

**MARC W. SPIEGELMAN**

Lamont-Doherty Earth Obs. Palisades, NY 10964 (845) 365-8425 mspieg@ldeo.columbia.edu	Dept. of App. Physics/App. Math Columbia University New York, NY 10027 (212) 854-4918	14 Louis Ave. Valley Cottage, NY 10989 (917) 699 6786
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**BIRTH DATE:** 20 March 1963, Wilmington, Delaware, USA

**NATIONALITY:** U.S. citizen

**PRESENT POSITION:** Assoc. Professor, tenured, Joint DEES/DAPAM Columbia Univ.

**EDUCATION:**

Ph.D. Geology/Geophysics (1989), University of Cambridge, U.K., Thesis: *Melting and Melt extraction: The physics of flow in deformable porous media.*  
Supervisor: Dan McKenzie

B.A. Geology (1985), Harvard University, Cambridge, MA, USA, Thesis: *Deformation of a thin viscous sheet as an analog for continental deformation: physical experiments,* Adviser: Philip England

**SCHOLARSHIPS AND AWARDS:**

2004 Nominated for Presidential Teaching Award  
2004 SEAS Kim award  
2003 SEAS Alumni Teaching Award  
2002 DEES Outstanding Teaching Award  
1998 DEES Outstanding Teaching Award  
1993 First Storke-Doherty Lecturer, LDEO  
1992 Storke Research Award, LDGO  
1988 Lamont Post-doctoral Fellowship  
1985 Marshall Scholarship  
1985 Summa Cum Laude, Harvard University  
1985 Phi Beta Kappa  
1985 Award for outstanding teaching, Harvard University  
1983-84 John Harvard Scholarship  
1980 U.S. Presidential Scholar

**RESEARCH INTERESTS:**

Coupled Fluid-Solid Dynamics  
Magma Dynamics, Geochemical transport and the integration of Geodynamics and Geochemistry  
Scientific Computation, Numerical methods and High performance computing  
Mantle Convection, Hydrology, Ecology, Mathematical Earth Science

**PROFESSIONAL SOCIETIES:** American Geophysical Union, SIAM, IUGG

**SERVICE/COMMITTEES:** Current Positions

NSF CIG (Computational Infrastructure for Geodynamics) – Executive Committee (vice-chair), SSC Nominating committee (Chair) 2004–present  
IUGG - Committee on Mathematical Geophysics, Meeting organizer CMG2004 (June 16-18, columbia) 2004  
NSF Computational GeoInformatics Workshop, Software Committee (Co-chair) (2004-present)  
NSF CIG Planning/Workshop/Proposal writing Committee (2003-present)  
NSF CIG Columbia Representative  
Secretary, IUGG Committee on Mathematical Geophysics (1999–present)  
DAPAM/SEAS representative to the “First 2 years committee” (2003)  
DAPAM Applied Math Undergraduate Adviser (2002–present)  
DAPAM Applied Math curriculum committee (2000–present)  
DAPAM IGERT coordination committee (L. Polvani chair, 2002–present)  
DAPAM AQF hardware and curriculum committee  
DEES Graduate Admissions Committee (2003–present)  
DEES Graduate Curriculum review committee (1995–2004, Chair 2004)  
DEES Solid Earth Geochemistry Search Committee (2002–present)  
LDEO Executive Committee (1998–Present)  
LDEO Solid Earth Dynamics Search Committee (Co-Chair, 2002–present)  
LDEO Data CyberInfrastructure Committee (2003-present)  
LDEO Solid Earth Planning group (2003–present)  
LDEO Computer Planning Committee (1999–present)

**SERVICE (cont’d):** Previous Positions

NSF RIDGE Steering committee (1995–2000)  
NSF RIDGE Relevancy Review panel member (1995–2000)  
NSF RIDGE2000/Workshop Organizing Committee (1999)  
NSF Planning Committee: Margins workshop on magmatism (1993)  
DEES Graduate Admissions Committee (1994–1997)  
DEES/CEI Web Oversight Committee (1998–2002)  
LDEO Selection committee for PGI Senior Scientist (2000)  
LDEO Selection committee for Storke Doherty Lecturer (1999–2000)  
LDEO Selection committee for LDEO Post-Doctoral Fellowships (1997–1999)  
LDEO co-organizer: Meeting for non-linear earth systems

**POSITIONS/EMPLOYMENT:**

2005–Present Assoc. Prof. with tenure joint DEES/DAPAM  
2000–2004 Assoc. Professor Joint between DEES/DAPAM.  
1997–1999 Adjunct Assoc. Professor/DEES  
1997–Present Research Scientist/LDEO  
1993–97 Storke-Doherty Lecturer/LDEO  
1991–97 Associate Research Scientist/ LDEO  
1989–91 Lamont Post-Doctoral Fellow/ LDEO

