

*Curriculum Vitae*  
**Gregory Mark Flato**  
*Canada*

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Education:

1991 — Ph.D. Engineering Science, Dartmouth College, USA.  
1984/1988 — B.Sc./M.Sc. Civil Engineering., U. Alberta, Canada.

Work Experience:

2014-present — Senior Scientist, Canadian Centre for Climate Modelling and Analysis  
2004-2014— Manager, Canadian Centre for Climate Modelling and Analysis  
2012 (Sept-Dec) — Acting Director, Climate Research Division, Environment Canada  
2003 (Spring) — Visiting Lecturer, University of the West Indies, Barbados  
2001 (Fall) — Visiting Prof., Physics Dept., Université Catholique de Louvain, Belgium  
1996-present— Adjunct Professor, School of Earth and Ocean Science, U. Victoria  
1993-present — Research Scientist, CCCma  
2012 promoted to RES-05 ('Senior Scientist' — the highest level)  
1992-93 — Research Associate, Institute of Ocean Sciences, Victoria, Canada  
1991-92 — Post-doctoral fellow, Dartmouth College, USA

Boards, Committees, (recent):

Co-Chair, WCRP Climate and Cryosphere Project (2013 - present)  
Member, WCRP Joint Scientific Committee (2007-2012)  
Member, WCRP Working Group on Coupled Modelling (2004 - present)  
Senior Editor, Oxford Research Encyclopedia of Climate Science (2014 – present)

Awards:

2013 Environment Canada "Citation of Excellence" (for contribution to development of Canadian Seasonal to Interannual Prediction System – CanSIPS)  
2008 Environment Canada "Citation of Excellence" (for contribution to IPCC AR4)  
2007 University of Victoria Craigdarroch Award for Societal Contributions (for contributions to IPCC AR4)  
2005 Environment Canada "Equinox Award"  
1999 Canadian Meteorological and Oceanographic Society National Tour Speaker  
1995 and 2000, AGU Editors' Citation for Excellence in Refereeing for JGR-Oceans

## IPCC Experience:

**Coordinating Lead Author:** Chapter 9: Evaluation of Climate Models. *Climate Change 2013: WGI contribution to the IPCC 5<sup>th</sup> Assessment Report*, Cambridge U. Press.

-also Contributing Author, Technical Summary and Summary for Policymakers.

**Lead Author:** Chapter 4 Observations: Changes in Snow, Ice and Frozen Ground. *Climate Change 2007: The Physical Science Basis*. Cambridge U. Press.

**Contributing Author:** *Climate Change 2001: The Science of Climate Change*. (Chapters 7, 8, 9 and 11). Cambridge U. Press.

**Contributing Author:** *Climate Change 1995: The Science of Climate Change*. (Chapters 5 and 6), Cambridge U. Press.

## Research Interests and Experience:

**Global coupled climate and earth system modelling** – Extensive involvement in the development of the Canadian global climate model (Flato et al., 2000; Flato and Boer, 2001; Kim et al., 2002; 2003); provided scientific leadership to the overall CCCma program culminating in the Canadian Earth System model (Flato, 2011; Arora et al., 2009; Christian et al., 2010), Canada's primary modelling contribution to the IPCC 5<sup>th</sup> Assessment.

**Sea-ice dynamics and thermodynamics** – Developed various sea-ice models used in climate simulation and operational forecasting (e.g. Flato, 2003 and many references therein – roughly 1/3 of total publications), and have analyzed the performance of sea-ice components in many climate models (e.g. Flato et al., 2004).

**Role of the cryosphere in climate and Arctic regional climate** – many publications in the area of climate and cryosphere (including sea-ice, lake-ice and snow). I have initiated work (with grad students) on downscaling of climate change projections to the Arctic (Dumas et al, 2006; Sou and Flato, 2009), and contributed to work on climate change and variability in the Arctic (e.g. Fyfe et al., 2013; Yang et al., 2010).

**Climate prediction** – Extensively involved in development of a global coupled seasonal to interannual prediction model now operational in Environment Canada (e.g. Merryfield et al., 2010; 2013; Sigmond et al. 2013).

