Supplement to The glacial systems model (GSM) Version 24G

Lev Tarasov[1], Benoit S. Lecavalier[1,2], Kevin Hank[3], and David Pollard[4]

[1]Department of Physics and Physical Oceanography, Memorial University of Newfoundland and Labrador, St. John's, Canada, A1B 3X7
[2]Defence Research & Development Canada (DRDC), Suffield Research Centre, PO Box 4000, Station Main, Medicine Hat, T1A 8K6, Alberta, Canada
[3]Natural Environment Research Council, British Antarctic Survey, High Cross, Madingley Road, Cambridge, CB3 0ET, United Kingdom
[4]Earth and Environmental Systems Institute, Pennsylvania State University, University Park, PA 16802, USA; and Department of Earth, Geographic, and Climate Sciences, University of Massachusetts, Amherst, MA 01003, USA

Correspondence: Lev Tarasov (lev@mun.ca)

1 GSM ensemble parameter sensitivities

As sensitivities will depend on both the base parameter vector as well as geographic choice of ice sheet, the parameter sensitivity plots below are solely for the purpose of showing that each GSM ensemble parameter can have significant impact on at least one relevant metric. Some of the sensitivities to critical metrics (such as those related to model fits to regional paleo data constraints) will be addressed in upcoming ice sheet specific papers. Though not shown, ensemble parameters are only retained when verified to be among the top quarter of most impactful parameters for more than two different test metrics.

1.1 Example GSM ensemble parameter sensitivity results for Antarctica

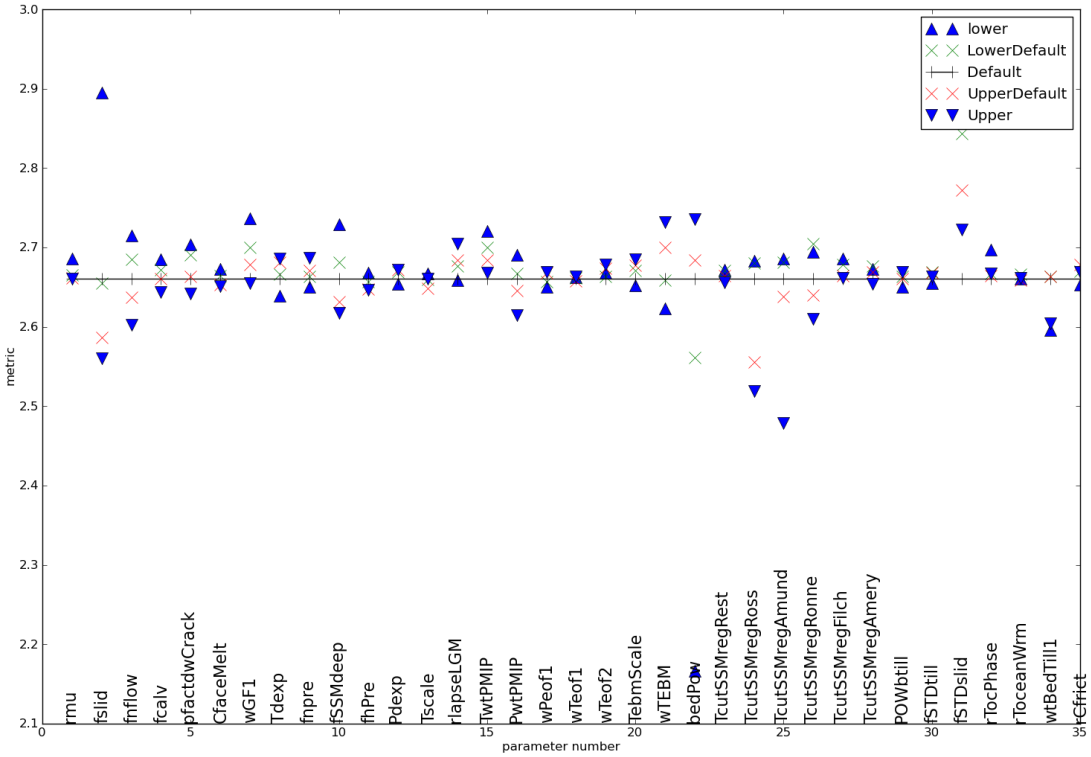

Figure S1. Antarctic present-day grounded ice volume ($10^{16} m^3$) sensitivity to ensemble parameters. Reference parameter vector is an1600 ("Default"). "Upper" and "lower values" (as per plot key) are the respective upper and lower bound values for the parameter range in Tables 2 and 3.