## TEACHING EXPERIENCE: Courses

*Myths and Methods in Modeling G6943y*, ([www.ldeo.columbia.edu/~mspieg/mmm/](http://www.ldeo.columbia.edu/~mspieg/mmm/)) a graduate course in numerical methods for earth scientists designed as an introduction to techniques and approaches for formulating and solving quantitative models of earth processes with examples chosen from a wide range of disciplines. Includes 200+ pages of detailed notes, 6 hands-on modeling assignments with example codes and a final project from the students own research. Taught every other year in Spring 1994–2004. Enrollment: 2004 — 15 graduate students + 3 post-docs, 2002—19 graduate students +3 post-docs, 2000—19 graduate students. Awarded DEES Graduate teaching award in 1998, 2002.

*Applied Math I E3101* Introduction to Linear Algebra. ([www.columbia.edu/itc/applied/e3101/](http://www.columbia.edu/itc/applied/e3101/)). Principal service course for the Dept. of Applied Physics and Applied Math introduces fundamentals of linear algebra with applications for engineers, physicists and applied mathematicians. Includes Matlab tutorial. Enrollment: 2001– 150 students in 2 sections, 2002– 122 students/2 sections. 2003– 171 students/2 sections. 2004– 185 students/2 sections. Awarded 2003 SEAS Alumni Teaching Award and 2004 Kim Award

*Computational Math I: Introduction to Numerical Methods E4300*, Introduction to Numerical Methods ([www.ldeo.columbia.edu/~mspieg/e4300](http://www.ldeo.columbia.edu/~mspieg/e4300)). including numerical linear algebra, solution of non-linear systems, optimization and non-linear least-squares, interpolation, quadrature, numerical differentiation and solution of ODE's (Initial value problems and BVP's with an introduction to FEM methods). Significant introduction to Matlab with 8 homeworks and programming assignments. This course is meant to be the first part of a two part sequences in scientific computation and designed to give a thorough grounding in the fundamentals of numerical methods to be continued in CM2 Numerical Methods for PDE's. First taught by MWS, Spring 2006. Enrollment: 2006 — 65 students ( 2/3 undergrad 1/3 graduate).

*Applied Math II E3102*, Introduction to partial differential equations ([www.columbia.edu/itc/applied/e3102/](http://www.columbia.edu/itc/applied/e3102/)). Dept. of Applied Physics and Applied Math. Theory and applications of (principally) linear PDE's plus Fourier Analysis, Green's Functions and Method of characteristics for non-linear wave equations. Taught in Spring 2000 (48 Students), 2001, (27 students... reduction in numbers reflects ABET removal of PDE's as requirement for Mechanical engineering.)

*Advanced Petrology Seminar: EESC G9701*, Graduate seminar. Fall 2002 subject is mid-ocean ridge basalts, covering global MORB compositions, relationships between lava and source chemistry, processes of magma generation and evolution. Spring 2003 “Dynamics and chemistry of subduction zones”. Spring 2004 “Uranium Series”. co-taught with Steve Goldstein, DEES. Spring 2005 “Melt transport and crustal accretion” co-taught with Peter Kelemen.

*Mathematical Earth Science Seminar: G9810*, an advanced graduate seminar in topics at the interface between applied mathematics and earth science. Fall 2000 concerned coupled fluid/solid mechanics. Spring 2001 (with Peter Dodds) considered topics in networks/ecology.

## TEACHING (Cont'd): STUDENT SUPERVISION/ADVISING:

### Graduate Students: DAPAM

*Ethan Coon*: (2004–present) Krell Graduate Student Computational Sciences Fellow “Fluid flow in complex media” (principal supervisor)

*Gideon Simpson*: (2004–present) “non-linear wave dynamics in solid-earth science” (joint supervision with M. Weinstein, APAM)

*Yanming “Pegasus” Fang*: (2001–present), “Dynamics of reactive flow systems” (principal supervisor)

*Michael Jung*: (2000–2004), “Mechanical Instability of multiphase systems under deformation” (withdrew from program)

*Yuan He*: (2003–present), “Numerical wave propagation in heterogeneous media” (joint with G. Bal and D. Keyes)

### Graduate Students: DEES

*Martin Collier*: (2004–present) “Chemical variability and mantle dynamics” (principal supervisor)

*Richard Katz*: (Ph.D 2005), Krell Graduate Student Computational Sciences Fellow. “Dynamics and Chemical Transport in Subduction Zones” (principal supervisor)

