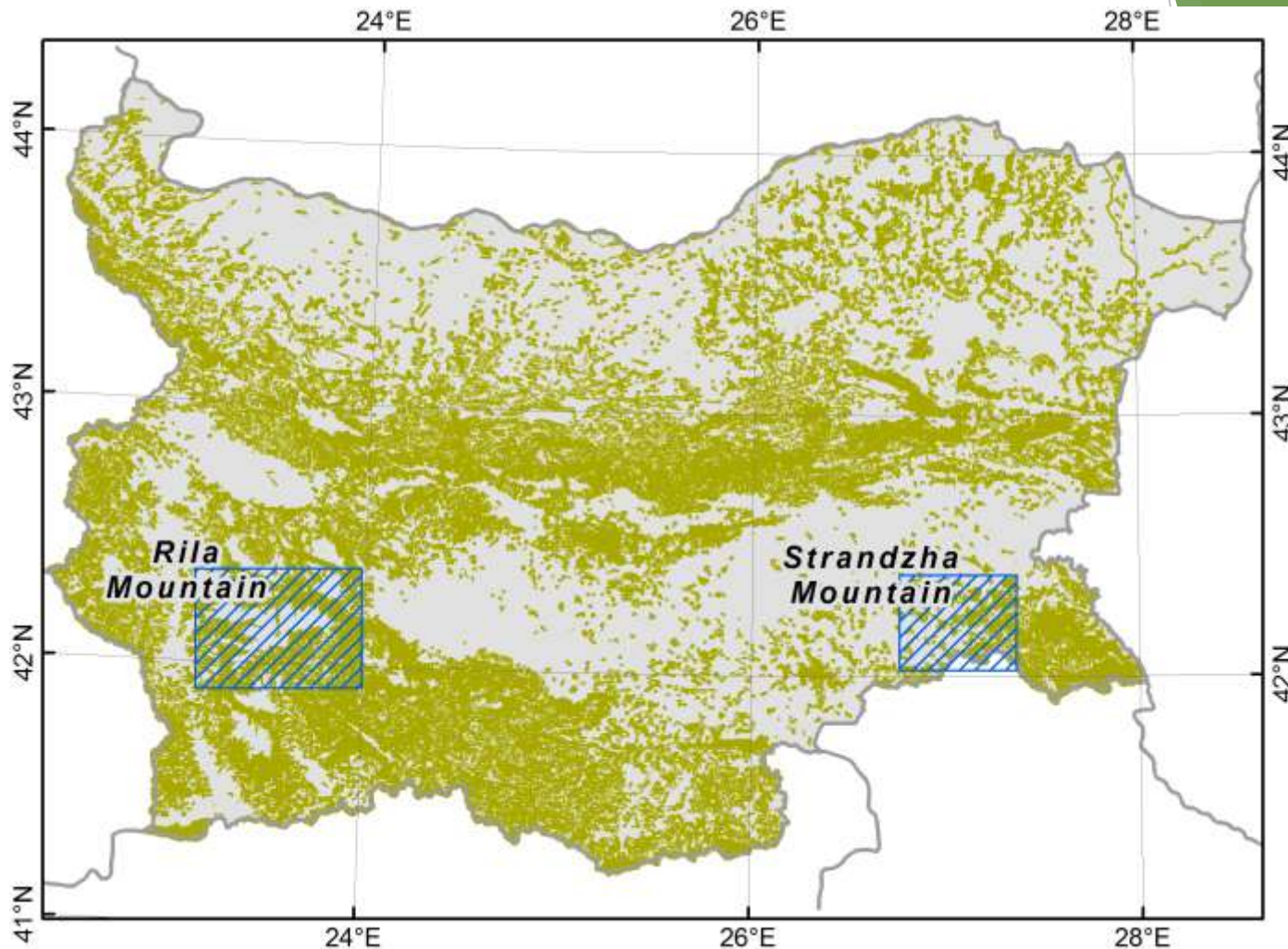
Research questions:

- which digital **change detection techniques** are the most appropriate for the studied forest types;
- which are the specific **problems and limitations**;
- what is the **accuracy** of the information extracted from the satellite imagery.

