

Gravity Surveying

Microgravity: a case history

A SUBWAY PROJECT IN LAUSANNE, SWITZERLAND, AS AN URBAN MICROGRAVIMETRY TEST SITE

P. Radogna, R. Olivier, P. Logean and P. Chasseriau
Institute of Geophysics, University of Lausanne



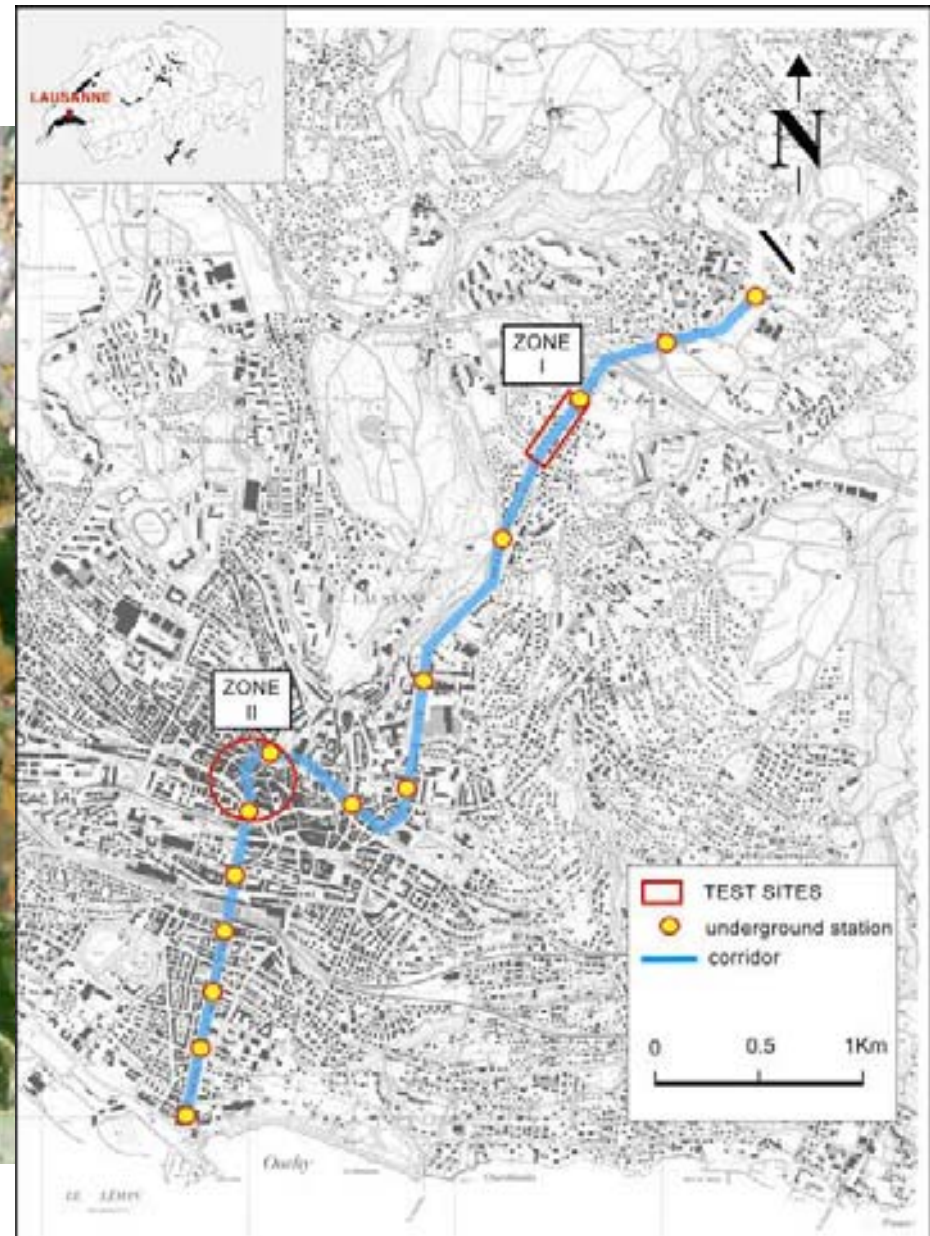
- length: 6 km
- difference in altitude: 323 m
- geology: alpine molassic bedrock (tertiary sandstone) and an overlaying quaternary glacial fill
- depth of bedrock: varying from 1.5 m to 25 m
- The choice of the corridor had to consider the depth of the bedrock

