# grat

## open source software for computing atmospheric gravity correction using numerical weather models

### The name of the game

**grat** is the software developed to facilitate computations of **at**mospheric **gr**avity corrections. In Polish it has also a meaning of junk – usually useless thing. Let's hope it's not the case...

### Phenomena

The atmosphere is one of most important source of disturbances in gravimetry. This effect can easily mask small geophysical and geodynamics signals. Usually it is corrected with single admittance factor Some improvement of few μGal can obtained when physical phenomena is taken into account.

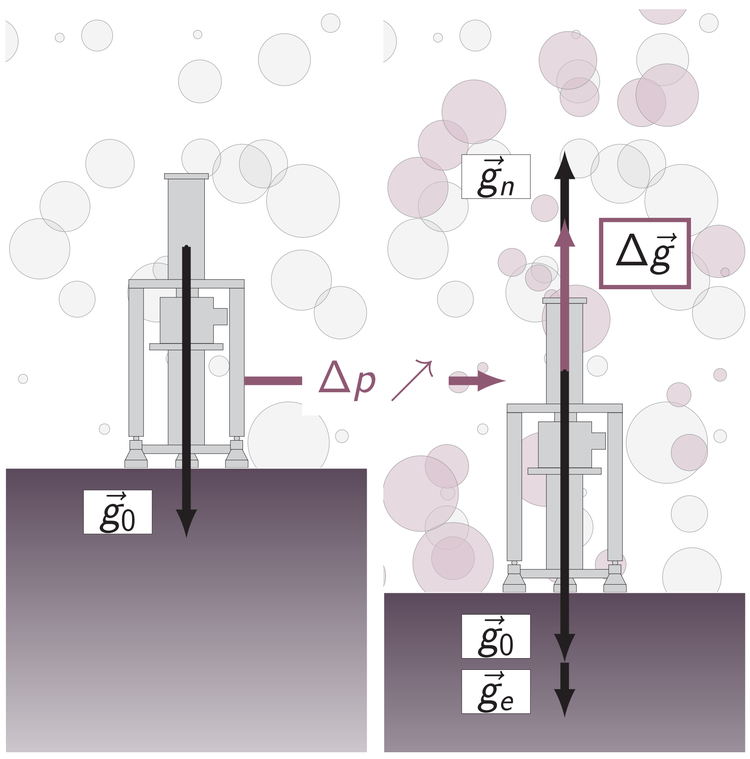


**Figure.** Atmospheric pressure changes causes two effects on gravity measurements. Direct attraction of air masses – newtonian term ($\Delta g_n$) and indirect effect due to atmospheric loading – deformation term ($\Delta g_e$),

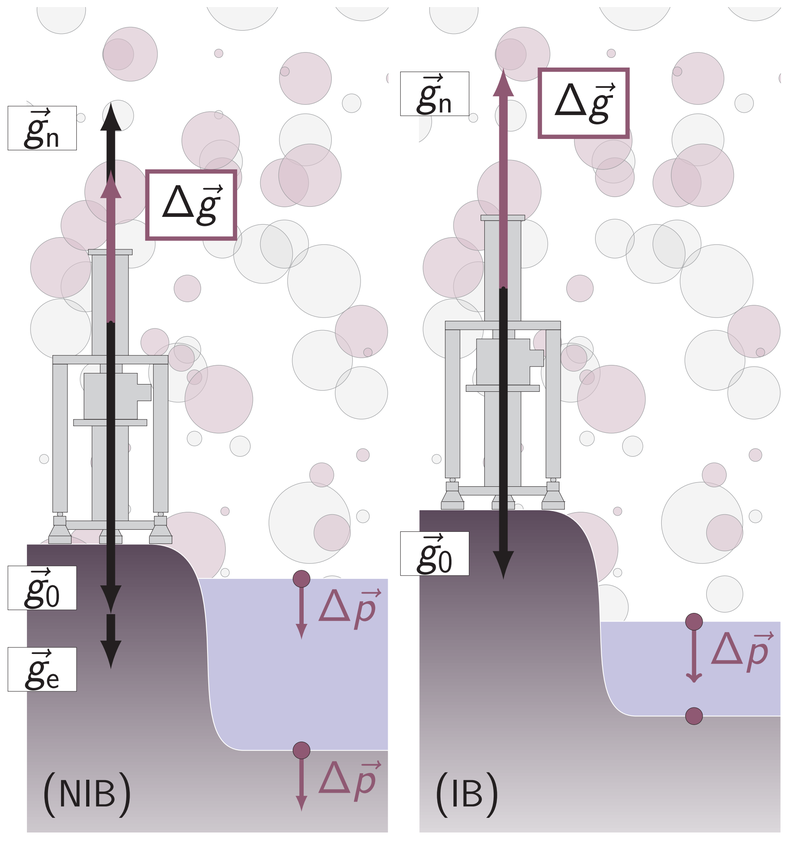


**Figure.** This is even more complicated when one takes into account different response of oceans on atmospheric pressure loading – this is usually handled with IB and NIB hypothesis

### Main features

- **grat** was designed as multi purpose tool. It uses numerical weather models for computation of atmospheric gravity corrections.
- **deformation** effect is computed using Greens function. It can also use user specified functions using appropriate normalization schemes.
- **attraction** term can be computed on the basis of atmospheric pressure fields using atmospheric gravity functions (computed on the fly or predefined tables from previous studies...
- ...or using fully 3D method! – integration of atmospheric masses

1D 2D 3D

### Pros

- open source (under GPL license) – you can do whatever you want (almost)
- very flexible – all settings can be adapted easily to user needs
- programmable – command line tool
- only free external library is needed – netCDF
- **speed** – fully written in Fortran with optimization in the loops, uses binary data files
- IB and NIB are supported
- ocean mass conservation on demand
- polygons inclusion and exclusion

### Cons

- the software is not finished (yet) – will be in very near future
- not tested by community
- no control (only one maintainer)
- some Fortran knowledge is needed in case of compilation problem (however Makefile is included)
- no portable (yet), no binaries
- needs compiler compliant with Fortran2008 specification

### Sources

- git repository: https://code.google.com/p/grat/
- documentation: https://grat.googlecode.com/git/doc/latex/refman.pdf
- this poster: https://bitbucket.org/mrajner/pubs/raw/master/2013_iag_grat.pdf
- examples and graphs in PhD thesis: https://bitbucket.org/mrajner/pubs/raw/master/dr.pdf

### References and Acknowledgements

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