

Curriculum Vitae

Matthijs Cornelis van Soest

Current job title and work address:

Associate Research Professional
Arizona State University
School of Earth and Space Exploration
Noble Gas Geochemistry and Geochronology Laboratories
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Date of Birth: May 1, 1972.

Location: Haarlem, The Netherlands.

Nationality: Dutch.

Marital Status: Single/Never married.

Passport/Visa Status: US Visa: H1B until January 2009. Holder of a Dutch (European Union) Passport.

Education:

9/1984-6/1990

Pre-university: Triniteitslyceum Haarlem, The Netherlands.
Graduation Subjects: Dutch, English, German, Maths, Physics, Chemistry, Biology, History.

9/1990-11/1994

Doctoral Degree: Vrije Universiteit, Amsterdam, The Netherlands.
Address: Faculteit der Aard- en Levenswetenschappen, Vrije Universiteit, De Boelelaan 1085, 1081 HV Amsterdam, The Netherlands. Ph: 31 (0)20 5987000, Fx: 31 (0)20 6462457, Em: falw@falw.vu.nl.
Earth Sciences. Specialisation: Petrology & Isotope Geochemistry
Date of Graduation: 10/28/1994.
Graduation Thesis subject: Magma intrusion directions in sheeted dikes of the extrusive series of the Troodos ophiolite, Cyprus.
Supervisors: Prof. Dr. H. Staudigel, Prof. Dr. L. Tauxe – now both at Scripps Institution of Oceanography, UCSD, La Jolla, CA, USA.
This was part of a larger project with a duration of four years.

11/1994-12/1999

Ph.D.: Vrije Universiteit, Amsterdam, The Netherlands
Address: Faculteit der Aard- en Levenswetenschappen, Vrije Universiteit, De Boelelaan 1085, 1081 HV Amsterdam, The Netherlands. Ph: 31 (0)20 5987000, Fx: 31 (0)20 6462457, Em: falw@falw.vu.nl.
Earth Sciences. Isotope Geochemistry Group.
Title: Sediment Subduction and Crustal Contamination in the Lesser Antilles Island Arc.
Supervisor: until 1996: Prof. Dr. H. Staudigel – now at Scripps Institution of Oceanography, UCSD, La Jolla, CA, USA. From 1996: Prof. Dr. J. Touret (has since retired)
Co-Supervisors: Prof. Dr. D. Hilton (de facto project leader – until 1996) – now at Scripps Institution of Oceanography, UCSD, La Jolla, CA, USA.
From 1996: Dr. T. Dunai – now at School of Geosciences, University of Edinburgh, Edinburgh, UK.
Scientific Advisor: Dr. T. Elliott – now at University of Bristol, Bristol, UK.
Date of actual defense: 03/28/00.

Post-graduate Experience:

11/1999-11/2001 Postdoctoral Researcher University of Connecticut/E. O. Lawrence Berkeley National Laboratory.
Subject: Noble gases in Hydrocarbon Hydrogeology. Supervisors: UConn: Prof. T. Torgersen; LBNL: Dr. B. M. Kennedy. Although I am funded by a grant based at the University of Connecticut, I have carried out all the work at LBNL.

11/2001-10/2006 Staff Research Associate, Center for Isotope Geochemistry, E. O. Lawrence Berkeley National Laboratory. Supervisor: B. Mack Kennedy; Group Leader: Don J. DePaolo.

11/2006 – present Associate Research Professional, School for Earth and Space Exploration, Arizona State University. Supervisor: Kip V. Hodges.

Research Interests:

The application and development of noble gas geochemical tracer and isotope (dating) techniques to problems in natural systems as a means to furthering our understanding of the Earth's geological system and processes. Currently my main research interest is in the application of existing U-Th/He geo- and thermochronology methods to geologic problems and further experimental investigation of details of these methods that have so far been ignored, glossed over or not sufficiently addressed. Additionally I am interested in expanding the U-Th/He methods to different minerals (for example dating of mafic minerals in previously hard to date rocks to get at eruption ages and possibly timing of magma chamber processes) that would expand the utility of the method into new areas of geology.

Secondary research interests include investigation of noble gas isotope and abundance systematics in magmatic, geothermal, hydrologic, and hydrocarbon systems. Of particular importance are the characterization of: (a) the specific sources of noble gases in these systems, (b) the transport mechanisms of noble gases in these systems, and (c) the times scales on which processes in these different systems take place.