*Elizabeth Cottrell*: (Ph.D 2003) “Diffusive re-equilibration in Melt Inclusions” (committee member w/ D. Walker and C. Langmuir and co-author)

*Bill Thompson*: (Ph.D 2004) “Open System models for U-series age dating in corals” (committee member w/ S. Goldstein and S. Hemming and co-author)

*Yue “Merry” Cai*: (2002–present) Geochemistry (Committee member)

*Shan Wei*: (Ph.D 2004) DEEE (committee member)

*Alex Lagatta*: (Ph.D 2002) “Geochemistry of the Western Mexican Volcanic Belt” (committee member)

*Yong Jun Su*: (Ph.D 2002) “PETDB: development and application of a database for global geochemical variation” (committee member)

*Michael West*: (Ph.D 2001) “Seismic imaging of Axial Seamount” (committee member)

*Gustavo Correa*: (Ph.D 1999) “The reflection seismic response of mid-ocean ridge magma chambers: Modeling and observations” (Committee member)

*Paul Hall*: (Ph.D 2003, “Free and Forced Convection in Earth’s Upper Mantle” URI GSO, external committee member)

*Luc Lavier*: (Ph.D 1999) (committee member)

*Gille Guerin*: (Ph.D 1998) (committee member)

*Wei He*: (Ph.D 1996) (committee member)

*Jianzhong Yu*: (MPhil 1995) (committee member)

*Ulisses Mello*: (Ph.D 1992) (committee member)

*Greg Walker*: (Ph.D Cambridge Univ. joint with Dan McKenzie)

**Other Orals/Defense committees:** 1993: *Wei He* (orals), 1994: *Wusi Su* (defense); 1995: *Suki Sheth*, *Annika Johannson* (orals), 1996: *Keith Putirka* (defense), 1997: *Vic Engels* (orals), 1998: *Anji Shah* (orals), 1999: *Mike Tischer* (orals), *Gustavo Correa* (defense), 2000: *Chang Duan* (orals), 2001: *Radley Horton*, *Matt Milbockler* (orals), 2002: *Alex Lagatta* (defense), 2003: *Christopher Walker*, *Joy Romanski*, *He Bo* (APAM) (orals) *Dana Himmel* (masters)

### **Undergraduates: DAPAM**

*Daniel Reich (AM)* (B.A. 2004) “Classification schemes for high-dimensional geochemical data”

*Jonathan Hodges (AP)* (B.A. Summa, 2002) “Implementation of PETSc for reactive flow problems”

*Isaac Benowitz (AP)* (B.A. 2001) “Simple models for spreading Plume heads” and “Dynamics of flow over ripply beds”

*Drew Youngren (AM)* (B.A. 2000) “Development of Parallel semi-lagrangian advection schemes”.

### **Undergraduates: DEES**

*Alison Cohen:* (Summer 2001) “Exploring reactive channel models”

*Chris Wiggins:* (1993) Summer Rabi Scholar (and now Asst. prof DAPAM)

### **INVITED TALKS:**

**2005** SIAM CS&E (Feb 2005), Melt inclusion conference, Schloss Ringberg, Germany (May 2005), CIG Mantle Convection Workshop, Boulder CO (June 2005)

**2004** CIG Planning Workshop (Jan 2004), LBL Fractured rock symposium (Feb 2004), Rutgers (Mar. 2004), U. Chicago (Apr. 2004), Comp. Geoinformatics, Washington, DC (May 2004), IUGG 25th CMG 2004 (June 2004), Cambridge GFD summer school (Sept. 2004)

**2003** CalTech (GeoFramework Workshop), Purdue, AGU-EGS-EUG (Nice, France), IUGG (Sapporo Japan), DOE Reactive transport workshop (Carmel, CA), Public Lecture, LDEO. The Daily Show with Jon Stewart

**2002:** Princeton, Berkeley, MIT, Yale, Woods Hole Geodynamics Seminar, 24th IUGG Mathematical Geophysics Conference (Torino, Italy...Keynote), Goldschmidt (Davos, Switzerland), Conference on Computational Infrastructure for Geodynamics (Tahoe, July 2002), NSF Arcs Modeling workshop, (Ann Arbor, Oct. 2002), Fall AGU

**2001:** Texas A&M, Lamont, Fall AGU, Stony Brook

**2000:** Goldschmidt, (Oxford, UK, keynote), Harvard University, Columbia Applied Mathematics

**1999:** University of Utrecht, NL; Duke University; University of Minnesota, Florida State University

**1998:** Gordon Research Conference (NH), 22nd IUGG Mathematical Geophysics (Cambridge, U.K., keynote), CalTech, Oxford University, Dartmouth Physics Dept., Fall AGU

**1997:** IRIS workshop (Breckenridge, CO), Geol. Soc. London, New directions in Fluid Mechanics (Beijing), Geol. Soc. London.

