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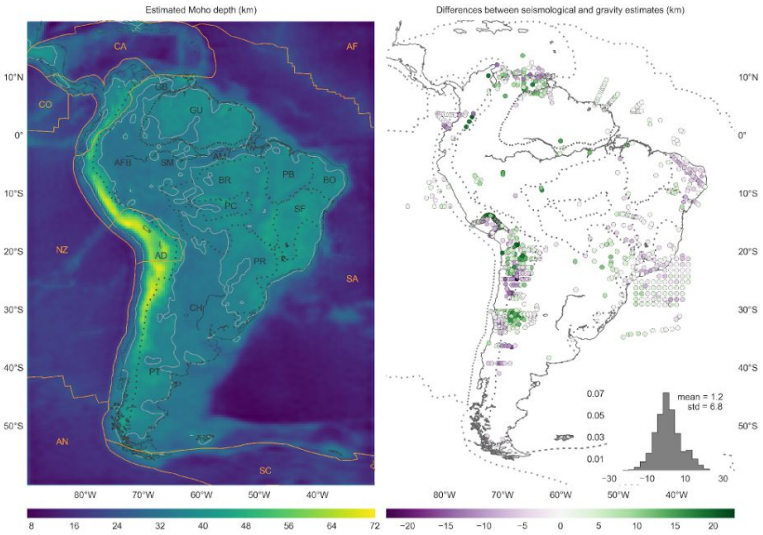
Inverting gravity to map the Moho: A new method and the open source software that made it possible



fatiando a terra

modeling and inversion for geophysics | fatiando.org

Abstract

The inner density distribution of the Earth can be inferred from disturbances in its gravitational field. However, accomplishing this is never easy. There are many possible parameterizations for the mathematical model, which is often non-linear. To make matters worse, gravity data alone do not contain enough information to obtain a unique and stable solution. One must add independent information to constrain the solution space, often in the form of regularization. Many different methods for performing this inference have been developed and research in this field is still active. Investigating new methodologies implies developing complex software, which often must be able to deal with sparse matrices and parallelism. I'll present the open-source Python library Fatiando a Terra. It implements many of the components required for developing inversion methods, such as forward modeling, data processing and I/O, and regularization. I'll also show how I used this library to develop a computationally efficient method for estimating the Moho depth from gravity data using a spherical approximation of the Earth.