investigation of the ancient climate and glacial history of Antarctica. It will link the results of geophysical surveys and geological studies on and around the Antarctic continent with ice sheet and climate models to identify the processes that govern Antarctic climate change, and those which feed this change back around the globe. It will provide case studies of past climate change for particular time slices, against which models of future change in Antarctica can be tested. Results will improve forecasts of how Antarctic climate is likely to respond to future global change.

The Evolution and Biodiversity in the Antarctic (EBA) program aims to determine how environmental change influences the properties and dynamics of Antarctic and Southern Ocean ecosystems, and to predict how organisms there might respond to future environmental change. This program integrates marine, terrestrial, and freshwater ecosystem studies in a manner never before attempted. By comparing the outcome of parallel evolutionary processes over the range of Antarctic environments, fundamental insights can be obtained into evolution and the ways in which life responds to change, from the molecular to the organism level and ultimately to the level of an entire biome.

The program on Interhemispheric Conjugacy Effects in Solar-Terrestrial and Aeronomy Research (ICESTAR) seeks a unified framework that can specify the global state of geospace, that part of outer space where the solar wind interacts with the Earth's outer atmosphere, ionosphere, and magnetosphere. The program will study how energy is transferred from the solar wind into the geospace environment simultaneously at both poles. Key goals are to increase knowledge about the dynamics of the Earth's magnetosphere during geomagnetic storms and to predict the solar-driven variations of geospace and hence "space weather," which pose a potential hazard to space-based and ground-based technologies.

The Subglacial Antarctic Lake Environments (SALE) program has been described in some detail by *Priscu et al.* [2003]. It will provide exciting opportunities to examine biodiversity and evolutionary responses in the subglacial lakes that are now known to be common in Antarctica, and which provide analogues for life on early Earth and on other planetary bodies.

Reference

Priscu, J. et al. (2003), An international plan for Antarctic subglacial lake exploration, *Polar Geogr. 27*(1), 69–83.

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Graphical User Interface for Interactive Seismic Ray Tracing

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RayGUI 2.0 is a new version of RayGUI, a graphical user interface (GUI) to the seismic travel time modeling program of *Zelt and Smith* [1992]. It represents a significant improvement over the previous version of RayGUI (RayGUI 1.04; *Loss et al.* [1998a, 1998b]).

RayGUI 2.0 uses an updated Java version (1.3), and can run on various operating systems (UNIX, Linux, and Mac OS X). Several new functions have been incorporated, including executing the forward and inversion codes of *Zelt and Smith* [1992], creating models or adding new parts of models from an ASCII file, graphically adding layers or points, graphically pinching layers, changing the velocity value of a control point, reporting point location and velocity, importing travel-time lists, generating postscript files, exporting the velocity model into an ASCII file, generating 1-D velocity profiles at specified locations, calculating root-mean-square errors between observed and calculated arrivals for selected phases, and accessing the ray trace log, as well as several other new display features.

Users of previous versions of RayGUI were prevented from modeling multiple arrivals from multiple shots due to computational speed limitations. This is no longer an issue, as RayGUI 2.0 is computationally efficient. RayGUI 2.0 can also be used by multiple users simultaneously as long as each user is working in a separate working directory.

Ray tracing in RayGUI is performed by invoking *rayinvr*, a widely-used package for a 2-D forward modeling and inversion of seismic rays in an isotropic medium [*Zelt and Smith*, 1992]. RayGUI 2.0 completely integrates all the functionalities of the *rayinvr* program, and the user does not need to run *rayinvr* separately.

The velocity model consists of distinct layers with continuous 2-D velocity gradients, with vertically and laterally varying velocities. Layer interfaces and velocities are defined by control points, which the user specifies (Figure 1). Observed and calculated travel times can be displayed either in the same window as the velocity model or in a separate window. Users can interactively select a portion of the velocity model to display by dragging a rectangle over the velocity model, and specify time and distance ranges of the displayed plots by entering ranges in separate windows. RayGUI 2.0 enables the user to graphically edit a velocity model, to select ray type, to select shot, and to change the ray-tracing parameters (Figure 1).

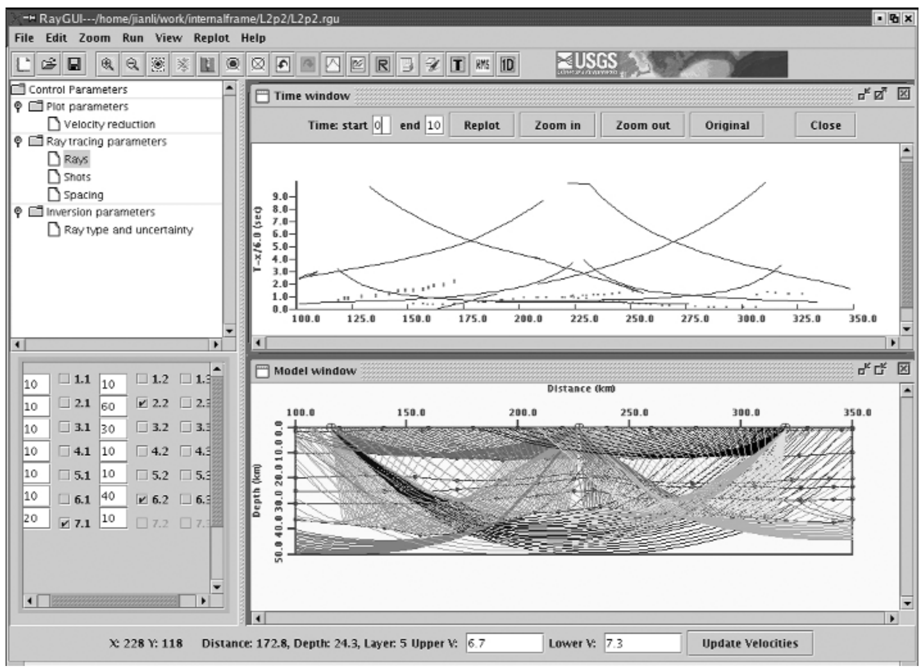

Fig. 1. An example of the screen display of RayGUI2.0, which includes drawing panels for the model and ray paths and for travel times, interactive control parameter panels (on the left), a menu and tool bar (on top), and a message bar (on the bottom).

RayGUI 2.0 was written in JAVA, and FORTRAN 77 and ANSI-C compliers are required to compile *rayinvr* and some auxiliary programs. The package can be freely obtained for non-commercial purposes by contacting Uri ten Brink at utenbrink@usgs.gov. More details and the complete manual are available at http://pubs.usgs.gov/of/2004/1426/.

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