**1996:** CalTech, Yale University, Danish Lithosphere Center (Copenhagen), Iceland Melts Meeting (Myvatn), Vrei University (Amsterdam, NL).

**1995:** Dartmouth University, University of Michigan, University of Kansas, URI GSO, MELT Meeting (Brown Univ.)

**1994:** MIT, 20th IUGG Mathematical Geophysics Meeting (Villefranche sur mer, France), Carnegie Institute Washington, IBM Watson Research center

**1993:** Carnegie Institute Washington, Schlumberger-Doll Research, Woods Hole Geodynamics seminar. **1992:** Royal Society of London, Woods Hole. , Bristol University, UK

**PUBLISHED PAPERS:** (*italics* indicate author is student advisee)

- [1] **SPIEGELMAN, M.** and R. *Katz* [2006]. A semi-lagrangian crank-nicolson algorithm for the numerical solution of advection-diffusion problems. *Geochem. Geophys. Geosyst.* (in press).
- [2] *Katz*, R., M. **SPIEGELMAN**, and B. HOLTZMAN [2005]. The dynamics of melt and shear localization in partially molten aggregates. *Nature*. (accepted).
- [3] *Katz*, R., M. **SPIEGELMAN**, and S. CARBOTTE [2004]. Ridge migration, asthenospheric flow and the origin of magmatic segmentation in the global mid-ocean ridge system. *Geophys. Res. Lett.*, **31**(15). Art. No. L15605.
- [4] DONNELLY, K. E., S. L. GOLDSTEIN, C. H. LANGMUIR, and M. **SPIEGELMAN** [2004]. Origin of enriched ocean ridge basalts and implications for mantle dynamics. *Earth Planet. Sci. Lett.*, **226**(3-4):347–366.
- [5] **SPIEGELMAN, M.** and P. B. KELEMEN [2003]. Extreme chemical variability as a consequence of channelized melt transport. *Geochem. Geophys. Geosyst.*, **4**(7). Article 1055, doi:10.1029/2002GC000336.
- [6] **SPIEGELMAN, M.** [2003]. Linear analysis of melt band formation by simple shear. *Geochem. Geophys. Geosyst.*, **4**(9). Article 8615, doi:10.1029/2002GC000499.
- [7] ELLIOTT, T. and M. **SPIEGELMAN** [2003]. Melt migration in oceanic crustal production: A U-series perspective. In: R. Rudnick, ed., *The Crust*, volume 3 of *Treatise on Geochemistry*. Elsevier.
- [8] *Katz*, R., M. **SPIEGELMAN**, and C. LANGMUIR [2003]. A new parameterization of hydrous mantle melting. *Geochem. Geophys. Geosyst.*, **4**(9). Article 1073, doi:10.1029/2002GC000433.
- [9] *Thompson*, W. G., M. W. **SPIEGELMAN**, S. L. GOLDSTEIN, and R. C. SPEED [2003]. An open-system model for U-series age determinations of fossil corals. *Earth Planet. Sci. Lett.*, **210**(1-2):365–381.
- [10] *Shaman*, J., M. **SPIEGELMAN**, M. CANE, and M. STIEGLITZ [2003]. A hydrologically driven model of swamp water mosquito population dynamics. (Submitted to *Ecology*).
- [11] *Corréa*, G. J. P., M. **SPIEGELMAN**, S. CARBOTTE, and J. C. MUTTER [2002]. Centered and staggered fourier derivatives and Hilbert transforms: Short note. *Geophysics*, **67**(5):1558–1563.
- [12] *Cottrell*, E. A., M. **SPIEGELMAN**, and C. H. LANGMUIR [2002]. Consequences of diffusive reequilibration for the interpretation of melt inclusions. *Geochem. Geophys. Geosyst.*, **3**(4):10.1029/2001GC000,205.