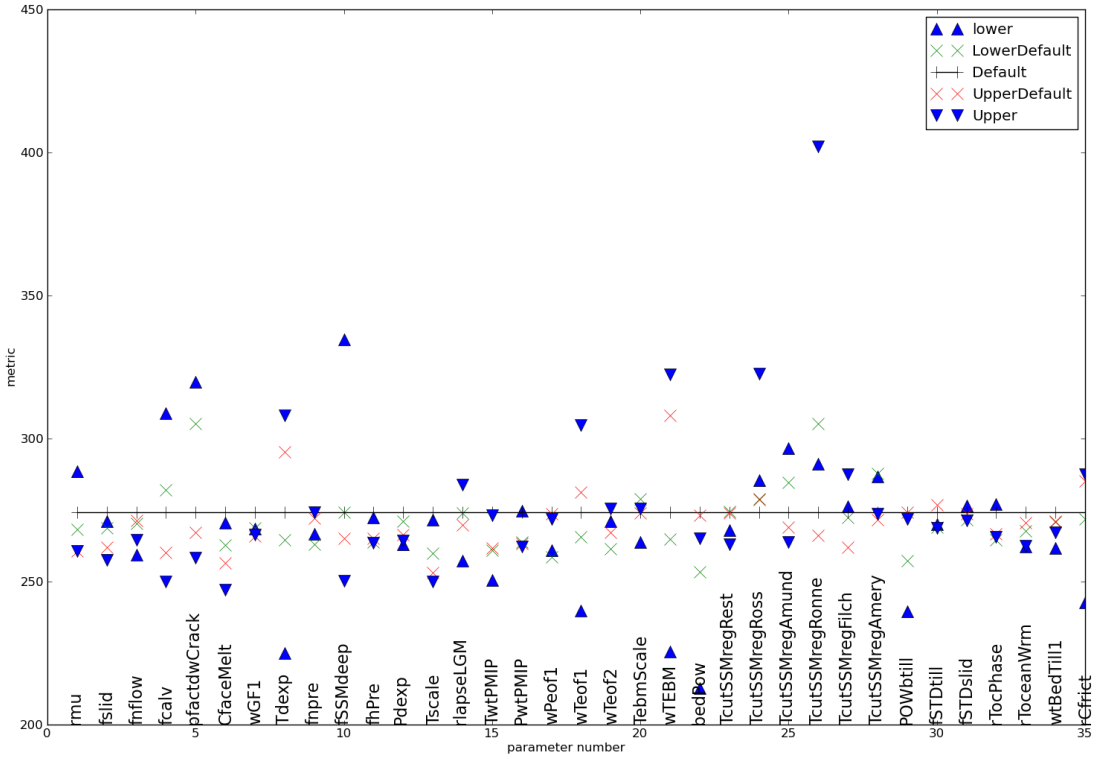

Figure S2. Antarctic 0ka root mean squared error for floating ice thickness (m) sensitivity to ensemble parameters. Reference parameter vector is an1600.

