



Solid Earth signatures of surface mass variations and improved global monitoring using multi-satellite data combination

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Tidal and climate-driven surface mass variations result in several distinct geophysical signatures of time-variable gravity, load-induced crustal deformation, geocenter motion, Earth orientation and ocean bottom pressure changes. Many of these are now accurately measured by multi-satellite geodetic techniques of GRACE, GPS/SLR/VLBI, Topex/Poseidon, and Jason. These independent techniques provide complimentary and overlapping information. They are compared for calibration and combined for enhanced estimation of the mass transport processes. The data combination yields inverse solutions of degree-1 surface mass variation coefficients at elastic time scales corresponding to equivalent geocenter motion with better than 0.4 mm annual precision in all three components. The combined inversions and posteriori optimal point and regional filtering also achieve superior estimates of global patterns and regional averages. Further improvements can be expected from more detailed and better quantification of a priori information, and from mitigation of correlated errors through intelligent use of more complete and accurate full covariance matrices.