

Achievements

過去と将来の気候における南極氷床の変動と力学的挙動に関する数値シミュレーション

Simulation of the evolution and dynamics of the Antarctic ice sheet in past and future climates

JSPS Grant-in-Aid for Scientific Research (A), No. 22244058, 2010.04 – 2014.03

Last update: 2015.05.15

Papers

1. Kusahara, K., T. Sato, A. Oka, T. Obase, R. Greve, A. Abe-Ouchi and H. Hasumi. 2015. Modelling the Antarctic marine cryosphere at the Last Glacial Maximum. *Annals of Glaciology* 56 (69), 425-435. DOI: 10.3189/2015AoG69A792. [May 2015, reviewed]
2. Levermann, A., R. Winkelmann, S. Nowicki, J. L. Fastook, K. Frieler, R. Greve, H. H. Hellmer, M. A. Martin, M. Meinshausen, M. Mengel, A. J. Payne, D. Pollard, T. Sato, R. Timmermann, W. L. Wang and R. A. Bindschadler. 2014. Projecting Antarctic ice discharge using response functions from SeaRISE ice-sheet models. *Earth System Dynamics* 5 (2), 271-293. DOI: 10.5194/esd-5-271-2014. [Aug 2014, reviewed]
3. Greve, R., T. Zwinger and Y. Gong. 2014. On the pressure dependence of the rate factor in Glen's flow law. *Journal of Glaciology* 60 (220), 397-398. DOI: 10.3189/2014JoG14J019. [Apr 2014, reviewed]
4. Sato, T., T. Shiraiwa, R. Greve, H. Seddik, E. Edelmann and T. Zwinger. 2014. Accumulation reconstruction and water isotope analysis for 1736-1997 of an ice core from the Ushkovsky volcano, Kamchatka, and their relationships to North Pacific climate records. *Climate of the Past* 10 (1), 393-404. DOI: 10.5194/cp-10-393-2014. [Feb 2014, reviewed]
5. Gagliardini, O., T. Zwinger, F. Gillet-Chaulet, G. Durand, L. Favier, B. de Fleurian, R. Greve, M. Malinen, C. Martín, P. Råback, J. Ruokolainen, M. Sacchettini, M. Schäfer, H. Seddik and J. Thies. 2013. Capabilities and performance of Elmer/Ice, a new-generation ice sheet model. *Geoscientific Model Development* 6 (4), 1299-1318. DOI: 10.5194/gmd-6-1299-2013. [Aug 2013, reviewed]
6. Greve, R. and U. C. Herzfeld. 2013. Resolution of ice streams and outlet glaciers in large-scale simulations of the Greenland ice sheet. *Annals of Glaciology* 54 (63), 209-220. DOI: 10.3189/2013AoG63A085. [Jul 2013, reviewed]
7. Nowicki, S., R. A. Bindschadler, A. Abe-Ouchi, A. Aschwanden, E. Bueller, H. Choi, J. Fastook, G. Granzow, R. Greve, G. Gutowski, U. C. Herzfeld, C. Jackson, J. Johnson, C. Khroulev, E. Larour, A. Levermann, W. H. Lipscomb, M. A. Martin, M. Morlighem, B. R. Parizek, D. Pollard, S. F. Price, D. Ren, E. Rignot, F. Saito, T. Sato, H. Seddik, H. Seroussi, K. Takahashi, R. Walker and W. L. Wang. 2013a. Insights into spatial sensitivities of ice mass response to environmental change from the SeaRISE ice sheet modeling project I: Antarctica. *Journal of Geophysical Research: Earth Surface* 118 (2), 1002-1024. DOI: 10.1002/jgrf.20081. [Jun 2013, reviewed]
8. Nowicki, S., R. A. Bindschadler, A. Abe-Ouchi, A. Aschwanden, E. Bueller, H. Choi, J. Fastook, G. Granzow, R. Greve, G. Gutowski, U. C. Herzfeld, C. Jackson, J. Johnson, C. Khroulev, E. Larour, A. Levermann, W. H. Lipscomb, M. A. Martin, M. Morlighem, B. R. Parizek, D. Pollard,