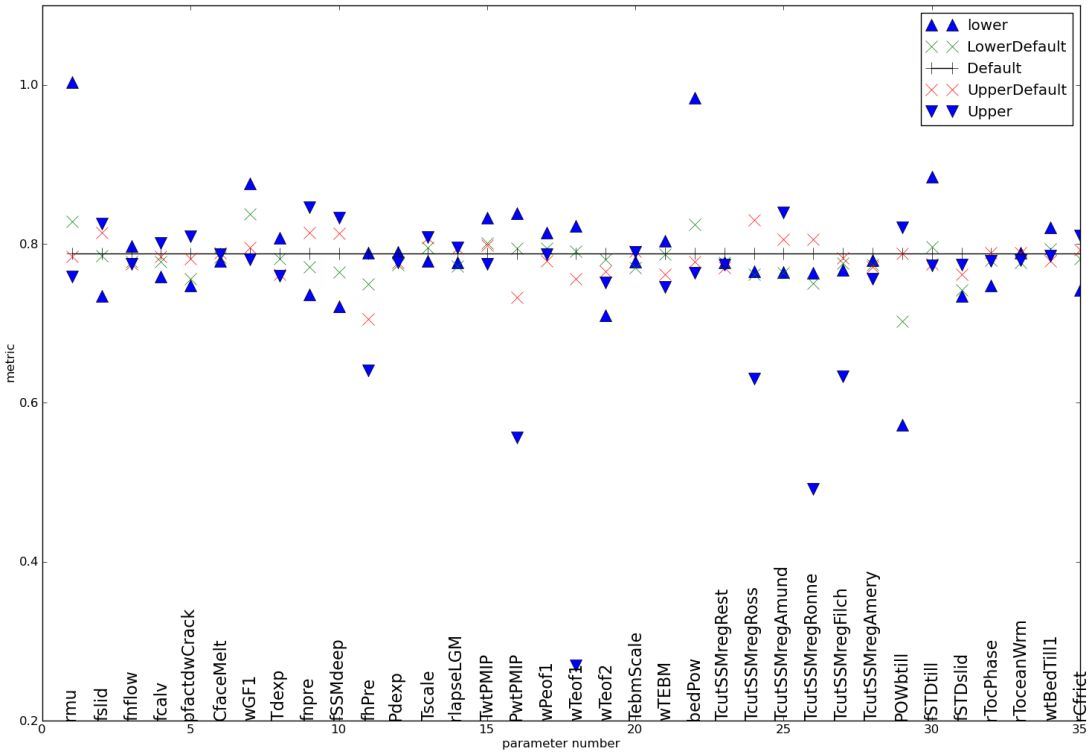

Figure S3. Antarctic LGM grounded ice volume anomaly ($10^{16} m^3$) relative to 0 ka sensitivity to ensemble parameters. Reference parameter vector is an1600.

1.2 Example GSM ensemble parameter sensitivity results for Greenland

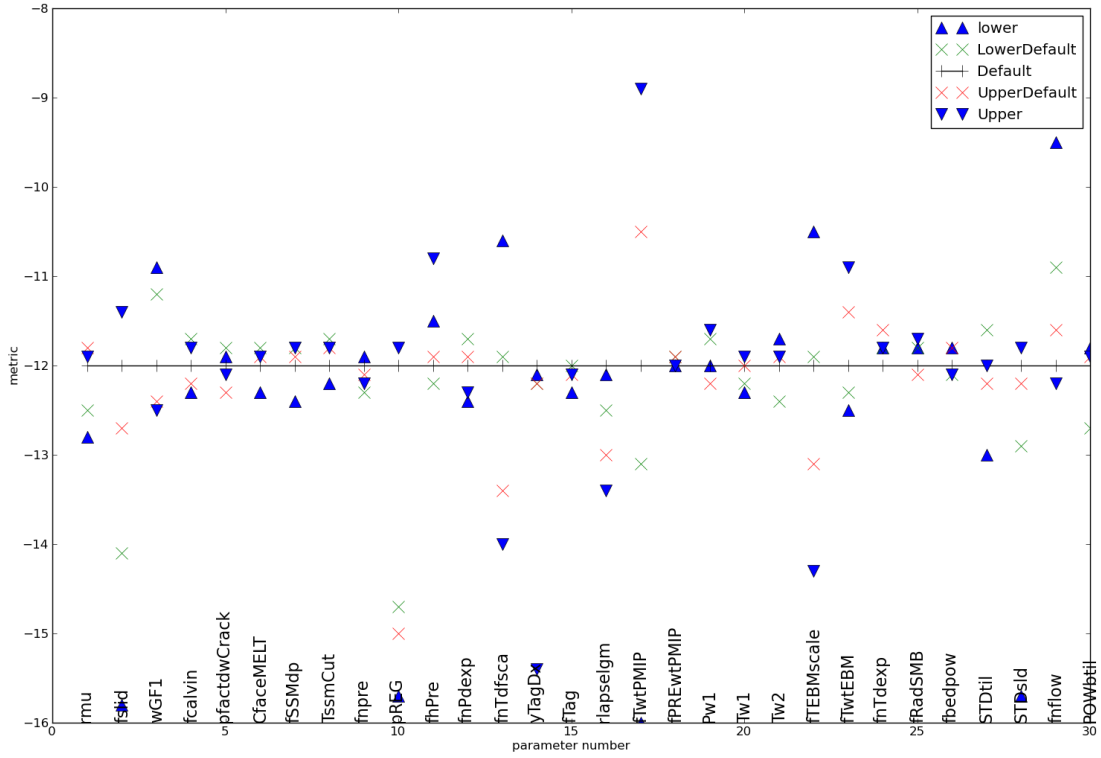

Figure S4. Dye3 basal temperature (^{o}C) sensitivity to ensemble parameters. Reference parameter vector is gr2000. "Upper" and "lower values" (as per plot key) are the respective upper and lower bound values for the parameter range in Tables 2 and 3.