My main research interests focus on noble gases, but it is my philosophy and background to approach problems with as many geochemical/petrological tools as possible, such as petrography, major and trace element geochemistry, radiogenic isotope geochemistry and where possible/necessary geophysical methods.

Teaching Experience:

1994-1998 During my Ph.D. I was a teaching assistant for several theoretical, practical, and field courses. This included:

- A 1st year undergraduate practical course in magmatic and metamorphic rock recognition.
- A 2nd year undergraduate practical course in microscope description of magmatic and metamorphic minerals, rocks and textures.
- A 1st year undergraduate structural/stratigraphic field mapping exercise of 3 weeks in Spain, approx. 150km. inland northwest of Alicante.
- A 2nd year undergraduate structural field mapping exercise of 4 weeks in Spain, approx. 250km. inland northwest of Valencia.
- A 1st year undergraduate crystal morphology course.
- An introduction excursion to geology in southern Holland, the Eifel, and the Sauerland (Germany) for 1st year undergraduate students.
- An excursion for metamorphic geology in the Pyrenees (France) for 2nd year undergraduate students.
- Several lectures in the course Endogene Isotope Geology for 3rd and 4th year undergraduate students.

Fieldwork/Work-study related visits to other institutions:

9/1990-11/1994 Structural and Stratigraphic mapping field work in Spain (2x – 1991, 1992).

Mapping and sampling the Troodos Ophiolite, Cyprus for paleo mag and geochemistry (2x - 1993, 1994). Participation in many short excursions and fieldtrips throughout Europe.

7/1993 Participation in the 'training through research' cruise aboard the R/V Gelendzhik. For two weeks I part of the scientific crew on a reconnaissance cruise for a planned ODP cruise in the eastern Mediterranean.

6/1994-8/1994 I was awarded a Scripps Undergraduate Research Fellowship (SURF) and attended a summer school at Scripps Institution of Oceanography, working with Prof. Lisa Tauxe.

1/1995-3/1995 Sampling rocks (lavas) and geothermal fluids on 12 islands with active volcanoes in the West Indies.

10/1996-12/1996 Sampling rocks (lavas) and geothermal fluids on 12 islands with active volcanoes in the West Indies, and visited the islands of Barbados and Trinidad to look for and sample mud volcanoes.

8/1997-12/1997 Work/Study visit to Scripps Institution of Oceanography working with Prof. David Hilton on helium isotope analyses of samples I collected in the West Indies for my PhD project.

1994-1998 Several teaching related field trips and excursions see above.

1999-present Multiple geothermal fluid and rock sampling field trips in the Cascades and Basin and Range provinces of the western United States. Too many individual trips of several days to several weeks at a time to list individually. Work was often done in collaboration with researchers from the USGS in Menlo Park, University of Nevada at Reno, and University of California at Berkeley.

I have fieldwork experience in many diverse areas, ranging from high grade metamorphic terrains, to active volcanoes. While most of the most recent fieldwork has mainly involved sampling of volcanic rocks or geothermal fluids, I have extensive experience in structural and stratigraphic field mapping.

Laboratory Experience/Skills:

During my studies I have obtained experience working with many different analytical methods and some of the preparation techniques required for them:

- * Rock crushing and mineral separation techniques.
- * Clean lab experience for elemental separation for Sr (and Nd) isotope analysis.
- * Preparation of XRF pellets for major and trace element geochemistry
- * Operation of an electron microprobe.
- * Operation of multi collector TIMS (MAT261 and 262).
- * Operation, maintenance, and trouble shooting of a multitude of noble gas magnetic sector and quadrupole mass spectrometers.
- * Design, construction, and maintenance of a multitude of high vacuum noble gas on-line and off-line extraction lines including high temperature furnaces and solenoid, pneumatic, and manually operated crushers.

Publications:

On this list I have included all manuscripts that were in some way peer reviewed. All short, less than 1 page conference abstracts have been excluded.

Matthijs C. van Soest, David R. Hilton, & Rob Kreulen. Using helium and carbon (CO₂) isotopes to distinguish between source and crustal contribution in arc magmas. A case study from the Lesser Antilles island arc. Geological Society of Australia Abstracts vol. 45, pp. 99-102, 1997.