**Climate scenarios** – Responsible for development of web-based dissemination of climate data and scenarios, providing quantitative, multi-model climate scenario information to serve the impacts, adaptation and planning communities in Canada and internationally. [www.ccds-dscc.ec.gc.ca](http://www.ccds-dscc.ec.gc.ca)

## Refereed Publications:

- Flato, G.M.**, J. Marotzke, et al., 2013: Chapter 9 – Evaluation of Climate Models *in* Climate Change 2013 : The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. [Stocker et al., (eds.)]. Cambridge University Press, 1535pp.
- Fyfe, J.C., K. von Salzen, N.P. Gillett, V.K. Arora, **G.M. Flato**, J.R. McConnell, 2013: One hundred years of Arctic surface temperature variation due to anthropogenic influence. *Scientific Reports*, 3:2645, doi: 10.1038/srep02645.
- Merryfield, W., W. Lee, G. Boer, V. Kharin, J. Scinocca, **G. Flato**, R. Ajayamohan, J. Fyfe, Y. Tang, and S. Polavarapu, 2013: The Canadian Seasonal to Interannual Prediction System. Part I: Models and Initialization. *Mon. Wea. Rev.* doi:10.1175/MWR-D-12-00216.1
- Sigmond, M., J.C. Fyfe, **G.M. Flato**, V.V. Kharin, W.J. Merryfield, 2013, Seasonal forecast skill of Arctic sea ice area in a dynamical forecast system. *Geophysical Research Letters*, doi: 10.1002/grl.50129
- Godlovitch, D., A. Monahan and **G. Flato**, 2012: An idealized stochastic model of sea ice thickness dynamics. *Cold Regions Science and Technology*, 78:14-30.
- Gillett, N.P., Arora, V.K., **Flato, G.M.**, Scinocca, J.F., von Salzen, K., 2012: Improved constraints on 21<sup>st</sup>- century warming derived using 160 years of temperature observations. *Geophys. Res. Lett.*, 39, doi:10.1029/2011GL050226.
- Flato, G.M.**, 2011: Earth System Models: An Overview. *Wiley Interdisciplinary Reviews, Climate Change*. doi: 10.1002/wcc.148 .
- Arora, V.K., Scinocca, J.F., Boer, G.J., Christian, J.R., Denman, K.L., **Flato, G.M.**, Kharin, V.V., Lee, W.G., Merryfield, W.J., 2011, Carbon emissions required to satisfy future representative concentration pathways of greenhouse gases. *Geophys. Res. Lett.*, 38, L05805, doi:10.1029/2010GL046270.
- Yang, X-Y, J.C. Fyfe and **G.M. Flato**, 2010: The role of poleward energy transport in Arctic temperature evolution. *Geophys. Res. Lett.*, 37:L14803, doi:10.1029/2010GL043934.
- Merryfield, W.J., W.-S. Lee, G.J. Boer, V.V. Kharin, B. Pal, J.F. Scinocca, and **G.M. Flato**, 2010: The first coupled historical forecasting project (CHFP1), *Atmosphere-Ocean*, 48(4):263-283.
- Christian, J.R., V.K. Arora, G.J. Boer, C.L. Curry, K. Zahariev, K.L. Denman, **G.M. Flato**, W.G. Lee, W.J. Merryfield, N.T. Roulet and J.F. Scinocca, 2010: The global carbon cycle in the Canadian Earth System Model (CanESM1): Preindustrial control simulation, *J. Geophys. Res.*, vol 115,doi:10.1029/2008JG000920.
- Arora, V.K., G.J. Boer, J.R. Christian, C.L. Curry, K.L. Denman, K. Zahariev, **G.M. Flato**, J.F. Scinocca, W.J. Merryfield, W.G. Lee, 2009: The effect of terrestrial photosynthesis down-regulation on the 20<sup>th</sup> century carbon budget simulated with the CCCma Earth System Model, *J. Climate*, 22: 6066-6088.
- Sou, T. and **G.M. Flato**, 2009: Sea ice in the Canadian Arctic Archipelago: Modelling the past (1950-2004) and the future (2041-2060). *J. Climate*, 22: 2181-2198.
- Saenko, O.A., A.J. Weaver, D.Y. Robitaille, and **G.M. Flato**, 2007: Warming of the subpolar Atlantic triggered by freshwater discharge at the continental boundary. *Geophys. Res. Lett.*, 34, doi:10.1029/2007GL030674 .
- Lemke, P., J. Ren, R. Alley, I. Allison, J. Carrasco, **G. Flato**, Y. Fuji, G. Kaser, P. Mote, R. Thomas, and T. Zhang, 2007: Observations: Changes in Snow, Ice and Frozen Ground, Chapter 4 in *IPCC 2007: Climate Change 2007- The Physical Science Basis*, Cambridge U. Press.
- Dumas, J.A. , H. Melling, **G.M. Flato**, 2007: Late-summer pack ice in the Canadian Archipelago: Thickness observations from a ship in transit, *Atmosphere-Ocean*, 45(1): 57-70.