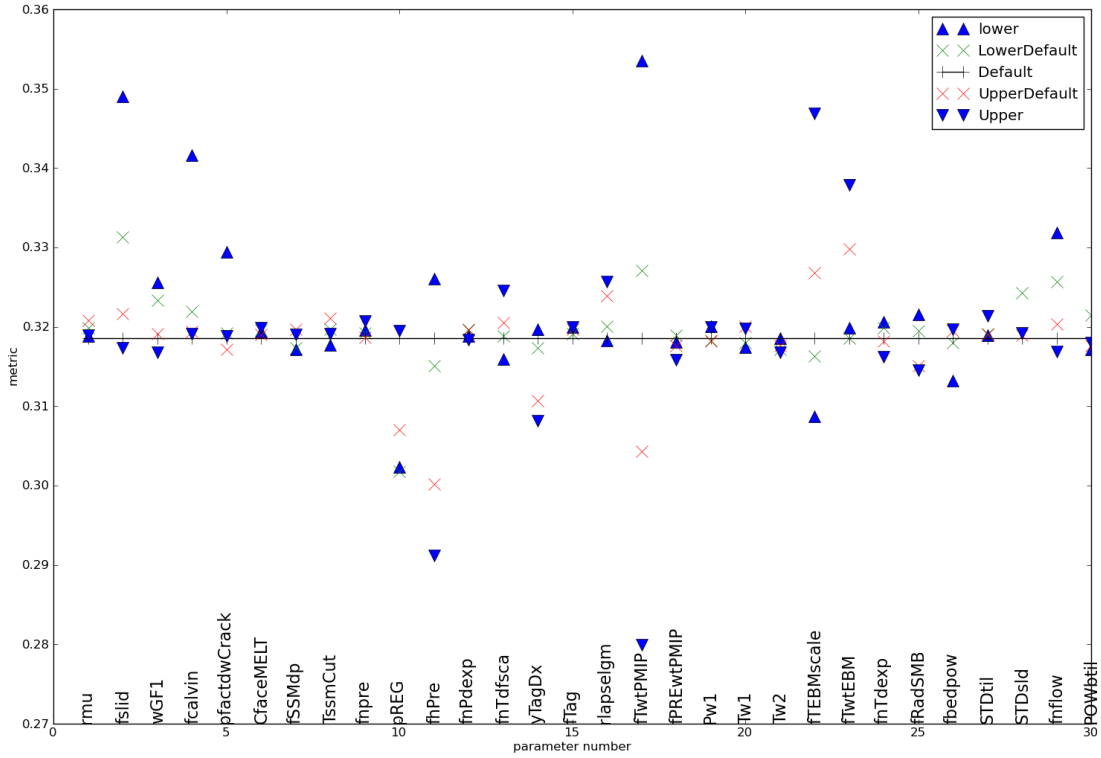

Figure S5. Greenland 0ka ice volume ($10^{16} m^3$) sensitivity to ensemble parameters (relative to BedMachineV3 input). Reference parameter vector is gr2000.

