Curriculum Vitae (Carmen Boening)

Education

Nov. 2005 – Jul. 2009: PhD in physics at the University of Bremen, Germany (Thesis: *Validation of ocean mass variability derived from the Gravity Recovery and Climate Experiment - Studies utilizing in-situ observations and results from a Finite Element Sea ice - Ocean Model*,
Advisors: Prof. Dr. Dirk Olbers (University of Bremen)
Dr. Jens Schroeter (Alfred Wegener Institute, Bremerhaven)

Oct. 2000 - Nov. 2005: University of Bremen, Department of Mathematics and Computer Science. MSc Mathematics ('Diplom Mathematik'). Major *mathematics*/Minor *computer science*

Additional training

Sep. 2007 CKO Summer School, Physical Oceanography, Les Diablerets, Switzerland

Employment experience:

Since June 2011: Scientist at Jet Propulsion Laboratory/ California Institute of Technology, Pasadena, CA, USA

Aug. 2009 – June 2011: Postdoctoral Scholar at California Institute of Technology, Jet Propulsion Laboratory, Pasadena, CA, USA

Sep. 1997 - Aug. 2000: Apprenticeship/employment as *mathematical technical assistant* (applied mathematics, software engineering and development) at STN Atlas Elektronik GmbH, Bremen, Germany

Technical skills:

- Software development and engineering using procedural (C, FORTRAN, ADA) and object-oriented (C++, Java) programming languages.
- Database development (SQL) and webpage design (HTML).
- Scientific programming for scalar, vector and parallel supercomputers (FORTRAN)
- Modifying and running ocean models (e.g. FESOM, ECCO, ECCO2)
- Computing on different architectures and operating systems (PC, UNIX&LINUX)
- Handling, analysis and visualization of large data sets using for example Matlab
- Multi-sensor analysis of various satellite data sets (GRACE, TOPEX/Poseidon + Jason-1/-2, ASCAT, TRMM).
- Analyzing/evaluating atmospheric and oceanic reanalysis products.
- Post-processing of satellite data (GRACE, ASCAT).
- Publishing scientific results in peer-reviewed papers or conference presentations (see Publications and Presentations)
- Conducting *in-situ* measurements (PIES (Pressure Sensor equipped inverted Echo Sounder), CTD, Moorings etc.)

Awards

JPL Outstanding Postdoc Poster Award (2010)

Professional Activities and Research Highlights

- Session convener for 2010 Fall AGU meeting on Southern Ocean variability
- Workshop organizer: "Understanding Sea Level Rise: The Roles of Coupled Systems", *JPL, Aug. 29-31, 2011*
- Reviewer for Science, NSF, SURP, NASA NESSF, GRL, JPO, JGR, Journal of Geodynamics, Ocean Science Discussions
- Interview with Australian ABC News
- Articles featured in German online news magazine "Spiegel"
    - "Forscher entdecken riesigen Wasserhügel": http://www.spiegel.de/wissenschaft/natur/0,1518,748482,00.html;
    - "Wetterumschwung senkt globalen Meeresspiegel": http://www.spiegel.de/wissenschaft/natur/0,1518,782324,00.html
- Article featured in Nature Geoscience:
    - "Bulge in the ocean": http://www.nature.com/ngeo/journal/v4/n7/full/ngeo1197.html
- NASA/JPL press release on sea level decline in 2010:
    - "NASA Satellites Detect Pothole on Road to Higher Seas" http://www.nasa.gov/topics/earth/features/earth20110823.html

Field work

R/V Polarstern, cruise ANT-XXIV/3, 06.02.2008 - 16.04.2008, Weddell Sea, Drake Passage, supply N/J Phys. oceanography, geosciences, IPY CASO, GEOTRACES

Fahrbach, E. (ed), de Baar, H. (ed)(2010).The expedition of the research vessel "Polarstern" to the Antarctic in 2008 (ANT-XXIV/3) / ed. by Eberhard Fahrbach and Hein de Baar, *Berichte zur Polar- und Meeresforschung = Reports on polar and marine research*, 606, 232 p.

Publications

2011

Boening, C., T. Lee, and V. Zlotnicki (2011), A record-high ocean bottom pressure in the South Pacific observed by GRACE, *Geophys. Res. Lett.*, 38, L04602, doi:10.1029/2010GL046013.

