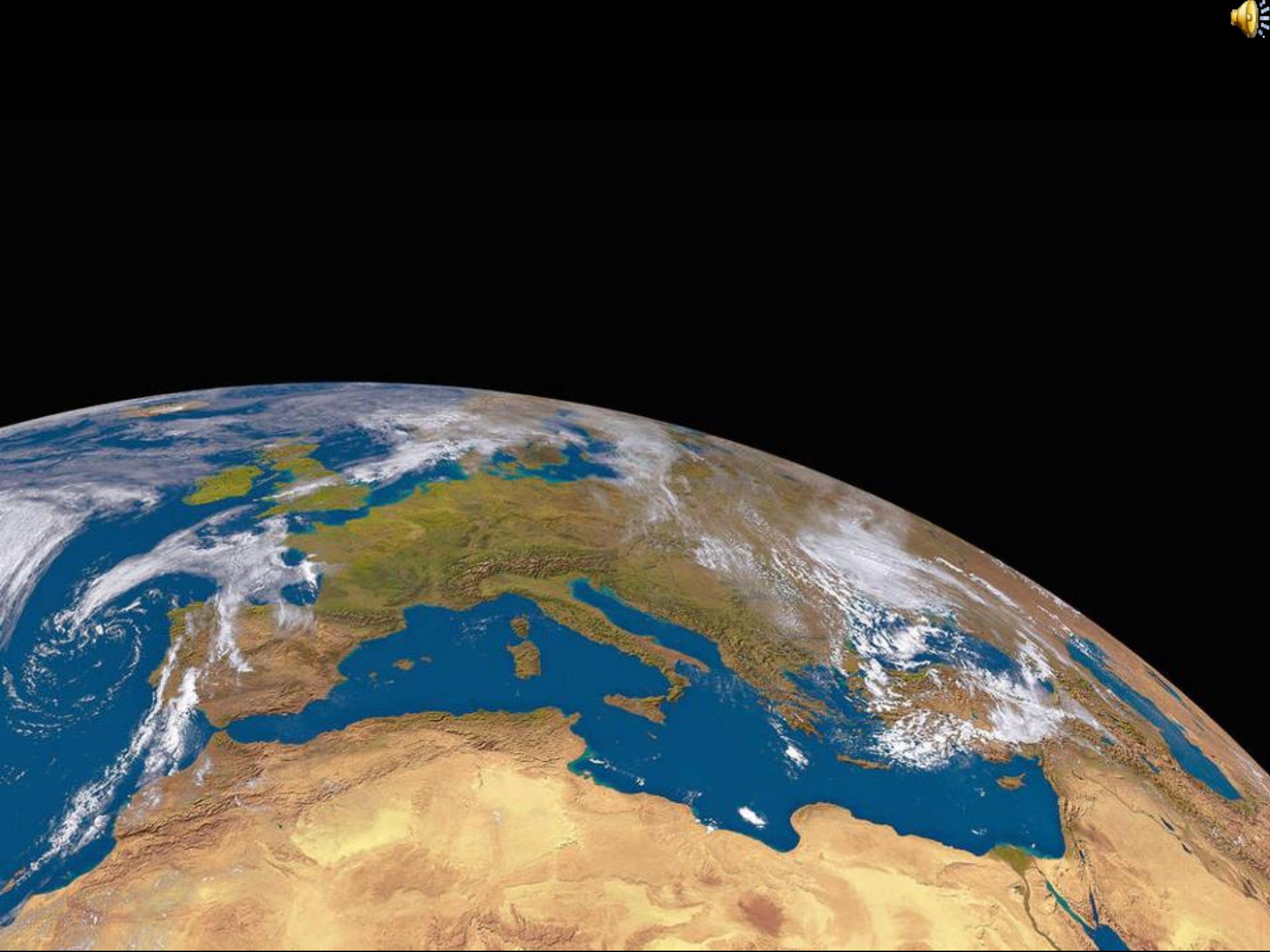


Development of a Web-based Remote Sensing Software for Schools

**Dipl.-Päd. RL Raimund Ditter
Prof. Dr. Alexander Siegmund
University of Education Heidelberg
Department of Geography
Research Group for Earth Observation**



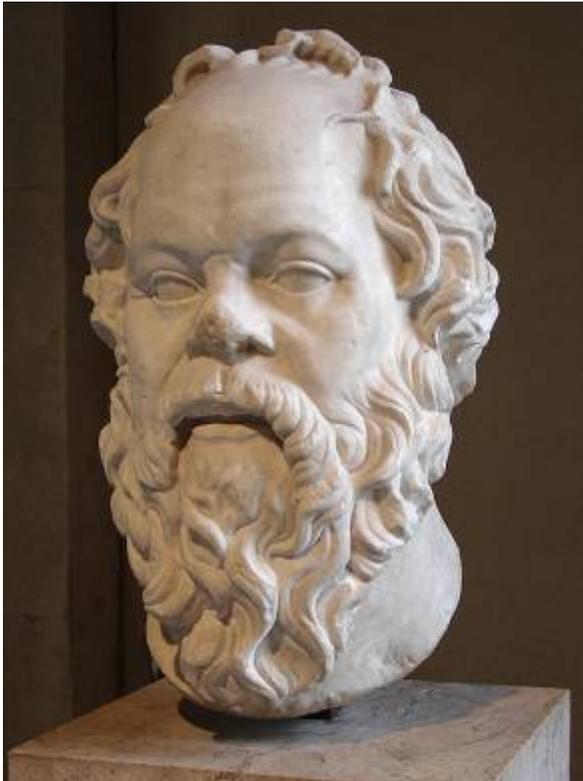












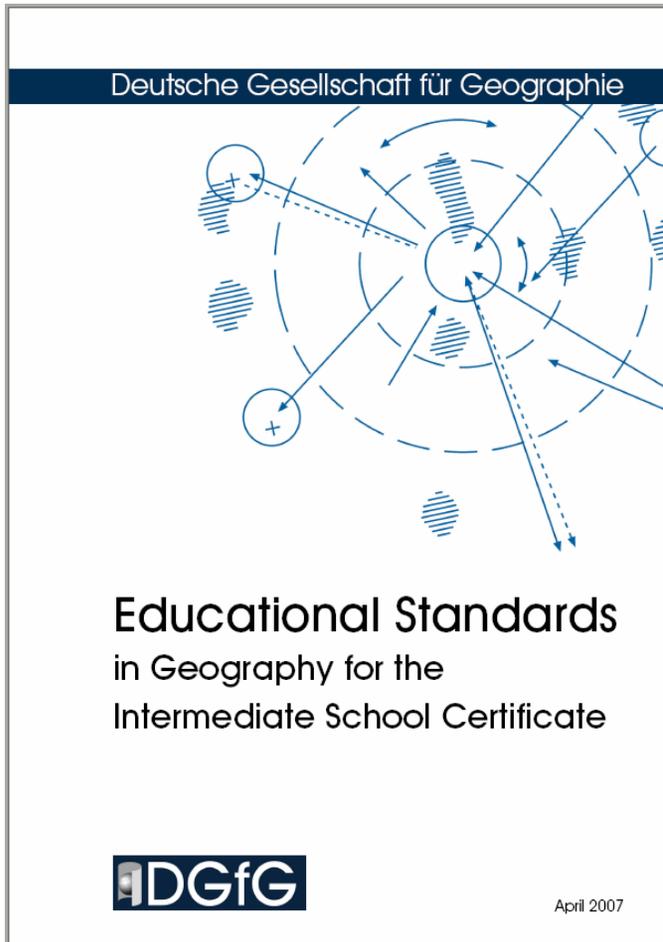
*„We would understand
the earth, if we could
see it from above “*

Sokrates



*„As I flew around the
earth, I recognized its
beauty...“*

Jurij Gagarin



Standards for the competence area "Spatial Orientation"

“topographic knowledge and skills and competences (...) to produce simple maps of one's own.”

Standards for the competence area "Acquisition of Knowledge/ Methodology"

“Knowledge of sources and forms of information, and information strategies (M1),
ability to gather information (M2),
ability to analyse information (M3),
ability to describe methodological steps for acquiring geographical/ geoscientific information (M4)”

Standards for the competence area "Evaluation"

“They learn, about the different value of maps, aerial photographs and **satellite images** (...) transform data into maps or diagrams”.

Scale Level



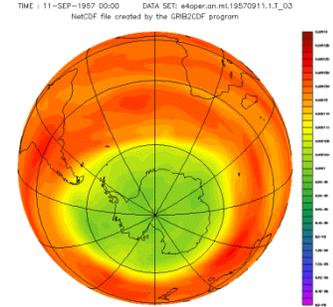
Examples

- Hole in the ozone layer
- Shifting of ecozone
- ...