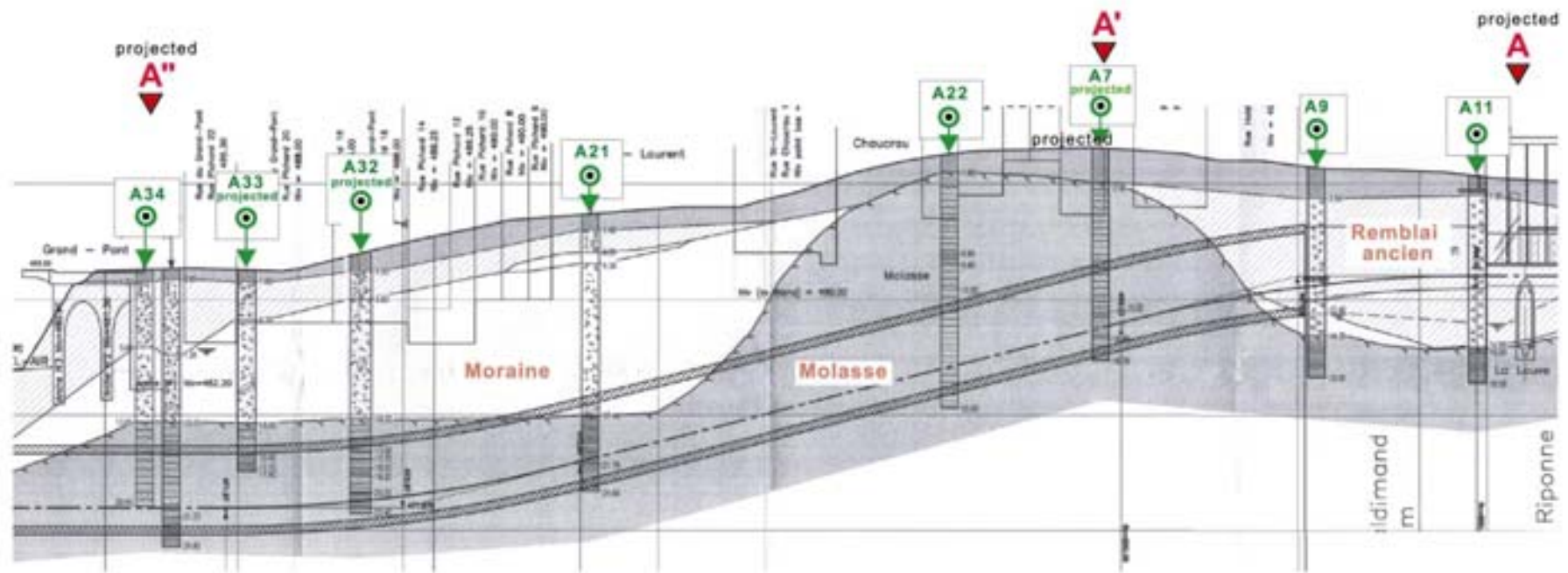
Zone II



Scintrex CG5

200 gravity stations

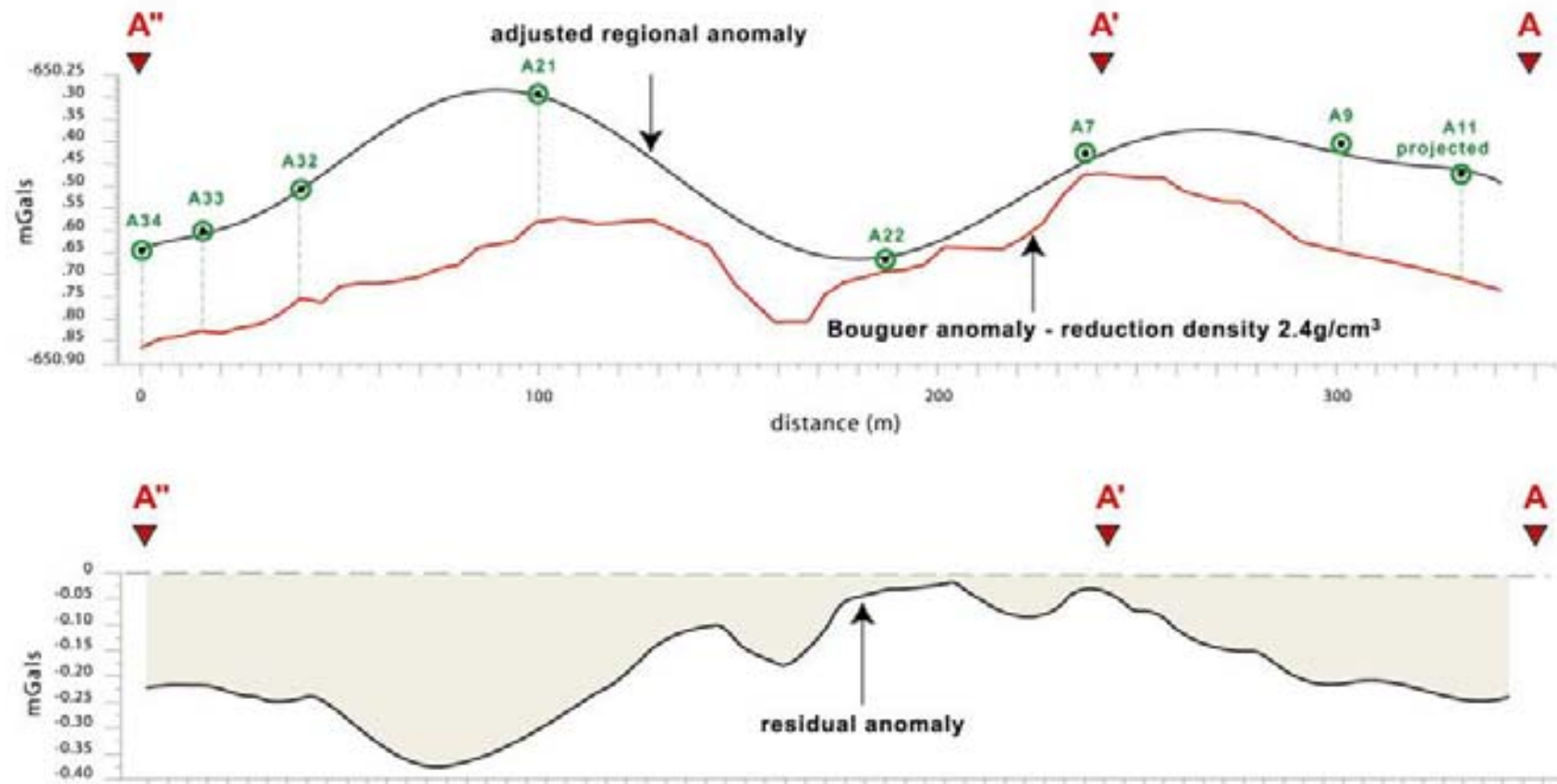




