UNIVERSITAS FRIBURGENSIS

FACULTY OF SCIENCES

GIS-supported Geology and fieldwork in the Eastern Greater Caucasus (AZ)

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MIDDLE EAST BASINS EVOLUTION PROGRAMME

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Summary

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  - Goals of GIS in this work
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- **Geodatabase**
- **Fieldwork**
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  - Topographical measures
- **Data for Azerbaijan**
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  - Geographic data
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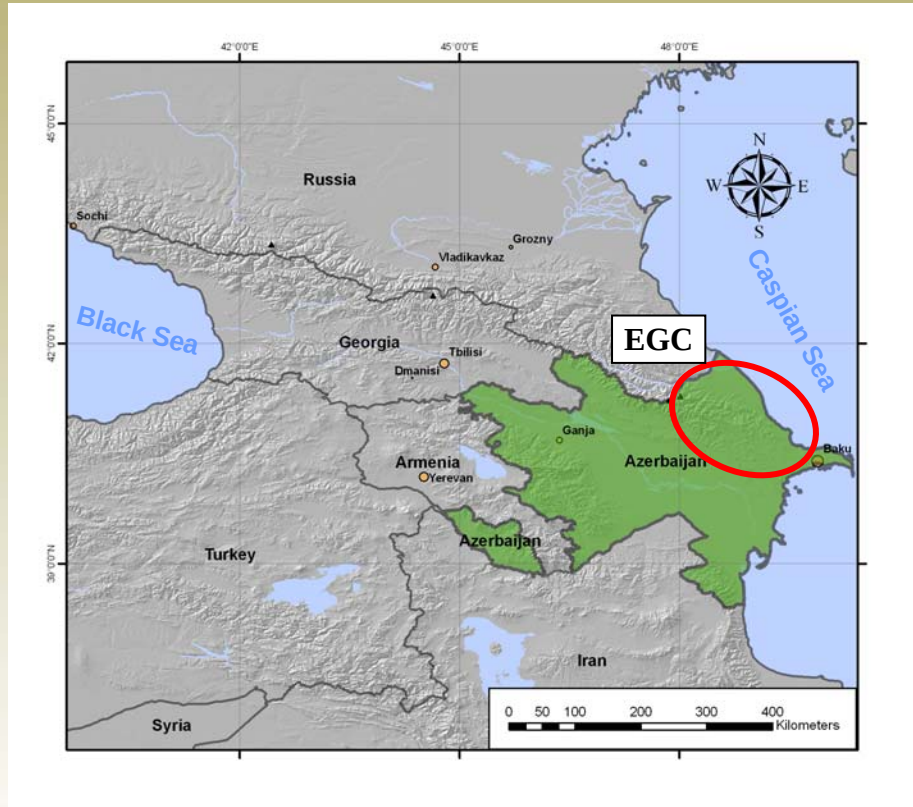
Project context

- Geodynamics and tectonics of the Eastern Greater Caucasus (EGC) and its surroundings
- Cooperation between UniFR and Azerbaijan
  - **2003-2006 MEBE project**
    (Middle East Basin Evolution project)
  - **2005 – 2008 SCOPES project**
    (Scientific CO-operation between Eastern Europe and Switzerland)
  - **2007 – 2009 INTAS project**
    (INTernational ASsociation for the promotion of co-operation)
- Cooperation :
  - University of Heildelberg (Thermochronology)
  - Université Pierre et Marie Curie (GIS and tectonique)
  - Keele University (UK) (sedimentology and modelisation)



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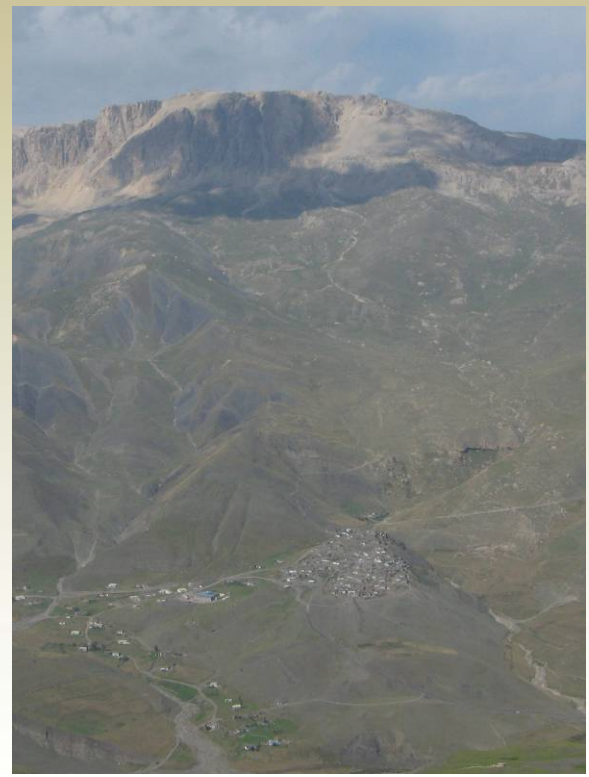
Goals of GIS in Azerbaijan

- Develop an useful GIS environment for fieldwork
- Geodatabase for all data we collect in the field
- Locate the outcrops in the field
- 3D measurements of geomorphological features.
- Geographical analyses of the data
- Find data for geological studies in Azerbaijan.



Xinaliq village in the Tufan zone and the Qizilqaya Nappe (M. Bochud, 2004)

Field equipment for GIS

Field equipement with 1 week of autonomy

Field computer

- ArcGIS (ArcMap, ArcCatalog, ArcScene)
- Trimble Pathfinder software
- Data for the area
- Backup (USB flash Memory)