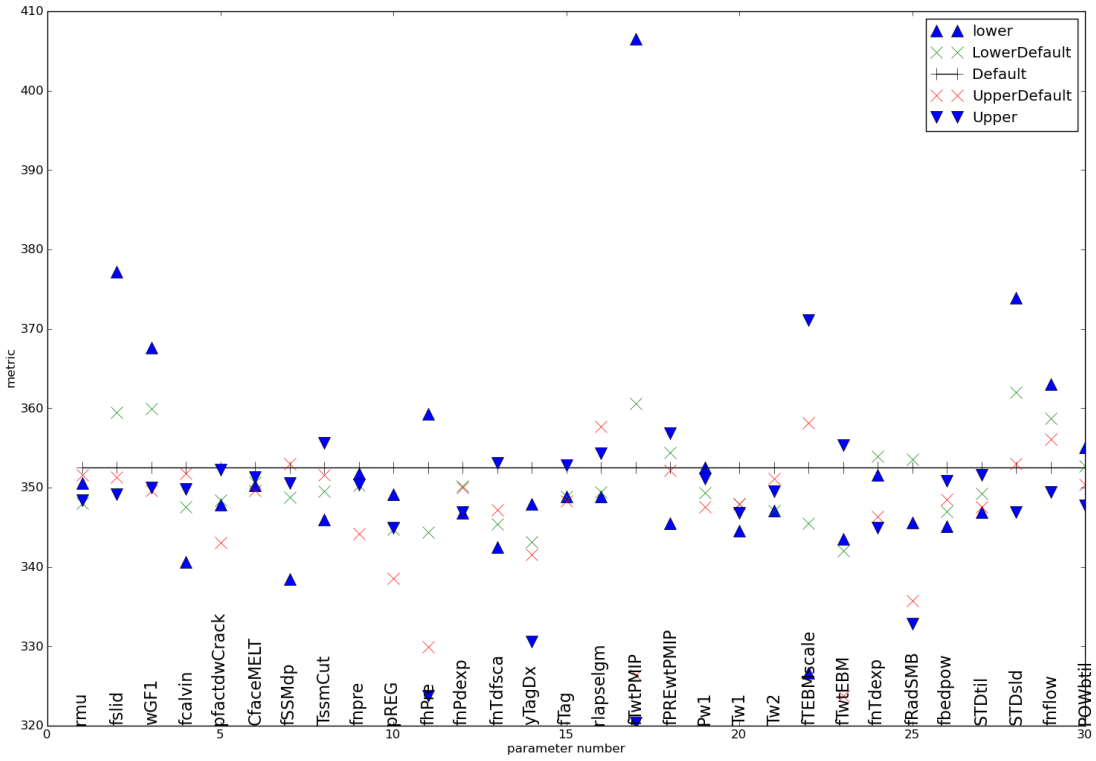

Figure S6. Greenland 0ka ice thickness root mean squared error (m) sensitivity to ensemble parameters (relative to BedMachineV3 input). Reference parameter vector is gr2000.