- Dumas, J.A., **G.M. Flato**, and R.D. Brown, 2006: Future Projections of Landfast Ice Thickness and Duration in the Canadian Arctic, *J. Climate*, 19: 5175-5189
- Stouffer, R.J., J. Yin, J. M. Gregory, K. W. Dixon, M. J. Spelman, W. Hurlin, A. J. Weaver, M. Eby, **G. M. Flato**, H. Hasumi, A. Hu, J. Jungclaus, I. V. Kamenkovich, A. Levermann, M. Montoya, S. Murakami, S. Nawrath, A. Oka, W. R. Peltier, D. Y. Robitaille, A. Sokolov, G. Vettoretti, N. Weber, 2006: Investigating the Causes of the Response of the Thermohaline Circulation to Past and Future Climate Changes, *J. Climate*, 19(8): 1365–1387.
- Flato, G.M.** and CMIP contributors, 2004: Sea-ice climate and sensitivity as simulated by global climate models, *Climate Dynamics*, 23: 229-241.
- Boer, G.J., B. Yu, S.-J. Kim and **G.M. Flato**, 2004: Is there observational support for an El Niño-like pattern of future global warming? *Geophys. Res. Lett.* 31, L06201, doi:10.1029/2003GL018722.
- Duguay, C.R., **G.M. Flato**, M.O. Jeffries, P. Ménard, K. Morris, and W.R. Rouse, 2003: Ice cover variability on shallow lakes at high latitudes: model simulations and observations. *Hydrological Processes*, 17(17): 3465-3483.
- Dumas, J.A., **G.M. Flato** and A.J. Weaver, 2003: The impact of varying atmospheric forcing on the thickness of Arctic multi-year sea ice, *Geophys. Res. Lett.*, 30(18), 1918, doi:10.1029/2003GL017433.
- Flato, G.M.**, 2003: Sea Ice Modelling. Chapter 9 in *Mass Balance of the Cryosphere: Observations and Modelling of Contemporary and Future Changes*, eds. J. Bamber and A. Payne, Cambridge University Press, pg. 367-389.
- Ménard P., C.R. Duguay, F.C. Pivot, **G.M. Flato**, and W.R. Rouse, 2003. Sensitivity of Great Slave Lake ice cover to climate variability and climatic change. *Proceedings of the 16<sup>th</sup> International Symposium on Ice*, Dunedin, New Zealand, 2-6 December 2002, Vol. 3, pp. 57-63.
- Kim, S.-J., **G.M. Flato**, G.J. Boer, 2003: A coupled climate model simulation of the Last Glacial Maximum, Part 2: Approach to equilibrium. *Climate Dynamics*, 20:635-661.
- Ménard, P., Duguay, C.R., **G.M. Flato**, W.R. Rouse, 2002: Simulation of ice phenology on Great Slave Lake, Northwest Territories, Canada. *Hydrological Processes*, 16:3691-3706.
- Kim, S.-J., **G.M. Flato**, G.J. Boer and N.A. McFarlane, 2002: A coupled climate model simulation of the Last Glacial Maximum, Part 1: Transient multi-decadal response. *Climate Dynamics*, 19:515-537.
- Saenko, O.A., **G.M. Flato** and A.J. Weaver, 2002: Improved representation of sea- ice processes in climate models. *Atmosphere-Ocean*, 40(1):21-43.
- Bitz, C.M., J.C. Fyfe, and **G.M. Flato**, 2002: Sea ice response to wind forcing from AMIP models. *J. Climate*, 15:522-536.
- Gregory, J.M., J.A. Church, G.J. Boer, K.W. Dixon, **G.M. Flato** and 4 others, 2002: Comparison of results from several AOGCMs for global and regional sea-level change 1900-2100. *Climate Dynamics*, 18:225-240.
- Davey, M.K., M. Huddleston, K.R. Sperber, P. Braconnot, F. Bryan, D. Chen, R.A. Colman, C. Cooper, U. Cubasch, P. Delecluse, D. DeWitt, L. Fairhead, **G. Flato** and 24 others, 2002: STOIC: A study of coupled model climatology and variability in tropical ocean regions. *Climate Dynamics*, 18:403-420.
- Latif, M., K. Sperber, J. Arblaster, P. Braconnot, D. Chen, A. Colman, U. Cubasch, C. Cooper, P. Delecluse, D. Dewitt, L. Fairhead, **G. Flato**, and 22 others, 2002: ENSIP: The El Nino simulation intercomparison project. *Climate Dynamics*, 18:255-276.
- Flato, G.M.** and G.J. Boer, 2001: Warming asymmetry in climate change simulations. *Geophys. Res. Lett.*, 28:195-198.
- Weaver, R.L.S., K. Steffen, J. Heinrichs, J. Maslanik, and **G.M. Flato**. 2000: Data assimilation in sea ice monitoring. *Annals of Glaciology*, 31:327-332.
- Schramm, J.L. **G.M. Flato** and J.C. Curry. 2000: Towards the modelling of enhanced basal melting in ridge keels. *J. Geophys. Res.*, 105(C6):14,081-14,092.