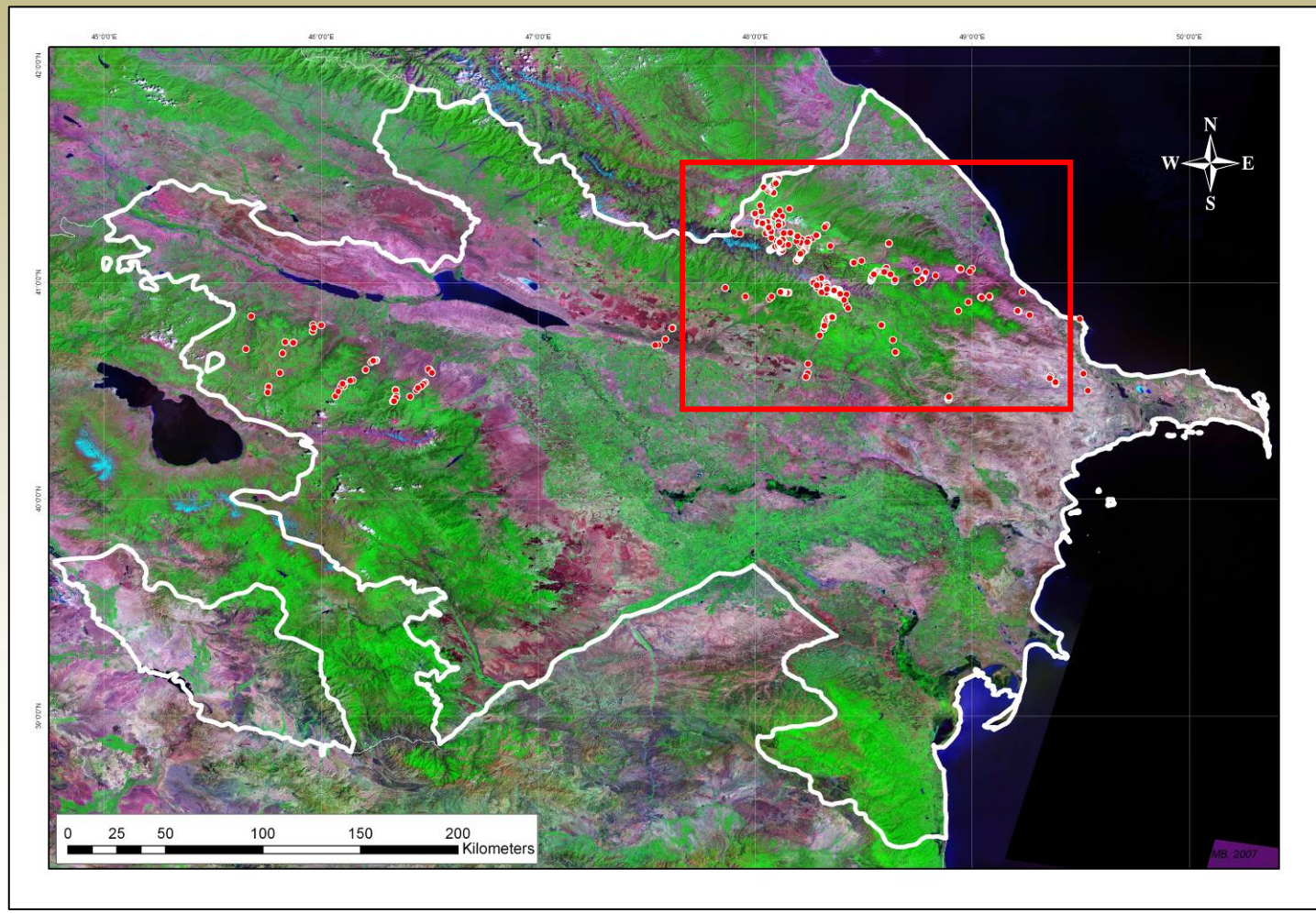
2x GPS and antenna

Arcpad (ESRI)
GPSCorrect Extension for Arcpad (Trimble)
Terrasync (Trimble) for base GPS

