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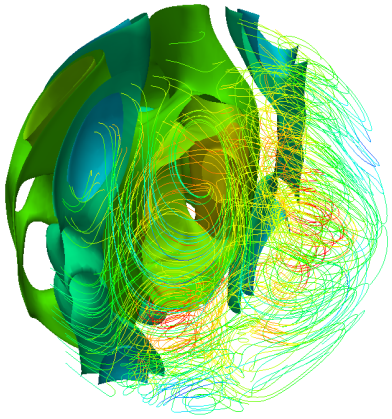
CIG News Elements

A Quarterly Newsletter

Computational Infrastructure for Geodynamics



Visualization of outer core shell dynamo simulation results from Calypso. Half of the shell is shown as pressure isosurfaces and half as velocity streamlines colored with the vertical magnitude of the magnetic field. In both sections the columnar convection cells are visible. Calypso was developed by Hiroaki Matsui and will be released through CIG in the upcoming quarter.

Announcements

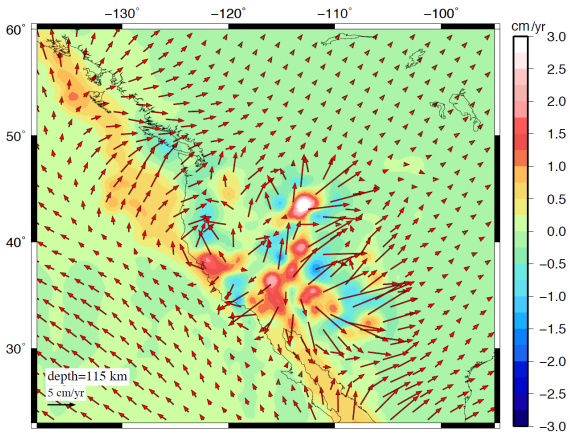
- **Next Webinar Thursday, October 10**
- **2013 Fall AGU**
- **CIG Business Meeting, December 10**

Inside this issue:

Research Highlight

Dynamics of the North American Continent

The forces that cause deformation of western North America have been debated for decades. Recent studies, primarily based on analysis of crustal stresses in the western United States, have suggested that the deformation of the region is mainly controlled by gravitational potential energy (GPE) variations and boundary loads, with basal tractions due to mantle flow playing a relatively minor role. Gosh et al. (2013) address these issues by modeling the deviatoric stress field over western North America from a 3-D finite element mantle circulation model, CitcomS, with lateral viscosity variations, using the latest tomography available for the region. They solve the equations for instantaneous, incompressible fluid flow with infinite Prandtl number, where flow is driven by mantle density anomalies (Boussinesq approximation). Their approach takes into account the contribution from both topography and shallow lithosphere structure (GPE variations that we apply as stress boundary condition) as well as that from deeper mantle flow in one single model, as opposed to separate lithosphere and circulation models, as has been done so far. In addition to predicting the deviatoric stresses, they also jointly fit the constraints of geoid, dynamic topography and plate motion both globally and over North America, in order to ensure that the forces that arise in our models are dynamically consistent. They use a resolution of ~0.75 × 0.75 ° for majority of the runs, although for the final models, they use a higher resolution of ~0.25 × 0.25 °. They argue that although GPE variations control a large part of the deformation of the western United States, deeper mantle tractions also play a significant role.



Horizontal velocity plotted on top of Radial flow underneath western North America from nested tomography model SH_TX2008 (Schmandt & Humphreys, 2010). Small scale convection can be seen at shallow depths.

Schmandt B., Humphreys E. ;2010) "Complex subduction and small-scale convection revealed by body wave tomography of the western u.s. upper mantle", *Geochem. Geophys. Geosyst.* 11:Q05004. doi:10.1029/2010GC003042

For the full article see: [10.1093/gji/ggt151](10.1093/gji/ggt151)

Submitted by Attreyee Gosh , USC

NEW RELEASES

⇒ Pylith 1.9.0 [2013 June 20]

⇒ ASPECT 0.3 [2013 May 31]

Computing

Git CIG

CIG will soon be completing the move to Git. Git offers several advantages over Subversion, including faster operation, more flexible and powerful tools for making changes to repositories, and strong support from various development platforms. All current repositories will remain in Subversion until their respective community is ready to change. Look for the CIG announcement when the Git based system is ready for community use.

Computing Summary. Cycles are available using CIG's community software allocation on the following machines:

Yellowstone	490,000
Stampede	546,000
Longhorn	215

Allocations can be used to run pre-installed software, benchmarking and project development. For more information see our website or contact Eric Heien (emheien @geodynamics.org).