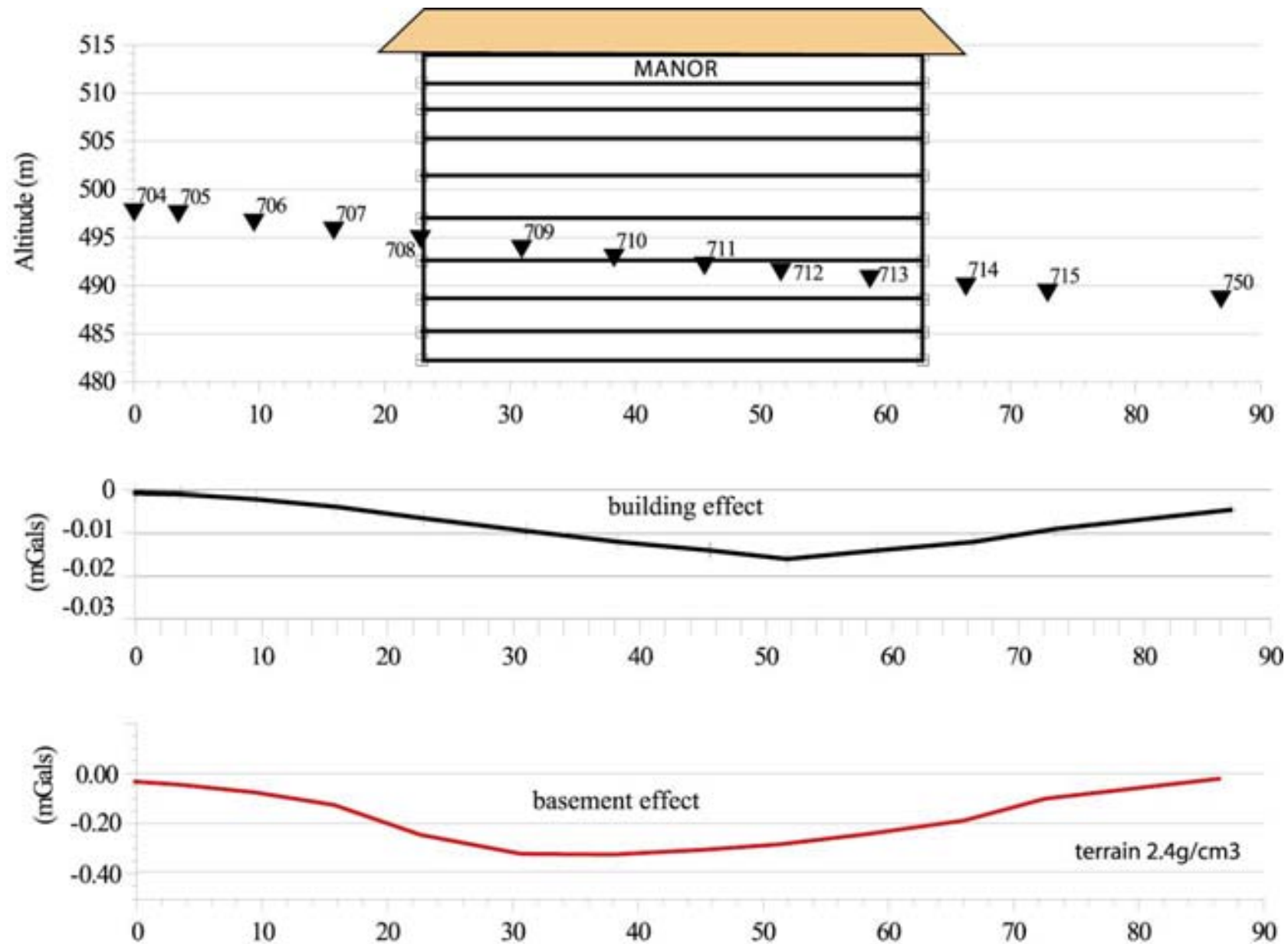
Geological section,
approximately A''-A'-A