2010

Böning, C., Timmermann, R., Danilov, S., Schröter, J. (2010). On the representation of transport variability of the Antarctic Circumpolar Current in GRACE gravity solutions and numerical ocean model simulations, In Flechtner F, Gruber T, Güntner A, Mandea M, Rothacher M, Schöne T, Wickert J (eds) *Satellite Geodesy and Earth System Science*, Springer-Verlag, Berlin, Heidelberg, Part 2, 187-199, DOI: 10.1007/978-3-642-10228-8_15

Macrander, A., **Böning, C.**, Boebel, O., Schröter, J. (2010). GRACE Validation by in-situ data of Ocean Bottom Pressure. In Flechtner F, Gruber T, Güntner A, Mandea M, Rothacher M, Schöne T, Wickert J (eds) *Satellite Geodesy and Earth System Science*, Springer-Verlag, Berlin, Heidelberg, Part 2, 169-185, DOI: 10.1007/978-3-642-10228-8_14

2009

Böning, C. (2009), Validation of ocean mass variability derived from the Gravity Recovery and Climate Experiment - Studies utilizing *in-situ* observations and results from a Finite Element Sea ice - Ocean Model, *Bremen, Univ., Diss., 2009,* http://nbn-resolving.de/urn:nbn:de:gbv:46-diss000115268

Timmermann, R., Danilov, S., Schröter, J., **Böning, C.,** Sidorenko, D., Rollenhagen, K.(2009). Ocean circulation and sea ice distribution in a finite element global sea ice -- ocean model, *Ocean Modelling*, doi:10.1016/j.ocemod.2008.10.009., doi:10.1016/j.ocemod.2008.10.009

2008

Böning, C., Timmermann, R., Macrander, A., Schröter, J.(2008). A pattern-filtering method for the determination of ocean bottom pressure anomalies from GRACE solutions, *Geophysical Research Letters*, 35, L18611, doi:10.1029/2008GL034974 .

Presentations
(speaker underlined)

2011

Boening, C., Landerer, F. W., Nerem, S. R., Willis, J. K. (2011), The 2010 decline in global mean sea level and its relation to ENSO, *GRACE Science Team Meeting, Austin, TX, August, 8-9, 2011*

Boening, C., Lee, T., Zlotnicki, V. (2011), A record-high ocean bottom pressure signal in the South Pacific observed by GRACE, *ECCO2 Meeting. Massachusetts Institute of Technology, Cambridge, 5-6 May 2011.*

Boening, C., Lee, T., Zlotnicki, V. (2011), A record-high ocean bottom pressure signal in the South Pacific observed by GRACE, *11th Conference on Polar Meteorology and Oceanography, Boston, MA, 2-5 May, 2011*

Lee, T., **Boening, C.**, William R. Hobbs, W. R., Willis, J. K., Halkides, D., Fukumori, I., Armstrong, E. M., Hayashi, A. K., Liu, W. T., Patzert, W., Wang, O. (2011), An extreme oceanic and atmospheric event in the South Pacific and western Antarctica associated with the 2009-10 El Nino, *International Ocean Vector Wind Science Team meeting in Annapolis, Maryland, May 9-11, 2011:*

Boening, C., Lee, T., Zlotnicki, V. (2011), Variability and Changes in Southern Ocean circulation from GRACE, *Invited talk at the University of South Florida, St. Petersburg, Florida, March, 2011*

2010

Boening, C., Lee, T., Zlotnicki, V. (2010), A record-high ocean bottom pressure signal in the South Pacific observed by GRACE, Abstract OS41E-03 presented at *2010 Fall Meeting, AGU, San Francisco, Calif., 13-17 Dec.*

Boening, C., Lee, T., Zlotnicki, V. (2010), A record-high ocean bottom pressure signal in the South Pacific observed by GRACE, *GRACE Science Team Meeting, Nov. 11-12, Potsdam, Germany*

Boening, C., Lee, T., Zlotnicki, V. (2010), A record-high ocean bottom pressure signal in the South Pacific observed by GRACE, *Australia - New Zealand Climate Forum 2010, Oct. 13-15, Hobart, Australia*

Boening, C., Lee, T., Zlotnicki, V. (2010), Record-high ocean bottom pressure in the South Pacific observed by GRACE, *JPL Postdoc Research Day 2010*

Boening, C., Zlotnicki, V. (2010), Antarctic Circumpolar Current Transport Variability for GRACE data and ECCO2 numerical model. *IPY Oslo Science Conference 2010*