- [13] ANDERS, M. H., K. M. GREGORY-WODZICKI, and M. SPIEGELMAN [2002]. A critical evaluation of Late Tertiary accelerated uplift rates for the Eastern Cordillera, Central Andes of Bolivia. *J. Geol.*, **110**(1):89–100.
- [14] SPIEGELMAN, M., P. B. KELEMEN, and E. AHARONOV [2001]. Causes and consequences of flow organization during melt transport: The reaction infiltration instability in compactible media. *J. Geophys. Res.*, **106**(B2):2061–2077. [Www.ldeo.columbia.edu/~mspieg/SolFlow/](http://www.ldeo.columbia.edu/~mspieg/SolFlow/).
- [15] SPIEGELMAN, M. [2000]. UserCalc: a web-based U-series calculator for mantle melting problems. *Geochem. Geophys. Geosyst.*, **1**. Paper Number 1999GC000030.
- [16] SPIEGELMAN, M. and J. REYNOLDS [Nov. 1999]. Combined theoretical and observational evidence for convergent melt flow beneath the EPR. *Nature*, **402**:282–285.
- [17] AHARONOV, E., M. SPIEGELMAN, and P. B. KELEMEN [1997]. Three-dimensional flow and reaction in porous media: Implications for the Earth’s mantle and sedimentary basins. *J. Geophys. Res.*, **102**(7):14,821–14,834.
- [18] KELEMEN, P. B., G. HIRTH, N. SHIMIZU, M. SPIEGELMAN, and H. J. B. DICK [1997]. A review of melt migration processes in the adiabatically upwelling mantle beneath oceanic spreading ridges. *Philos. Trans. R. Soc. London, Ser. A*, **355**(1723):283–318.
- [19] SPIEGELMAN, M. [1996]. Geochemical consequences of melt transport in 2-D: The sensitivity of trace elements to mantle dynamics. *Earth Planet. Sci. Lett.*, **139**:115–132.
- [20] Wiggins, C. and M. SPIEGELMAN [May 15 1995]. Magma migration and magmatic solitary waves in 3-D. *Geophys. Res. Lett.*, **22**(10):1289–1292.
- [21] AHARONOV, E., J. WHITEHEAD, P. B. KELEMEN, and M. SPIEGELMAN [1995]. Channeling instability of upwelling melt in the mantle. *J. Geophys. Res.*, **100**:20,433–20,450.
- [22] BAKER, J. and M. SPIEGELMAN [1995]. Modeling an infiltration-driven geochemical front. *Earth Planet. Sci. Lett.*, **136**:87–96.
- [23] PLANK, T., M. SPIEGELMAN, C. H. LANGMUIR, and D. W. FORSYTH [Aug 1995]. The meaning of “mean  $F$ ”: Clarifying the mean extent of melting at ocean ridges. *J. Geophys. Res.*, **100**(8):15,045–15,441.
- [24] SPIEGELMAN, M. [1994]. Geochemical effects of magmatic solitary waves: some analysis. *Geophys. J. Int.*, **117**:296–300.
- [25] Watson, S. and M. SPIEGELMAN [1994]. Geochemical effects of magmatic solitary waves. *Geophys. J. Int.*, **117**:284–295.
- [26] SPIEGELMAN, M. [1993]. Flow in deformable porous media. part 1. Simple analysis. *J. Fluid Mech.*, **247**:17–38.

- [27] **SPIEGELMAN, M. [1993].** Flow in deformable porous media. part 2. Numerical analysis—The relationship between shock waves and solitary waves. *J. Fluid Mech.*, **247**:39–63.
- [28] **SPIEGELMAN, M. [1993].** Physics of melt extraction: Theory, implications and applications. *Philos. Trans. R. Soc. London, Ser. A*, **342**:23–41.
- [29] **SPIEGELMAN, M. and T. ELLIOTT [1993].** Consequences of melt transport for U-series disequilibrium in young lavas. *Earth Planet. Sci. Lett.*, **118**:1–20.
- [30] **ANDERS, M. H., M. SPIEGELMAN, D. W. ROGERS, and J. T. HAGSTRUM [1993].** The growth of fault-bounded tilt blocks. *Tectonics*, **12**(6):1451–1459.
- [31] **SPIEGELMAN, M. and P. KENYON [1992].** The requirements for chemical disequilibrium during magma migration. *Earth Planet. Sci. Lett.*, **109**:611–620.
- [32] **SPIEGELMAN, M. [1989].** *Melting and melt migration: The physics of flow in deformable porous media.* Ph.D. thesis, University of Cambridge.
- [33] **SPIEGELMAN, M. and D. MCKENZIE [1987].** Simple 2-D models for melt extraction at mid-ocean ridges and island arcs. *Earth Planet. Sci. Lett.*, **83**:137–152.