- S. F. Price, D. Ren, E. Rignot, F. Saito, T. Sato, H. Seddik, H. Seroussi, K. Takahashi, R. Walker and W. L. Wang. 2013b. Insights into spatial sensitivities of ice mass response to environmental change from the SeaRISE ice sheet modeling project II: Greenland. *Journal of Geophysical Research: Earth Surface* 118 (2), 1025-1044. DOI: 10.1002/jgrf.20076. [Jun 2013, reviewed]
9. Bindschadler, R. A., S. Nowicki, A. Abe-Ouchi, A. Aschwanden, H. Choi, J. Fastook, G. Granzow, R. Greve, G. Gutowski, U. C. Herzfeld, C. Jackson, J. Johnson, C. Khroulev, A. Levermann, W. H. Lipscomb, M. A. Martin, M. Morlighem, B. R. Parizek, D. Pollard, S. F. Price, D. Ren, F. Saito, T. Sato, H. Seddik, H. Seroussi, K. Takahashi, R. Walker and W. L. Wang. 2013. Ice-sheet model sensitivities to environmental forcing and their use in projecting future sea level (the SeaRISE project). *Journal of Glaciology* 59 (214), 195-224. DOI: 10.3189/2013JoG12J125. [Apr 2013, reviewed]
 10. Gillet-Chaulet, F., O. Gagliardini, H. Seddik, M. Nodet, G. Durand, C. Ritz, T. Zwinger, R. Greve and D. G. Vaughan. 2012. Greenland ice sheet contribution to sea-level rise from a new-generation ice-sheet model. *The Cryosphere* 6 (6), 1561-1576. DOI: 10.5194/tc-6-1561-2012. [Dec 2012, reviewed]
 11. Herzfeld, U. C., J. L. Fastook, R. Greve, B. McDonald, B. F. Wallin and P. A. Chen. 2012. On the influence of Greenland outlet glacier bed topography on results from dynamic ice-sheet models. *Annals of Glaciology* 53 (60), 281-293. DOI: 10.3189/2012AoG60A061. [Nov 2012, reviewed]
 12. Sato, T. and R. Greve. 2012. Sensitivity experiments for the Antarctic ice sheet with varied sub-ice-shelf melting rates. *Annals of Glaciology* 53 (60), 221-228. DOI: 10.3189/2012AoG60A042. [Nov 2012, reviewed]
 13. Levermann, A., R. Winkelmann, S. Nowicki, J. L. Fastook, K. Frieler, R. Greve, H. H. Hellmer, M. A. Martin, M. Mengel, A. J. Payne, D. Pollard, T. Sato, R. Timmermann, W. L. Wang and R. A. Bindschadler. 2012. Projecting Antarctic ice discharge using response functions from SeaRISE ice-sheet models. *The Cryosphere Discussions* 6 (4), 3447-3489. DOI: 10.5194/tcd-6-3447-2012. [Aug 2012, not reviewed]
 14. Seddik, H., R. Greve, T. Zwinger, F. Gillet-Chaulet and O. Gagliardini. 2012. Simulations of the Greenland ice sheet 100 years into the future with the full Stokes model Elmer/Ice. *Journal of Glaciology* 58 (209), 427-440. DOI: 10.3189/2012JoG11J177. [Jun 2012, reviewed]
 15. Applegate, P. J., N. Kirchner, E. J. Stone, K. Keller and R. Greve. 2012. An assessment of key model parametric uncertainties in projections of Greenland Ice Sheet behavior. *The Cryosphere* 6 (3), 589-606. DOI: 10.5194/tc-6-589-2012. [May 2012, reviewed]
 16. Rogozhina, I., J. M. Hagedoorn, Z. Martinec, K. Fleming, O. Soucek, R. Greve and M. Thomas. 2012. Effects of uncertainties in the geothermal heat flux distribution on the Greenland Ice Sheet: An assessment of existing heat flow models. *Journal of Geophysical Research: Earth Surface* 117 (F2), F02025. DOI: 10.1029/2011JF002098. [May 2012, reviewed]
 17. Blatter, H., R. Greve and A. Abe-Ouchi. 2011. Present state and prospects of ice sheet and glacier modelling. *Surveys in Geophysics* 32 (4-5), 555-583. DOI: 10.1007/s10712-011-9128-0. [Sep 2011, reviewed, invited]
 18. Greve, R., F. Saito and A. Abe-Ouchi. 2011. Initial results of the SeaRISE numerical experiments with the models SICOPOLIS and IcIES for the Greenland ice sheet. *Annals of Glaciology* 52 (58), 23-30. DOI: 10.3189/172756411797252068. [Aug 2011, reviewed]
 19. Blatter, H., R. Greve and A. Abe-Ouchi. 2010. A short history of the thermomechanical theory and modelling of glaciers and ice sheets. *Journal of Glaciology* 56 (200), 1087-1094. DOI: 10.3189/002214311796406059. [Dec 2010, reviewed, invited]
 20. Iizuka, Y., H. Miura, S. Iwasaki, H. Maemoku, T. Sawagaki, R. Greve, H. Satake, K. Sasa and Y. Matsushi. 2010. Evidence of past migration of the ice divide between the Shirase and Sôya drainage basins derived from chemical characteristics of the marginal ice in the Sôya drainage