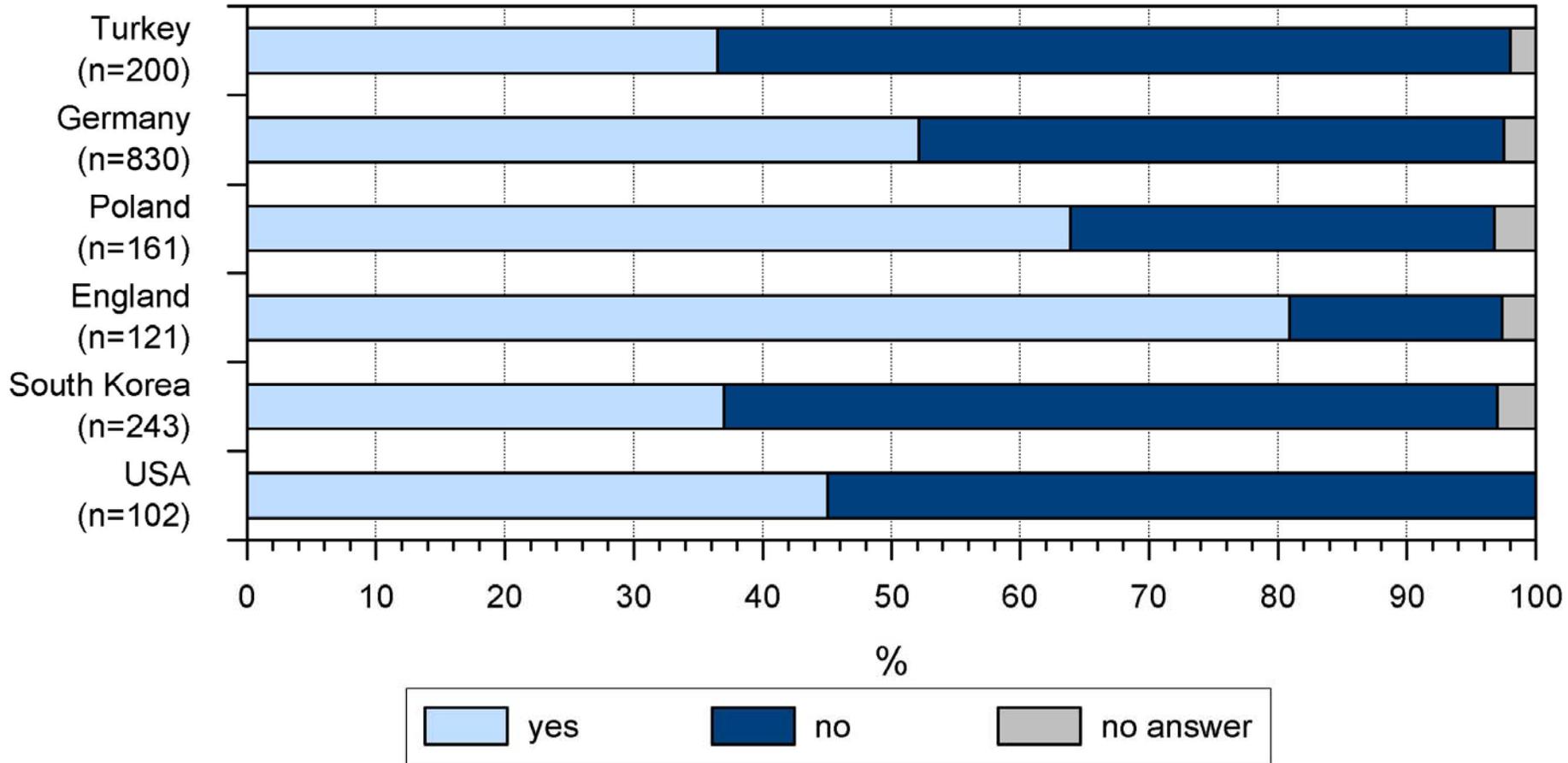
- Deforestation of the rainforest
- Desertification
- Land-use change and land consumption
- ...

- Discovering proximity
- Transport infrastructure
- Digging and mining of geossources
- ...