Tasks:

To test several combinations of **image pre-processing** and **classification** techniques for their utility to map changes in forest cover of **two test areas**.

## Test areas



**Study Area Rila Mountain:**  
high relief, coniferous forest,  
logging, tourism

**Study Area Strandzha Mountain:**  
hilly relief, broadleaved forest,  
coniferous plantations, agriculture



## Examples

## Deforestation, wildfire



Landsat TM

1984



1985

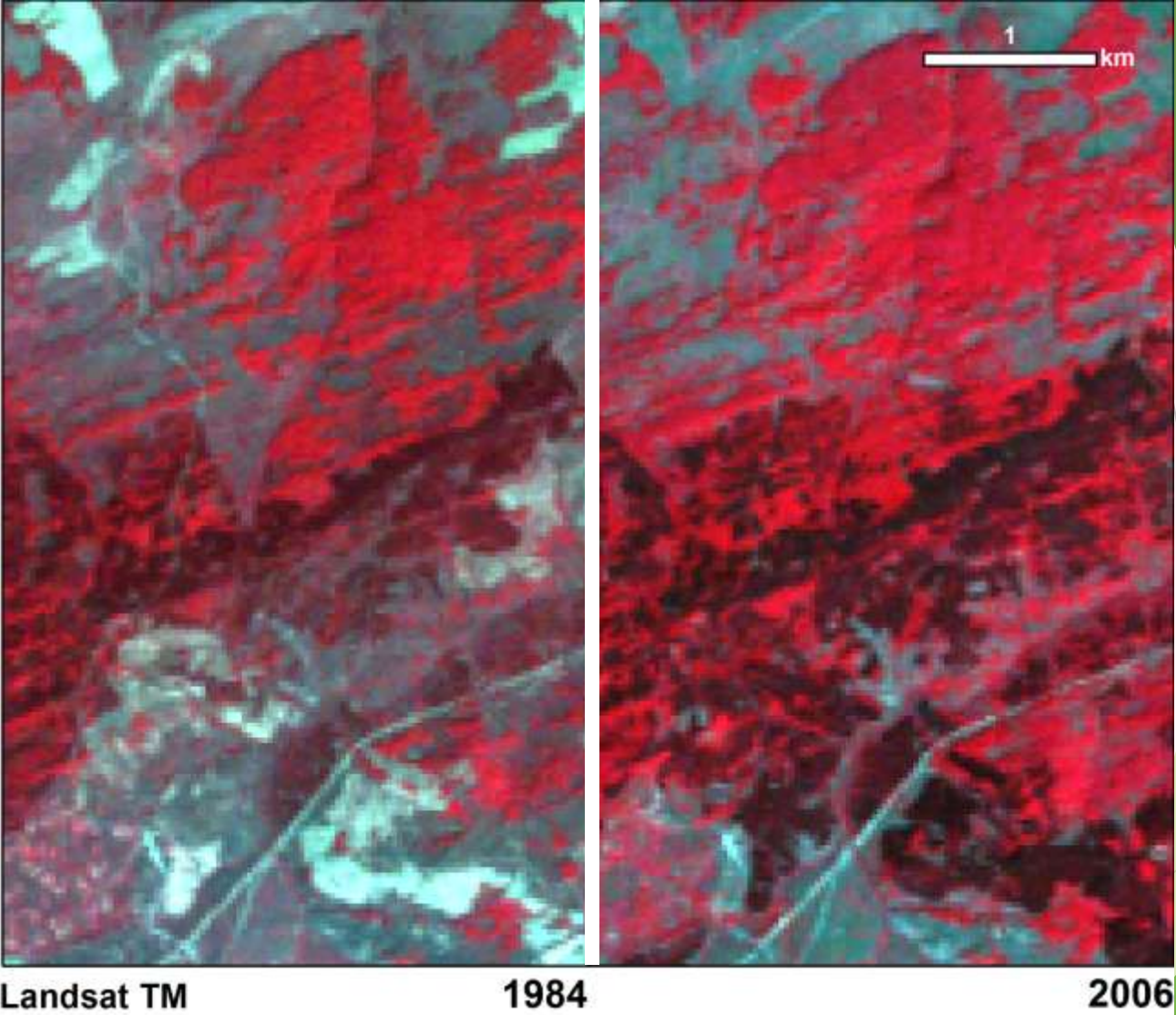


2006



Examples

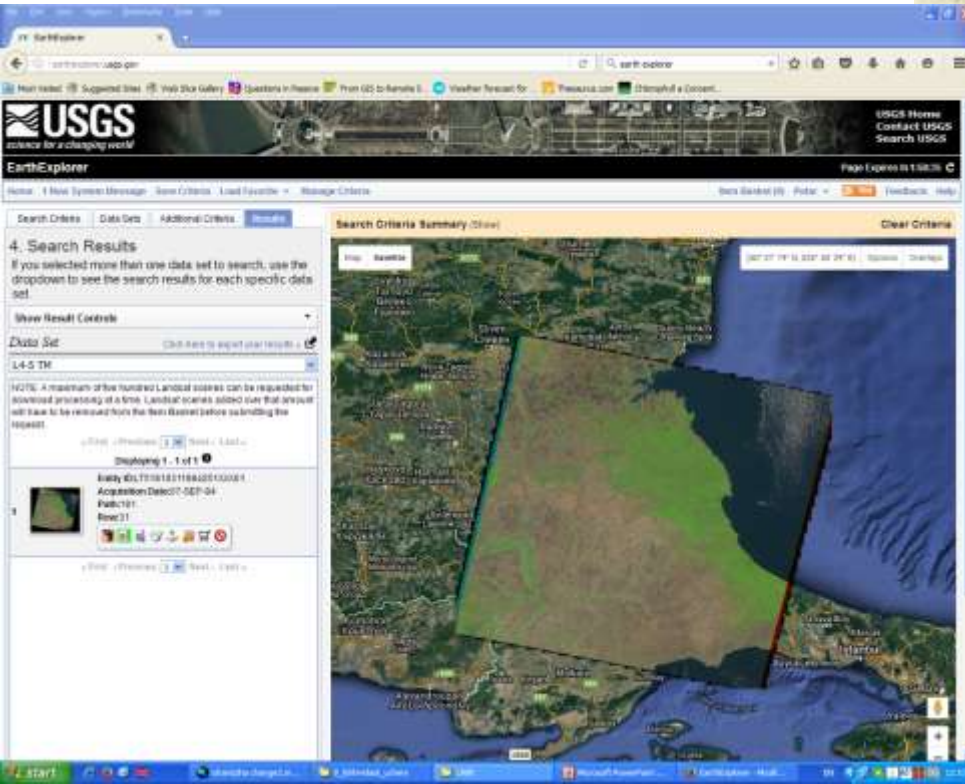
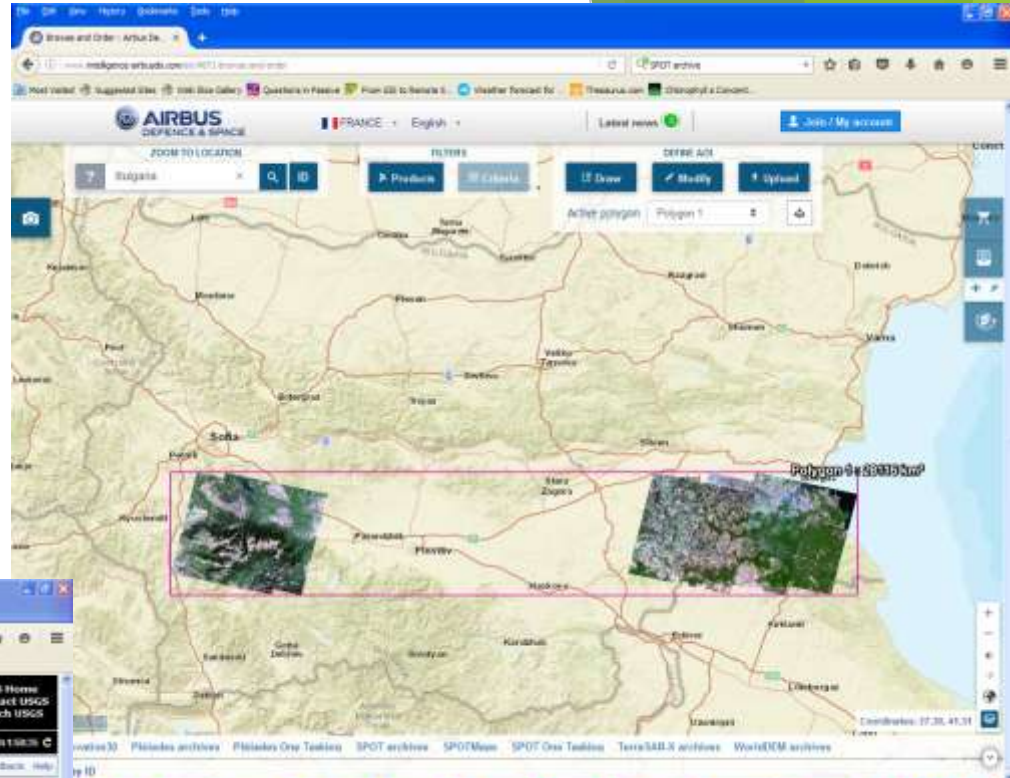
Reforestation / afforestation