Matthijs C. van Soest, David R. Hilton, & Rob Kreulen. Tracing crustal and slab contributions to arc magmatism in the Lesser Antilles island arc using helium and carbon relationships in geothermal fluids. *Geochimica et Cosmochimica Acta*, vol. 62, no. 19/20 pp. 3323-3335, 1998.

Hubert Staudigel, L. Tauxe, J. S. Gee, P. Bogaard, J Haspels, G. Kale, A. Leenders, P. Meijer, B. Swaak, M. Tuin, **M. C. van Soest**, E. A. Th. Verdurmen, & A. Zevenhuizen. Geochemistry and intrusive directions in sheeted dikes in the Troodos ophiolite: Implications for Mid-Ocean Ridge spreading centers. *G³ Geochemistry, Geophysics, Geosystems* vol. 1, 11p., 1999.

M. Griselin, J. C. van Belle, C. Pomiès, P. Z. Vroon, **M. C. van Soest**, & G. R. Davies. An improved chromatographic separation technique of Nd with application to NdO⁺ isotope analysis. *Chemical Geology* vol. 172, pp. 347-359, 2001.

M. C. van Soest, D. R. Hilton, C. G. Macpherson, & D. P. Matthey. Resolving Sediment Subduction and Crustal Contamination in the Lesser Antilles Island Arc: a Combined He-O-Sr Isotope Approach. *Journal of Petrology* vol. 43 no. 1 pp. 143-170. LBNL-50641, 2002.

W. C. Evans, R. H. Mariner, S. E. Ingebritsen, B. M. Kennedy, **M. C. van Soest**, & M. A. Huebner. Report of hydrologic investigations in the Three Sisters area of central Oregon, summer 2001. USGS Water-Resources Investigations Report 02-4061, 16 pp. LBNL-50649. 2002.

B. W. Christenson, E.K. Mroczek, B.M. Kennedy, **M. C. van Soest**, M. K. Stewart, & G. Lyon. Ohaaki reservoir chemistry: Characteristics of an arc-type hydrothermal system in the Taupo Volcanic Zone, New Zealand. *Journal of Volcanology and Geothermal Research* 115, pp 53-82. LBNL-48570, 2002.

B. M. Kennedy, T. Torgersen, **M. C. van Soest**. Multiple Atmospheric Noble Gas Components in Hydrocarbon Reservoirs: A Study of the Northwest Shelf, Delaware Basin, SE New Mexico. *Geochimica et Cosmochimica Acta* 66, no. 16, pp. 2807-2822, LBNL-47387, 2002.

M. C. van Soest, B. M. Kennedy, W. C. Evans, & R. H. Mariner. Mantle helium and carbon isotopes in Separation Creek geothermal springs, Three Sisters area, central Oregon: Evidence for renewed volcanic activity or a long term steady state system. *GRC Transactions* 26, pp. 361-366, LBNL-50646, 2002.

L. Shevenell, L. Garside, G. Arehart, **M. C. van Soest**, & B. M. Kennedy. Geochemical sampling of thermal and nonthermal waters in Nevada to evaluate potential for resource utilization. GRC transactions 26, pp. 501-506, LBNL-50647, 2002.

W. C. Evans, **M. C. van Soest**, R. H. Mariner, S. Hurwitz, S. E. Ingebritsen, C. W. Wicks Jr., & M. E. Schmidt. Magmatic intrusion west of Three Sisters, central Oregon, USA: The perspective from spring geochemistry. *Geology* 32, no. 1, p. 69-72, LBNL-53877, 2004.

M. C. Van Soest, W. C. Evans, R. H. Mariner, & M. E. Schmidt. Chloride in hot springs of the Cascade volcanic arc – the source puzzle. In: *Water – Rock Interaction Vol. 1; Proceedings of the eleventh international symposium on water – rock interaction (WRI-11)*, Eds: Wanty, R. B. and Seal II, R. R., Saratoga Springs, NY, USA, 27 June – 2 July 2004. 209-213. LBNL-55553.

T. Torgersen, B. M. Kennedy, & **M. C. van Soest**. Diffusive separation of noble gases and noble gas abundance patterns in sedimentary rocks. *Earth and Planetary Science Letters* 226, 477-489, LBNL-55507, 2004.