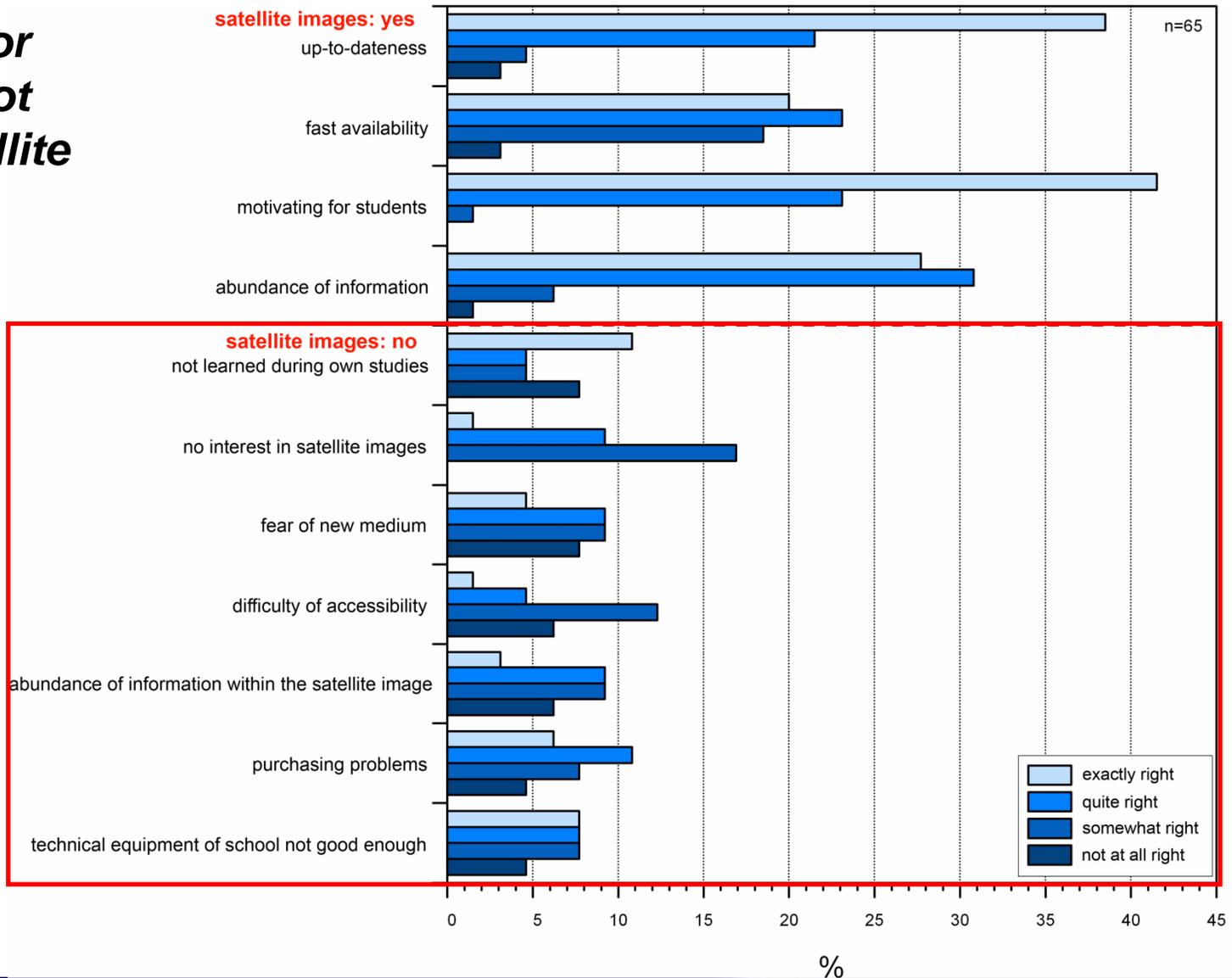
Use of Remote Sensing

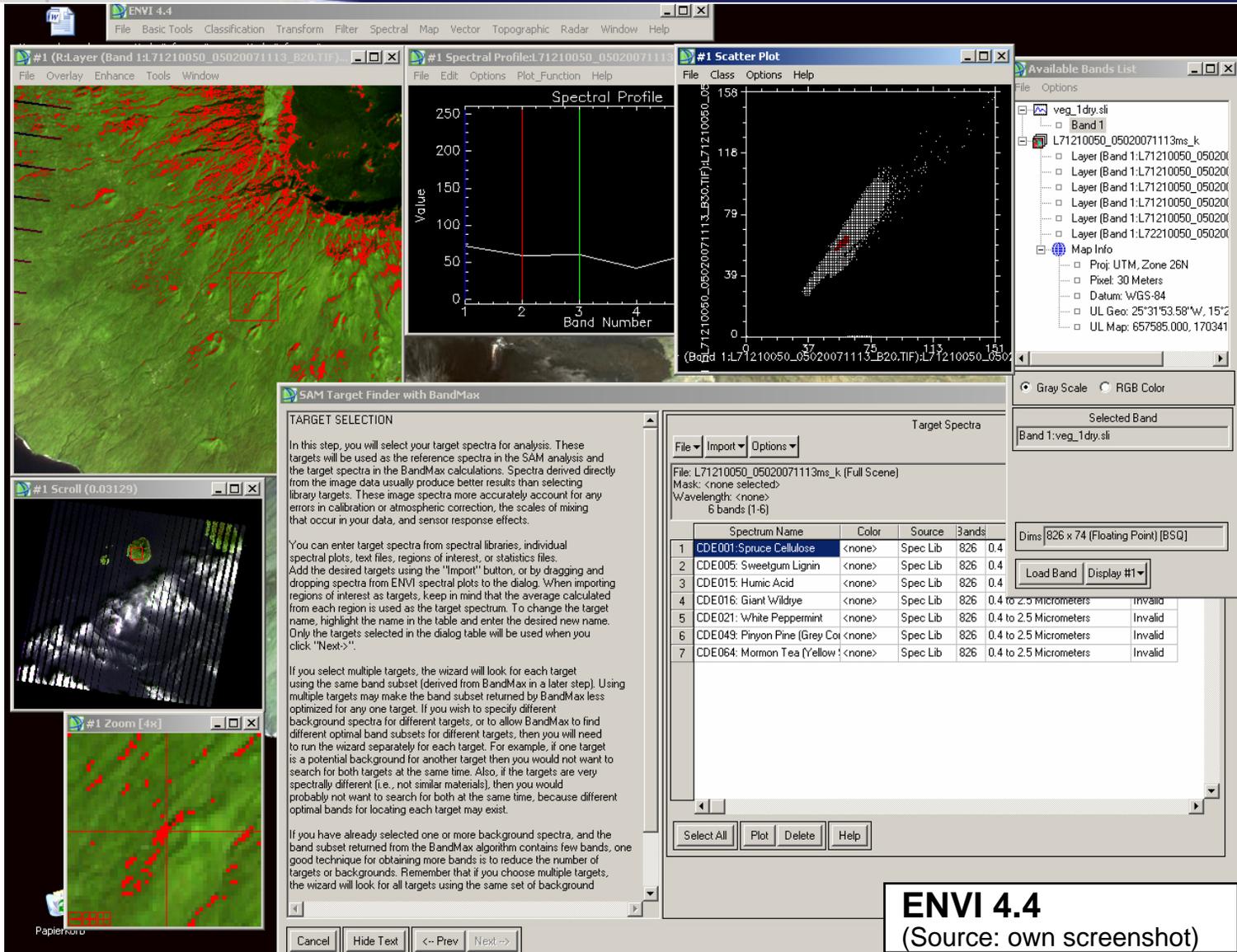


“I have already worked with satellite images at school ...”



Reasons for using or not using satellite images in schools





The screenshot displays the ENVI 4.4 software interface with several windows open:

- #1 (R:Layer (Band 1:L71210050_05020071113_B20.TIF))**: Main image window showing a false-color satellite image with red and green regions.
- #1 Spectral Profile: 71210050_05020071113**: A line graph showing spectral response across four bands. The y-axis is labeled 'Value' (0 to 250) and the x-axis is 'Band Number' (1 to 4). Two vertical lines are drawn at band 2 and band 3.
- #1 Scatter Plot**: A scatter plot showing the relationship between two spectral bands. The y-axis ranges from 0 to 158, and the x-axis ranges from 0 to 151. A diagonal cluster of points is visible.
- Available Bands List**: A tree view showing the loaded bands, including 'veg_1dry.sli' and 'Band 1'.
- SAM Target Finder with BandMax**: A dialog box for target selection. It includes a 'TARGET SELECTION' section with instructions and a 'Target Spectra' table.

SAM Target Finder with BandMax - TARGET SELECTION

In this step, you will select your target spectra for analysis. These targets will be used as the reference spectra in the SAM analysis and the target spectra in the BandMax calculations. Spectra derived directly from the image data usually produce better results than selecting library targets. These image spectra more accurately account for any errors in calibration or atmospheric correction, the scales of mixing that occur in your data, and sensor response effects.

You can enter target spectra from spectral libraries, individual spectral plots, text files, regions of interest, or statistics files. Add the desired targets using the "Import" button, or by dragging and dropping spectra from ENVI spectral plots to the dialog. When importing regions of interest as targets, keep in mind that the average calculated from each region is used as the target spectrum. To change the target name, highlight the name in the table and enter the desired new name. Only the targets selected in the dialog table will be used when you click "Next>".

If you select multiple targets, the wizard will look for each target using the same band subset (derived from BandMax in a later step). Using multiple targets may make the band subset returned by BandMax less optimized for any one target. If you wish to specify different background spectra for different targets, or to allow BandMax to find different optimal band subsets for different targets, then you will need to run the wizard separately for each target. For example, if one target is a potential background for another target then you would not want to search for both targets at the same time. Also, if the targets are very spectrally different (i.e., not similar materials), then you would probably not want to search for both at the same time, because different optimal bands for locating each target may exist.

If you have already selected one or more background spectra, and the band subset returned from the BandMax algorithm contains few bands, one good technique for obtaining more bands is to reduce the number of targets or backgrounds. Remember that if you choose multiple targets, the wizard will look for all targets using the same set of background

Target Spectra

File: L71210050_05020071113ms_k (Full Scene)
Mask: <none selected>
Wavelength: <none>
6 bands [1-6]

	Spectrum Name	Color	Source	Bands
1	CDE001: Spruce Cellulose	<none>	Spec Lib	826 0.4
2	CDE005: Sweetgum Lignin	<none>	Spec Lib	826 0.4
3	CDE015: Humic Acid	<none>	Spec Lib	826 0.4
4	CDE016: Giant Wildiye	<none>	Spec Lib	826 0.4 to 2.5 micrometers Invalid
5	CDE021: White Peppermint	<none>	Spec Lib	826 0.4 to 2.5 Micrometers Invalid
6	CDE049: Pinyon Pine (Grey Co	<none>	Spec Lib	826 0.4 to 2.5 Micrometers Invalid
7	CDE064: Mormon Tea (Yellow	<none>	Spec Lib	826 0.4 to 2.5 Micrometers Invalid

Buttons: Select All, Plot, Delete, Help

Buttons: Cancel, Hide Text, <- Prev, Next ->

ENVI 4.4
(Source: own screenshot)

The screenshot displays the ERDAS IMAGINE 9.3 software interface. The main window shows a SAR coherence change map with a color scale from blue (low coherence) to red (high coherence). A 'Radars' dialog box is open, listing various processing steps: Coherence Change Detection..., InSAR..., StereoSAR..., OrthoRadar..., Radar Interpreter..., and Generic SAR Node... The 'Coherence Change Detection (1_test.ccd) - Coherence' dialog box is also open, showing the following settings:

- Processing Steps:** Input, Coregister, Subset, Coherence, Analysis, Rectify, Output (all checked).
- Interferometric Multilook Parameters:**
 - Multilook Factor X: 2
 - Multilook Factor Y: 10
 - Coherence Window X: 15
 - Coherence Window Y: 15
- Output Coherence (Change) Images:**
 - d:\radardata\isar\bam\ccd\1_test_coher.img
 - d:\radardata\isar\bam\ccd\1_test_coher_change_RGB.img
 - d:\radardata\isar\bam\ccd\1_test_coher_change_IHS.img

The status bar at the bottom left shows coordinates: 596.27, -1773.19.