# Satellite data

Third Party Mission Scheme  
ESA Category-1 Project ID 33443

5 SPOT 1/2/4 imagery  
Reference year 1986



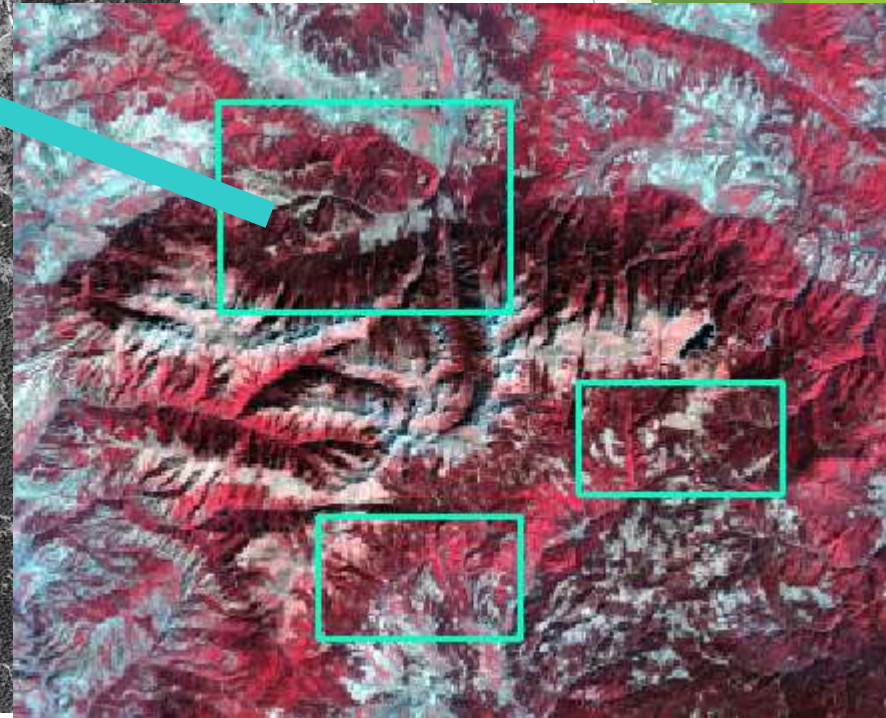
