WE ARE

- Frank van Ruitenbeek  
  Remote sensing geologist
- Mark van der Meijde  
  Geophysicist

- Faculty of ITC (Geo-Information Science and Earth Observation)
- Department of Earth Systems Analysis
- Enschede

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THIS TALK

- Background of the course
  - Course structure
  - Learning outcomes
- Field area
- Group and individual assignments
- Achievements
- Lessons learnt
MASTER’S IN GEO-INFORMATION SCIENCE AND EARTH OBSERVATION (M-GEO) AT ITC

Specializations:

- Applied Remote Sensing for Earth Sciences (ARS)
- Geoinformatics
- Land Administration
- Natural Hazards and Disaster Risk Reduction
- Natural Resources Management
- Urban Planning and Management
- Water Resources and Environmental Management
### APPLIED RS FOR EARTH SCIENCES (YEAR 1)

<table>
<thead>
<tr>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
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<tr>
<td><strong>Y1</strong></td>
<td><strong>Common course (14 ec)</strong> Geo-Information Science and Earth Observation: a Systems-Based Approach</td>
<td><strong>Specialisation course (7 ec)</strong> Data Analysis in Earth Sciences</td>
<td><strong>Specialisation course (7 ec)</strong> Geological Remote Sensing</td>
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<td>Academic skills (1 ec)</td>
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[View of a student working on a computer, presumably a geo-information science task.]

[View of two researchers in a field setting, possibly engaged in field measurements or validation.]
M-GEO PROGRAMME (2 YEARS)

- Specialization: Applied Remote Sensing for Earth Sciences
- Course: Field Measurements and Validation
- 4th quartile of 1st year MSc
- Total length of course is 7 ECTS in 11 weeks
- Field work (5 days): Harz mountains, Germany
BACKGROUND OF STUDENTS

- All international; Nationalities current students in ARS: Brazil, Ethiopia, India, Iran, Kenya, Nigeria, Tanzania, Indonesia, Philippines
- Background: BSc in Earth Sciences or comparable
MAIN IDEA

- To integrate RS and field instrument technology in Earth Science study workflows
# COURSE STRUCTURE

## Field work

<table>
<thead>
<tr>
<th>Week</th>
<th>23-Apr</th>
<th>29-30 April</th>
<th>6-7 May</th>
<th>13-14 May</th>
<th>20-24 May</th>
<th>27-28 May</th>
<th>3-4 June</th>
<th>11-Jun</th>
<th>17-18 June</th>
<th>24-25 June</th>
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<td>3</td>
<td>Fieldwork</td>
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<tr>
<td>4</td>
<td>Group assignment</td>
<td>Introduction of group assignment</td>
<td>Presentation of data collection plan</td>
<td>Submission of field data base</td>
<td>Peer evaluation</td>
<td>Lab analyses</td>
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<td>5</td>
<td>Q&amp;A</td>
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Upon completion of this course the student is able to:

1. **Create a data acquisition plan** for field measurements based on a GIS remote sensing desk study and objectives specific to the geology of an area.

2. **Acquire field measurements** that cover the lithological variability at outcrop scale using a variety of different field instruments and manage the measurements adequately.

3. **Perform quality assessment** of the field measurements and derive meaningful information about rock composition and rock formation from the measurements.
LEARNING OUTCOMES (4-5)

4. Evaluate the results of the desk study, the field campaign and laboratory analyses and explain the observed relationships between the remote sensing and field data, considering sensor type, scale, physiography and other factors.

5. Perform a specific task in a manner that is largely self-directed but that requires cooperation with other colleagues during a field campaign.
ASSIGNMENTS AND ASSESSMENT

Group assignment (preparation of field work, data collection in the field, processing and management of acquired field data)

- Assessment of individual contribution to the group work by peer evaluation (25%)
- Assessment of the quality and organization of the acquired field data by supervising staff (25%)

Individual assignment (on a chosen topic, objective can be met through the analysis of the field measurements acquired during the field work)

- Assessment of the clarity and completeness of the report and the quality and depth of the data analysis and interpretation by supervising staff (50%)

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FIELDWORK AREA HARZ, GERMANY