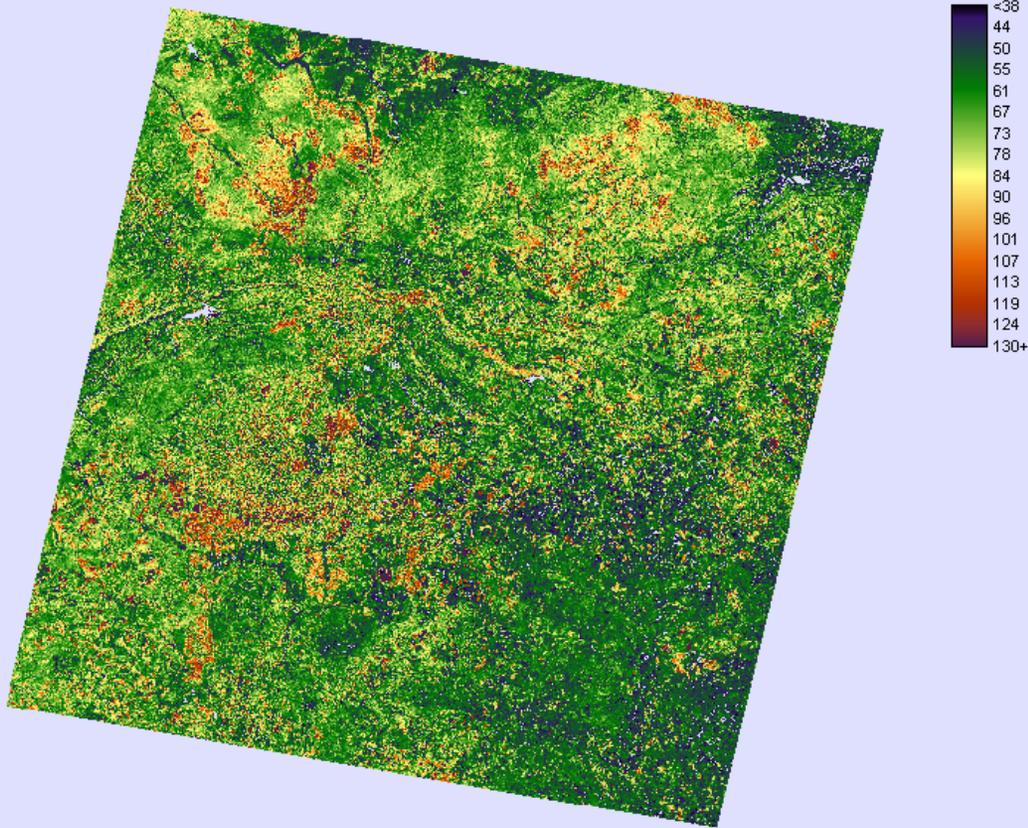
ERDAS IMAGINE 9.3

(Source: http://www.erdas.com/portals/0/files/screenshots/IMG_Coherence_Change.JPG)

IDRISI The Kilimanjaro Edition
 File Display GIS Analysis Modeling Image Processing Reformat Data Entry Window List Help

johannesburgband3

Conversion from Tiff



Legend values: <38, 44, 50, 55, 61, 67, 73, 78, 84, 90, 96, 101, 107, 113, 119, 124, 130+

Layer Properties
johannesburgband3

Display Parameters Properties Visibility

Layer Name : johannesburgband3
 Layer Type : Raster
 Data Type : Byte
 Ref System : utm-35n
 Ref Units : meters
 Min X : 523815,75
 Max X : 773133,75
 Min Y : -2987298,75
 Max Y : -2765739,75
 Columns : 8748
 Rows : 7774
 Min Value : 0
 Max Value : 255
 Value Units : m

View Metadata Histogram

OK Close Help

Composer

johannesburgband3

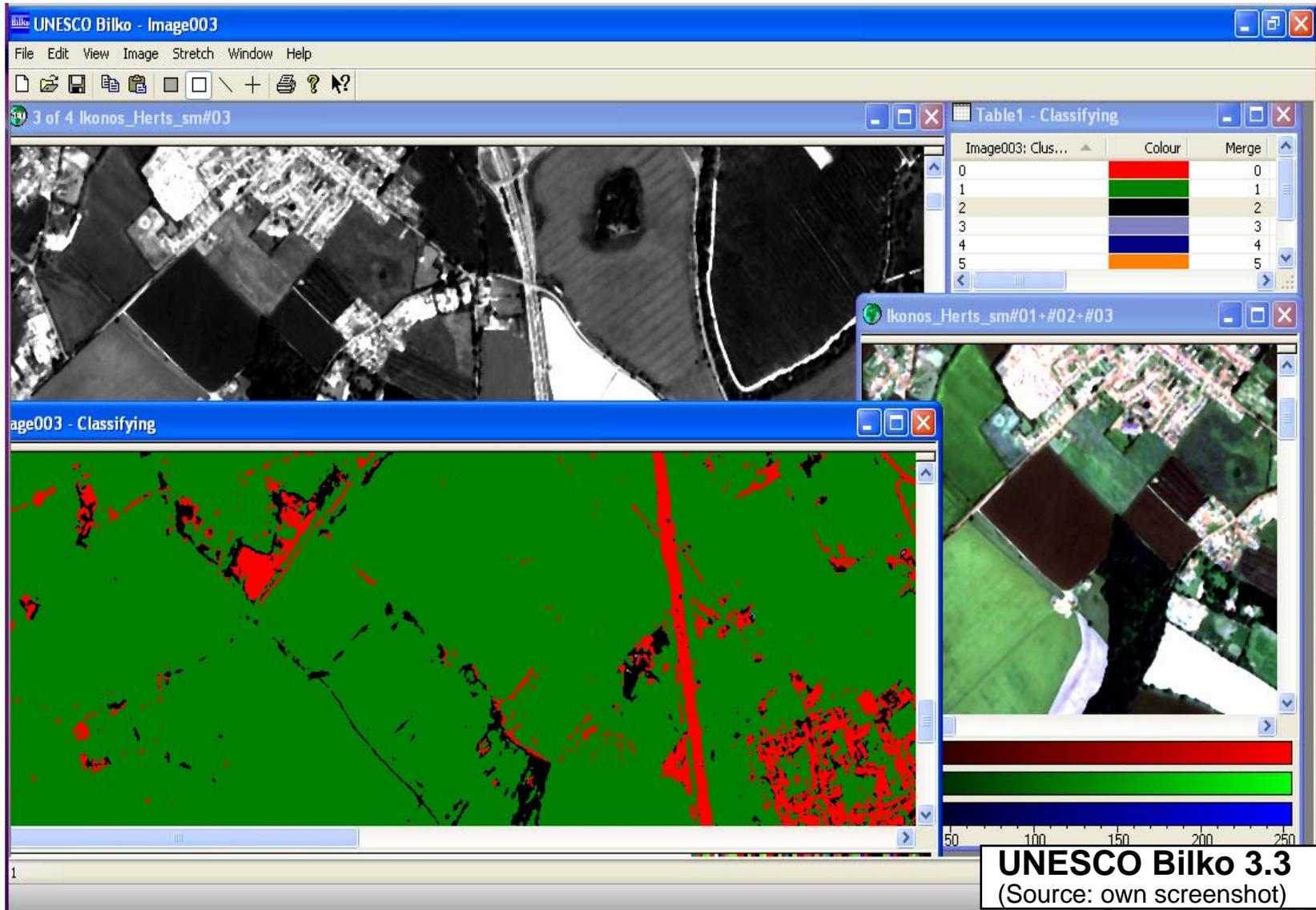
Add Layer
 Remove Layer
 Layer Properties
 Map Properties
 Feature Properties
 Save Print

Feature Properties

Attribute	Value
column	4057
row	5101
x coord	639449
y coord	-2911126
value	123

View as Graph

IDRISI - The Kilimanjaro Edition
 (Source: own screenshot)



The screenshot displays the UNESCO Bilko 3.3 software interface. The main window, titled "UNESCO Bilko - Image003", shows a grayscale satellite image of a landscape. A "Table1 - Classifying" window is open, displaying a classification table with columns for "Image003: Clus...", "Colour", and "Merge". Below the table, a color-coded legend is visible. A "Image003 - Classifying" window shows the same image with a color-coded classification overlay, where green represents vegetation, red represents water, and black represents urban areas. A "Table1 - Classifying" window is also open, showing the classification table and a color-coded legend. The table is as follows:

Image003: Clus...	Colour	Merge
0	Red	0
1	Green	1
2	Black	2
3	Blue	3
4	Blue	4
5	Orange	5

The interface also includes a menu bar (File, Edit, View, Image, Stretch, Window, Help), a toolbar, and a status bar at the bottom.

