1067-86-842 **Frederik J Simons*** (fjsimons@gmail.com), Guyot Hall 321B, Princeton, NJ 08544, and **Sofia C. Olhede**, Department of Statistical Science, London, WC1E 6BT, England.
Maximum-likelihood theory for the inversion of gravity and topography data to recover the elastic strength of a planetary lithosphere.

The lithosphere is modeled using a differential equation characterized by a set of parameters, at least one of which, under the assumption of elastic behavior, is generally thought of as a proxy for its strength: the flexural rigidity (D), or, by extension, the elastic thickness. This lithospheric system then takes an input: topographic loading by mountain building and other processes, and maps it into an output: the gravity anomaly and the final, measurable, topography. Estimating D, most usually in the spectral domain, generally involves constructing summaries of gravity and topography. Both admittance and coherence are popular.Rarely, if ever, are lithospheric models found that satisfy both coherence and admittance to within their true error. We intend to abandon coherence and admittance studies for good, by proposing an entirely different method of estimating flexural rigidity, which returns it and its confidence interval, as well as tests for the suitability of the assumptions made along the way, and the possible presence of correlated loads and anisotropy in the response. The crux of the method is that it employs a maximum-likelihood formulation that remains very grounded in the data themselves and is formulated in terms of variables that do have a Gaussian distribution. (Received September 15, 2010)