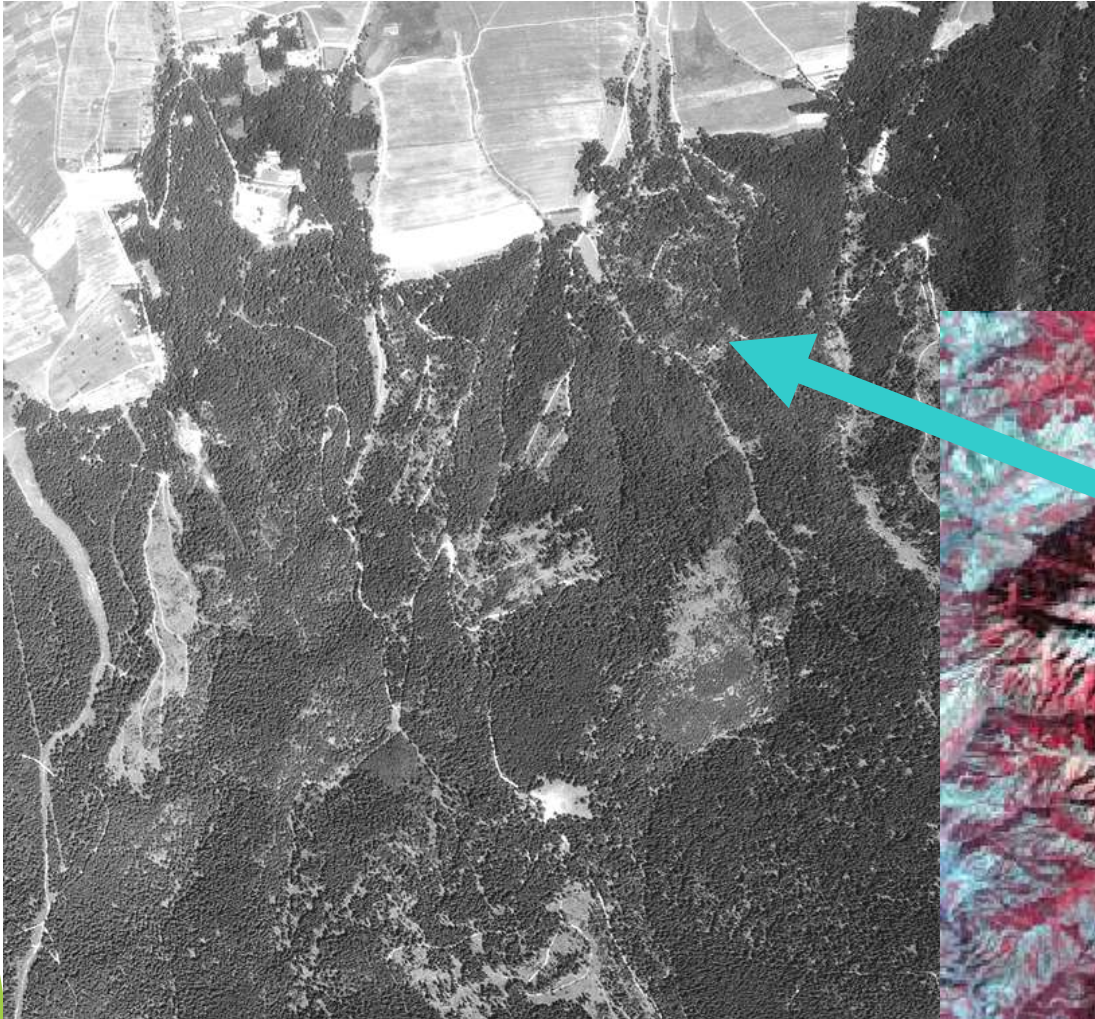
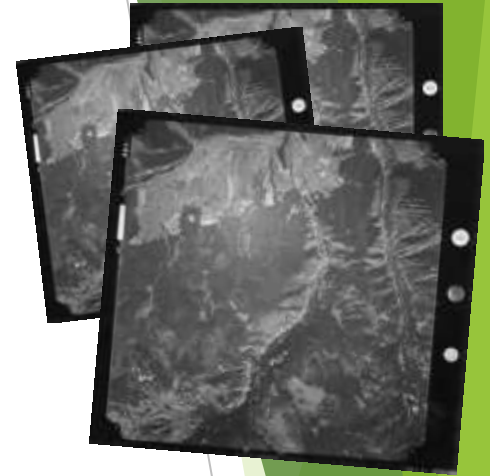
Landsat TM imagery  
Reference year 1984/1986