Fieldbook

Pen

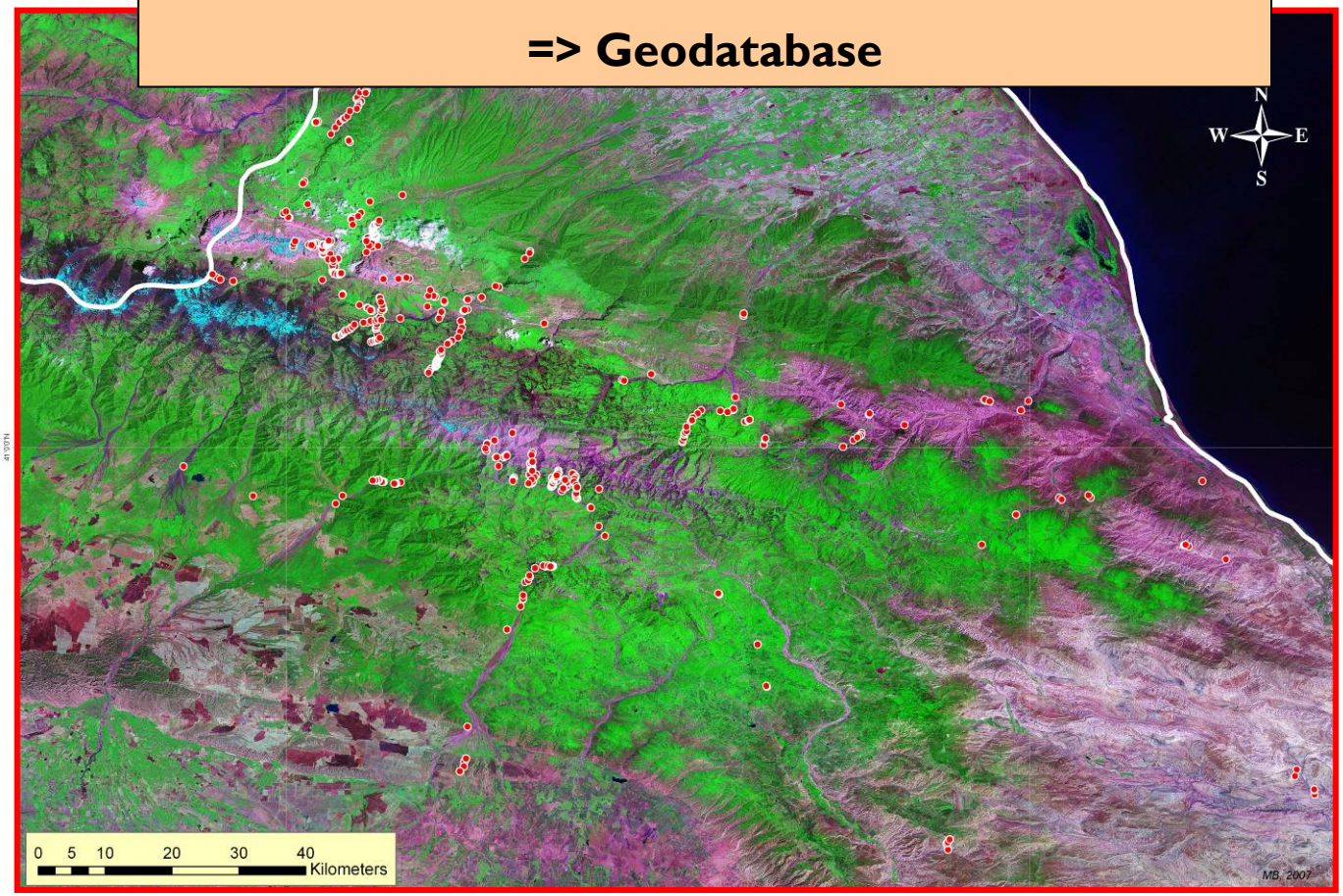
Geodatabase for Azerbaijan



Geodatabase for Azerbaijan

Lots of outcrops and measurements all around the Eastern Greater Caucasus

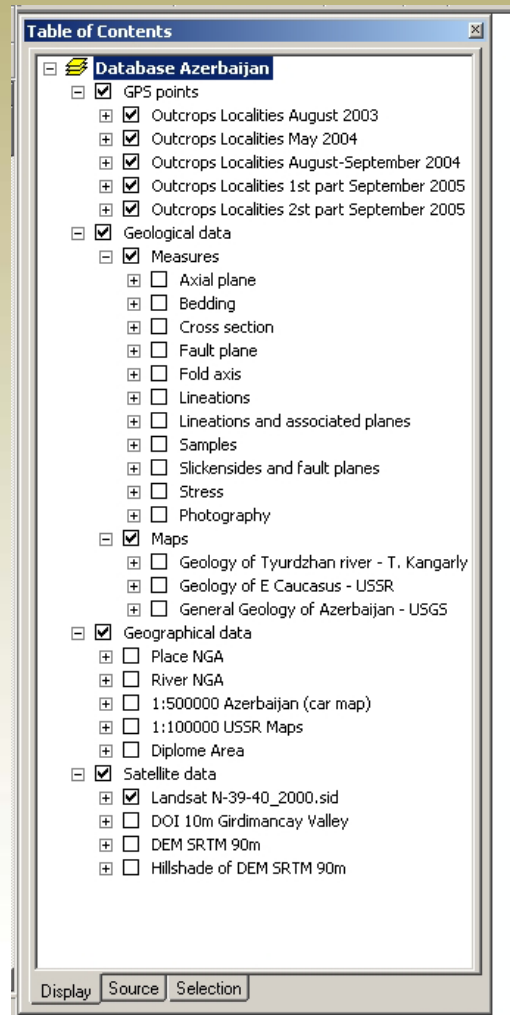
=> Geodatabase



Geodatabase for Azerbaijan

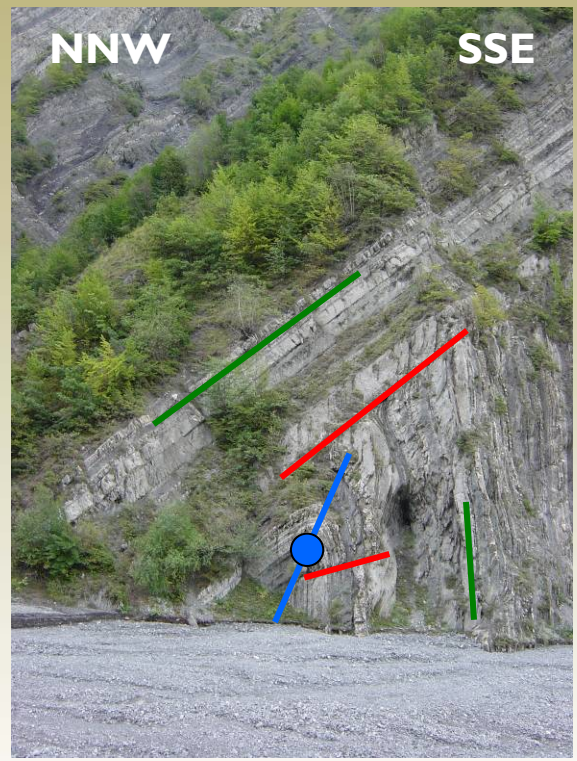
- **ArcGIS geodatabase**
  All possibility of ArcGIS and ArcPad can be used
  - Field Data (collected in the field)
    - Pictures
    - Structural data (bedding, faults, …)
    - Samples

- **Shapefiles :**
  Good compatibility
  - Lineaments
  - Fault line
  - Geology
  - river



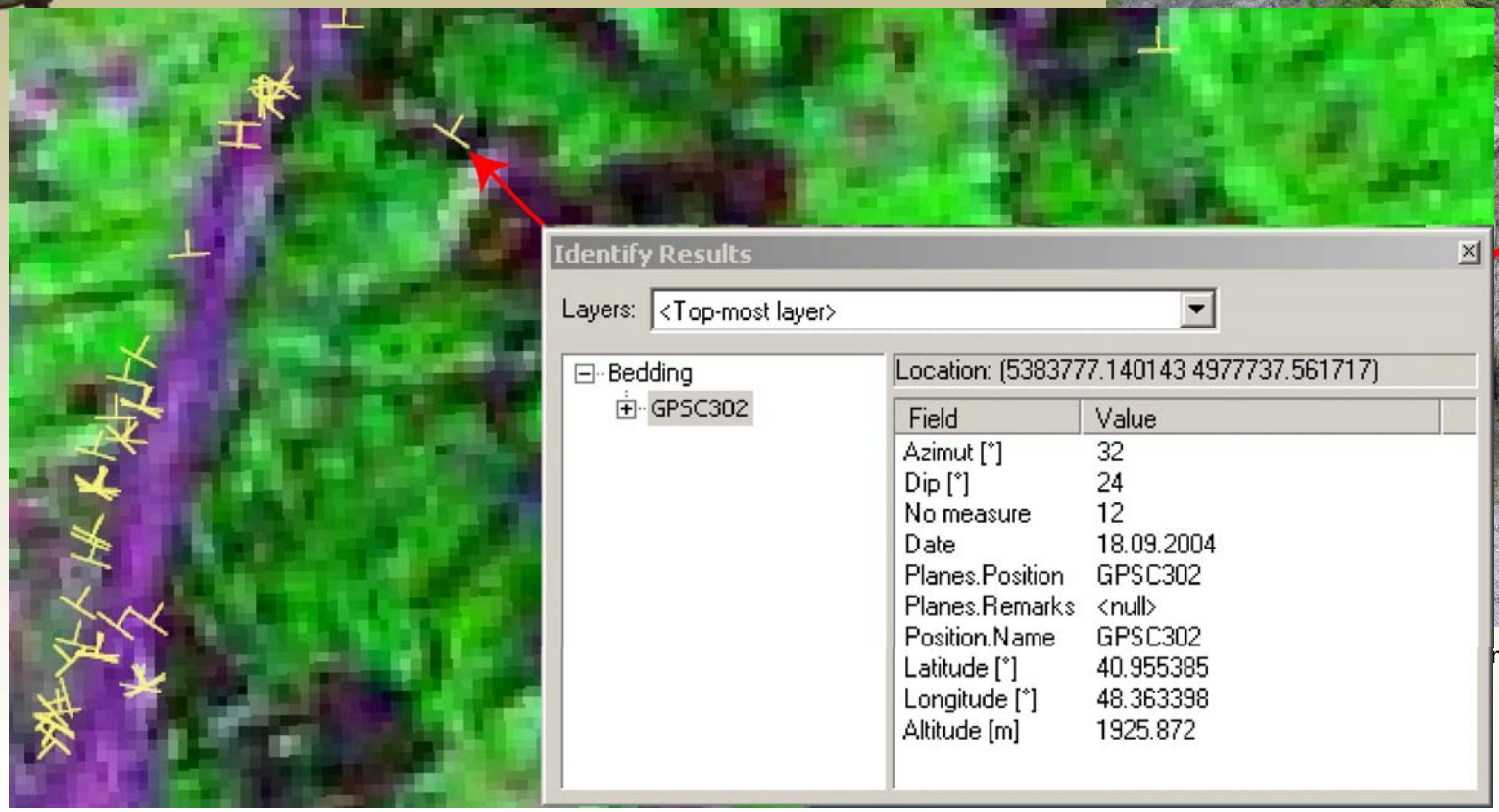
Fieldwork
Structural data acquisition

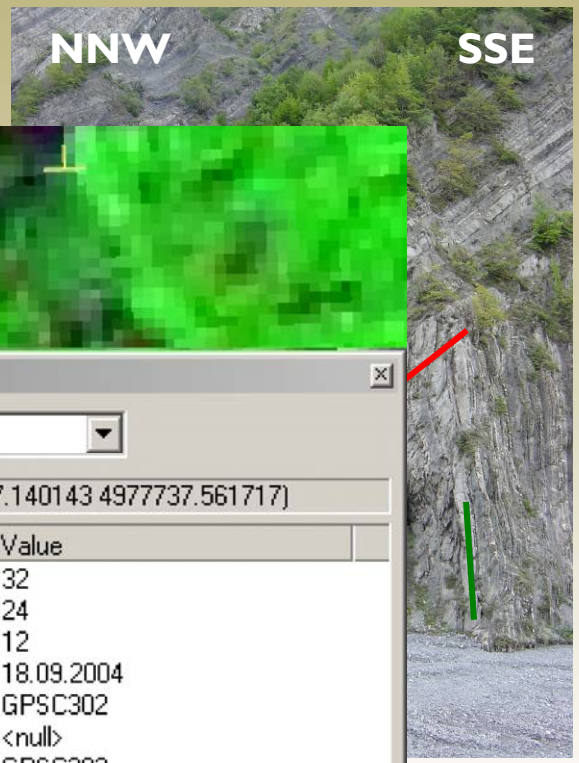
- **Field Data (Ponctual data):**
  - Pictures with direction and legend
  - Bedding (az., dip, XYZ, remarks)
  - Fault and lineations
  - Axial planes
  - Fold axis
  - Samples



Fault bend fault in Març valley near Babadag (N of Lahic)