basin, East Antarctica. *Journal of Glaciology* 56 (197), 395-404. DOI: 10.3189/002214310792447707. [Aug 2010, reviewed]

Book chapter

1. Church, J. A., P. U. Clark, A. Cazenave, J. M. Gregory, S. Jevrejeva, A. Levermann, M. A. Merrifield, G. A. Milne, R. S. Nerem, P. D. Nunn, A. J. Payne, W. T. Pfeffer, D. Stammer and A. S. Unnikrishnan (and 57 contributing authors including R. Greve). 2013. Sea level change. In: T. F. Stocker, D. Qin, G.-K. Plattner, M. Tignor, S. K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P. M. Midgley (Eds.), *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, pp. 1137-1216. Cambridge University Press, Cambridge, UK, and New York, NY, USA.

Thesis

1. Sato, T. 2012. Dynamics of the Antarctic ice sheet with coupled ice shelves. Doctoral thesis, Graduate School of Environmental Science, Hokkaido University, Sapporo, Japan. URL http://www.ice.lowtem.hokudai.ac.jp/repo/theses/Sato_2012_DoctoralThesis.pdf.

Presentations at scientific conferences

1. Sato, T., B. Galton-Fenzi and R. Greve: A simple parameterization of sub-ice-shelf melting constrained by results from the ocean model ROMS, and its implementation in the ice sheet model SICOPOLIS. IGS (International Glaciological Society) Symposium on Sea Ice in a Changing Environment, Hobart, Tasmania, Australia, 2014.03.13.
2. Kusahara, K., T. Sato, H. Hasumi and R. Greve: Modeling sea-ice extent and basal melting of Antarctic ice shelves at the Last Glacial Maximum. IGS (International Glaciological Society) Symposium on Sea Ice in a Changing Environment, Hobart, Tasmania, Australia, 2014.03.10.
3. Greve, R., T. Sato and B. Galton-Fenzi: Simulations of the Antarctic ice sheet in past and future climates with the model SICOPOLIS, using a simple parameterisation of ice-shelf basal melting. AGU (American Geophysical Union) Fall Meeting, San Francisco, USA, 2013.12.11.
4. Zwinger, T., H. Seddik, R. Greve, F. Saito and A. Abe-Ouchi: Full Stokes ice sheet model Elmer/Ice, and its application to regional drainage systems in Greenland and Antarctica. Fourth NIPR Symposium on Polar Science, Tokyo, 2013.11.15.
5. Kusahara, K., T. Sato, H. Hasumi and R. Greve: 最終氷期における南極棚氷底面融解に関する数値モデリング. Fourth NIPR Symposium on Polar Science, Tokyo, 2013.11.13.
6. Sato, T. and R. Greve: 南極氷床・棚氷末端での融解、カービングによる質量損失が棚氷-氷床に与える影響. Fourth NIPR Symposium on Polar Science, Tokyo, 2013.11.13.
7. Sato, T., R. Greve, B. Galton-Fenzi and R. Warner: 海洋モデル結果を考慮した棚氷融解量のパラメタリゼーションと南極氷床変動への影響. 日本雪氷学会・雪氷研究大会, Kitami, 2013.09.18.
8. Herzfeld, U. C., P. Chen, B. McDonald, B. Wallin, J. Paden, C. Leuschen, R. Greve and J. Fastook: A new Greenland subglacial topographic DEM derived from MCORDS data by application of mathematical morphological algorithms. IGS (International Glaciological Society) Symposium on Radioglaciology, Lawrence, Kansas, USA, September 2013.09.12.
9. Sato, T., B. Galton-Fenzi and R. Greve: A simple parameterisation of ice shelf basal melting and its implementation in the ice sheet model SICOPOLIS. DACA-13 (Davos Atmosphere and Cryosphere Assembly), Davos, Switzerland, 2013.07.08.