UNESCO Bilko 3.3
(Source: own screenshot)

LEOWorks 3.0

File Edit View Image Enhance Multivariate Analysis GIS Tools Help

143_06_sahara2_utm33_tm_bd3.tif [1:1]

143_06_sahara2_utm33_tm_bd7.tif [1:1]

143_06_sahara2_utm33_tm_bd5.tif [1:1]

Combined Image [1:1]

Cursor Position/Value

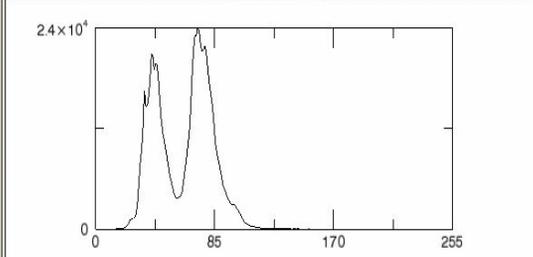
Location:
 X->236
 Y->274
 Screen Data: 50
 Original Data: 50
 Easting: 63954.14 metre
 Northing: 2331151.95 metre
 Latitude: 21° 4' 33.97" N
 Longitude: 16° 20' 50.01" E

Close Help

Histogram for 143_06_sahara2_utm33_tm_bd3

Options Properties Help

Single Channel



Min: 13	Std Dev: 19.71	Level: 208
Max: 192	Median: 69	Count: 0
Bins Used: 168	Pixels: 843335	Percent: 0.00%
Mean: 63.18		Mean:
		Std Dev:

[236,274]->[50]

LEOWorks 3.0
 (Source: <http://www.eduspace.esa.int/subdocument/images/Leoworks.gif>)

EINKANAL

Histo 1

ZWEIKANAL

4 3

HisXY PVI

CDVI **NDVI**

A - B A / B

DREIKANAL

R 3
 Start **G** 3
B 2

KLASS (un)

Klasse1 Stop

Cluster 5

Rad.= 4

KLASS (üb)

1.EINGABE

2.STATISTIK

Quad MiDi

Maxlik Maha

4.Ergebnisse

PIXEL-GIS-Strahlungswertanalyse

G Landsat7 19-11-1999 NDVI=43 N Datei laden



NDVI
 -0.20
 -0.15
 -0.10
 -0.05
 0.00
 0.05
 0.10
 0.15
 0.20
 0.25
 0.30
 0.35
 0.40
 0.45
 0.50
 0.55
 0.60
 0.65
 0.70
 0.75
 0.80
 0.85
 0.90
 0.95

Kanal1 150
 40
 Kanal2 120
 30
 Kanal3 150
 20
 Kanal4 200
 30
 Kanal5 200
 30
 Kanal6 255
 1
 Kanal7 250
 1
 Kanal8 255
 1

X=473 Y= 60 LupePos Bild480->Doku
 Zoom Lupe GLupe Bild520->Doku

PixelGIS 3.0
 (Source: own screenshot)

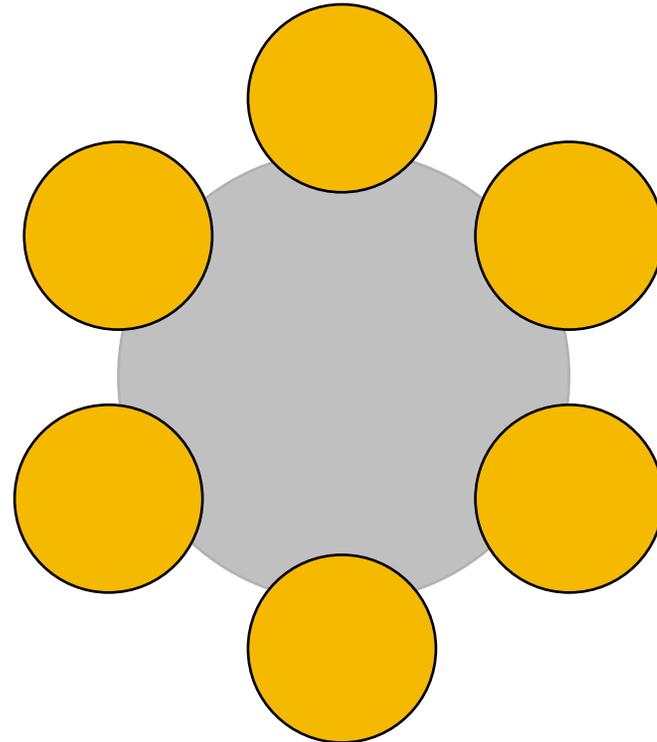
Evaluation and Dissemination of Remote Sensing Software **BLIF**

**Compilation of satellite
images on an dynamic
web server**

**Basic conditions for
requesting remote sensing
software in schools**

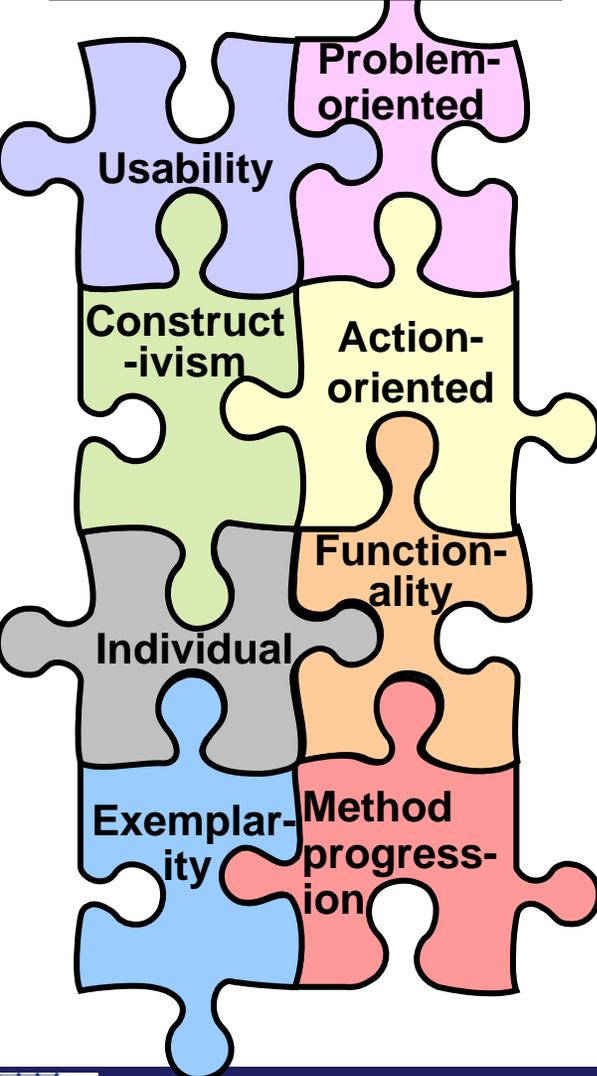
**Development of teaching
and learning aids
(conforming to
educational standards)**