Profile A''-A'-A



Building and basement gravity effect



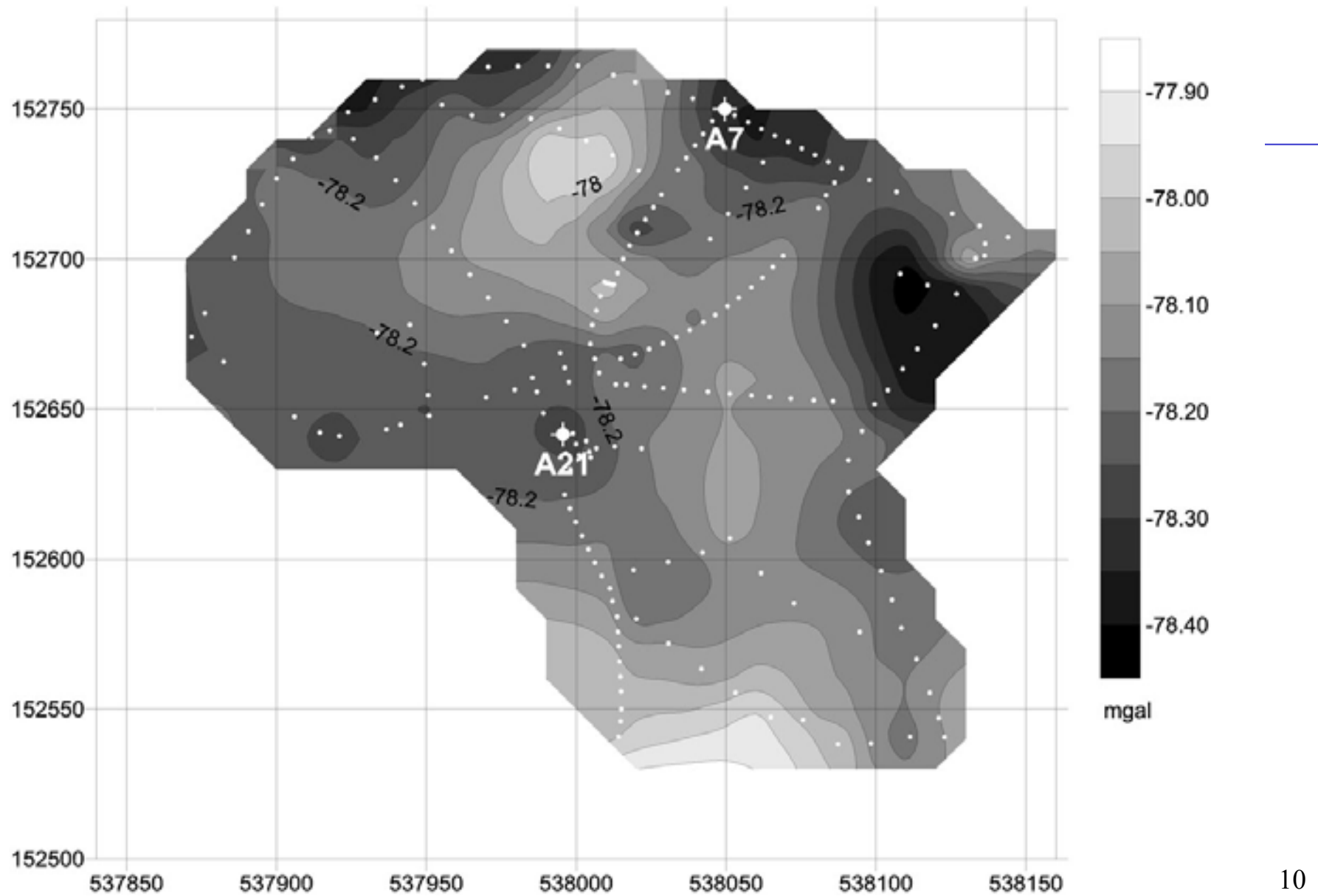
DEM for topographical corrections



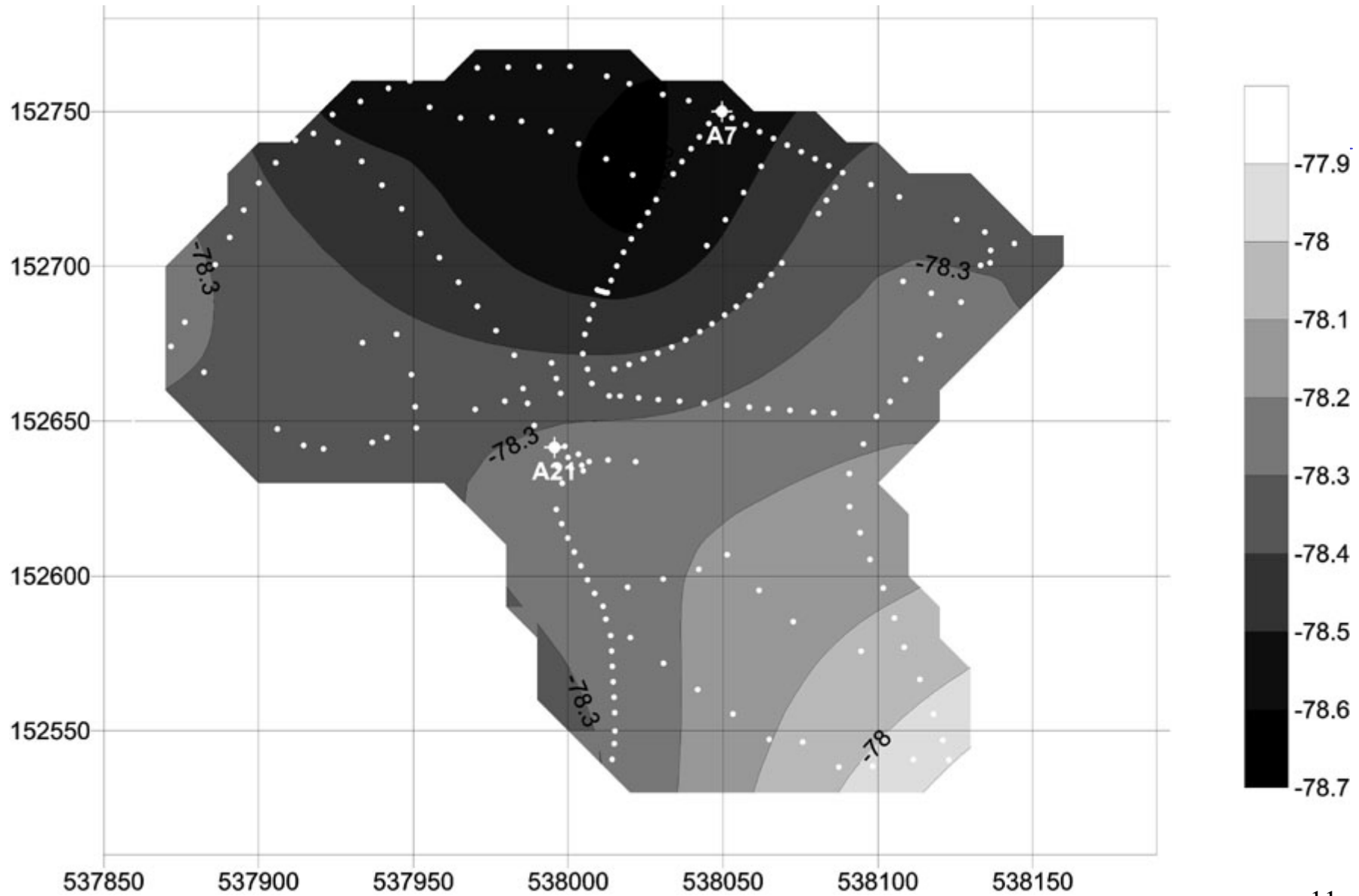
BASEMENT FROM:

- Cadastral plan
- Building typology
- GIS

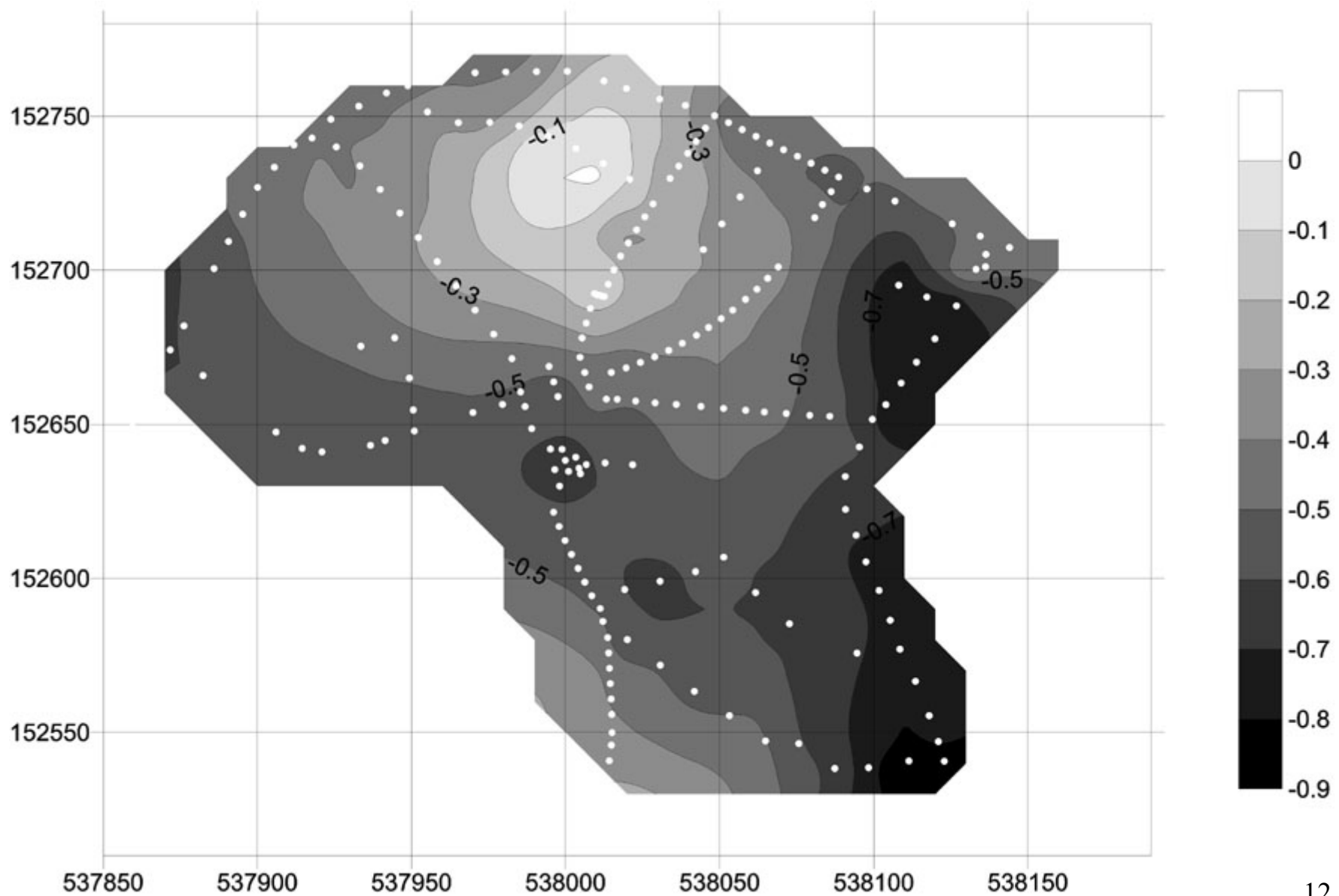
Bouguer Anomaly



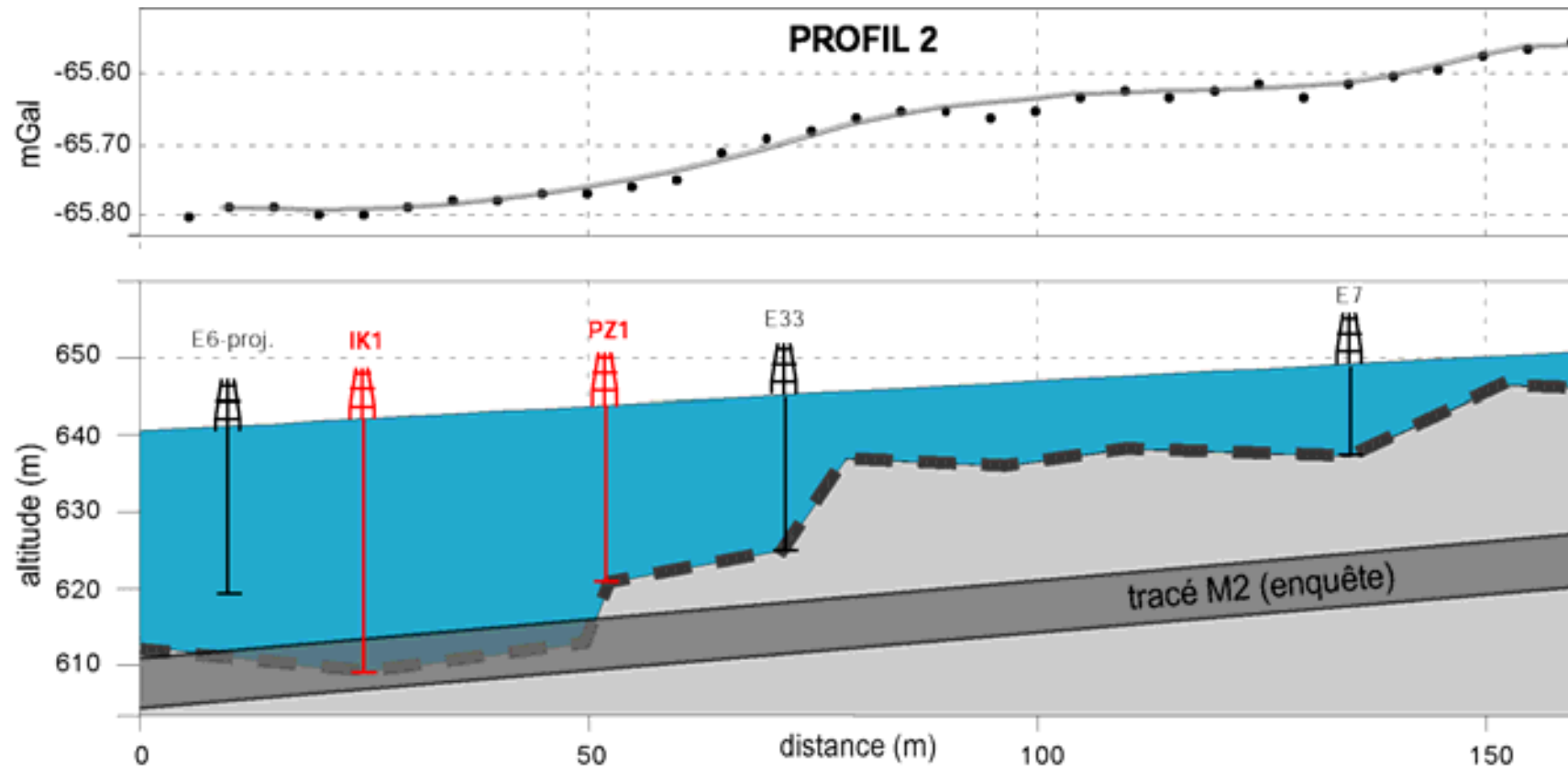
