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Mantle viscosity inference comparing PGR with GRACE data at global scale

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Until the 1998 in the time-variable gravity field retrieved with the SLR (Satellite Laser Ranging) technique the PGR (Post Glacial Rebound) was clearly visible. After the 2000 some other phenomena become much more intense, and now from the analysis of GRACE data it is evident that the Greenland and the whole North Pole is loosing mass at a rate much larger than the antagonist PGR signal. So since the 2002 the time-variable gravity field shows clearly this other phenomenon and the PGR signal is shaded. For this reason it is now impossible to perform correctly a global inversion problem using the GRACE data compared with the synthetic PGR. Only at local scale, such as in the Hudson Bay, the only site where the PGR signal is clearly visible, is possible to perform an inversion problem. It is thus of importance to gain the capability to quantify and to localize the mass distribution from the gravity field, in order to discriminate among various geophysical phenomena whose gravitational effects are superimposed. An approach has been developed to derive a surface mass distribution in water equivalent, starting from an initial guess, which best reproduces the observed gravity field at the desired spatial resolution. By taking advantage of this methodology, surface mass distributions, attributable to the secular effects of present-day ice loss or snow accumulation in a variety of sites over the globe, to hydrologic basins and even to some ocean signals, have been derived and so the gravity generated by them has been removed from the GRACE data. The result is a gravity pattern where the effects of PGR are much clearer and ready to be compared with the synthetic ones. Inversion of the PGR signal from different Pleistocene deglaciation models (ICE-3G and ANU) has thus produced valuable viscosity profiles of the upper and lower mantle, which can be compared with those obtained from SLR (Satellite Laser Ranging) analyses.