**Furthering of a didactical
remote sensing concept**



Development of **BLIF**

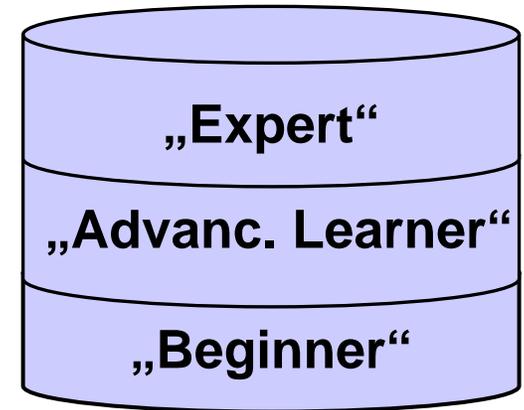
Didactical Principles



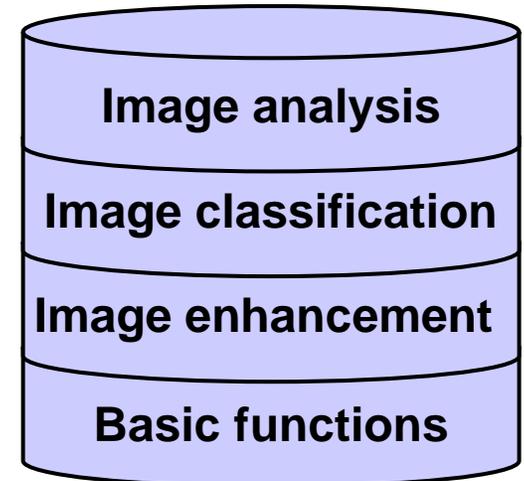
Two Modes



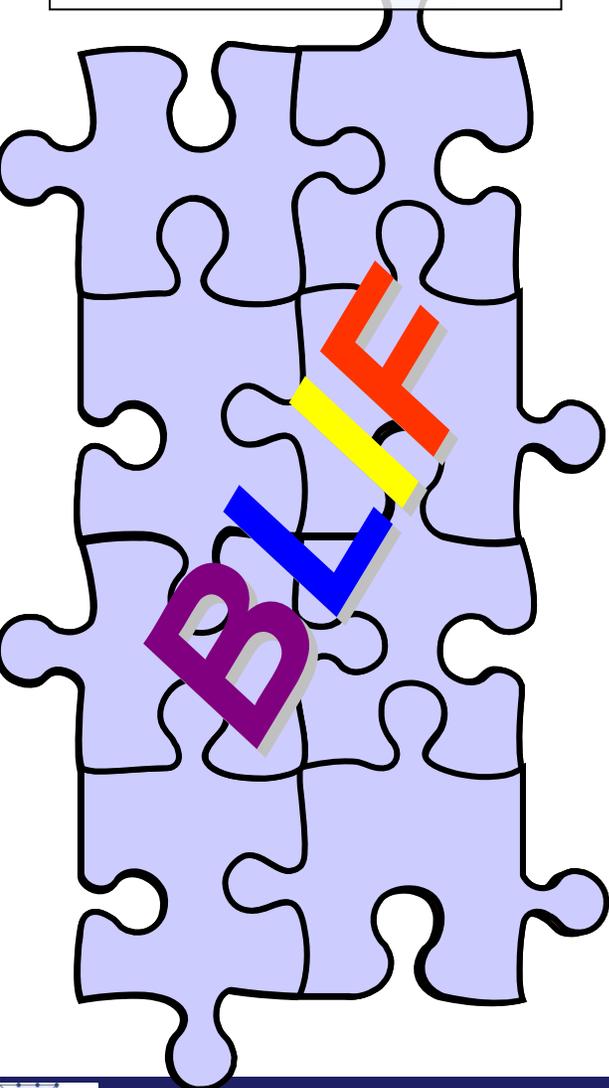
User Level



Software Functions



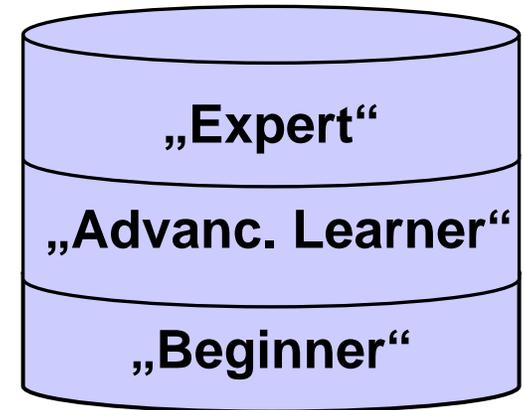
Didactical Principles



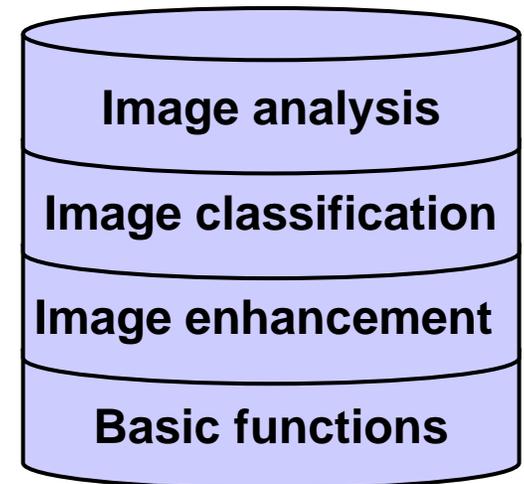
Two Modes



User Level



Software Functions



Assistent Mode: „Beginner“

BliF












i

?

Area selection ✔

[Next >](#)

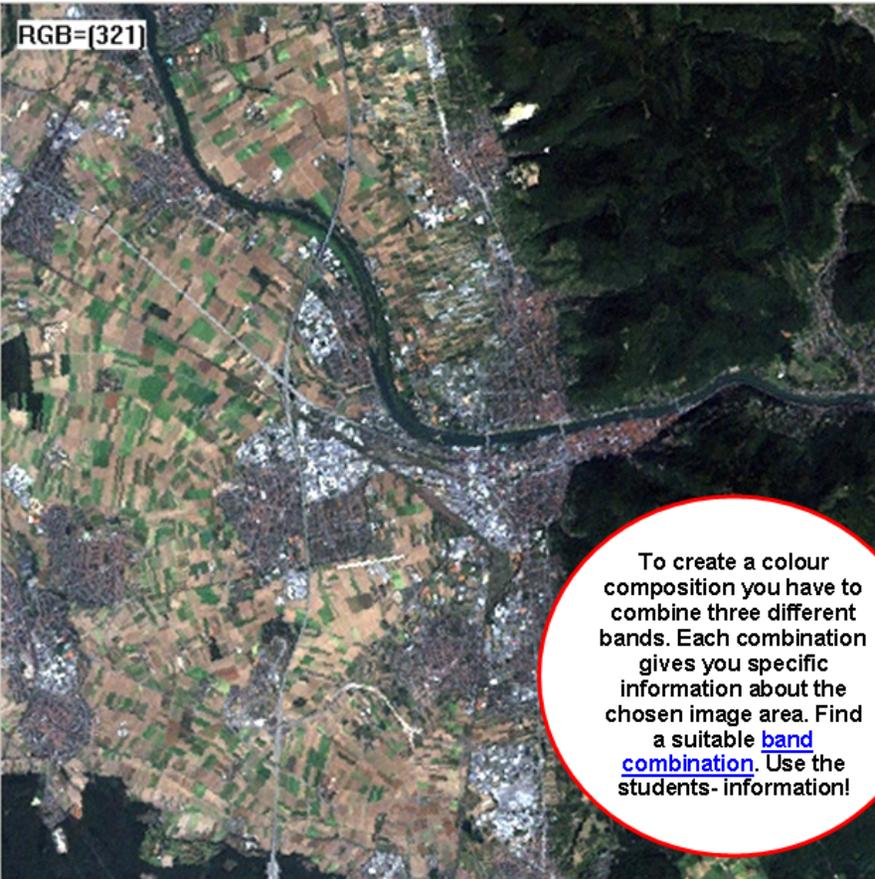


Image improvement ✔

Automatic stretching ✔

Manual

Brightness +6

Contrast 100

[Next >](#)

Band composites ✔

R = 1 ✔

G = 4

B = 3

[Next >](#)

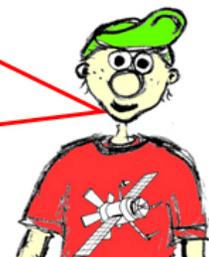
Band comparison ✔

Vegetation index I (VI) ✔

[Next >](#)

To create a colour composition you have to combine three different bands. Each combination gives you specific information about the chosen image area. Find a suitable **band combination**. Use the students- information!

Satellitus



KTS
KLAUS TSCHEBA STIFTUNG
VERGLEICHENDE ERDEBEWERTUNG

Dipl.- Päd. RL Raimund Ditter, Prof. Dr. Alexander Siegmund

Padagogische Hochschule
Heidelberg

Assistent Mode: „Advanced Learner“

BliF












i

?

Area selection

Next >

Image improvement

Automatic stretching

Manual

Brightness

Contrast

Next >

Band composites

R =

G =

B =

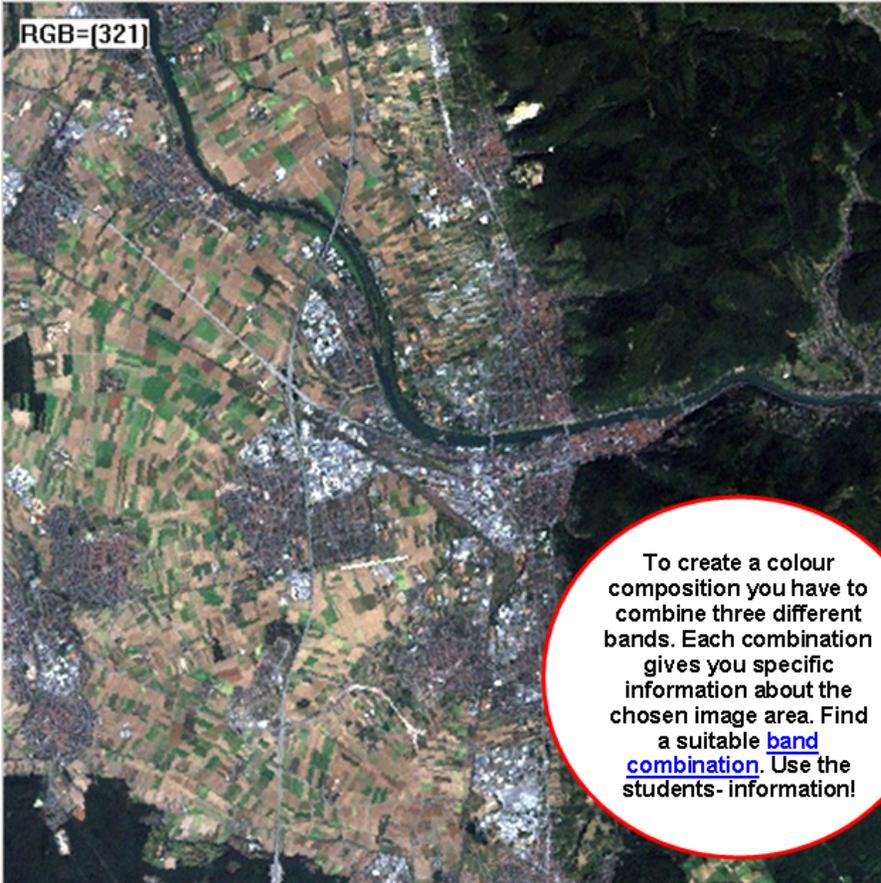
Next >

Band comparison

Vegetation index I (VI)

Vegetation index II (NDVI)

Next >



Supervised Classification

Quader-Classification

Maximum-Likelihood-Classification

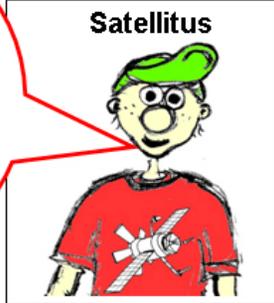
Next >

Image analysis

Percentage of classes 

To create a colour composition you have to combine three different bands. Each combination gives you specific information about the chosen image area. Find a suitable band combination. Use the students- information!