## Reference data

Archive panchromatic aerial photographs  
mid 1980s

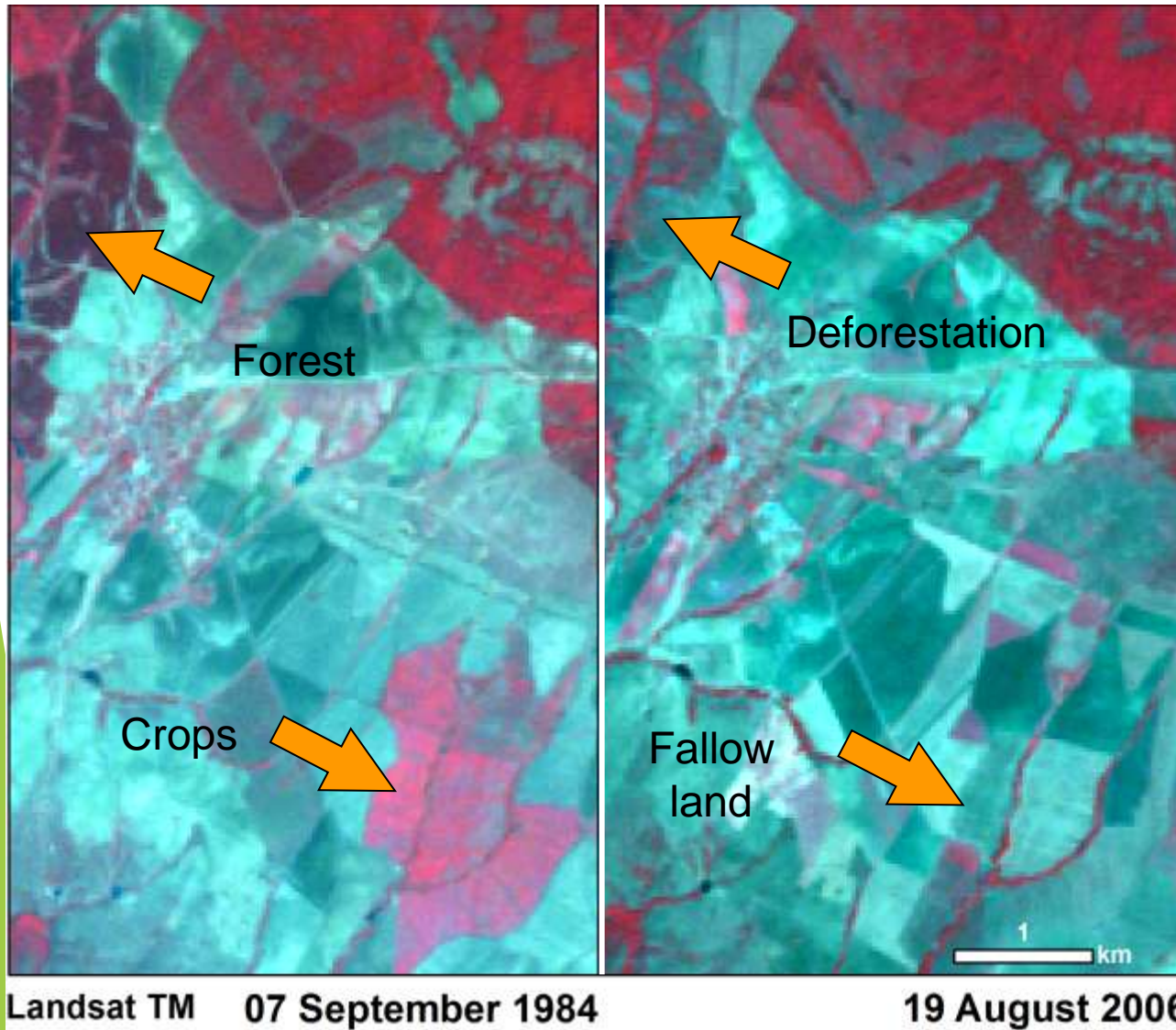
Reference data confined to several verification areas  
within each study area – orthorectification is time  
consuming