Boening, C., V Zlotnicki, Fetter, A. (2010). Influences on Southern Ocean mass variability derived from GRACE gravity field anomalies, *Eos Trans. AGU, 91(26), Ocean Sci. Meet. Suppl.*, Abstract IT45K-09

2009

Boening, C., Danilov, S., Macrander, A., Schroeter, J., Timmermann, R., Zlotnicki, V., Fetter, A. (2009). On the representation of Southern Ocean mass variability in GRACE-derived ocean bottom pressure anomalies, *Eos Trans. AGU, 90(52), Fall Meet. Suppl.*, Abstract G43A-0712

Boening, C., Zlotnicki, V., Fetter A. (2009), Variability in Southern Ocean circulation derived from ocean bottom pressure anomalies. *ECCO2 Meeting, California Institute of Technology, Pasadena, 8-10 November 2009*.

Böning, C., Timmermann, R., Macrander, A., Schröter, J., Boebel, O. (2009), Southern Ocean variability derived from GRACE retrievals, model simulations and in-situ measurements, *General assembly of the European Geophysical Union*, EGU2009-10129

Brunnabend, S.-E., **Boening, C.**, Rietbroek, R., Dahle, C., Kusche, J., Flechter, F., Savchenko, R., Bosch, W., Timmermann, R., Schroeter, J. (2009). On ocean density variations as observed by altimetry and GRACE, *General Assembly of the European Geophysical Union*, EGU2009-9930

Brunnabend, S. -E., Schröter, J., Rietbroek, R., Kusche, J., Dahle, Ch., Flechtner, F., **Böning, C.**, Timmermann, R.(2009).Abschätzung des Fehlers modellierter Veränderungen im Ozeanbodendruck und Vergleich mit in-situ Bodendruckdaten, *Geodätische Woche, Karlsruhe, Germany, 22.-24. September 2008*.

Brunnabend, S.-E., Schroeter., J., Timmermann, R., **Boening, C.**, Rietbroek, R., Kusche, J., Dahle, Ch., Flechtner, F. (2009). Variations of ocean mass from a Finite Element Sea-Ice Ocean Model (FESOM), *General assembly of the European Geophysical Union*, EGU2009-1296

Macrander, A., **Böning, C.**, Boebel, O., Schröter, J.(2009). Antarctic Circumpolar Current variability - a combined analysis of in-situ Bottom Pressure, Altimetry, and GRACE gravity, *General assembly of the European Geophysical Union*, EGU2009-11172

Macrander, A., **Böning, C.**, Schröter, J., Boebel,O. (2009). GRACE gravity solutions validated by in-situ ocean bottom pressure in different regions of the global ocean, *General assembly of the European Geophysical Union*, EGU2009-11188

2008

Böning, C., Timmermann, R., Macrander, A., Schröter, J., Boebel, O. (2008).Variability of the Antarctic Circumpolar Current derived from GRACE retrievals, model simulations and in-situ measurements, *AGU Fall Meeting 2008, San Francisco, USA, 15.-19. December 2008*

Böning, C., Timmermann, R., Macrander, A., Schröter, J. (2008). Evaluation of ocean mass variability derived from different GRACE solutions, *GEODÄTISCHE WOCHE, Bremen, 30.9.-2.10.2008.*

Böning, C., Timmermann, R., Macrander, A., Schröter, J. (2008). Ocean bottom pressure variability derived from different GRACE solutions, *GRACE Science Team Meeting 2008, San Francisco, USA, 12.-13. December 2008*

Brunnabend, S. -E., Schröter, J., Rietbroek, R., Kusche, J., Dahle, Ch., Flechtner, F., Jansen, M. J. F., Gunter, C., **Böning, C.**, Timmermann, R. (2008).Surface mass transport by joint inversion of modeled ocean bottom pressure, GRACE gravity models and GPS site displacements, *Geodetic Week, Bremen, Germany, 30. September - 02. October 2008*.