1.3 Example GSM ensemble parameter sensitivity results for North America

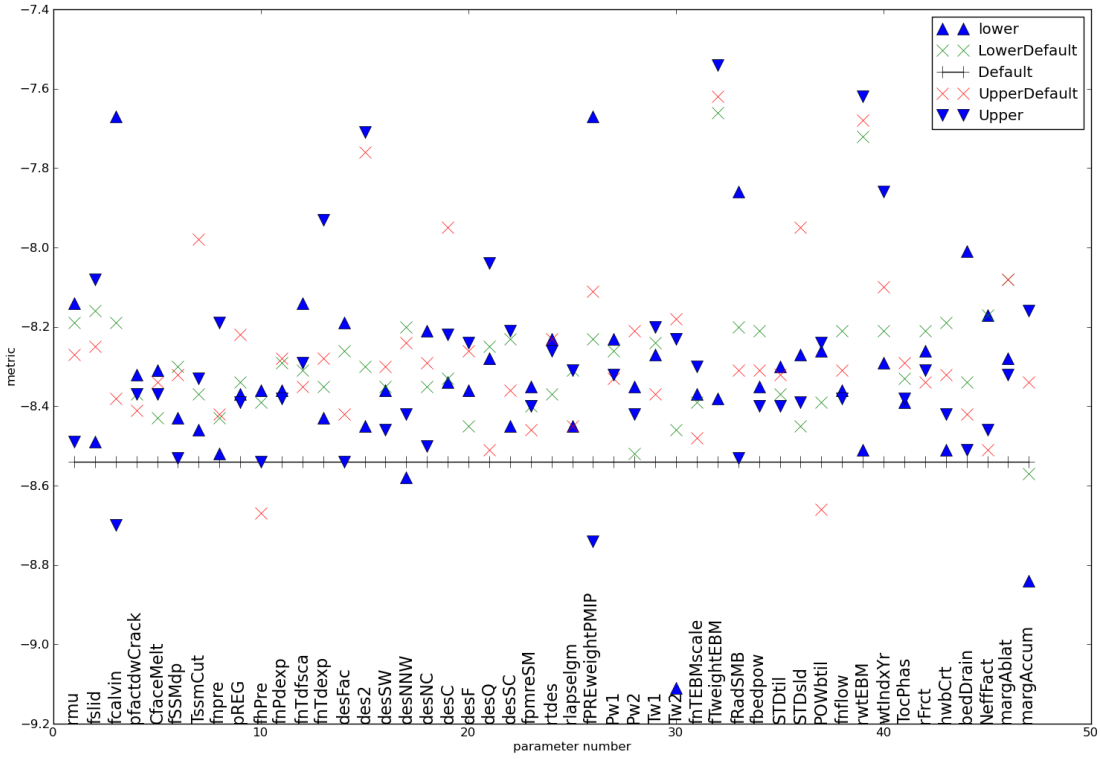

Figure S7. Hudson Bay deglaciation time (ka) sensitivity to ensemble parameters. Reference parameter vector is na4300. "Upper" and "lower values" (as per plot key) are the respective upper and lower bound values for the parameter range in Tables 2 and 3.

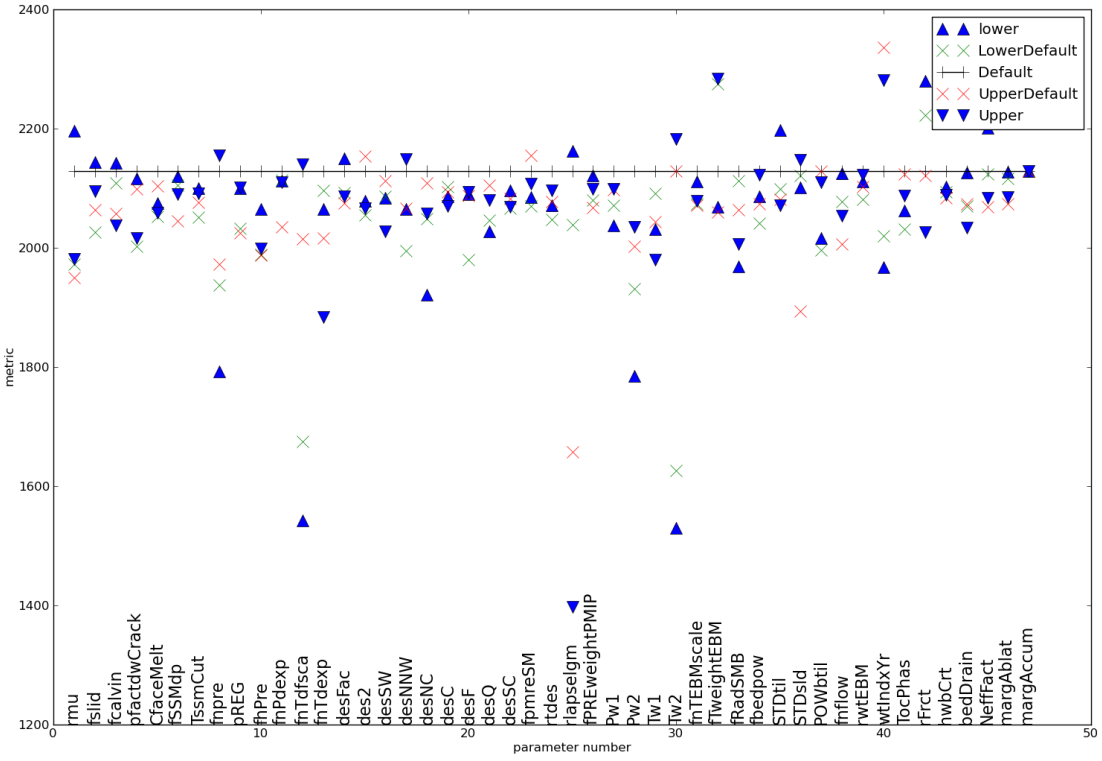

Figure S8. NA 60ka mean ice thickness (m) sensitivity to ensemble parameters. Reference parameter vector is na4300.

