

A Solid Earth Research and Teaching Environment Hannah Waterhouse, Kevin Milner, Thorsten Becker, Jared Sain, & Danijel Schorlemmer University of Southern California, Los Angeles (twb@usc.edu) Open-source implementation

Design goals

SEATREE provides a modular, robust, and user-friendly software framework to facilitate using solid Earth research tools in the classroom and for interdisciplinary, scientific collaboration. We use python wrappers and a "soft" object-oriented programming approach to make use of modern software design, while remaining compatible with traditional scientific coding. Our goals are to provide a fully contained, yet transparent package that allows users to operate in an easy, graphically supported "black box" mode, while allowing to look under the hood. In the long run, we envision SEATREE to contribute to new ways of sharing scientific research, and making (numerical) experiments truly reproducible again.

hc module

Availability

Requirements

Documentation

Edit Viscosity

__300 km____

___1750 km______

Revert

Cancel

_<u>660 km</u>__

Use

-2500

Installation

Screenshots from currently implemented modules Global mantle flow 2D tomography

hc module

hc is a C-language implementation of a Hager & O'Connell (1981), semi-analytical, propagator matrix approach to solving for velocities and tractions in spherical shell Stokes flow in the presence of only radially varying viscosity.

This code is based on work by Bernhard Steinberger who modified the original source from ➡ Brad Hager and ➡ Rick O'Connell.

Bernhard's F77 was rewritten in C by
Thorsten Becker and Craig O'Neill in 2006 during the CIG mantle flow benchmarking effort.

References

z = 0 km

-10

- Hager, B. H. and O'Connell, R. J. (1981). A simple global model of plate dynamics and mantle convection J.
- Geophys. Res. 86, 4843 • 🖙 Steinberger, B. (2000). Slabs in the lower mantle - results of dynamic modelling compared with
- tomographic images and the geoid, Phys. Earth Planet. Inter., 118, 241. • 🖙 Steinberger, B. and A. Calderwood (2006). Models of large-scale viscous flow in the Earth's mantle with
- constraints from mineral physics and surface observations, Geophys. J. Int., 167, 1461.





Syn2D is a 2-D Cartesian tomography teaching tool contributed originally by ⇒ Lapo Boschi and slightly modified by ⇒ Thorsten Becker. The user can choose between

- a checkerboard or PGM grayscale image "Earth" structure,
- different, random station/receiver distributions, • different synthetic noise levels

The code will then trace rays through the input medium, and create synthetic datasets. The latter can then be inverted using LSQR least squares for different parameterizations and normal damping choices. The code creates map-view plots of the inverted structure and output for L-curve tradeoff analysis.



Low level: C, Fortran modules Wrappers: Python, module objects GUI: PyGtk GNOME toolkit Development: SVN, Trac Documentation: Wiki

- most recent release of SEATREE in a single tar file which includes the GUI and the most stable modules
- eodynamics.usc.edu/~becker/software/seatree.recent.tgz
- becker users 16750415 2008-03-13 09:13 seatree-0.1.1-031308.t
- ncludes a fully functional GUI and drivers for hc and larry. You will need this file if you do not VN version, and either obtain it manually or by running the fully automated install
- You can inspect the current source code through our \Rightarrow source browser, or checkout the \Rightarrow SVN repository by svn co http://geosys.usc.edu/svn/seatree/ seatree
- To install, then follow the SEATREE installation procedure below.

Non-Linear Earthquake Relocation

✓ G✓ God

NonLinLoc Module

Nonlinloc is a python-wrapped GUI for Anthony Lomax' NonLinLoc nonlinear earthquake location routines, visualization by means of Matplotlib calls. Ideally users will be able to change the veolcity models of the surrounding ground, and the take of angles and the travel times of the P & S waves and then visually be able to see the effects of these paremters on earthquake locations, as well as wave propogation. It also allows one to gain an understanding of the structure and patterns of the seismicity of an area.

III	SEATREE		
<u>F</u> ile <u>S</u> cript			
NonLinLoc			
Create Model Grid	Plot Model Grid		
Create Travel Time Grid	Plot Travel Time Grid		
Create Travel Angle Grid	Plot Angle Grid		
Do Event Location	Plot Locations 🗌 Plot Loc Sum		
Create Location Sum	Plot Locations		





syn2D module Availability Requirements Installation Documentation Python wrappers Command line shell interface



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	Wiki Timeline Roadmap Brows	e Source	View 1
root / <mark>py</mark>	rthon / seatree / modules / hc / flowGUI.py		
Revision 3	42, 22.2 kB (checked in by becker, 4 days ago)		
Added flag f	or density scaling.		
1 jmp	ort pygtk		
2 pvg	tk, require('2.0')		
3 imp	ort gtk, os, shutil		
4 imp	ort seatree.gui.util.guiUtils as guiUtils		
5			
<u>6</u> try			
7	from xyDialog import XYDialog		
<u>8</u>	snowEgitors = True;		
10	ept. print "matplotlib / pylab is not installed: Viscosity and density file editing will be disabled"		
11	showEditors = False;		
13 cla	ss FlowGUI:		
14			
15	<pre>definit(self, mainWindow, accel_group, flowCalc):</pre>		
16	self.mainWindow = mainWindow		
17	self.flowCalc = flowCalc		
18	solf toolting - atk Toolting()		
20	set (collips - glk.loclips()		
21	self.vBox = atk.VBox()		
22			
23	#		
24	# Calculations Section		
25	#		
20	# / aba1		
28	<pre>self.computeLabel = gtk.Label("Calculation Settings")</pre>		
29	self.computeLabel.set use markup(True)		
30	<pre>self.vBox.pack_start(self.computeLabel, expand=False)</pre>		
31			
32	# Density Scaling Type		
33	<pre>self.densScalingLabel = gtk.Label("Density Scaling Type")</pre>		
34	<pre>setT.gensScalingSelect = gtK.comDo_Dox_new_text() calf_depcScalingSelect append_text("Constant_scaling_factor")</pre>		
36	sett.densScalingSelect.append_text("Constant scaling (actor)		
37	self.densScalingSelect.connect("changed",self.setDensitvScalingTvpe)		
38	<pre>self.densScalingBox = gtk.HBox(homogeneous=True, spacing=5)</pre>		