Macrander, A., **Böning, C.**, Boebel, O., Schröter, J. (2008). Global comparison of in-situ Ocean Bottom Pressure observations with GRACE, *Geodätische Woche 2008 Bremen.*

Schröter, J., Danilov, S., Sidorenko, D., Wang, Q., Timmermann, R., Nerger, L., Huerta-Casas, A., Maßmann, S., **Böning, C.**, Janjic, T., Behrens, J., Androssov, A., Richter, F., Hiller, W., Harig, S., Brunnabend, S.(2008).FEOM, status and plans, *Seventh International Workshop on Unstructured Grid Numerical Modelling of Coastal, Shelf and Ocean Flows, September 17-19 2008, Halifax, Canada.*

Macrander, A., **Böning, C.**, Boebel, O., Schröter, J. (2008). A global Performance Estimate of GRACE Gravity Solutions validated by in-situ Ocean Bottom Pressure, *General assembly of the European Geophysical Union*, EGU2008-A-03528

Rietbroek, R., Kusche, J., Dahle, Ch., Schmidt, R., Flechtner, F, Schröter, J., Jansen, M. J. F., Gunter, B., **Böning, C.**, Brunnabend, S. -E. (2008). Surface mass estimation from GPS site displacements, modeled Ocean bottom pressure and GRACE, *General assembly of the European Geophysical Union*, EGU2008-A-07928.

Schröter, J., Timmermann, R., Androsov, A., **Boening, C.**, Danilov, S., Huerta-Casas, A., Massmann, S., Sidorenko, D., Rollenhagen, K., Wang, Q. (2008).EGU2008-A-09296; A global finite-element sea ice and ocean model, *General assembly of the European Geophysical Union*, EGU2008-A-09296

2007

Böning, C., Macrander, A., Timmermann, R., Boebel, O., Schröter, J.(2007).Global Validation of GRACE Gravity Measurements by in-situ and modeled Ocean Bottom Pressure, *GRACE Science Team Meeting, 15--17 October 2007, Potsdam, Germany.*

Böning, C., Timmermann, R., Macrander, A., Schröter, J.(2007).GRACE mass variations and ocean bottom pressure fluctuations in the South Atlantic, *XXIV IUGG General Assembly, 02--13 July 2007, Perugia, Italy.*

Böning, C., Timmermann, R., Schröter, J., Macrander, A.(2007).Ocean bottom pressure and circulation in the South Atlantic, *European Geosciences Union General Assembly, 15–20 April 2007, Vienna, Austria., SRef-ID:EGU2007-A-07800* .

Schröter, J., Sidorenko, D., Harig, S., Wang, Q., Timmermann, R., Rollenhagen, K, **Boening, C.**, Janjic-Pfander, T., Huerta-Casas, A.(2007).FEOM, an unstructured mesh Finite Element Ocean Model, *European Geosciences Union General Assembly, Vienna, 15 - 20 April*.

Timmermann, R., **Böning, C.**, Wang, Q., Schröter, J.(2007).Southern Ocean water mass formation in a finite-element coupled sea ice--ocean model, *IUGG XXIV General Assembly, Perugia, Italy, July 1-13, 2007.*

Timmermann, R., **Böning, C.**, Schröter, J., Danilov, S.(2007).On the representation of the Southern Ocean in a finite-element coupled sea ice-ocean model, *Geophysical Research Abstracts 9, EGU2007-A-07368.*

Timmermann, R., **Böning, C.**, Danilov, S., Schröter, J.(2007).Representation of Southern Ocean circulation variability in a global finite-element coupled sea ice--ocean model, *Polar Dynamics Conference, Bergen, Norway, August 29-31, 2007.*

2006

Macrander, A., **Böning, C.**, Flechtner, F.(2006).Comparison of Ocean Bottom Pressure estimates from different GRACE products, *GRACE Science Team Meeting, 08. - 09.12. 2006, San Francisco.*

Böning, C., Schröter, J., Timmermann, R., Danilov, S., Macrander, A., Wenzel, M. (2006).GRACE Massenanomalien und Ozeanzirkulation, *Geodetic Week 2006, 10 - 12 October 2006 . Munich, Germany*.

Böning, C., Timmermann, R., Danilov, S., Schröter, J., Boebel, O. (2006).A global finite element ocean model: Circulation and bottom pressure anomalies in the South Atlantic, *European Geosciences Union General Assembly, 02–07 April 2006, Vienna, Austria.*

Macrander, A., **Böning, C.**, Boebel, O., Schröter, J.(2006).A global Ocean Bottom Pressure data base as ground-truth reference for GRACE gravity field products, *Geodetic Week 2006, 10 - 12 October 2006 . Munich, Germany.*