- Goyette, S., N.A. McFarlane, and **G.M. Flato**. 2000: Application of the Canadian Regional Climate Model to the Laurentian Great Lakes region: Implementation of a lake model. *Atmosphere-Ocean*, 38:481-503.
- Covey, C., A. Abe-Ouchi, G.J. Boer, B.A. Boville, U. Cubasch, L. Fairhead, **G.M. Flato**, plus 16 others. 2000: The seasonal cycle in coupled ocean-atmosphere general circulation models. *Climate Dynamics*, 16:775-787.
- Flato, G.M.**, G.J. Boer, W.G. Lee, N.A. McFarlane, D. Ramsden, M.C. Reader, and A.J. Weaver. 2000: The Canadian Centre for Climate Modeling and Analysis Global Coupled Model and its Climate. *Climate Dynamics*, 16:451-467.
- Boer, G.J., **G.M. Flato**, M.C. Reader, and D. Ramsden. 2000: A transient climate change simulation with greenhouse gas and aerosol forcing: experimental design and comparison with the instrumental record from the 20th century. *Climate Dynamics*, 16:405-425.
- Boer, G.J., **G.M. Flato**, and D. Ramsden. 2000: A transient climate change simulation with greenhouse gas and aerosol forcing: projected climate change in the 21st century. *Climate Dynamics*, 16:427-450.
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- Hanesiak, J.M., D.G. Barber, and **G.M. Flato**. 1999. The role of diurnal processes in the seasonal evolution of sea ice and its snow cover. *J. Geophys. Res.*, 104, 13593- 13604.
- Fyfe, J.C. and **G.M. Flato**. 1999. Enhanced climate change and its detection over the Rocky Mountains. *J. Clim.*, 12:230-243.
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- Flato, G.M.** 1998. The thickness variable in sea-ice models. *Atmos.-Ocean*, 36(1): 29-36.
- Randall, D., J. Curry, D. Battisti, **G. Flato**, plus 6 others. 1998. Status and outlook for large-scale modeling of atmosphere-ice-ocean interactions in the Arctic. *Bull. Am. Meteorol. Soc.*, 79(2):197-217.
- Flato, G.M.** and D. Ramsden. 1997. Sensitivity of an atmospheric general circulation model to the parameterization of leads in sea-ice. *Annals of Glaciology*, 25:96- 101.
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- Flato, G.M.** and R.D. Brown. 1996. Variability and climate sensitivity of landfast Arctic sea ice. *J. Geophys. Res.*, 101(C10):25,767-25,777.
- Flato, G.M.** and W.D. Hibler III. 1995. Ridging and strength in modelling the thickness distribution of Arctic sea ice. *J. Geophys. Res.*, 100(C9):18,611-18,626.
- Flato, G.M.** 1995. Spatial and temporal variability of Arctic ice thickness. *Annals of Glaciology*, 21:323-329.
- Flato, G.M.** 1994. Review of: "Microwave Remote Sensing of Sea Ice". *Bull. Am. Meteorol. Soc.*, Vol. 75, No. 5, pp.866-868. [Invited Book Review]
- Tang, B., **G.M. Flato**, and G. Holloway. 1994. A study of Arctic sea ice and sea level pressure using POP and neural network methods. *Atmos.-Ocean*, 32, 507-529.

- Flato, G.M.** 1993. A particle-in-cell sea-ice model. *Atmos.-Ocean*, 31, 339-358.
- Flato, G.M.** and W.D. Hibler III. 1992. Modeling pack ice as a cavitating fluid. *J. Phys. Oceanogr.*, 22, 626-651.
- Hibler, W.D. III and **G.M. Flato**. 1992. Sea Ice Models. Chapter 12 in *Climate System Modeling*, K.E. Trenberth (ed.), Cambridge University Press.
- Ip, C.F., W.D. Hibler III, and **G.M. Flato**. 1991. On the effect of rheology on seasonal sea ice simulations. *Annals of Glaciology*, 15, 17-25.
- Flato, G.M.** and W.D. Hibler III. 1991. An initial numerical investigation of the extent of sea ice ridging. *Annals of Glaciology*, 15, 31-36.
- Hopkins, M.A., W.D. Hibler III, and **G.M. Flato**. 1991. On the numerical simulation of the sea ice ridging process. *J. Geophys. Res.*, 96, 4809-4820.
- Flato, G.M.** and W.D. Hibler III. 1990. On a simple sea ice dynamics model for climate studies. *Annals of Glaciology*, 14, 72-77.
- Flato, G.M.** and W.D. Hibler III. 1989. The effect of ice pressure on marginal ice zone dynamics. *IEEE Trans. on Geoscience and Remote Sensing*, 27, 514-521.