Still valuable measurements taken with spring gravimeter

results from Józefosław observatory

Marcin Rajner

Politechnika Warszawska
Warsaw University of Technology

1 Introduction

Figure. Location of Józefosław Observatory

We show here selected results obtained with spring gravimeter LCR-ET26 located at Józefosław observatory, in the vicinity of Warsaw. With a few year of measurements we were able to present some geodynamics effects in gravity. Particularly we put an attention to estimation of tidal gravimetric factors, atmospheric effects, Earth free oscillations and Free Core Nutation. We found here a very good agreement with modeled values for these phenomena and with previous estimations by other authors. We present here that even in the era of superconducting gravimeters the spring type one can also give valuable results.

2 Anthropogenic noise

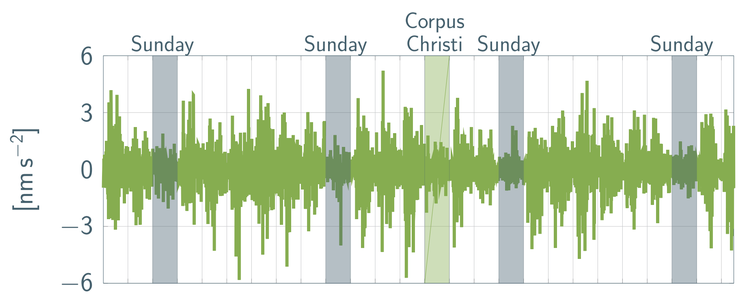


Figure. Time derivative of gravity residuals (tides, ocean loading and pressure effects removed)

3 Atmosphere (admittance)

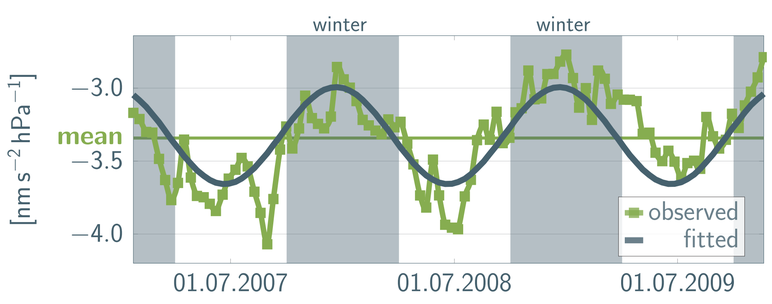


Figure. Seasonal variation of admittance factor (upper graph) and the difference in term of gravity correction when compared to single constant value

4 Atmosphere (frequency dependent)

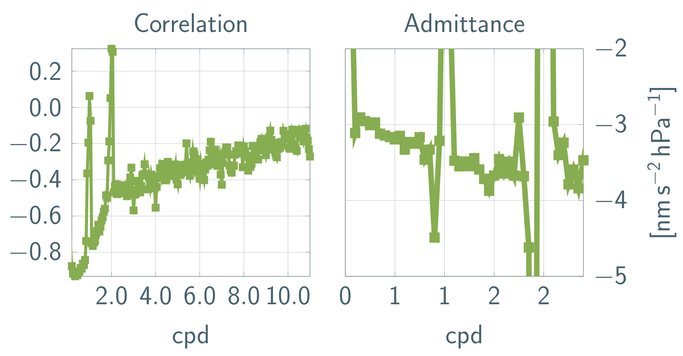


Figure. Correlation coefficient (left graph) and admittance factor (right graph) from frequency dependent analysis

5 Earth free oscillations

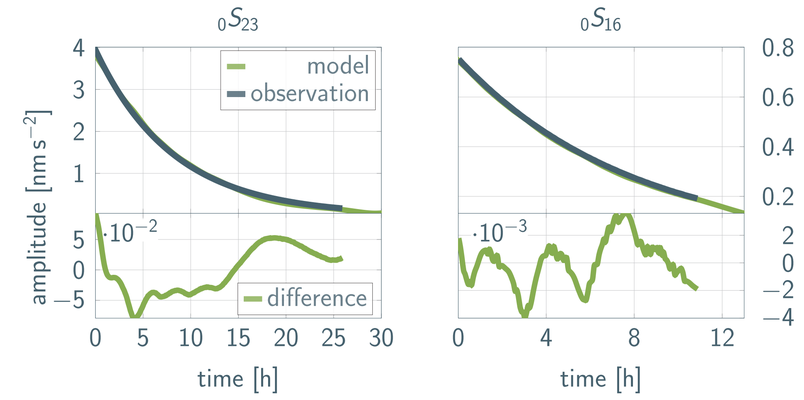


Figure. Fitted exponential regression function for two modes. The estimated Q value for $_0S_{23}$ is 293 comparing to theoretical value of 259. For $_0S_{16}$ we found 284 when the expected from Earth model is 325 respectively

