

Department of Geology
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Education

California Institute of Technology, *Division of Geological and Planetary Sciences*

Ph.D. Geophysics, 2010

Dissertation: Mechanical Models for Interseismic Deformation in Subduction Zones

Advisor: Prof. Mark Simons

University of Kentucky, *Department of Geological Sciences*

M.S. Geology, 2003

Thesis: Nonlinear Asperity-Scale Frictional Melting Model

Advisors: Prof. Kieran O'Hara (Geol.), Prof. Jim McDonough (Mech. Eng.)

University of Cincinnati, *Department of Civil & Environmental Engineering*

M.S. Environmental Engineering, 1997

Thesis: A Model for Urban Ozone Dynamics in the Cincinnati Metropolitan Area

Advisors: Prof. Pratim Biswas, Prof. Shafiq Islam

Indian Institute of Technology – Bombay, *Department of Mechanical Engineering*

B.Tech. Mechanical Engineering, 1994

Senior Thesis: Experimental & Theoretical Study of Gas-Liquid Slug Flows in Horizontal Channels

Thesis Advisor: Prof. Kannan Iyer

Professional Experience

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|--------------------------------|--|----------------------------------|
| Research Fellow | Utah State University | 2016 - Present |
| 3D Modeler/Detailer | Nucor Building Systems (<i>steel buildings</i>) | 2016-2018 |
| Post-doctoral Associate | Utah State University | Mentor: Tony Lowry 2014 - 2016 |
| Post-doctoral Fellow | National Taiwan University | Mentor: John Suppe 2010-2014 |
| Teaching Assistant | California Institute of Technology (<i>Geodynamics, Inverse Theory, Field Geophysics</i>) | 2005-2007 |
| Research Assistant | California Institute of Technology | Advisor: Mark Simons 2004-2010 |
| Research Assistant | University of Kentucky | Advisor: Kieran O'Hara 2001-2003 |
| Teaching Assistant | University of Cincinnati (<i>Fluid Mechanics</i>) | 1995-1996 |
| Environmental Engineer | Science Applications International Corporation | 1997-2002 |

Grants, Awards and Honors

Selected Grants Pending, Utah State University

USGS: Toward Earthquake System Science: Western U.S. Lithospheric Stress/Strain Partitioning of Mantle Dynamics; with Tony Lowry (USU); \$179,086 to USU. 2016-2018

NSF: Dynamics and rheology of Africa's magmatic rift zone from modeling of potential field and seismic data; with Tony Lowry (USU), and Cindy Ebinger (Rochester); \$ 154,132 to USU

Gutenberg Fellowship, Seismological Laboratory, California Institute of Technology 2003-2004
Department-wide competitive award given to the best incoming PhD student

Pirtle Fellowship, Department of Geological Sciences, University of Kentucky 2001-2003

Research Interests

Crustal and lithospheric dynamics: 3D/4D numerical modeling of regional tectonic deformation over timescales for mountain-building/orogenesis (tens of million years), incorporating plate-motion history, as well as realistic material properties (rheology) and Earth structure.

Developing spatio-temporal constraints for numerical models (i.e., initial and boundary conditions): new plate-motion histories; lithospheric/mantle structure inferred from tomography; present-day 3D lithospheric stress field from focal-mechanisms; gridding geologic datasets.

Seismic hazards: Complete seismic-cycle simulations ($\sim 10^2$ - 10^3 yr scale) of fault creep following seismic ruptures along realistic 3D faults, using high resolution geodetic, seismic, and neotectonic datasets to constrain fault/off-fault rheology.

Professional Service

Session co-convenor, American Geophysical Union Fall Meeting (T51F/T53C) 2010

Linking Geodetic Observations to Mechanical Properties of the Lithosphere: New Methods & Models

Peer review: *NSF-EAR, Geophys. J. Intl. (GJI), Earth Planets Space (EPS), Seismol. Res. Lett. (SRL)*