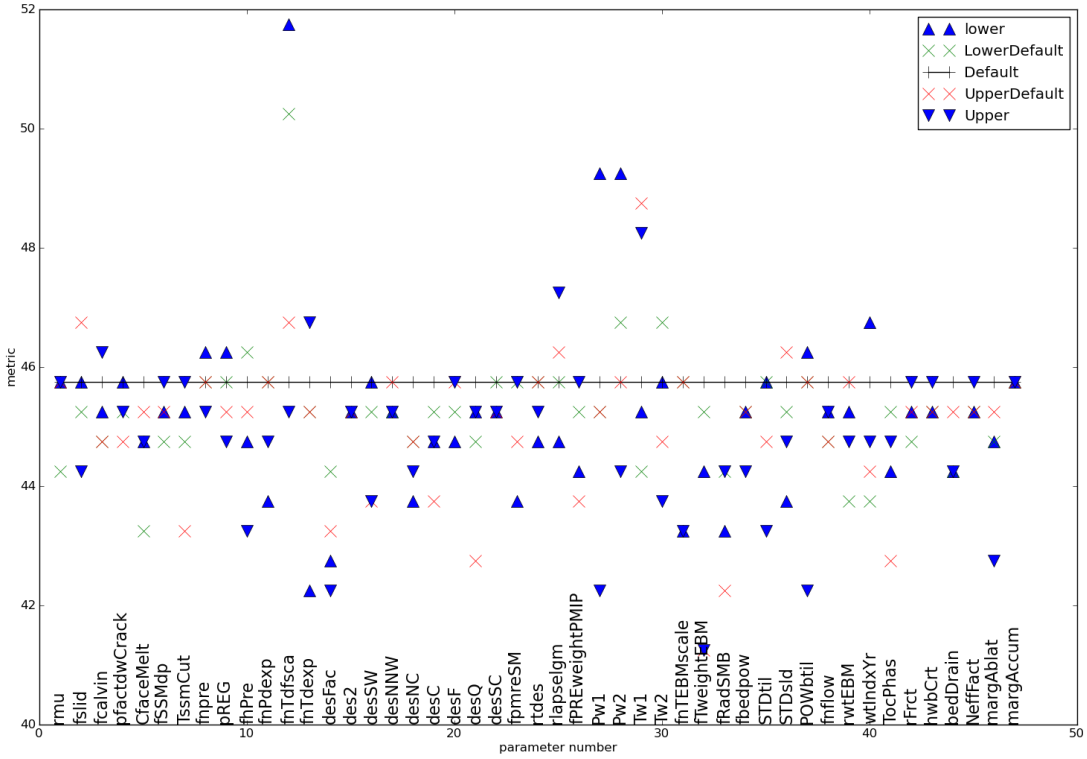

Figure S9. Eastern (69.7^o W) NA maximum southern (^{o} N) ice extent at 60 ka sensitivity to ensemble parameters. Reference parameter vector is na4300.

