# CURRICULUM VITAE: MARC ANDRE HESSE


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## PROFESSIONAL APPOINTMENTS

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|---|---|
| 2009 – current | Assistant professor of Geological Sciences, University of Texas at Austin |
| 2008 – 2009 | Postdoctoral scholar in Geological Sciences, Brown University |
| 2003 – 2008 | Graduate Research Assistant in Petroleum Engineering, Stanford University |
| 2006 & 2007 | Reservoir Simulation Research Team, Chevron Energy Technology Company |
| 1999 | Summer Intern, Hawaii Scientific Drilling Project |

## PROFESSIONAL PREPARATION

**2009 Postdoc** **Geological Sciences** **Brown University**
Advisors: Y. Liang & E. M. Parmentier
Topic: *Multiscale modeling of the physics and chemistry of melting and melt migration.*

**2008 Ph.D.** **Petroleum Engineering** **Stanford University**
Advisors: H. Tchelepi & F. M. Orr Jr.
Thesis: *Mathematical modeling and multiscale simulation of $CO_2$ storage in saline aquifers.*

**2003 M.Phil.** **Fluid Flow** **University of Cambridge**
Advisor: J. Lie
Thesis: *Numerical simulation of axis-symmetric rising bubbles.*

**2002 M.S.** **Oceanography** **M.I.T. - W.H.O.I. Joint Program**
Advisors: T. Grove & N. Shimizu
Thesis: *Absarokites from Western Mexico: Constraints on mantle wedge conditions.*

**2000 Hon. BSc** **Geology** **University of Edinburgh**
Advisor: G. Graham
Thesis: *Metamorphic rocks of the southern Tayvallich peninsula.*

**1998 Vordiplom** **Geologie** **Technische Universität München**

## HONOURS AND AWARDS

| | | |
|---|---|---|
| 2009 | David Crighton Fellowship | University of Cambridge |
| 2002 | European Trust Bursary & EPSRC Studentship | University of Cambridge |
| 2000 | Presidential Graduate Fellowship | Massachusetts Institute of Technology |
| 2000 | Edinburgh Geological Society Prize | University of Edinburgh |
| 1999 | Mineralogical Society Student Award | University of Edinburgh |
| 1999 | Total Oil Marine Prize | University of Edinburgh |

## PROFESSIONAL ACTIVITIES

### Affiliations

American Geophysical Union (AGU), Society for Industrial Applied Mathematics (SIAM), American Physical Society (APS), Geochemical Society (GS), Interpore, Society of Petroleum Engineers (SPE).

### Reviewer for technical journals

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|---|---|
| Geoscience: | Earth and Planetary Science Letters, Water Resources Research, International Journal of Greenhouse Gas Control. |
| Physics & Engineering: | Journal of Fluid Mechanics, Transport in Porous Media, Advances in Water Resources. |
| Scientific Computing: | Journal of Computational Physics, Journal of Scientific Computing, International Journal of Numerical Analysis and Modeling. |

### Service to scientific community

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| Conference organizing committees: | 2008 & 2010 Gordon Research Conference<br>Flow and Transport in Permeable Media |
| Conference chair: | 2010 Gordon-Keenan Graduate Research Seminar<br>Flow and Transport in Permeable Media |
| Mini-symposia organizer: | SIAM Mathematical and Computational Geosciences 2009<br>MS53 & 60: Geological $CO_2$ storage<br>MS38: Dynamics of partially molten rocks |
| Convener: | American Geophysical Union Fall Meeting 2009<br>V41: Geochemical consequences of melt migration |
| Mini-symposia organizer: | SIAM Mathematical and Computational Geosciences 2007<br>MS43: Self-similar solutions in porous media flow |

### Scientific outreach activities

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| Explore UT: | Large-scale demonstration of non-Newtonian fluid behavior for the UT open house, approximately 700 children aged 4-12 participated |

## LANGUAGES

German (native), English (proficient), Italian (beginner)

## PUBLICATIONS

**Citation metrics** (ISI-Web of Science. last updated: 03/26/2011)

| | |
|---|---|
| Researcher-ID: | B-4914-2011 |
| Total articles in publication list: | 10 |
| Articles with citation data: | 10 |
| Sum of the times cited: | 158 |
| h-index: | 6 |