## Problems

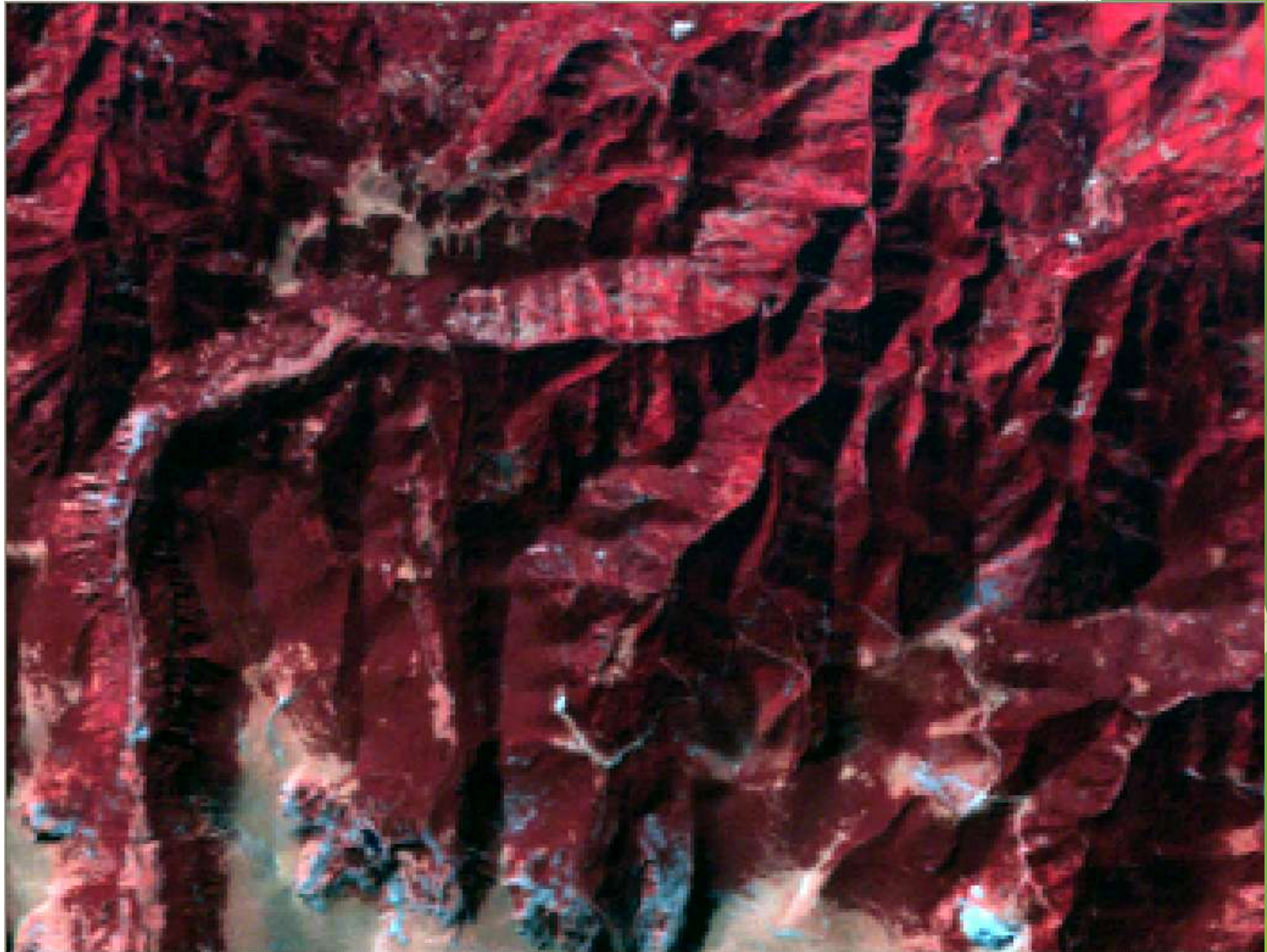
### Study Area Strandzha Mountain: forest-agricultural land mosaic



Challenges to the automatic change detection techniques:  
false change due to crops

## Problems

Study Area Rila Mountain: different illumination conditions within scene and between acquisitions



## ***Acknowledgments***

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