Regional Anomaly



Residual Anomaly



Result...

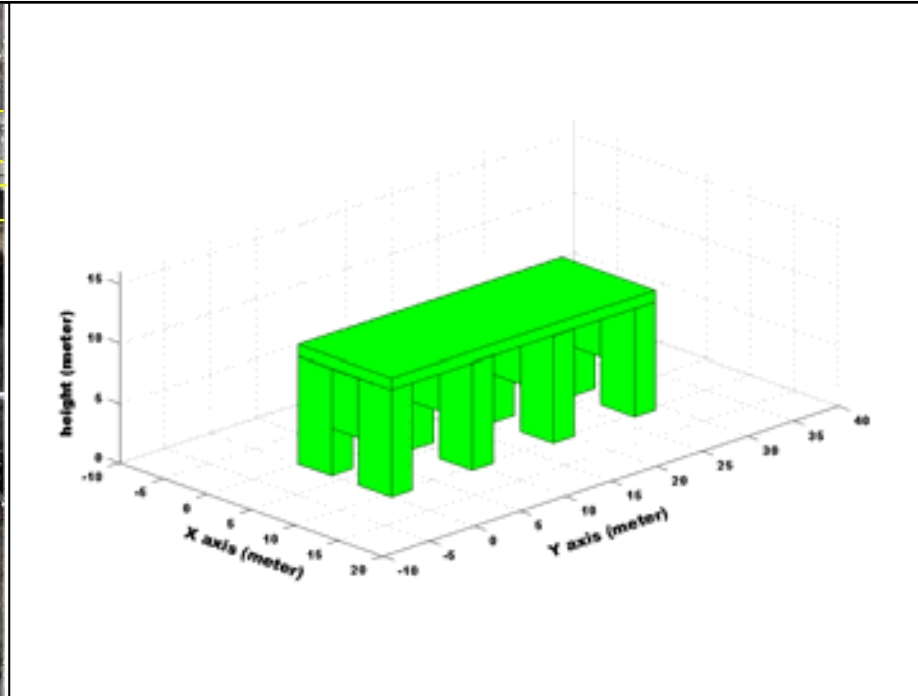
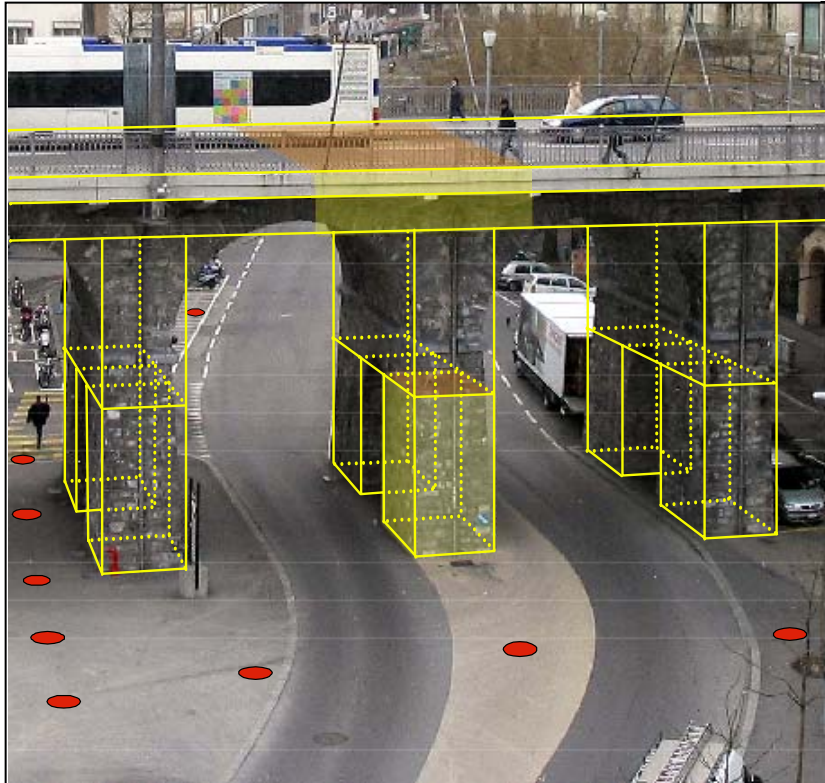