**List of publications:**

1. **Hesse**, Schiemenz, Liang, Parmentier (201X) Compaction-dissolution waves in viscously deforming porous media, submitted to *J. Fluid Mech*

2. Golding, Neufeld, **Hesse**, Huppert (2011) Two-phase gravity currents in porous media, accepted for publication to *J. Fluid Mech.*

3. Schiemenz, **Hesse**, and Hesthaven (2010) Modelling magma dynamics with a mixed Fourier collocation - discontinuous Galerkin method, *Comm. in Comput. Phys.*, accepted for publication

4. Neufeld, **Hesse**, Riaz, Hallworth, Tchelepi, Huppert (2010) Convective dissolution of carbondioxide in saline aquifers, *Geophys. Res. Lett.*, **37**, L22404, doi:10.1029/2010GL044728

5. Liang, Schiemenz, **Hesse**, Parmentier, and Hesthaven (2010) High-porosity channels for melt migration in the mantle: Top is the dunite and bottom is the harzburgite and lherzolite, *Geophys. Res. Lett.* **37**, L15306, doi:10.1029/2010GL044162

6. **Hesse** & Woods (2010) Buoyant dispersal of $CO_2$ during geological storage, *Geophys. Res. Lett.* **37**, L01403, doi:10.1029/2009GL041128

7. Hadjibeygi, Bonfigli, **Hesse**, Jenny (2008) Iterative multi-scale finite volume method, *J. Comput. Phys.* **227**, 8604-8621

8. **Hesse**, Mallison, Tchelepi (2008) Compact Multiscale Finite Volume Method for Heterogeneous Anisotropic Elliptic Equations, *Multiscale Model. Simul.* **7**, 934-962

9. **Hesse**, Tchelepi, Orr Jr. (2008) Gravity currents with residual trapping, *J. Fluid Mech.* **611**, 35-60

10. **Hesse**, Tchelepi, Orr Jr. & Cantwell (2007) Gravity currents in horizontal porous layers: transition from early to late self-similarity, *J. Fluid Mech.* **577**, 363-383

11. Riaz, **Hesse**, Tchelepi, Orr Jr. (2006) Onset of convection on a gravitationally unstable diffusive boundary layer, *J. Fluid Mech.* **548**, 87-111

12. Li, **Hesse**, Ziegler, Woods (2005) An arbitrary Lagrangian-Eulerian method for moving-boundary problems and its applications to jumping over water, *J. Comput. Phys.* **208**, 289-314

13. **Hesse** & Grove (2003) Absarokites from the western Mexican Volcanic Belt: Constraints on mantle wedge conditions, *Contrib. Mineral. Petrol.* **146**, 10-27

## PATENTS

| | |
|---|---|
| Title: | Iterative multi-scale method for flow in porous media |
| Inventors: | Hadjibeygi, Bonfigli, **Hesse**, Jenny |
| Application number: | 20100094605 |

## CURRENT EXTERNAL RESEARCH SUPPORT

### Principal investigator

| | |
|---|---|
| Title: | **CMG Research: Robust numerical methods for multi-phase Darcy-Stokes flow** in heterogeneous and anisotropic partially molten materials |
| Agency: | National Science Foundation EAR - CMG-1025321 |
| Amount: | $324,667 |
| Duration: | 09/01/2010 - 08/31/2013 |
| Title: | **2010 Flow and Transport in Permeable Media GRC & GRS** |
| Agency: | National Science Foundation EAR-HS-1009435 |
| Amount: | $41,885 |
| Duration: | 05/01/2010 - 04/30/2011 |

### Co-Principal investigator or collaborator

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|---|---|
| Title: | **CDI-Type II: Dynamics of Ice Sheets: Advanced Simulation Models**, Large-Scale Data Inversion, and Quantification of Uncertainty in Sea Level Rise Projections |
| Agency: | National Science Foundation CDI ARC-0941678 |
| Amount: | $2,002,463 |
| Duration: | 09/01/2009 - 08/31/2013 |
| Title: | **Developing a comprehensive risk assessment framework for geological $CO_2$ storage** |
| Agency: | US DOE National Energy Technologies Laboratory |
| Amount: | $1,996,402 |
| Duration: | 01/01/2010 - 12/31/2013 |