Doxygen. CIG has completed implementation of automatic documentation through doxygen. Doxygen extracts documentation from source file comments and can be used to extract code structure from undocumented source files. The latter is very useful for developers navigating around large source distributions. Doxygen pages for each code are available from their respective software web pages.

NCAR/CISL Allocation Requests. NCAR/CISL invites NSF-supported university researchers in the atmospheric, oceanic, and related sciences to submit large allocation requests for the Yellowstone system by September 16, 2013. All requesters are strongly encouraged to review the instructions before preparing their submissions. Please visit: http://www2.cisl.ucar.edu/docs/allocations for more university allocation instructions and opportunities. Contact Dave Hart, dhart@ucar.edu

2013-2014 Strategic Plan

The CIG 2013-14 Strategic Plan is now available for download at:

http://www.geodynamics.org/cig/community/documents/Strategic_Plan_2013

CIG Researchers in the News

GPU-Acclerated Servers at Princeton. 200 NVIDIA Tesla K20 GPU accelerators with four K20 GPUS per each 2U Rackable servers have been deployed at the Department of Geosciences. They will be used for fast analysis of seismic activity as well as seismic simulation using the CIG supported software SPECFEM 3D. For more details see: http://www.sgi.com/company_info/newsroom/press_releases/2013/june/princeton.html

Upcoming Events — AGU FALL MEETING

San Francisco | 9–13 December 2013

NSF Street Booth Fair. Come visit us at the NSF Street Booth Fair in the exhibit hall. Turn left as you enter North Hall. We are Booth 200 at the south end of NSF Street. CIG developers will be on hand answering questions and providing support. Booth scheduling will be posted on our website at a later date. In addition, UC Davis KeckCAVES will again have exciting visuals on their large 3D TV screen.

Don't forget to drop off your AGU posters for display in the CIG offices.

CIG Annual Business Meeting. The CIG Annual Business Meeting will be held on Tuesday, December 10th during Fall AGU. Please join us and meet our new Executive Committee, Science Steering Committee and CIG HQ Staff members at a reception with light hors d'oeuvres beginning at 6pm followed by the Business Meeting at 6:30 pm at the Parc55. Bring your ideas and suggestions for future code development direction and activities for CIG. We hope to see many of you there!

AGU Abstracts. Remember to send us your CIG related abstracts and session information. As last year, these will be highlighted on geodynamics.org.

Sessions of Note. For sessions being organized by CIG community members, see: http://www.geodynamics.org/cig/news/AGU2013Sessions

CIG Elections. Institutional representatives will be electing new EC and SSC members soon. Election notices will be sent via email in the fall.

Webinar

CIG webinars draw from a pool of experts from mathematicians, to computer scientists, and to geoscientists, among others to bring together a cross-cutting community of faculty, students and researchers to both inform and disseminate knowledge on the tools and methodologies employed to further the study of problems in geodynamics.

The one hour webinars will be held the 2nd Thursday of each month October through April (no webinar in December due to AGU) at 2pm PT unless otherwise noted. Webinars will be recorded for later viewing.

Our webinar series will kick off this year on October 10, 2013. Look for webinars on new codes in the CIG repository, visualization, benchmarking and a talk that is totally out of this world. Reminders and details will be sent out through the cig-all mailing list.

Thursday, October 10, 2013 @ 2pm PT

The World is Not Enough: Mantle Dynamics from a Planetary Perspective
Professor Scott King
Virginia Polytechnic Institute

http://www.trinitysem.edu/images/webinar.jpg

While many CIGers are firmly rooted here on planet Earth, CIG modeling tools can and are being applied to interesting problems on other bodies in the Solar System. This webinar will touch on some of the exciting research problems beyond the terrestrial sphere, including: Is Mercury's topography and volcanic history indicative of a dynamic interior today?; What is the mechanism of resurfacing on Venus?; Is Mars a one plume planet? Come learn how CIG tools are a common bond between earth and planetary science researchers.

Submitted by Scott King, VT

See http://www.geodynamics.org/cig/community/Webinar for details on all CIG webinars.

Events

CDM

The Short-Term Crustal Dynamics working group held an online workshop June 24-28 to provide training in the use of PyLith for quasi-static and dynamic modeling of crustal deformation. The tutorial involved six two-hour sessions with two different schedules to accommodate a wide range of time zones. The first session provided an overview of PyLith as a refresher and gave an overview of recently added features. The other sessions focused on specific topics, such as constructing finite-element meshes of nonplanar surfaces with CUBIT, computing static Green's functions with PyLith, choosing PETSc solver parameters, using fault constitutive models in PyLith, and running PyLith in parallel. Nearly 40 people attended at least one of the six sessions, with most people attending at least three sessions. For recordings of online sessions see: http://www.geodynamics.org/cig/community/workinggroups/short/workshops/cdm2013/agenda

CIG Scientists in deep discussion at this summer's Gordon Conference – Earth's Deep Interior June 2013

Dr. Mike West, Alaska State Seismologists, explains operations during a tour of the Alaska Earthquake Information Center.

