Geophysical Research Abstracts,
Vol. 10, EGU2008-A-10113, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-10113
EGU General Assembly 2008

Construction of the maximal solution of Backus' problem

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Let Ω denote the domain exterior to the unit sphere S. The (simplified) Backus problem consists in finding a function $u \in C^1(\bar{\Omega})$, harmonic on Ω, such that u tends to zero at infinity and the norm of the gradient of u takes prescribed values on S. Apart from a change of sign, the solution is not unique in general. However, the solution is unique in the class of functions with the additional property that the radial component of the gradient of u on S is nonpositive, such as it is relevant in Geodesy. If this solution exists, then $\pm u$ are the maximal and the minimal solutions of the problem. In this paper we continue our previous research on this problem, but this time our purpose is to further a method of successive approximations studied by F. Sacerdote and F. Sansò (1989) that makes possible to construct the maximal solution of the Backus problem.