**ABSTRACTS:**

- [1] **Katz, R. F., M. SPIEGELMAN, and B. K. HOLTZMAN [2005].** Shear-induced melt localization and the rheology of the partially molten mantle. *EOS Trans. AGU*, **86**(52). Fall 2005 Meeting Suppl: T35F-07.
- [2] **Coon, E., P. KELEMEN, G. HIRTH, and M. SPIEGELMAN [2005].** Periodic viscous shear heating instability in fine-grained shear zones: Mechanism for intermediate depth earthquakes. *EOS Trans. AGU*, **86**(52). Fall Meeting Suppl: T14A-05.
- [3] **SPIEGELMAN, M., R. F. Katz, and M. JUNG [2004].** Getting on the band wagon: analysis of melt localization instabilities due to mechanical shear. *EOS Trans. AGU*, **85**(47). Fall 2004 Meeting Suppl: V24-A02.
- [4] **Fang, Y. and M. SPIEGELMAN [2004].** Consequences of adiabatic decompression melting on magmatic channeling instabilities. *EOS Trans. AGU*, **85**(47). Fall Meet. Suppl., Abstract V21A-0595.
- [5] **Katz, R., M. SPIEGELMAN, and S. CARBOTTE [2004].** Ridge migration, asthenospheric flow and the origin of magmatic segmentation in the global mid-ocean ridge system. *EOS Trans. AGU*, **85**(47). Fall Meet. Suppl., Abstract T11G-08.
- [6] **Katz, R. and M. SPIEGELMAN [2004].** Progress towards an integrated computational model of magma genesis and transport in subduction zones. *EOS Trans. AGU*, **85**(47). Fall Meet. Suppl., Abstract V12A-04.



- [7] CARBOTTE, S., C. SMALL, K. DONNELLY, R. *Katz*, M. SPIEGELMAN, and S. SUPAK [2004]. A plate kinematic explanation for the magmatic segmentation of mid-ocean ridges. *EOS Trans. AGU*, **85**(47). Fall Meet. Suppl., Abstract T11G-07.
- [8] GURNIS, M., L. H. KELLOGG, J. BLOXHAM, B. H. HAGER, M. SPIEGELMAN, S. WILLET, M. E. WYSESSION, and M. AIVAZIS [2004]. Computational infrastructure for geodynamics (CIG). *EOS Trans. AGU*, **85**(47). Fall Meet. Suppl., Abstract SF31B-04.
- [9] SPIEGELMAN, M. [2004]. Reactive transport in magma dynamics. In: *DOE conference on Dynamics of fluids in fractured rock*. [Http://esd.lbl.gov/fluidsinrock/index.html](http://esd.lbl.gov/fluidsinrock/index.html).
- [10] CARBOTTE, S. M., C. SMALL, M. SPIEGELMAN, W. B. F. RYAN, W. HAXBY, and R. BUCK [2003]. A causal relationship between the migration of oceanic spreading centers and the magmatic segmentation of ridges. *EOS Trans. AGU*, **84**(6). Fall Meet. Suppl., Abstract T51B-07.
- [11] SPIEGELMAN, M. and R. F. *Katz* [2003]. Plumbing the depths: Toward a comprehensive model of fluid transport, melting and melt transport in subduction zones. *IUGG Abstracts*, p. A.2. (General Assembly, Sapporo, Invited Union U2).
- [12] SPIEGELMAN, M. [2003]. Crossing the channel with U: Consequences of channelized melt transport for uranium series nuclides. *EOS Trans. AGU*. (Spring Meeting, Joint EGS-AGU-EUG, Nice, Invited).
- [13] SPIEGELMAN, M. [2003]. Extreme chemical variability as a consequence of channelized melt transport: An explanation for melt inclusion variability? *EOS Trans. AGU*. (Spring Meeting, Joint EGS-AGU-EUG, Nice, Invited).
- [14] *Katz*, R. and M. SPIEGELMAN [2003]. Toward computational models of magma genesis and geochemical transport in subduction zones. *EOS Trans. AGU*. (Spring Meeting, Joint EGS-AGU-EUG, Nice).
- [15] *Thompson*, W. G., M. W. SPIEGELMAN, S. L. GOLDSTEIN, and R. C. SPEED [2003]. An open-system model for U-series age determinations of fossil corals. XVI INQUA Congress, Reno NV.
- [16] LANGMUIR, C. H., S. GOLDSTEIN, K. DONNELLY, and M. SPIEGELMAN [2003]. A simple model for the origin of suboceanic mantle reservoirs. *EOS Trans. AGU*. (Spring Meeting, Joint EGS-AGU-EUG, Nice, Invited).
- [17] MONTÉSI, L. G. J., P. B. KELEMEN, and M. SPIEGELMAN [2003]. Formation of inclined melt channels beneath mid-ocean ridges. *EOS Trans. AGU*. (Spring Meeting, Joint EGS-AGU-EUG, Nice).
- [18] SPIEGELMAN, M. and P. B. KELEMEN [2002]. Let's get physical: Physically consistent models of melt and geochemical transport (that actually work). *EOS Trans. AGU*, **83**(47). Fall Meeting Suppl., Abstract V52D-07, Invited.