Fieldwork
Structural data acquisition

- 



r Babadag (N

Fieldwork

Topographical measurements

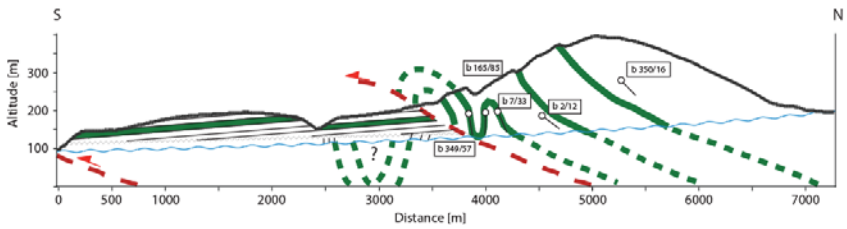
Relative Measurement of a Quaternary structure

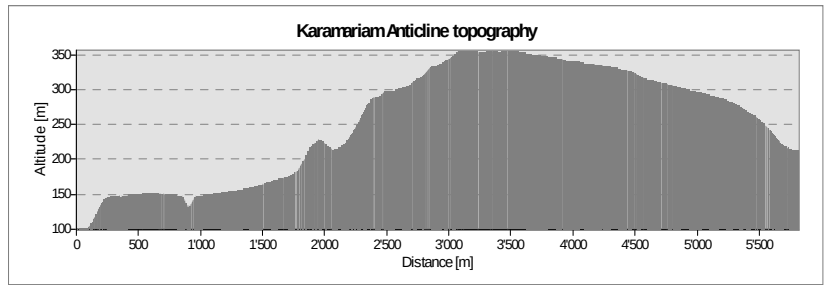
⇒ Link between the topography and faults

⇒ Theorically accuracy of 20cm but in the field 70cm

Base station

Mobile station





Topographic cross-section with <1m relative accuracy

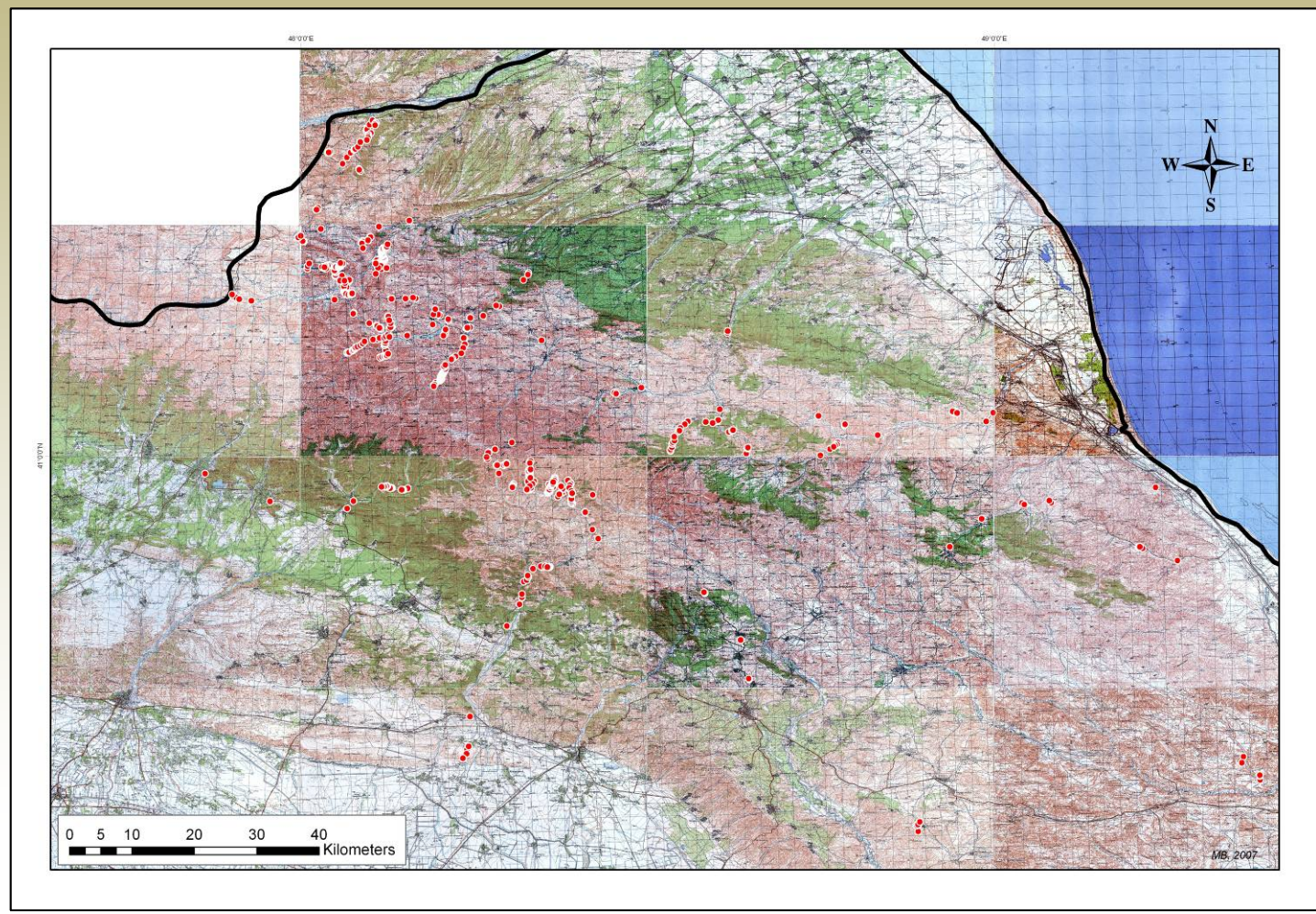
Free GIS data for Azerbaijan

- **Maps :** 1:100'000 Russian Maps (1974-1991)
- **DEM :** NASA **S**huttle **R**adar **T**opographic **M**ission (for free : 90m accuracy)
- **Satellite image :**
  - Landsat (7 layers)
  - Geocover (based on Landsat)
- **Geographic features : (USGS website, NGA Raster Roam website)**
  - Rivers and lakes
  - Boundary
  - Roads, …
  - Place name (http://earth-info.nga.mil/gns/html/cntry_files.html)
- **Geologic data :**
  - Earthquake (ex. : http://neic.usgs.gov/neis/epic/epic.html)
  - Geological maps (>1:1'000'000)

Free GIS data for Azerbaijan

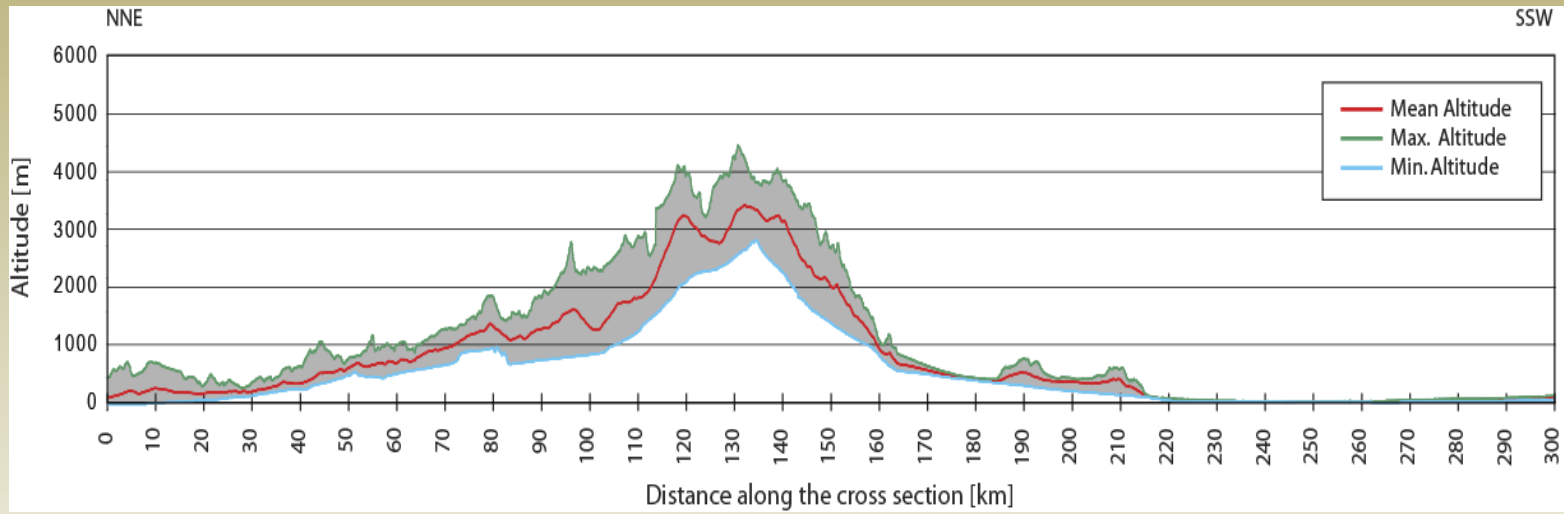
1:100K Topographic maps (1974-91)