Publications

- [7] Wu, J., J. Suppe, Lu R.-Q., **R.V. S Kanda** (2016), Philippine Sea and East Asian plate tectonics since 52 Ma constrained by new subducted slab reconstruction methods, *J. Geophys. Res.*, *121*, 4670–4741, doi: [10.1002/2016JB012923](https://doi.org/10.1002/2016JB012923).
- [6] Lu R.-Q., J. Suppe, D.-F. He, J. Wu, **R.V. S Kanda**, B. Liu, Y.-G. Chen (2013), Deep subducting slab reconstruction and its geometry, kinematics: a case study for the Tonga-Kermadec slab from tomography, *Chinese J. Geophys.*, *V56* (11), p.3837-3845.
- [5] **Kanda, R. V. S.**, E. A. Hetland, and M. Simons (2013), Asperity model for fault creep and interseismic deformation in northeastern Japan, *Geoph. J. Intl.*, *192*, p.38-57, doi: 10.1093/gji/ggs028.
- [4] **Kanda, R. V. S.**, and M. Simons (2012), Practical implications of the geometrical sensitivity of Elastic Dislocation models for field geologic surveys, *Tectonophysics*, *560–561*, p. 94–104, doi: 10.1016/j.tecto.2012.06.040.
- [3] **Kanda, R. V. S.**, and M. Simons (2010), An elastic plate model for interseismic deformation in subduction zones, *J. Geophys. Res.*, *115*, B03405, doi:10.1029/2009JB006611.
- [2] Thomas, W. A., **R. V. S. Kanda**, K. D. O'Hara, D. M. Surles (2008), Thermal footprint of an eroded thrust sheet in the Southern Appalachian Thrust Belt, Alabama, USA, *Geosphere*, *4*(5), p. 814-818, doi 10.1130/GES00168.1.
- [1] **Kanda, R. V. S.**, and D. J. Stevenson (2006), Suction mechanism for iron entrainment into the lower mantle, *Geophys. Res. Lett.*, *33*, L02310, doi:10.1029/2005GL025009.

Manuscripts in Preparation (3)

- Kanda, R. V. S.**, Lowry, A. R., Onset and stability of flat-slab subduction using thermo-mechanical geodynamic models and laboratory based rheological flow laws
- Kanda, R. V. S.**, Suppe, J., Y.-J. Hsu, Y.-M. Wu, Multi-scale characterization of the present day 3D stress field based on focal mechanisms and tomographic structure in the vicinity of Taiwan
- Kanda, R. V. S.**, Suppe, J., Constraints on lithospheric rheology of the Taiwan region based on comparisons of geodynamic models with present day tomographic structure and stress field.

Selected Conference Abstracts

- Kanda, R. V. S.**, A. R. Lowry, S. Buiter, S. Ellis (2015), Causes for the Onset and Stability of Flat Slabs and Associated Overriding Plate Deformation Inferred from Numerical Thermo-Mechanical Models, *EOS Trans AGU*, 96, Fall Meet. Suppl., Abstract T33B-03
- Berry, M., A.R. Lowry, D. Schutt, **R.V. S. Kanda**, J. Buehler (2015), Cold and Wet at the Roots of US Cordilleran High Elevation, *EOS Trans AGU*, 96, Fall Meet. Suppl., Abstract T11C-2907
- Suppe, J.; J. Wu, C. D. Lin, **R. V. S. Kanda** (2014), The trajectory of India towards Eurasia recorded by subducted slabs: evidence for southward subduction of the Tethys Ocean under India after 130 Ma, *EGU General Assembly*, Abstract 15713.
- Wu, J., R.-Q. Lu, J. Suppe, **R. V. S. Kanda** (2014), The East Asian Sea: A vanished Cenozoic ocean between the Pacific and Indian oceans revealed by subducted slab constraints, *EGU General Assembly*, Abstract 11339.
- Liu, H.-F., J. Wu, J. Suppe, R.-Q. Liu, **R. V. S. Kanda** (2014), Seismic tomographic constraints on the Antarctic-Eastern Australian margin of Gondwanaland in the Mesozoic, *EGU General Assembly*, Abstract 10350
- Kanda, R. V. S.**, J. Suppe J. E. Wu (2013) 2D/3D Numerical Models of the Taiwan Orogen: Oblique Arc-Continent Collision overlying Orthogonal Subduction Systems, *EOS Trans AGU*, 94, Fall Meet. Suppl., Abstract T51F-2524.
- Suppe, J., S. Carena, **R. V. S. Kanda**, Y.-M. Wu, H.-H. Huang, J. E. Wu (2013), Kinematics of subduction and plate convergence under Taiwan and its geomorphic, geodetic and seismic expressions, *EOS Trans AGU*, 94, Fall Meet. Suppl., Abstract T21G-07.
- Wu, J.E., J. Suppe, **R.V. S. Kanda** (2013), Plate tectonic reconstruction of South and East Asia since 43 Ma using seismic tomographic constraints: role of the subducted 'East Asia Sea', *EOS Trans AGU*, 94, Fall Meet. Suppl., Abstract T21G-01.
- J. E. Wu, J. Suppe, R. Lu, C. D. Lin, **R. V. S. Kanda** (2013), Constraints of subducted slab geometries on trench migration and subduction velocities: flat slabs and slab curtains in the mantle under Asia, *EOS Trans AGU*, 94, Fall Meet. Suppl., Abstract T51F-2532.
- Kanda, R..V. S.**, J. Suppe, S. M. Ellis, S. Buiter (2012), 3D Numerical Models of Slab-Mantle Interactions: Implications for Eurasia Philippine Sea Arc-Continent Collision, *EOS Trans AGU*, 93, Fall Meet. Suppl., Abstract T43F-2739.
- Suppe, J., **R..V. S. Kanda**, Y.-M. Wu (2012), The 3D lithospheric structure and plate tectonics of the on-going Taiwan arc-continent collision and delamination: a context for understanding patterns of geomorphic uplift and contemporary stress and geodetic displacement fields, *EOS Trans AGU*, 93, Fall Meet. Suppl., Abstract T41E-05.
- Kanda, R. V. S.**, E. A. Hetland, M. Simons (2010), Persistence of Coseismic Rupture Asperities as Inferred from Interseismic Geodetic Observations from Northeastern Japan, *EOS Trans AGU*, 91(53), Fall Meet. Suppl., Abstract T51F-04.
- Kanda, R. V. S.**, E. A. Hetland, M. Simons, S. E. Owen, and F. W. Webb (2008), Can Interseismic Geodetic Observations Resolve Persistent Rupture Asperities? A study of the Japan trench off Tohoku. *EOS Trans AGU*, 89(53), Fall Meet. Suppl., Abstract T23A-1989.
- Kanda, R. V. S.** and M. Simons (2006), Simple Elastic Dislocation Models for Interpreting Interseismic Deformation in Subduction Zones, *EOS Trans AGU*, 87(52), Fall Meet. Suppl., Abstract T12C-02.
- Kanda, R. V. S.** and D. J. Stevenson (2004), A suction mechanism for iron entrainment from the outer core into the lower mantle, *EOS Trans AGU*, 85(47), Fall Meet. Suppl., Abstract MR43A-0880.
- Kanda, R. V. S.**, and K. O'Hara (2002), Nonlinear Modeling of Frictional Melting at Asperity Tips, *EOS Trans AGU*, 83(47), Fall Meet. Suppl., Abstract S52B-1078.