10. Sato, T., R. Greve, B. Galton-Fenzi and R. Warner: 棚氷底面融解量のパラメタリゼーションによる氷床海洋相互作用の研究. 日本雪氷学会北海道支部・支部研究発表会, Sapporo, 2013.05.18.
11. Saito, F., A. Abe-Ouchi, K. Takahashi and T. Obase: Recent status of development of the numerical ice sheet/shelf/stream model IcIES. WGOMD/SOP Workshop on Sea Level Rise, Ocean/Ice Shelf Interactions and Ice Sheets. CSIRO Marine and Atmospheric Research, Hobart, Tasmania, Australia, 2013.02.18.
12. Seddik, H., R. Greve, T. Zwinger and S. Sugiyama: Full Stokes or shallow ice approximation? Comparing the ice flow dynamics at the Shirase Drainage Basin, Antarctica. AGU (American Geophysical Union) Fall Meeting, San Francisco, USA, 2012.12.05.
13. Greve, R.: Ice sheet modelling and applications to Greenland, Antarctica and the Martian polar caps. Australasian Fluid Mechanics Conference, Launceston, Australia, 2012.12.04. [Invited]
14. Greve, R., H. Seddik and T. Sato: Modelling the response of ice sheets to environmental forcing and projecting future sea level rise within the framework of the SeaRISE community effort. Third NIPR Symposium on Polar Science, Tokyo, 2012.11.28.
15. Abe-Ouchi, A.: Why and how did the Middle Pleistocene Transition occur? Modelling challenge of the ice sheet change in both hemispheres. Third NIPR Symposium on Polar Science, Tokyo, 2012.11.26. [Invited]
16. Greve, R.: Ice sheet modelling and applications to the past, present and future glaciation of the Earth. IPICS (International Partnerships in Ice Core Sciences) Open Science Conference, Giens, France, 2012.10.02. [Invited]
17. Sato, T., R. Greve, K. Kushara and H. Hasumi: 南極氷床変動への棚氷、海洋からの影響 – SeaRISE 実験および海洋モデル、衛星データ等の応用. 日本雪氷学会・雪氷研究大会, Toyama, 2012.09.25.
18. Greve, R.: Modelling the response of ice sheets to environmental forcing and projecting future sea level rise. Northern Environmental Research Symposium, Hokkaido University Sustainability Weeks, Oulu and Oulanka Research Station (Kuusamo), Finland, 2012.09.11.
19. Greve, R. and U. C. Herzfeld: Resolution of ice streams and outlet glaciers in large-scale simulations of the Greenland ice sheet. IGS (International Glaciological Society) Symposium on Glaciers and Ice Sheets in a Warming Climate, Fairbanks, USA, 2012.06.28.
20. Seddik, H., R. Greve, T. Zwinger, F. Gillet-Chaulet and O. Gagliardini: Simulations of the Greenland ice sheet 200 years into the future with the full Stokes model Elmer/Ice. IGS (International Glaciological Society) Symposium on Glaciers and Ice Sheets in a Warming Climate, Fairbanks, USA, 2012.06.28.
21. Greve, R.: Results of the SeaRISE numerical experiments with the model SICOPOLIS for the Greenland ice sheet. JpGU (Japan Geoscience Union) Meeting, Chiba, 2012.05.22.
22. Seddik, H., R. Greve, T. Zwinger, F. Gillet-Chaulet and O. Gagliardini: Simulations of the Greenland ice sheet 200 years into the future with the full Stokes model Elmer/Ice. JpGU (Japan Geoscience Union) Meeting, Chiba, 2012.05.22.
23. Seddik, H., R. Greve, T. Zwinger, F. Gillet-Chaulet and O. Gagliardini: Simulations of the Greenland ice sheet 100 years into the future with the full Stokes model Elmer/Ice. AGU (American Geophysical Union) Fall Meeting, San Francisco, USA, 2011.12.07.
24. Greve, R.: Resolution of ice streams and outlet glaciers in large-scale simulations of the Greenland ice sheet. Second NIPR Symposium on Polar Science, Tokyo, 2011.11.15.
25. Sato, T. and R. Greve: Sensitivity experiments for the Antarctic ice sheet with varied climate boundary conditions. Second NIPR Symposium on Polar Science, Tokyo, 2011.11.15.
26. Seddik, H., R. Greve, T. Zwinger, F. Gillet-Chaulet and O. Gagliardini: Simulations of the Greenland ice sheet 100 years into the future with the full Stokes model Elmer/Ice. Second NIPR Symposium on Polar Science, Tokyo, 2011.11.15.