Seismic Imaging

The CIG/QUEST/IRIS Joint Workshop on Seismic Imaging of Structure and Source met at the University of Alaska, Fairbanks July 14-17, 2013. This international workshop brought together over 90 early career, faculty and researchers in seismology for in depth talks on forward and inverse modeling to image crustal structure and seismic sources. Tutorials offered by CIG and QUEST on SPECFEM, GEOCUBIT, AXISEM, and ObsPy overflowed the computer lab at UAF. Many thanks to workshop sponsors and Carl Tape for his Oscar winning hosting!

2013-2014 Webinar Schedule

November 14	Giorgio Spada. Using *SELEN to Solve the Sea Level Equation*		
January 9	Oliver Kreylos	**February 13**	Hank Childs
March 13	TBD	**April 10**	Aspect Team
May 8	Jon Aurnou (lead). *CIG's Community Dynamo Development Project*		

Do you have a suggestion for a talk or theme for a seminar series? Let us know by contacting events@geodynamics.org

Recent Publications

Ballmer, Maxim D.; Conrad, Clinton P.; Smith, Eugene I.; Harmon, Nicholas; (2013) "Non-hotspot volcano chains produced by migration of shear-driven upwelling toward the East Pacific Rise", *Geology* Volume 41 (4) 479-482 DOI: 10.1130/g33804.1

Basini, P.; Nissen-Meyer, T.; Boschi, L.; Casarotti, E.; Verbeke, J.; Schenk, O.; Giardini, D.; (2013) "The influence of nonuniform ambient noise on crustal tomography in Europe", *Geochemistry, Geophysics, Geosystems* n/a-n/a DOI: 10.1002/ggge.20081

Ghosh, A.; Becker, T. W.; Humphreys, E. D.; (2013) "Dynamics of the North American continent", *Geophysical Journal International* DOI:10.1093/gji/ggt151

Martens, Hilary R.; White, Robert S.; (2013) "Triggering of microearthquakes in Iceland by volatiles released from a dyke intrusion", *Geophysical Journal International* DOI: 10.1093/gji/ggt184

Quéré, S.; Lowman, J. P.; Arkani-Hamed, J.; Roberts, J. H.; Moucha, R.; (2013) "Subcontinental sinking slab remnants in a spherical geometry mantle model", *Journal of Geophysical Research: Solid Earth* n/a-n/a DOI: 10.1002/jgrb.50102

Thébaud, N.; Rey, P. F.; (2013) "Archean gravity-driven tectonics on hot and flooded continents: Controls on long-lived mineralised hydrothermal systems away from continental margins", *Precambrian Research* Volume 229 93-104 DOI: 10.1016/j.precamres.2012.03.001

van Summeren, Joost; Gaidos, Eric; Conrad, Clinton P.; (2013) "Magnetodynamo Lifetimes for Rocky, Earth-Mass Exoplanets with Contrasting Mantle Convection Regimes", *Journal of Geophysical Research: Planets* n/a-n/a DOI: 10.1002/jgre.20077

Please send us your recent publications as well as research highlights so we may continue to keep the geosciences community informed of all the current research being conducted in geodynamics with CIG codes.
Submit to: geodynamics.org/cig/community/documents/reference

Upcoming Meetings

December 9-13, 2012, Fall AGU Meeting
Join more than 20,000 Earth and space scientists, educators, students, and other leaders in San Francisco, California December 9-13 as they gather to present groundbreaking research and connect with colleagues. http://fallmeeting.agu.org/2013/

December 10, 2012, CIG Annual Business Meeting
The CIG Annual Business Meeting will be held on Tuesday, December 10 during Fall AGU. Please join us and meet our new staff members at a reception with light hors d'oeuvres beginning at 6 pm followed by the Business Meeting at 6:30 pm.
Agenda items can be sent to: events@geodynamics.org to be forwarded to the meeting committee.

May 4-7, 2014 CIG Mantle and Lithospheric Dynamics Workshop, Joint with the Canadian Geophysical Union 2014
Banff, Alberta. More information forthcoming at: http://www.cgu-ugc.ca/meetings/index.htm

For more information on all CIG hosted events, please got to geodynamics.org.

CIG COMPUTATIONAL INFRASTRUCTURE for GEODYNAMICS

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Computational Infrastructure for Geodynamics (CIG) is a membership-governed organization that supports and promotes Earth science by developing and maintaining software for computational geophysics and related fields.

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