Complex building corrections

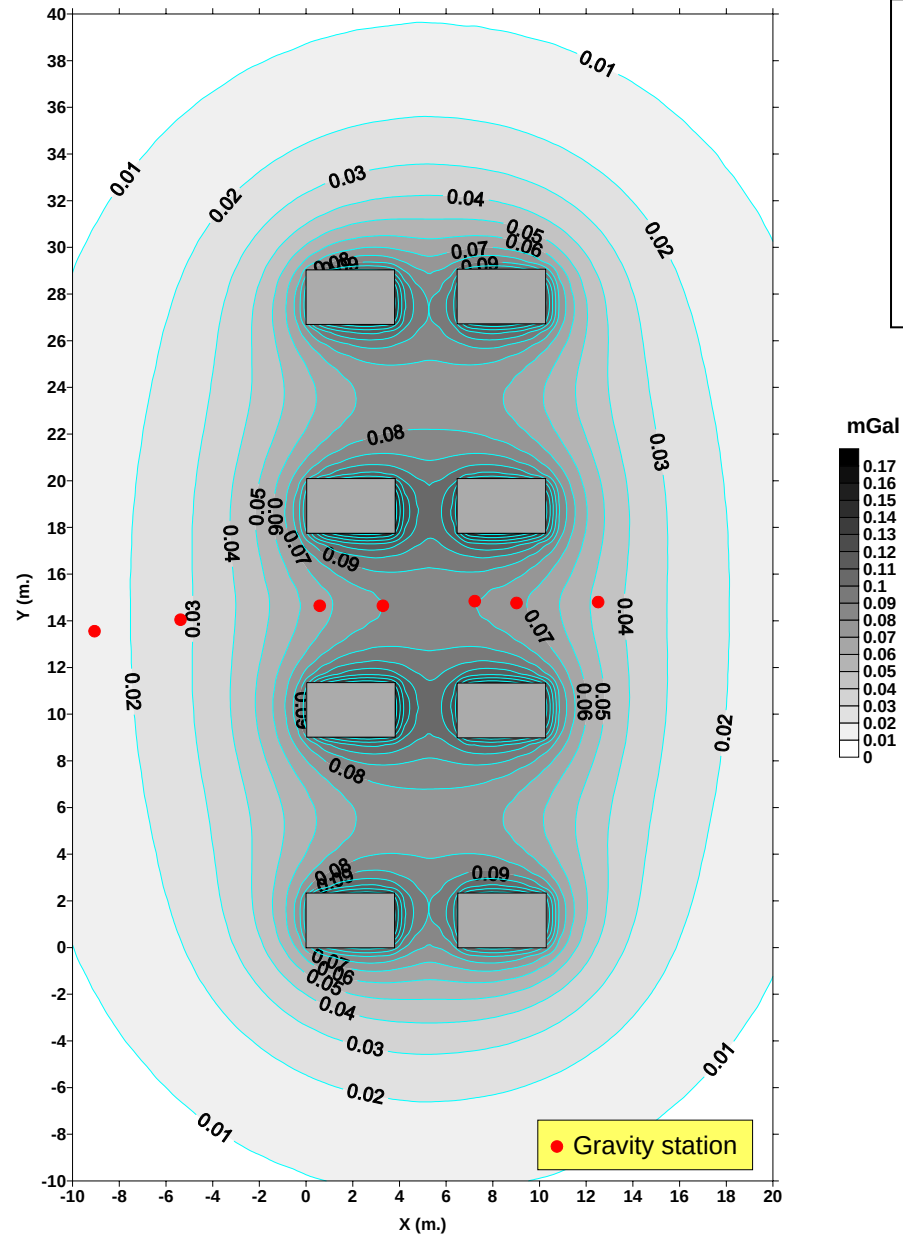


Painting of the valley and the bridge before 1874
and actual picture of the same zone