Available on : http://mapy.mk.cvut.cz

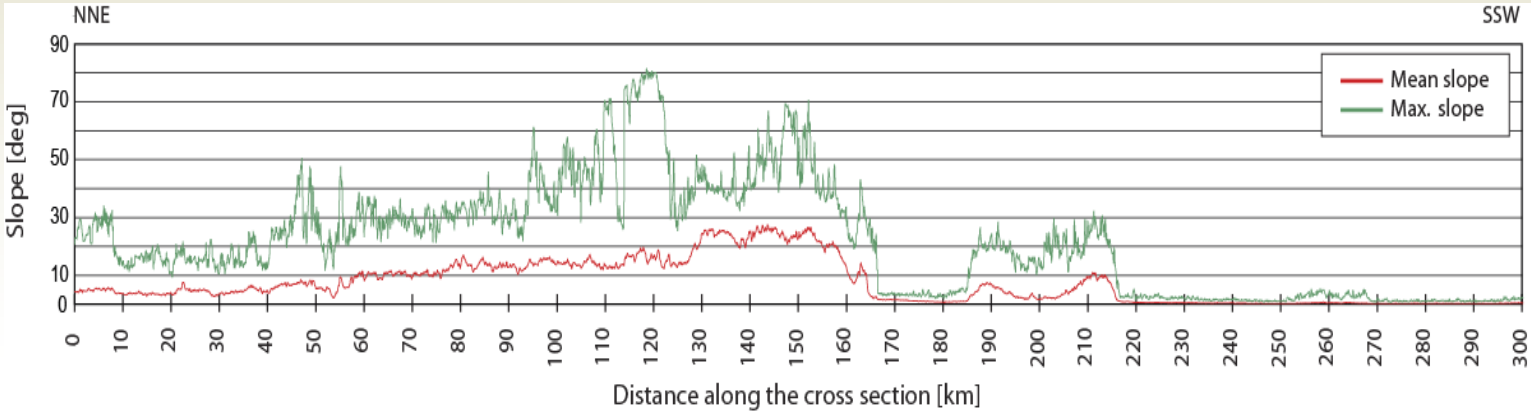


SRTM Digital Elevation Model 90m

Topography



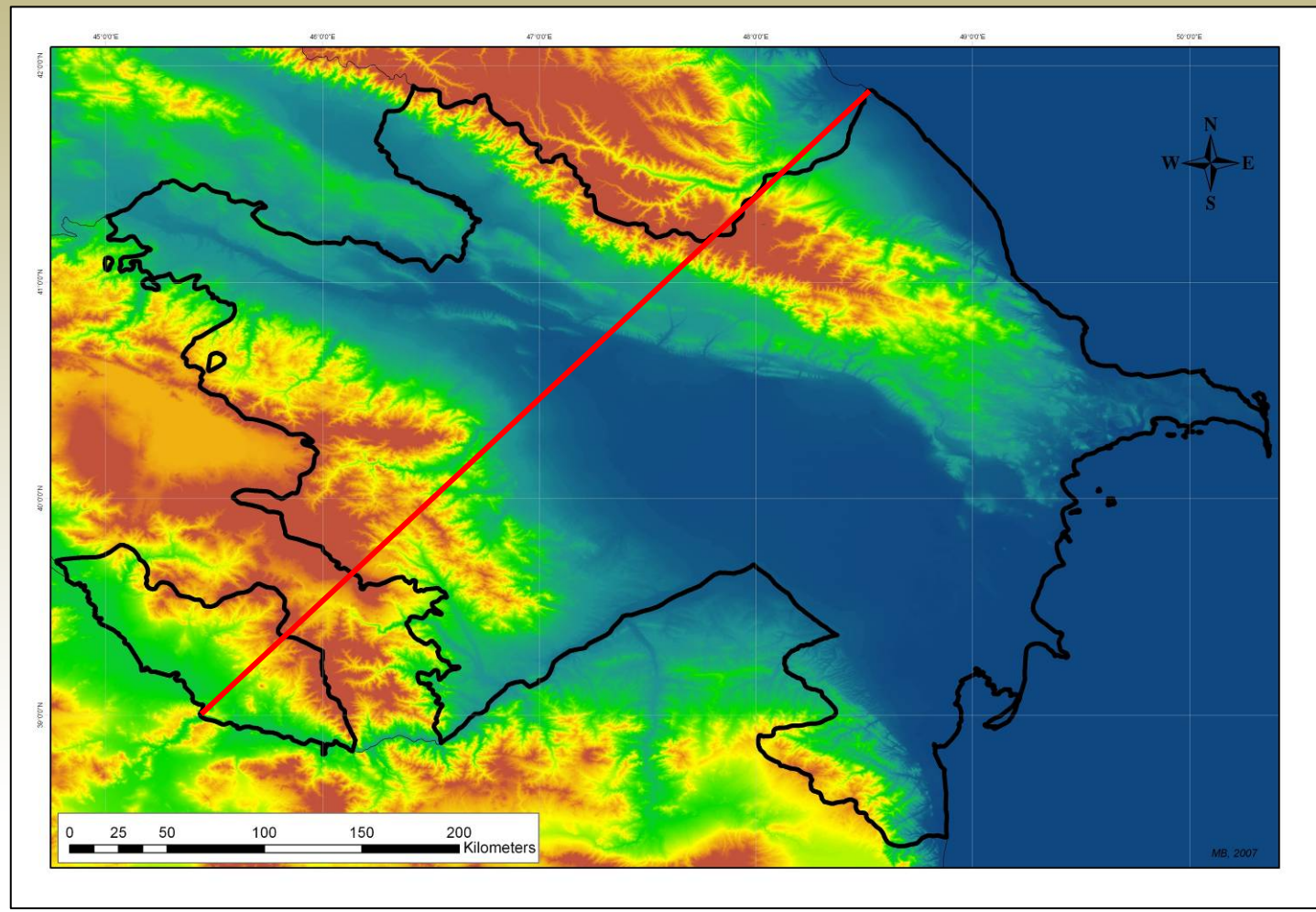
Slope



Free GIS data for Azerbaijan

SRTM Digital Elevation Model 90m

