SENSITIVITY OF SATELLITE GOCE TO DETECT BASEMENT AND MOHO UNDULATIONS

C. Braitenberg [1], M. Reguzzoni [2]

1 Dipartimento di Geoscienze, Università degli Studi di Trieste, Italy

2 DIIAR, Politecnico di Milano, Polo Regionale di Como, Italy

The Goce satellite is the first mission to carry a gravity gradiometer on board with the goal to improve knowledge of the global earth gravity potential field. It has been launched march 17, 2009 and has been acquiring data since that date, including a several month lasting calibration phase. The satellite is designed to produce a global satellite-only gravity field in the spherical harmonic expansion up to degree and order n=250. Previous missions, including the Grace satellite, contribute to a maximum degree and order of n=120. Up to date the global field with the highest degree and order of the expansion is the EGM2008 field (Pavlis et al., 2008), complete to n=2159. The goal of our work is to estimate the geologically relevant crustal structures which can be studied with the GOCE-data and for which we can expect to obtain an improved knowledge with respect to existing models. We base our study on the degree error values of the Stokes coefficients of the existing gravity models (EGM2008 and EIGEN5C) and on the first error values of the GOCE satellite. The degree error values are tied to the spherical harmonic expansion and consequently we perform the sensitivity study in the spectral domain.

We consider in detail two density discontinuities, which can be found everywhere in the crust, and which are the top basement and the Moho (Braitenberg et al., 2010). The density discontinuity is expressed as a sheet mass which we can expand in spherical harmonics. We use the relations that tie the sheet mass to the disturbing potential field to determine the smallest mass that can be detected, given the error corresponding to a certain degree of the field. We obtain thus the smallest boundary oscillation that can be detected at the level of the crust-mantle boundary, and at the level of the basement. In our solution available constraints on the Moho stemming from seismic or receiver functions are taken into account. We show under which conditions the GOCE gravity field produces an improvement of present knowledge on the boundaries. We discuss the satellite derived gravity and gravity gradient field for North-Africa, where large parts are lacking terrestrial measurements, and therefore the new observations are an effective improvement. Our study is accomplished in the frame of different projects as the GOCE-Italy project supported by the Italian Space Agency, responsible Prof. F. Sansò , the Brazilian FAPESP project, responsible Prof. I. Vittorello, and is part of the ESA GOCE EO project ID 4323, responsible Prof. C. Braitenberg.

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SHALLOW VELOCITY STRUCTURES FROM NON-LINEAR INVERSION OF SURFACE WAVES DISPERSION CHARACTERISTICS: APPLICATION AT VOLCANO ETNA

L. Cauchie [1], G. Saccorotti [2]

1 School of Geological Sciences, University College of Dublin, Ireland

2 Istituto Nazionale di Geofisica e Vulcanologia, Pisa, Italy

The determination of the elastic properties of the shallow crust is very important for understanding the propagation of seismic waves close to the Earth's surface. Experimental observations and theoretical considerations demonstrate that the shallowest velocity structure can influence significantly amplitude, frequency and phase of the seismic waves. Such determinations are of primary