Satellitus



Assistent Mode: „Expert“

BliF















Area selection

Next >

Image improvement

Automatic stretching

Manual

Brightness

Contrast

Histogram 

Next >

Band composites

R =

G =

B =

Next >

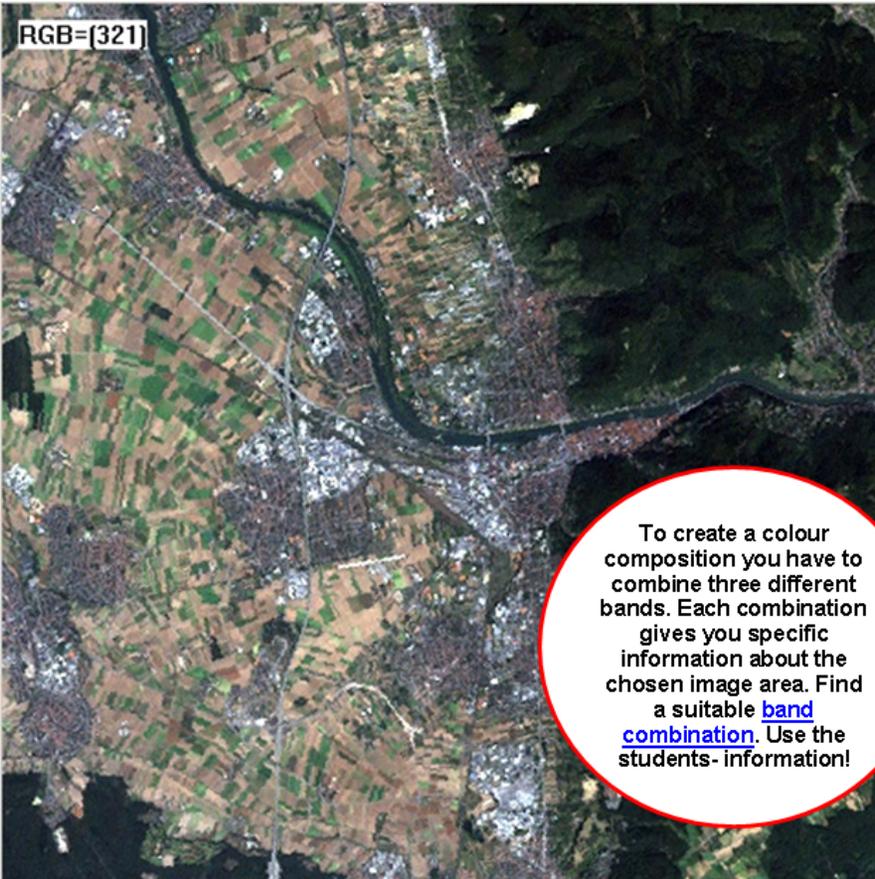
Band comparison

Histogram comparison 

Vegetation index I (VI)

Vegetation index II (NDVI)

Next >



Unsupervised Classification

Number of clusters

Next >

Supervised Classification 

Quader-Classification 

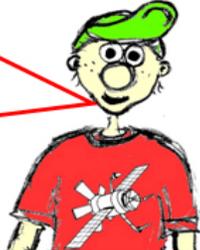
Maximum-Likelihood-Classification 

Next >

Image analysis

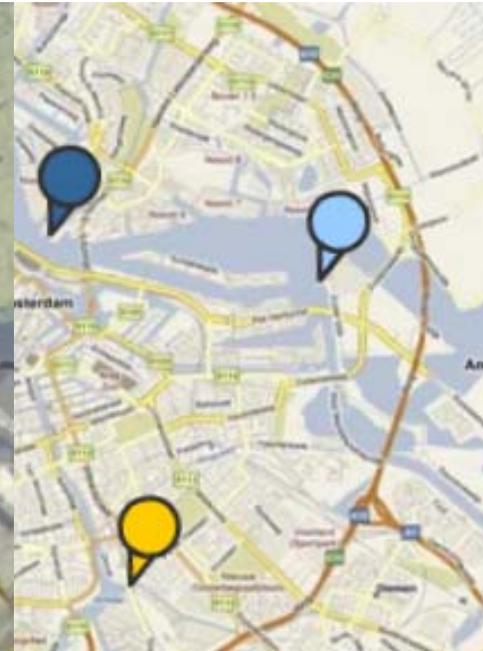
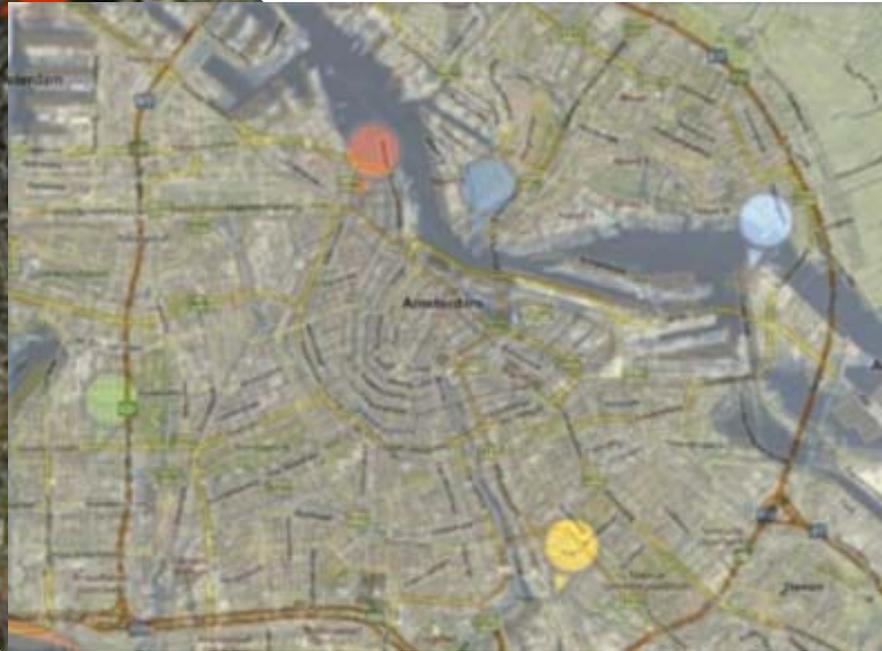
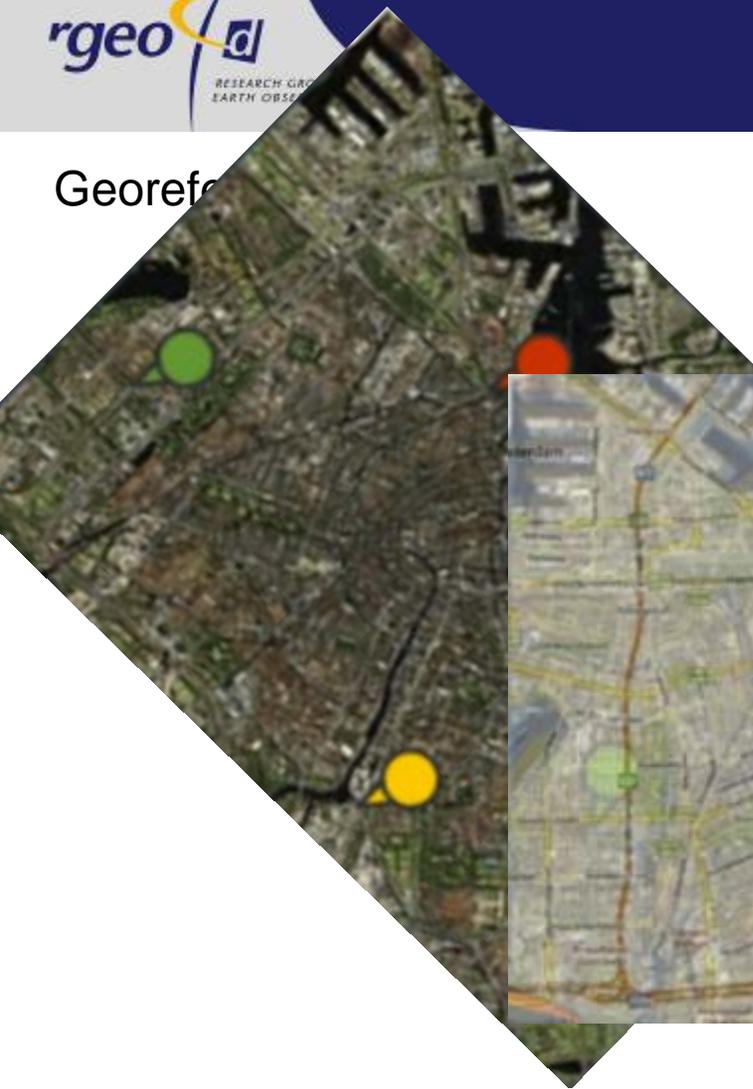
Percentage of classes 