Available on : http://www2.jpl.nasa.gov/srtm/



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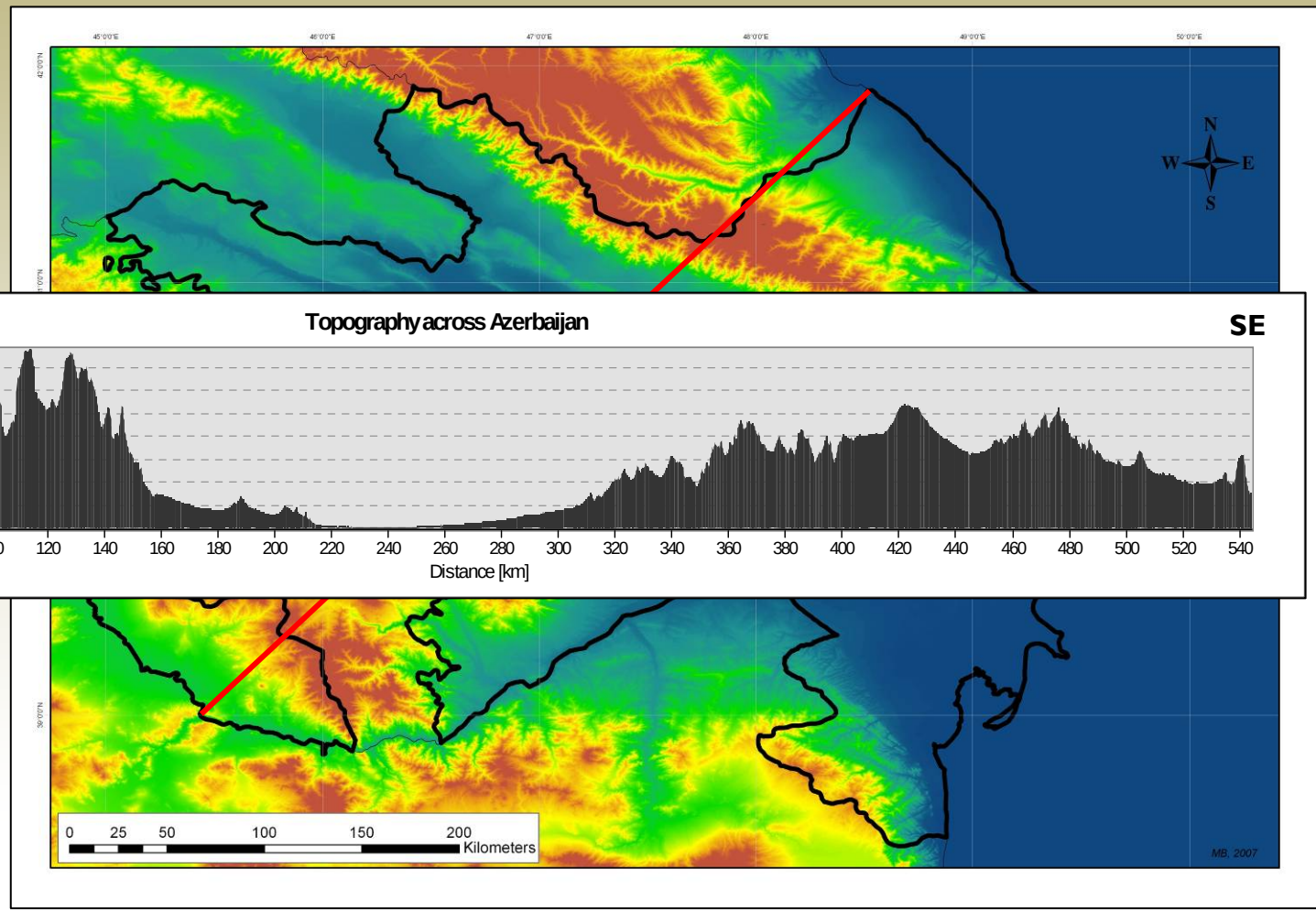
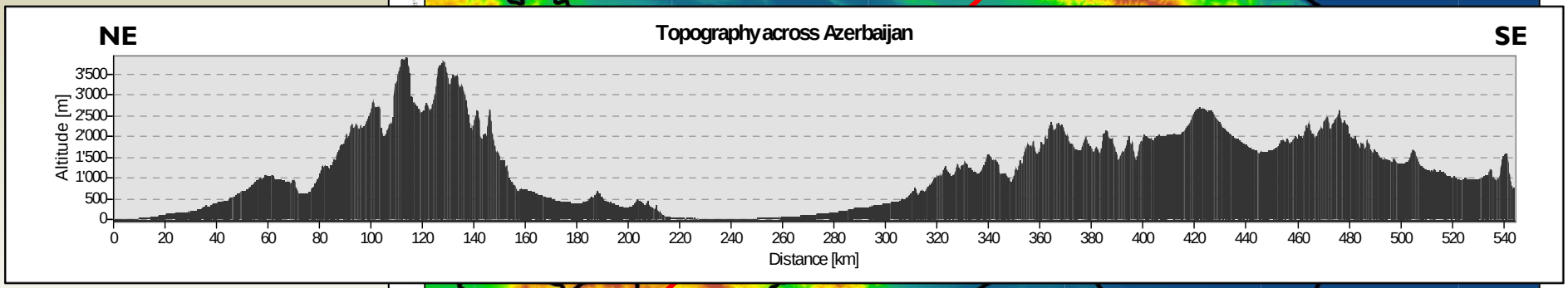


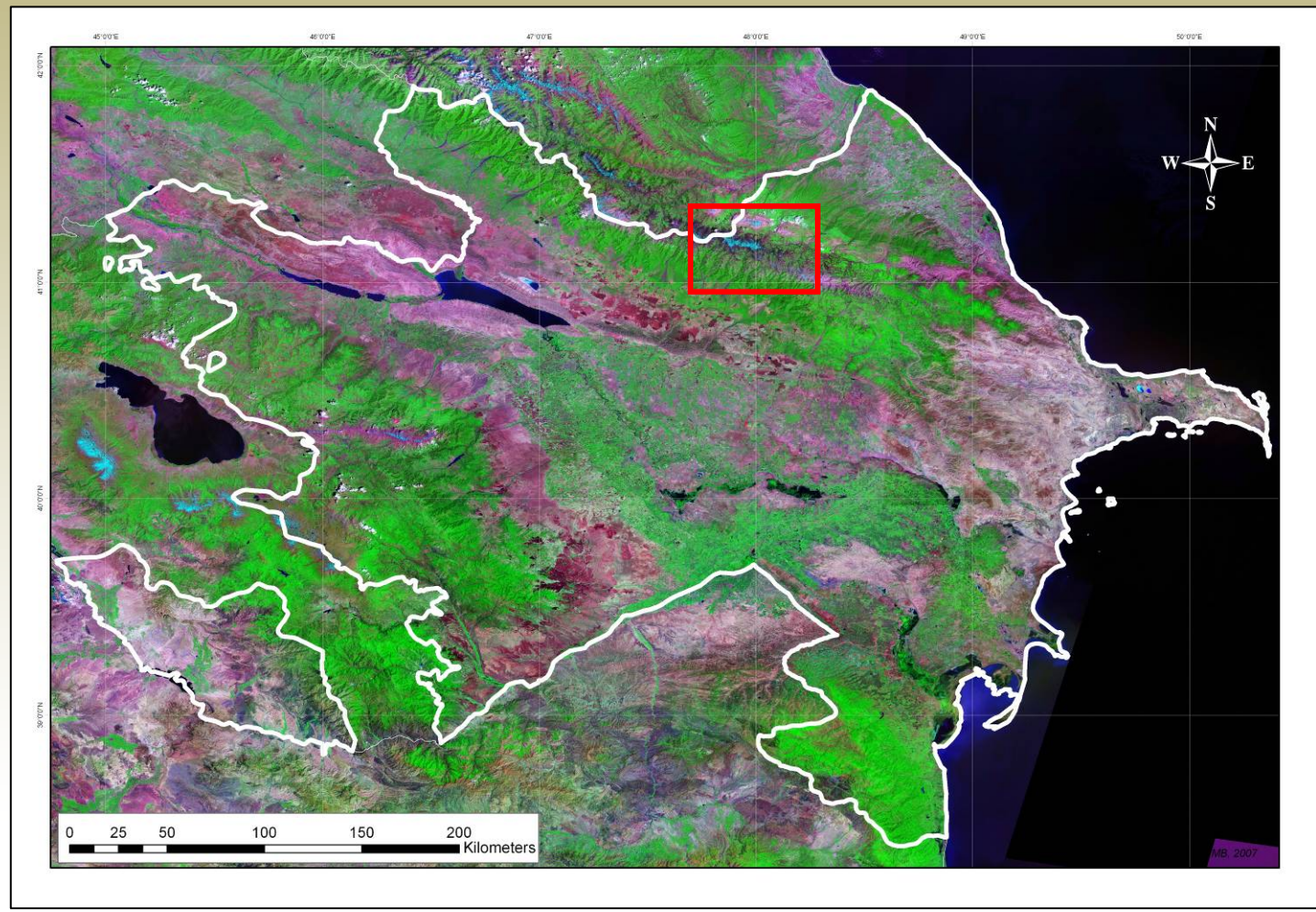


Free GIS data for Azerbaijan

Landsat Geocover (NASA)