Rectangular prisms are used for modeling the bridge's pillars

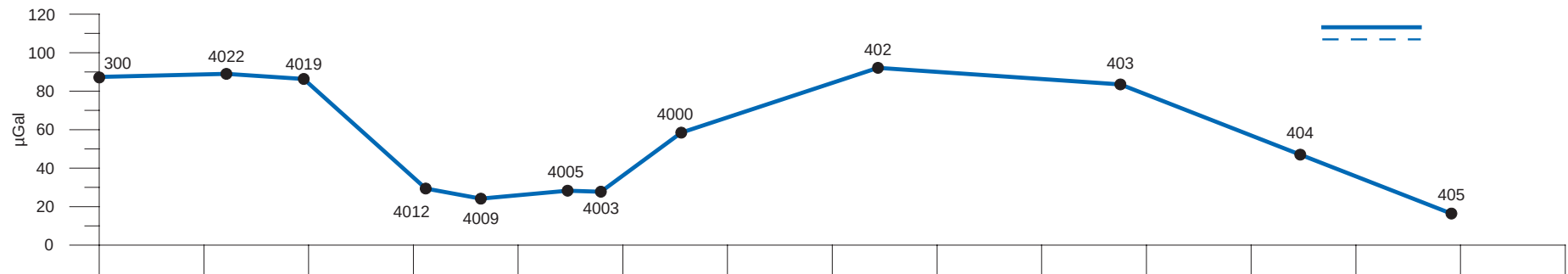


Gravity effect of the bridge

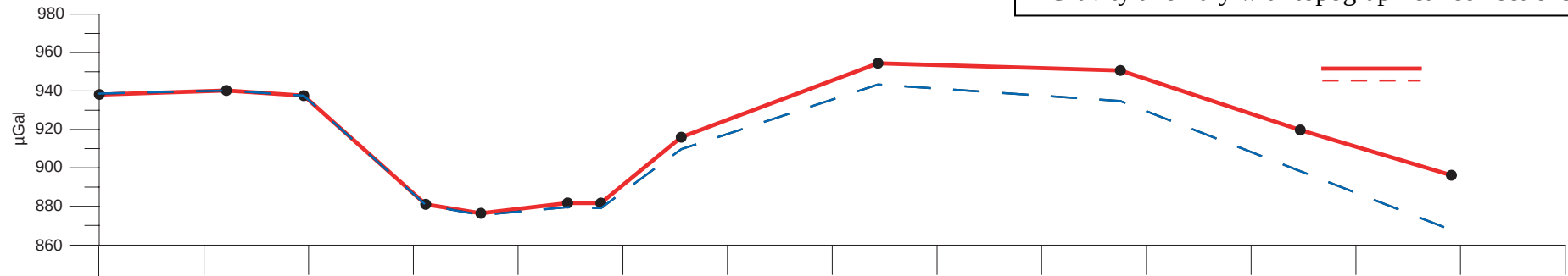


- Formulation of rectangular prism (Nagy, 1966)
- Pillar's density is fixed to 2.00 g/cm^3

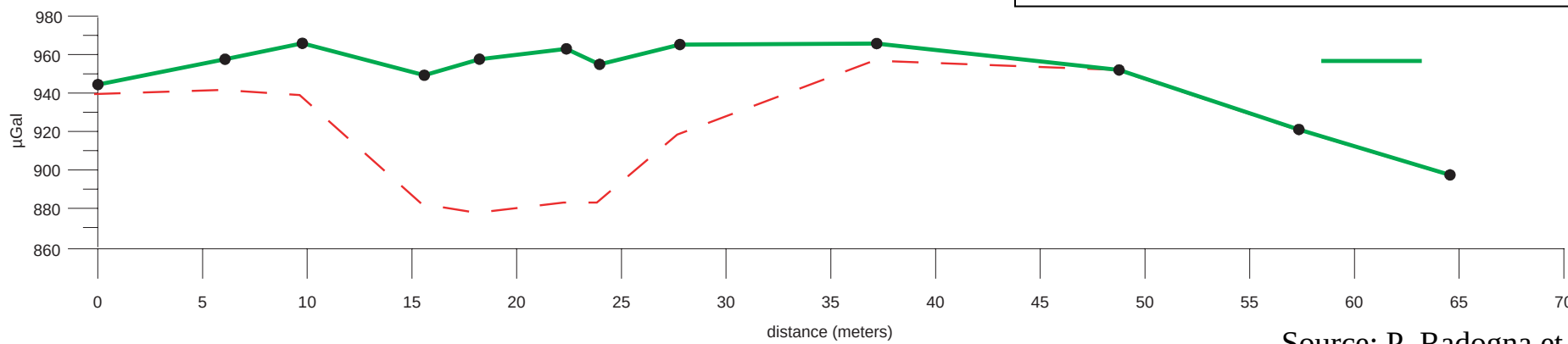
Standard corrections gravity anomaly without
topographical corrections.
Reduction density : 2.40 g/cm^3



Gravity anomaly with topographical corrections



Gravity anomaly with bridge effect corrections



6. Conclusions

Advantages

- The only geophysical method that describes directly the density of the subsurface materials
- No artificial source required
- Useful in urban environment!

Drawbacks

- Expensive
- Complex acquisition process
- Complex data processing
- Limited resolution
- Very sensitive to non-uniqueness in the modeling solutions