Abstract Submitted
for the TSF19 Meeting of
The American Physical Society

Seafloor topography estimation from Vertical Gravity Gradients using Particle Swarm Optimization YELBIR KAZHYKARIM, SOUMYA D. MOHANTY, University of Texas Rio Grande Valley — The Earth's Vertical Gravity Gradient (VGG) can be used to map seafloor topography but presents a challenging inverse problem. A promising approach is forward modeling, in which one searches over a set of candidate topographies and selects the one whose predicted VGG best fits the observed one. The main bottleneck here is solving the associated high-dimensional and non-linear optimization problem. Yang et al (2018) demonstrated a method in which the topography is parametrized by heights of mass elements on a rectangular grid and the $\approx 10^4$ dimensional optimization problem is tackled with simulated annealing (SA). We propose a computationally much cheaper method, using a stochastic optimization method known as Particle Swarm Optimization (PSO) and representing the topography as a linear combination of Radial Basis Functions (RBFs). First results, obtained without any tuning, show that the MATLAB code achieves an RMS error of 700 m with 500 RBFs (1500 parameters) and a 30 min run time. This is comparable to the error of 350 m from the much more expensive SA method that takes hours. Improvements to our method are likely to result in state of the art performance levels.

Yelbir Kazhykarim
University of Texas Rio Grande Valley

Date submitted: 07 Oct 2019 Electronic form version 1.4