Available on : http://glcf.umiacs.umd.edu/portal/geocover/

- 15m accuracy



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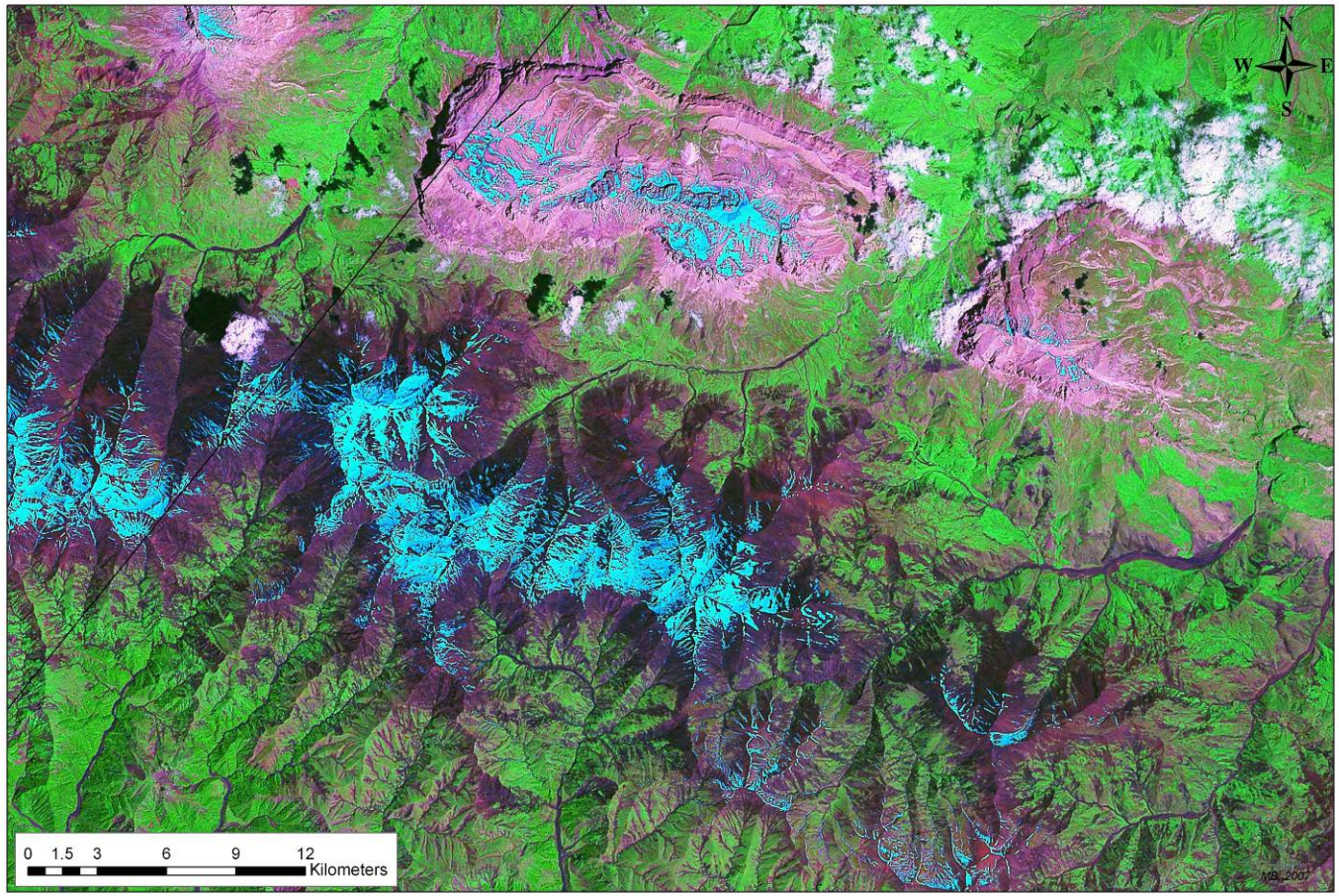
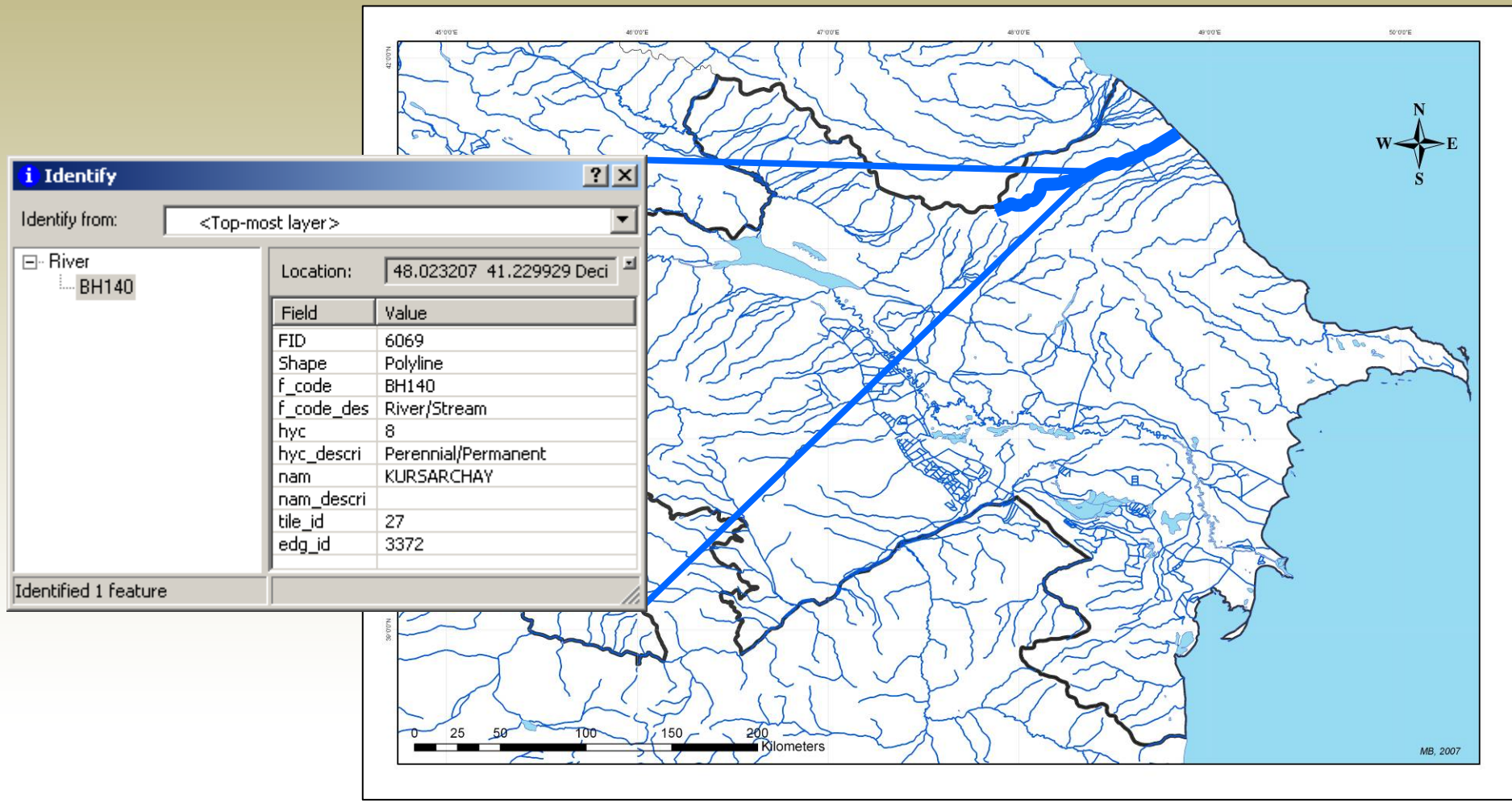