27. Greve, R. and T. Zwinger: Cooperation between the Nordic countries and Japan in advanced ice sheet and glacier modelling. Northern Environmental Research Symposium, Hokkaido University Sustainability Weeks, Sapporo, 2011.10.31. [Invited]
28. Sato, T. and R. Greve: 棚氷の底面融解による南極氷床変動の変動性. 日本雪氷学会・雪氷研究大会, Nagaoka, 2011.09.20.
29. Greve, R. and T. Sato: Implementation of ice shelf dynamics in the ice sheet model SICOPOLIS. IUGG (International Union of Geodesy and Geophysics) General Assembly, Melbourne, Australia, 2011.07.02.
30. Sato, T. and R. Greve: SeaRISE sensitivity experiments with the model SICOPOLIS for the Antarctic ice sheet with varied sub-ice-shelf melting rates. IGS (International Glaciological Society) Symposium on Interactions of Ice Sheets and Glaciers with the Ocean, San Diego, USA, 2011.06.09.
31. Greve, R., F. Saito and A. Abe-Ouchi: SeaRISE: Modelling the present-day state and future evolution of the Greenland Ice Sheet with the models SICOPOLIS and IcIES. AGU (American Geophysical Union) Fall Meeting, San Francisco, USA, 2010.12.15. [Invited]
32. Sato, T. and R. Greve: Modeling the flow of the Antarctic Ice Sheet with the SeaRISE set-up: influence of different treatments of the flow regimes. AGU (American Geophysical Union) Fall Meeting, San Francisco, USA, 2010.12.14.
33. Seddik, H., R. Greve, T. Zwinger, F. Gillet-Chaulet and O. Gagliardini: Investigating the Greenland ice sheet evolution under changing climate using a three-dimensional full-Stokes model. AGU (American Geophysical Union) Fall Meeting, San Francisco, USA, 2010.12.14.
34. Sato, T. and R. Greve: Modeling the flow of the Antarctic Ice Sheet and ice shelves with the model SICOPOLIS and the SeaRISE set-up. IGS (International Glaciological Society) Nordic Branch Meeting, Copenhagen, Denmark, 2010.10.29.
35. Sato, T. and R. Greve: 棚氷・氷床結合モデルによる現在の南極氷床の流れ. 日本雪氷学会・雪氷研究大会, Sendai, 2010.09.27.
36. Greve, R., F. Saito and A. Abe-Ouchi: Towards a Japanese contribution to the multi-model community effort SeaRISE. IGS (International Glaciological Society) Symposium on Snow, Ice and Humanity in a Changing Climate, Sapporo, 2010.06.25.
37. Seddik, H., R. Greve, T. Zwinger and O. Gagliardini: Steady-state simulations of the Greenland ice sheet using a three-dimensional full-Stokes model. IGS (International Glaciological Society) Symposium on Snow, Ice and Humanity in a Changing Climate, Sapporo, 2010.06.25.
38. Greve, R., T. Dunse and T. Sato: Implementation of marine ice dynamics and ice shelf dynamics in the ice sheet model SICOPOLIS. IGS (International Glaciological Society) Symposium on Snow, Ice and Humanity in a Changing Climate, Sapporo, 2010.06.22.
39. Sato, T. and R. Greve: Modeling the coupled ice-sheet/ice-shelf dynamics of Antarctica. IGS (International Glaciological Society) Symposium on Snow, Ice and Humanity in a Changing Climate, Sapporo, 2010.06.22.

(Principal investigator [研究代表者] and co-investigators [研究分担者, 連携研究者] underlined.)