Satellitus

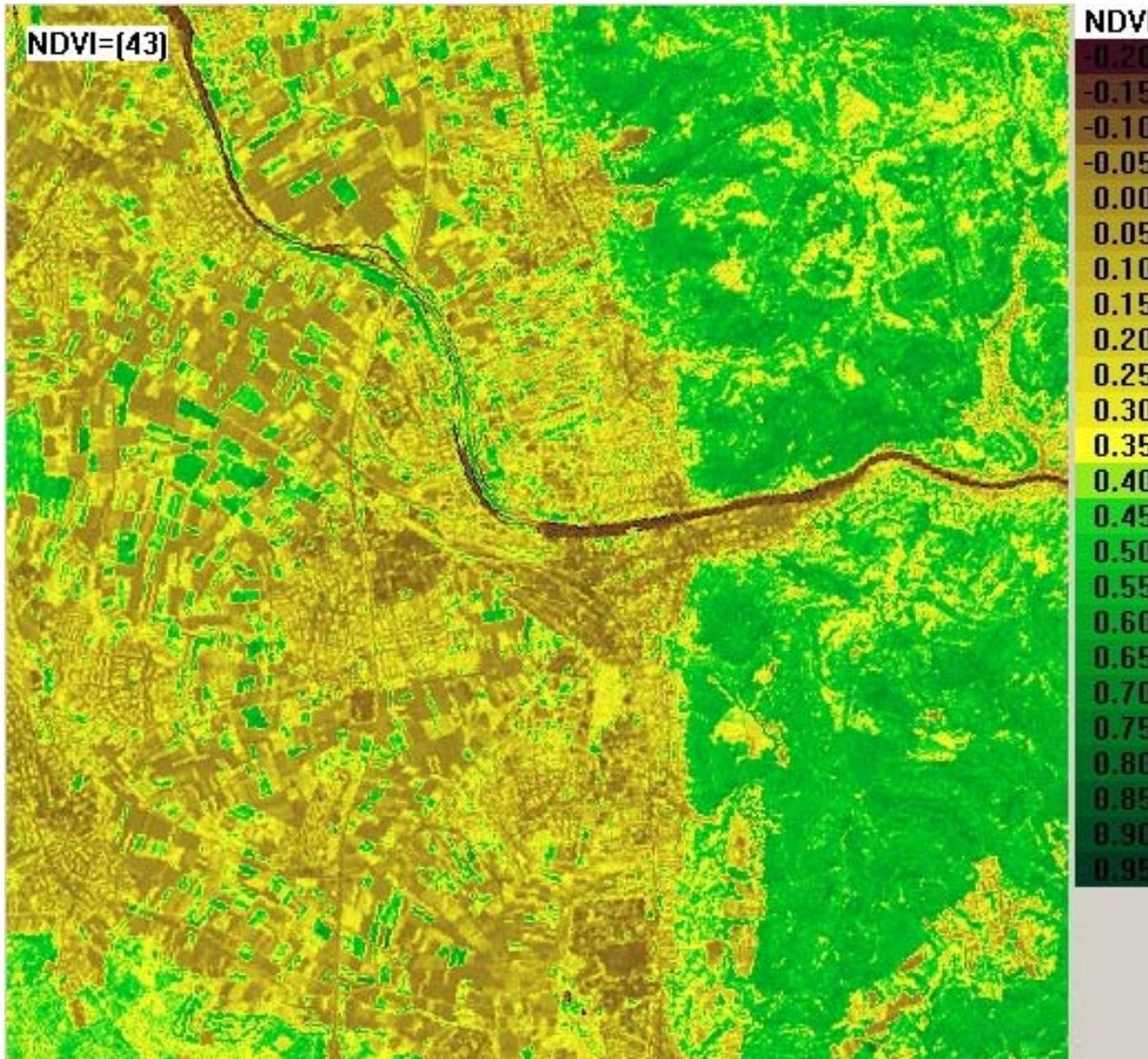


To create a colour composition you have to combine three different bands. Each combination gives you specific information about the chosen image area. Find a suitable [band combination](#). Use the students- information!

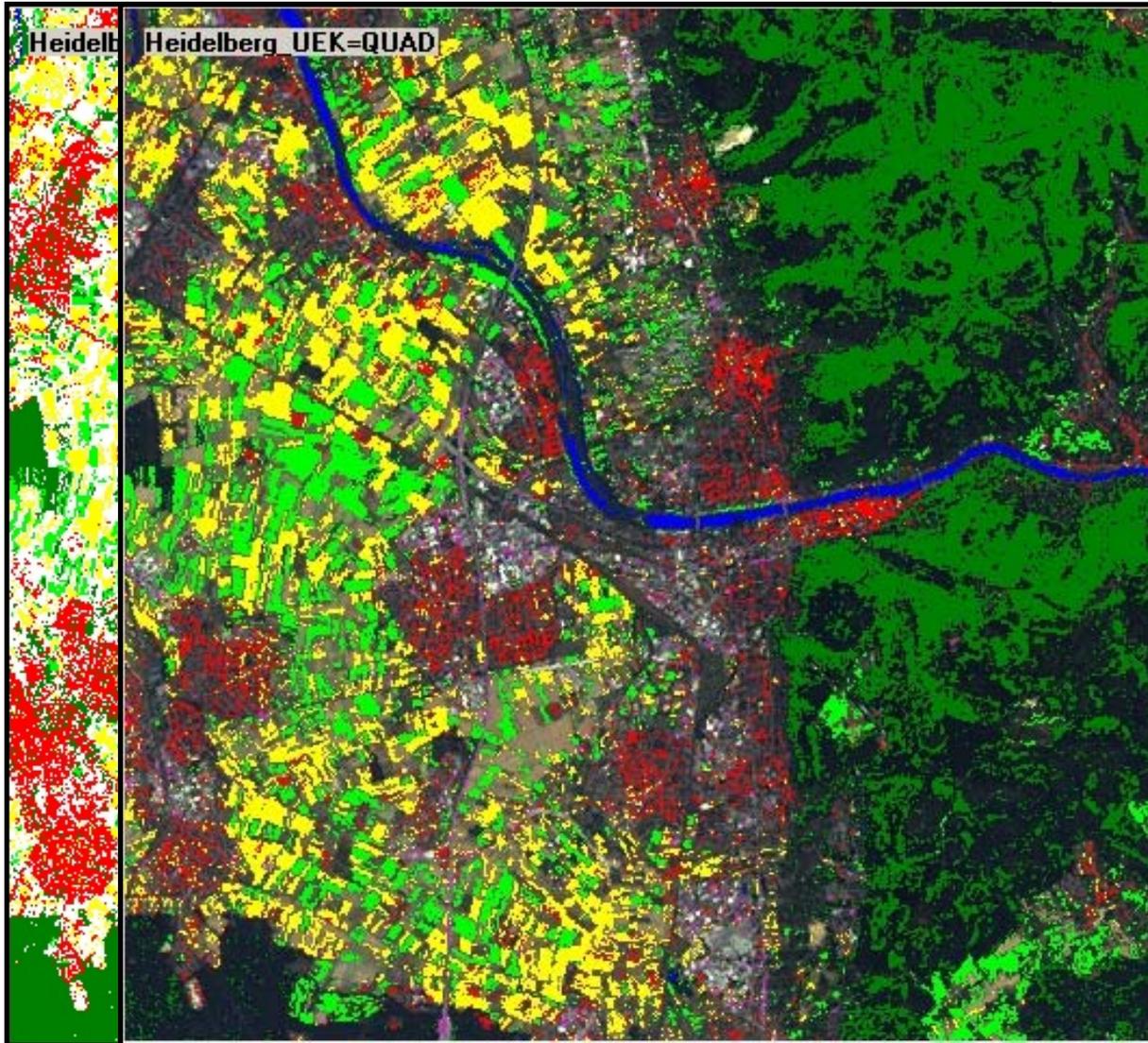
Georefer

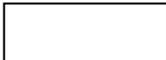






Technical Features: Supervised Classification



-  Settlement
-  Forest
-  Grassland
-  Farmland
-  Water
-  Unclassified





**2nd EARSeL Workshop on
Education and Training**



Development of a Web-based Remote Sensing Software for Schools

Thank you for your attention!

**Dipl.-Päd. RL Raimund Ditter
Prof. Dr. Alexander Siegmund
University of Education Heidelberg
Department of Geography
Research Group for Earth Observation**