Teaching Experience

- Dept. of Geology, Utah State University:** *Adjunct Faculty* 2014
- **Numerical Geodynamic Modeling** (*Graduate/Undergraduate mini-course, Fall 2014*): Prof. Tony Lowry
- Division of Geological & Planetary Sciences, Caltech:** *Graduate Teaching Assistant* 2005-07
- **Geodynamics** (*Graduate, Spring 2007*): Prof. Mike Gurnis
 - **Inverse Theory** (*Graduate, Winter 2007*): Prof. Malcolm Sambridge (visiting from ANU)
 - **Field Geophysics** (*Graduate/Undergraduate*): Profs. Rob Clayton, Mark Simons, Joann Stock.
Spring 2006: GPS, gravity, magnetic, seismic, & resistivity surveys: Chalfant Valley, E. California.
Summer '2005: Developed Matlab-based graphical user interface for field seismic refraction studies
- Dept. of Civil & Environmental Eng., Univ. of Cincinnati:** *Graduate Teaching Assistant* 1996
- **Fluid Mechanics** (Hydraulic Systems) (*Undergraduate, Spring 1996*): Prof Shafiq Islam
- University of Cincinnati - Educational Services:** *Undergrad Math/Physics Tutor* 1994-95

Computational Experience

- Numerical Methods** *Forward modeling*: Arbitrary Lagrangian-Eulerian (ALE), particle-in-cell, finite element & finite difference formulations;
Inverse modeling: linear/non-linear optimization, Bayesian/Monte-Carlo schemes.
- Scientific Programming** Python (Numpy/Scipy/Matplotlib/VTK), Fortran 95/90/77, C
- Software Applications** GMT, Matlab/Octave, CUBIT, Paraview, gOcad, Move, SAC
- System Administration** Linux/OS-X administration; shell-scripting; remote desktop management
 Currently, sole system administrator for:
- 48-core RHEL Linux workstation (NTU)
 - 12-core Ubuntu Linux workstation (USU)

Selected Invited Talks

- Institute of Geological & Nuclear Sciences (GNS-Science), Lower Hutt, New Zealand
- Academia Sinica, Taipei, Taiwan
- National Taiwan University, Taipei, Taiwan
- National Central University, Jongli, Taiwan