- Variety of rock types
- Availability of airborne geophysical data
- Interesting geology (processes, history)
- Proximity to Enschede (< 4 hours drive)
FIELDWORK AREA HARZ, GERMANY

Granite
Carboniferous flysch deposits
Middle-Devonian shales and slates
Gneiss
Gabbro

1: Geologic path
2: 1berg limestone
3: Greywacke quarry
3b: Turbidites - optional
4: Gabbro quarry
5: Harzburgite type locality
5b: Eckergneiss - optional
6: Wurmberg granite
7: Rammelsberg mine
8: Okercal - Devonian sequence of Rammelsberg shale
9: Weathered granite
10: West landscape
Iberg limestone (M–UD)
Wissenbacher black shale (MD)
Ore formation Rammelsberg (MD)
Ecker gneiss (PC-C)
Gabbro – Harzburgite complex (P)
Brocken granite (P)
Variscan orogeny (C)
Greywacke (LC)
Iberg limestone (M–UD)
Ore formation Rammelsberg (MD)
Wissenbacher black shale (MD)
Granite weathering (LT)
Uplift of Variscan basement (LCr & LT)
Zechstein Gypsum deposits (P)
STAFF PROVIDES THE GEOLOGICAL FRAMEWORK
STUDENTS ARE RESPONSIBLE FOR THE DATA COLLECTION
GROUP ASSIGNMENT

Four elements:
1. To learn to operate a selected instrument
2. To create ONE data collection plan
3. To conduct fieldwork
4. To archive field data and information
1. To learn to operate selected instruments. Each team of two persons chooses an instrument and makes sure that they can:
   - Correctly and safely operate the instrument,
   - Test equipment for correct working and make sure that it is complete and fully charged before departure,
   - Instruct fellow students,
   - Perform data quality checks,
   - Process and archive the data.
FIELD INSTRUMENTS

Magnetic susceptibility meter

Portable XRF

Gammaray spectrometer

Magnetometer

GPR

ASD IR spectrometers
INSTRUCTING FELLOW STUDENTS
2. To create a data collection plan. The group prepares the following prior to field work:

- A plan of the kind of measurements and data that will be collected;
- A schedule of who collects what at each stop.
- Data collection sheets and a strategy for data storage and quality check.
- A folder and file structure for archiving the data sets to make the data easily accessible for later use and further data analyses.
Data acquisition
Describing outcrop
Making photos
Discussing where to measure
Collecting rock samples
3. To conduct fieldwork.

- The group carries out the field data collection according to plan. The group must be flexible to change the plan if required (for instance because of changed conditions at field stops, faulty equipment, etc.). Perform data quality checks as much as possible during the field work. Start interpreting and organizing the data in the evenings in the hotel.
DATA ACQUISITION – DIGITAL AND ON HARDCOPY

GRS Spectra of Harz igneous rocks

$K^{40}(1.46\text{ MeV})$

$eU(1.76\text{ MeV})$  $e\text{Th}(2.61\text{ MeV})$

Harzburgite  Basalt  Pyrite Ore  Gabbro  Granite  weathered Granite
4. To archive field data and information. The group ensures that all data is quality checked and adequately archived. All collected data and information must be available and accessible for use after the field work. This includes processing of data for further analysis and interpretation (e.g., list of minerals interpreted from reflectance spectra)
DATA QUALITY ASSESSMENT

Reflectance spectra of Day 1 Stop 1

Reflectance spectra of Day 4 Stop 7
ACHIEVEMENTS

- They are aware of the importance and limitations of acquiring and using field instrument data and the potential pitfalls
- Students are better prepared for the use of RS technology in their MSc research project
- The course greatly enhances the effectiveness of an MSc research fieldwork in the second year
LESSONS LEARNT

- Relying on technology is potentially risky – instruments may fail
- Too much focus on technology makes students blind to field geology
- Trade-off between using technology and basic geological observations
- Field instruments are complementary and will not replace basic geological field knowledge and skills.
- Solid field-geology skills are required for proper use of RS and field instrument technology
Feeling lost in the field?

Not with the field measurements and validation course