- [19] MONTÉSI, L. G. J., P. B. KELEMEN, and M. SPIEGELMAN [2002]. Interaction of dissolution channels with a crystallization front in the shallow mantle beneath mid-ocean ridges. *EOS Trans. AGU*, **83**(47). Fall Meeting Suppl., Abstract V61A-1344.
- [20] SPIEGELMAN, M. and P. B. KELEMEN [2002]. Highway to hell: geochemical consequences of channelized melt transport. *Jour. of Conf. Abs.*, **66**:A731. Goldschmidt 2002: invited.
- [21] LANGMUIR, C. H. and M. SPIEGELMAN [2002]. Influence of subduction parameters on wedge melting. *Jour. of Conf. Abs.*, **66**:A431. Goldschmidt 2002.
- [22] *Thompson*, W. G., M. SPIEGELMAN, and R. C. SPEED [2002]. Elevated  $^{234}\text{U}$  and U-series age determination of corals: an open-system model. *Jour. of Conf. Abs.*, **66**:A773. Goldschmidt 2002.
- [23] SPIEGELMAN, M. and P. B. KELEMEN [2001]. Variety is the spice of life: Extreme chemical variability as a consequence of channelized melt transport. *EOS Trans. AGU*, **82**(47). Fall Meet. Suppl., Abstract V51E-06.
- [24] *Katz*, R. F., M. SPIEGELMAN, and C. H. LANGMUIR [2001]. A new parameterization of hydrous/anhydrous melting for use in numerical models of magma genesis in subduction zones. *EOS Trans. AGU*, **82**(47):Fall Meet. Suppl., Abstract T41C-0883.
- [25] SPIEGELMAN, M. [2000]. How low can U go? New models for coupled fluid/melt transport in subduction zones. *EOS Trans. AGU*. (fall meeting).
- [26] *Cottrell*, E. A., M. SPIEGELMAN, and C. H. LANGMUIR [2000]. Numerical models for diffusive exchange between melt inclusions and crystals. *EOS Trans. AGU*. (fall meeting).
- [27] SPIEGELMAN, M. [2000]. Making... Moving... Mixing? the role of magma transport in controlling observable geochemical variation in mantle melts. *Jour. of Conf. Abs.*, **5**(2):948. Goldschmidt 2000: keynote.
- [28] SPIEGELMAN, M. and J. R. REYNOLDS [1999]. Mixmaster deluxe: the role of magma dynamics for integrating geochemistry and geodynamics. *EOS Trans. AGU*. (fall99 meeting).
- [29] SPIEGELMAN, M. and D. W. SPARKS [1998]. Everybody wants a super model: Towards an integrated theory of mid-ocean ridge dynamic. *EOS Trans. AGU*, **79**(45):F39. Fall Meeting, Invited.
- [30] SPIEGELMAN, M. [1998]. Chem-flow to go: Coupled chemical-dynamic models for mid-ocean ridges (and island arcs). *EOS Trans. AGU*, **79**(45):F991. Session organizer.
- [31] SPIEGELMAN, M., E. AHARONOV, and P. B. KELEMEN [1996]. The compaction reaction: Magma channel formation by reactive flow in deformable media (abstract). *EOS Trans. AGU*, **77**(46):F783. Fall Meet. Suppl.

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#### **WORKS IN PROGRESS/MISC.:**

- [1] **Simpson**, G., M. **SPIEGELMAN**, and M. I. **WEINSTEIN** [2006]. Degenerate dispersive equations arising in the study of magma dynamics. For submission, non-linearity.
- [2] **Fang**, Y. and M. **SPIEGELMAN** [2004]. Reactive channeling instabilities in adiabatically upwelling systems. (in prep).
- [3] **Benowitz**, I., M. **SPIEGELMAN**, and M. H. **ANDERS** [2003]. Speculations and consequences of a spreading-plume head model for the western U.S. For submission to *Geology*.
- [4] **SPIEGELMAN**, M. [1998–2003]. Myths and methods in modeling. URL <http://www.ldeo.columbia.edu/~mspieg/mmm>. A comprehensive set of course notes on the basics of numerical modeling, 192 pp.
- [5] **SPIEGELMAN**, M. [1999]. Equations for modeling disequilibrium temperature/entropy transport in two-phase open systems. (private notes, available from the author on request).
- [6] **SPIEGELMAN**, M. [April 1998]. General equations for modeling geochemical transport in open systems. (private notes for solving fractional major-element transport, Reactive trace-element transport and Reactive U-series transport, available from the author by request).
- [7] **SPIEGELMAN**, M. [1998]. 2-d potential form equations for flow in viscously deformable permeable media. (private notes, available from the author on request).