6 Free Core Nutation and Quality Factor

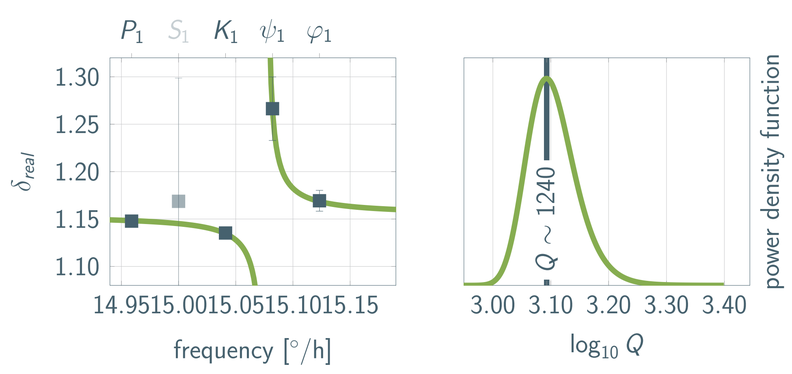
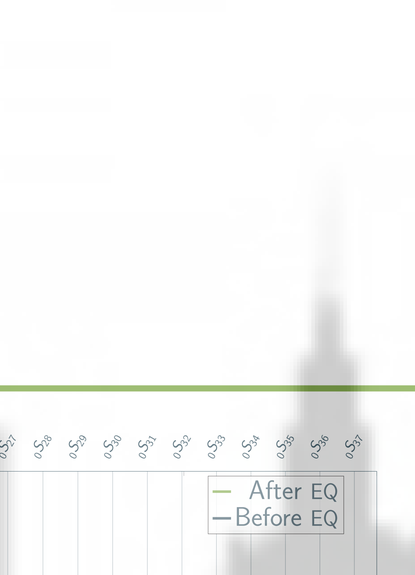


Figure. Resonance curve fitted to gravimetric factors and quality factor determined with bayesian method

7 FCN (result)

Table. Comparison of FCN period determination from different studies

Author	Method
this study	gravity
Rosat *et al.* (2009)	gravity
Ducarme *et al.* (2007)	gravity
Sun *et al.* (2004)	gravity
Sato *et al.* (2004)	gravity
Mathews *et al.* (2002)	VLBI
Dehant *et al.* - hydrostatic (1999)	theory
Dehant *et al.* - nonhydrostatic inelastic (1999)	theory
Neumeyer and Dittfeld (1997)	gravity
Haas and Schuh (1996)	VLBI
Jiang and Smylie (1995)	VLBI
Defraigne*et al.* (1994)	combined
Cummins and Wahr (1993)	gravity
Herring *et al.* (1991)	VLBI
Neuberg *et al.* (1990)	gravity
Richter and Zurn (1988)	gravity
Herring *et al.* (1986)	VLBI
Wahr and Bergen (1986)	theory
Wahr (1981)	theory
Sasao *et al.* (1980)	theory



8 Conclusions and Acknowledgements

In the era of Superconducting gravimeters the spring type can also give valuable results.

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9 Earth free oscillations (amplitude spectra)

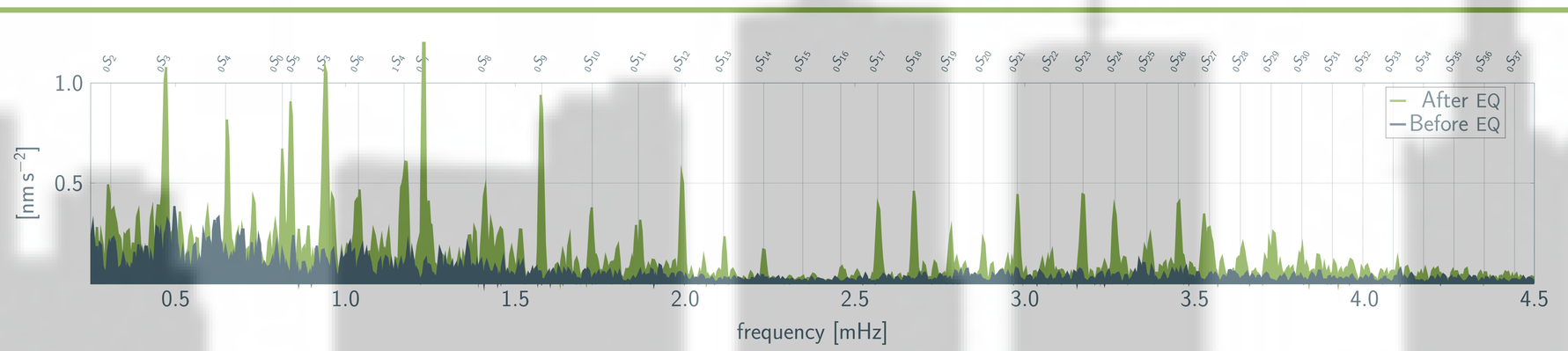

Figure. Amplitude spectra from about 5h to 43h after Chilean (2010) earthquake. For comparison the spectra from window of 48 length before earthquake are shown