Free GIS data for Azerbaijan

Rivers and lakes (NGA)

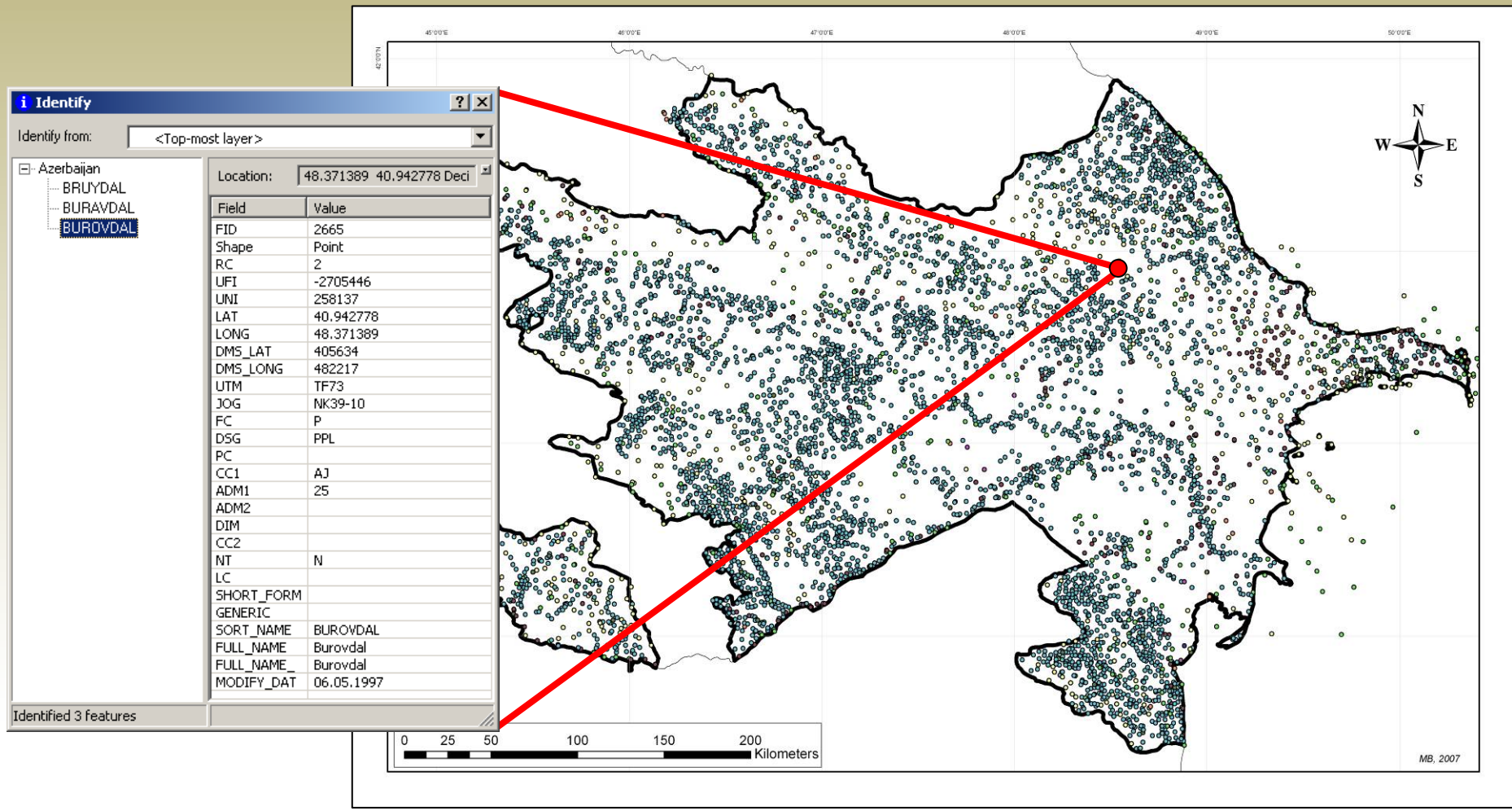
Available on : http://geoengine.nga.mil/



Free GIS data for Azerbaijan

Geographic names (NGA)

Available on : http://earth-info.nga.mil/gns/html/cntry_files.html



Conclusion

Geographic information systems

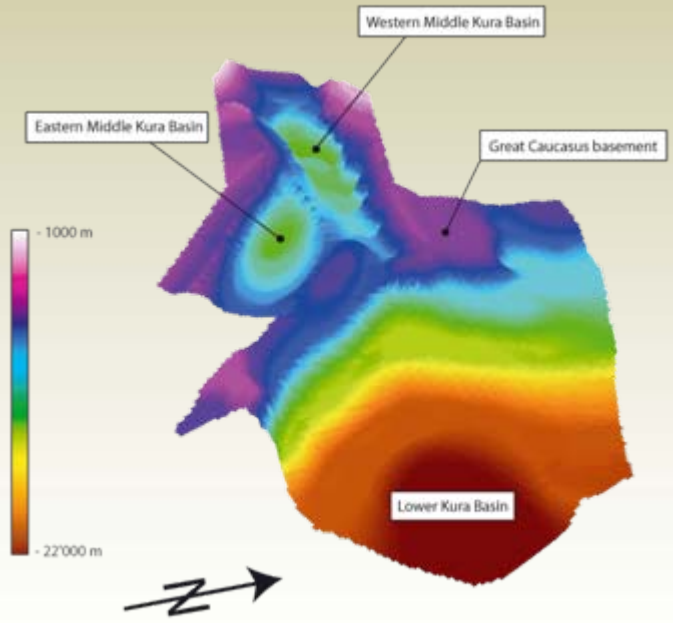
Give tools to improve the efficiency of the scientific work and to give some new possibilities in research

Fieldwork

- Measures direct in the GPS-PDA
- Until 1 week in the field
- All data with us all the time – useful for a several years work
- Security of data better than in the fieldbook
- Fieldbook is always useful but finaly only for notes and drawings not to have array of measure.

Geological Geodatabase for Azerbaijan

- Good view on all different kind of data
- Possibilities to select them on a map and to make directly some calculations
- Creation of 3D maps and cross-section
- Easy access to the data for all the project participants



Conclusion

Geographic information systems

Give tools to improve the efficiency of the scientific work and to give some new possibilities in research

Free data for GIS work

- **SRTM DEM at 90m :**
  - not accurate enough to do geomorphological studies
  - Good enough to prepare a fieldtrip
- **Landsat original 7 layers :**
  - Some layers are very useful to distinguish lithology
- **Landsat Geocover :**
  - Good enough to prepare a fieldtrip and see some big difference in lithology
- **Geographic information :**
  - Place name : useful in Azerbaijan to normalize all the place name
  - Rivers, lakes, boundaries, … : useful to prepare some maps for papers, presentations or to prepare a fieldtrip.