## **PROPOSALS:**

**NSF-EAR0624648** 26th International Conference on Mathematical Geophysics: student and early career scientist support. \$27,680 (funded 2006)

**NSF-EAR0610138** Geochemical Consequences of Melt Channelization: Exploring New Models for U-series Variability. \$187,068 (Pending 2006).

**NSF-EAR/DMS** CMG RESEARCH: Analytical and computational studies of magma dynamics, \$316,627 (Co-PI; with Michael Weinstein, APAM) (awarded 2005)

**NSF-OCE** Understanding Magma Genesis in Subduction Zones: New models for Reactive Hydrous Melting and Transport \$102,644(PI) (funded 2005)

**NSF-OCE0452457** RIDGE2000 Postdoc: Dynamics of Coupled Tectonic/Hydrothermal Systems at Mid-Ocean Ridges; a Damage Rheology Approach. \$131,170 (2004).

**NSF-EAR/GEOINFORMATICS** Computational infrastructure for geodynamics, CIG (funded 2004, \$6,750,473, Mike Gurnis, Caltech lead PI; M. Spiegelman Proposal writing committee, Vice-Chair Exec. Committee),

**NSF-DGE0221041** IGERT: A Joint Graduate Program in applied mathematics and the Earth and Environmental Sciences (Polvani, L., PI; Phong, D., Spiegelman, M., Lall, U., De La Pena, V., CO-PI) \$1,554,710 12/15/2002 11/30/2004

**NSF-EAR/GEO** 25th International meeting on Mathematical Geophysics. \$10,000 travel support. (2004)

**ONR** Modeling the Stratigraphic Sequences at the Adriatic and Rhone Continental Margins (Michael Steckler, LDEO, lead PI) \$214,783 funded 2002.

**NSF-EAR/GEO** 24th International meeting on Mathematical Geophysics. \$25,000 travel support. (2002)

**Columbia-AQF** Establishment of a center for scientific computing. Richard Friesner and Michael Mauel PI's. (2002)

**NSF-EAR0207851** Dynamics of Partially Molten Regions: Development of New Tools for Understanding Melt Localization by Mechanical Deformation \$145,481. Funded 2002

**NSF-OCE0137108** Collaborative Research: Geochemical Consequences of Melt Channeling: Exploring a New Class of Models for Geochemical Variability. \$265,266 (Columbia) with Peter Kelemen WHOI. Funded 2002

**Lamont Investment Fund** "Disposable SuperComputing": investing in a new model of low cost/high performance computing at LDEO/Columbia. With Lorenzo Polvani Dept. of App. Physics and App. Math.. \$80,000. Seed money for developing high-performance Linux Clusters. (2000)

- NSF-EAR/GEO** 23rd International meeting on Mathematical Geophysics. \$32,002 travel support. (2000)
- NSF OCE-9907079** Development of models for coupled geochemical/geophysical dynamics at subduction zones \$149,818. funded 1999.
- NSF RIDGE OCE-9618706** Understanding the sensitivity of geochemistry to mantle dynamics. (with David Sparks) Funded \$295,394. 1997.
- NSF EAR-9601930** Acquisition of a very large mass storage system for earth and environmental science research and research training at LDEO (with Art Lerner-Lam and Bob Bookbinder) Funded \$500,000. 1996
- NSF RIDGE OCE-9530307** Causes and consequences of flow organization during melt transport. Funded \$270,769 1996
- NSF RIDGE OCE-9402922** Three dimensional convection and magma migration beneath mid-ocean ridges: a new approach to multi-scale mantle dynamics (with David Sparks). funded \$98,000 1994
- NSF RIDGE OCE-9314626** Experimental and theoretical constraints on mantle melting beneath ridges: extensions to the spinel to garnet transition and beyond. (with Ro Kinzler). Funded \$181,475 1994
- NSF Continental Dynamics EAR-9220106** A combined observational and Theoretical investigation of thermal and chemical transport in subduction zones and the evolution of active continental margins. Joint proposal with URI, and Carnegie Inst. Wash. Funded \$600,000, 1992
- NSF RIDGE OCE-9114959** Focusing on Freezing: Investigating a novel mechanism for melt migration beneath mid-ocean ridges. Funded \$70,293 1991
- NSF: OCE-9012572** Trace element response to mantle process: An application of magma migration. Funded \$43,201 1991