L. J. Patterson, N. C. Sturchio, B. M. Kennedy, **M. C. van Soest**, M. Sultan, Z.-L. Lu, B. Lehmann, R. Purtschert, Z. El Alfy, B. El Kaliouby, Y. Dawood, & A. Abdallah. Cosmogenic, radiogenic, and stable isotopic constraints on groundwater residence time in the Nubian Aquifer, Western Desert of Egypt. *Geochemistry, Geophysics, Geosystems*, G3 vol. 6, no. 1, Q01005, doi:10.1029/2004GC000779, LBNL-57471, 2005.

Barker, B., M. Kennedy, M. Hoversten, **M.C. van Soest**, and K. Williams, Geothermal Exploration At Fort Bidwell, California. Thirtieth Workshop on Geothermal Reservoir Engineering. Stanford, CA, PROCEEDINGS, Thirtieth Workshop on Geothermal Reservoir Engineering Stanford University, SGP-TR-176, 2005. LBNL-57275 Ext. Abs. 2005.

B. Mack Kennedy and **Matthijs C. van Soest**. Regional and Local Trends in Helium Isotopes, Basin and Range Province, Western North America: Evidence for Deep Permeable Pathways. GRC Transactions Vol. 29, 263-267 - PDF file, 2005.

B. Mack Kennedy and **Matthijs C. van Soest**. A Helium Isotope Perspective on the Dixie Valley, Nevada Hydrothermal System. *Geothermics* 35, pp. 26-43, 2006.

William C. Evans, Deborah Bergfeld, **Matthijs C. van Soest**, Mark A. Huebner, John Fitzpatrick, and Kinga M. Revesz. Geochemistry of low-temperature springs northwest of Yellowstone caldera: seeking the link between seismicity, deformation, and fluid flow. *Journal of Volcanology and Geothermal Research*, 154, pp. 169-180, 2006.

Dobson, P., Sonnenthal, E., Kennedy, M., **Van Soest, T.**, and Lewicki, J. Temporal changes in noble gas compositions within the Aidlin sector of The Geysers geothermal system. Transactions, Geothermal Resources Council, 2006 Annual Meeting (LBNL #60159), 2006.

Kennedy, B. M. & **M. C. van Soest**, Mapping Strain Induced Permeability: Helium Isotope Trends Across the Northern Basin and Range Province, Western North America. Transactions, Geothermal Resources Council, 2006 Annual Meeting, 2006.

Kennedy, B. M. & **M. C. van Soest**, Flow of mantle fluids through the ductile lower crust: Helium isotope trends. *Science* 318 (5855) pp. 1433-1436, 2007.

Papers/Presentations in Proceedings of International Conferences and Workshops (for complete references see publications list above):

- State of the Arc – Workshop 1997.
- 11th international symposium on Water-Rock Interaction (WRI): 2004.
- GRC – Geothermal Resources Council Annual meeting: 2002, 2005, 2006.
- SGRW – Stanford Geothermal Research Workshop: 2005.

Abstracts/Presentations at International Conferences:

I have attended and presented papers at the following conferences/workshops:

- AGU - American Geophysical Union Fall Meeting: 1995, 1997, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2008.
- BES – DOE Basic Energy Sciences Workshop (Multiscale Reservoir Symposium): 2001.

- EUG – European Union for Geosciences: 1995, 1997, and 1999.
- Goldschmidt – International Meetings for Geochemistry: 1996, 2000, 2005, 2008.
- GSA – Geological Society of America Annual meeting: 2003.
- GSA – Cordilleran Section Annual meeting: 2002.
- NAC – Dutch Earth Sciences Conference: 1994, 1996.
- SGRW – Stanford Geothermal Research Workshop: 2003, 2004.

Professional Association Memberships:

- * American Geophysical Union: since 1995
- * Geological Society of America: since 2003
- * Geothermal Resources Council: since 2002
- * Geochemical Society: since 2001
- * Mineralogical Society of America: since 2007
- * European Union for Geosciences: 1995 – 1999

Awards:

- * Scripps Undergraduate Research Fellowship (1994)
- * Best Paper Award for the Exploration 1 session of the annual meeting of the Geothermal Resources Council 2006.

References:

Below I provide the names and addresses of four references:

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