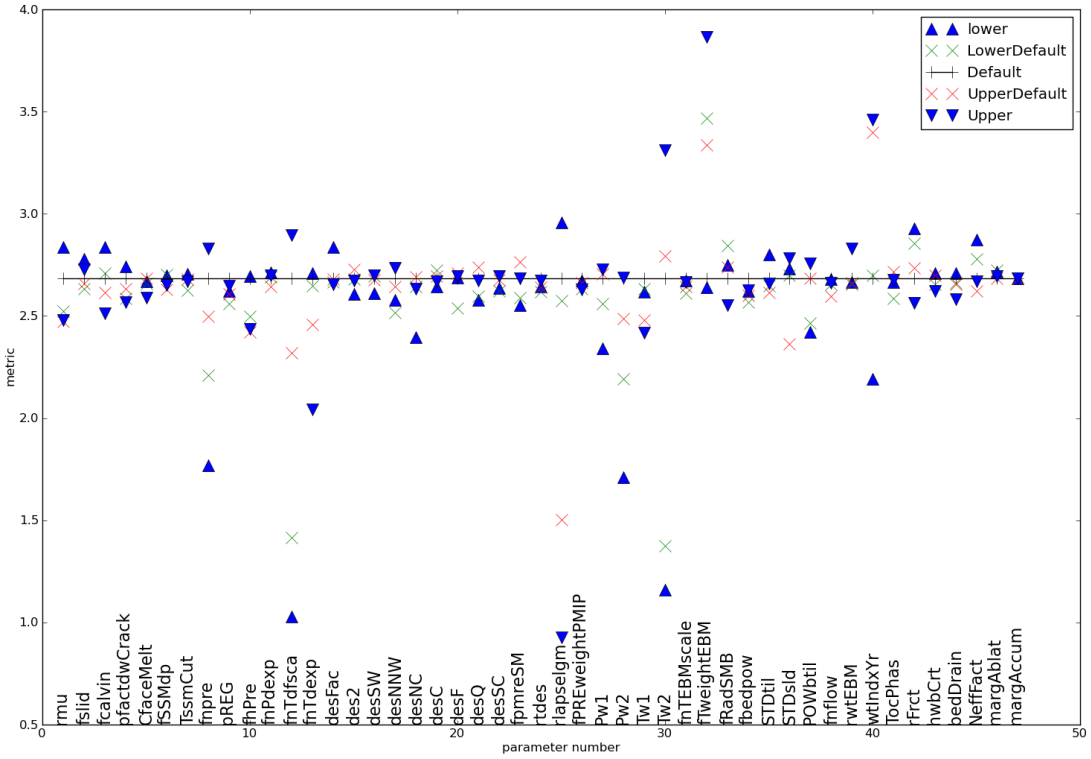

Figure S10. NA 60 ka ice volume ($10^{16} m^3$) sensitivity to ensemble parameters. Reference parameter vector is na4300.

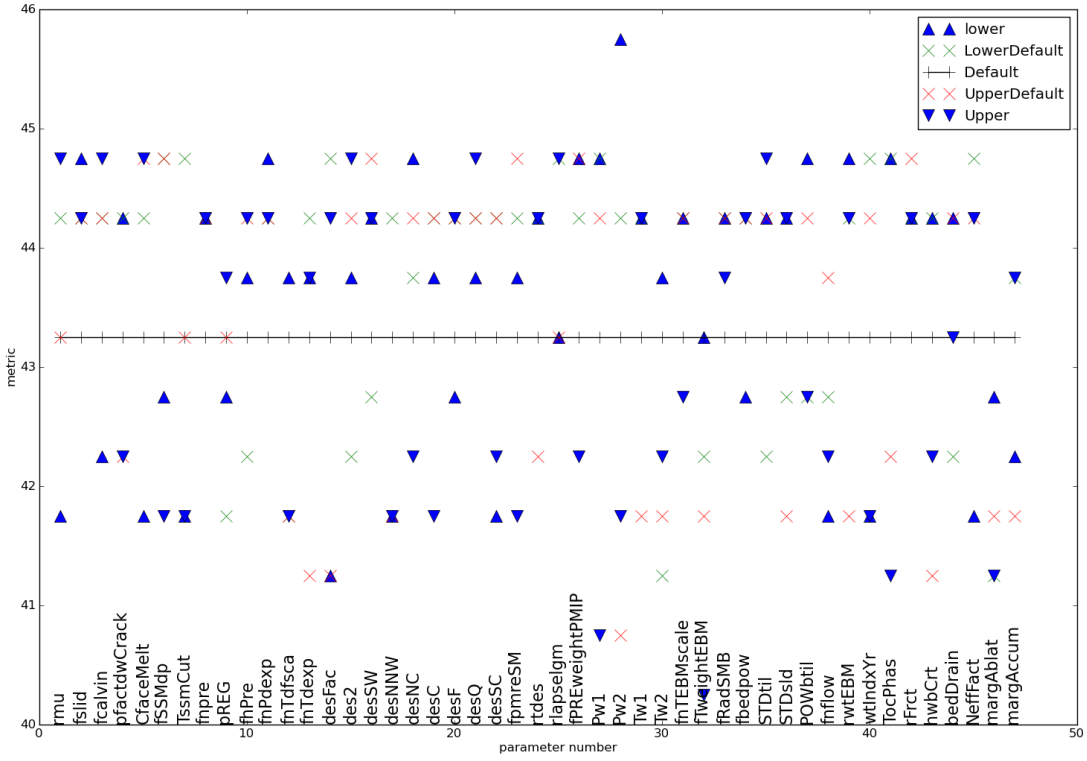

Figure S11. Eastern (69.7^o W) NA maximum southern (^{o} N) ice extent at 20 ka sensitivity to ensemble parameters. Reference parameter vector is na4300.