Topographic controls on ice flow and recession for Juneau Icefield (Alaska/British Columbia)

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Electronic Supplementary Material (ESM)

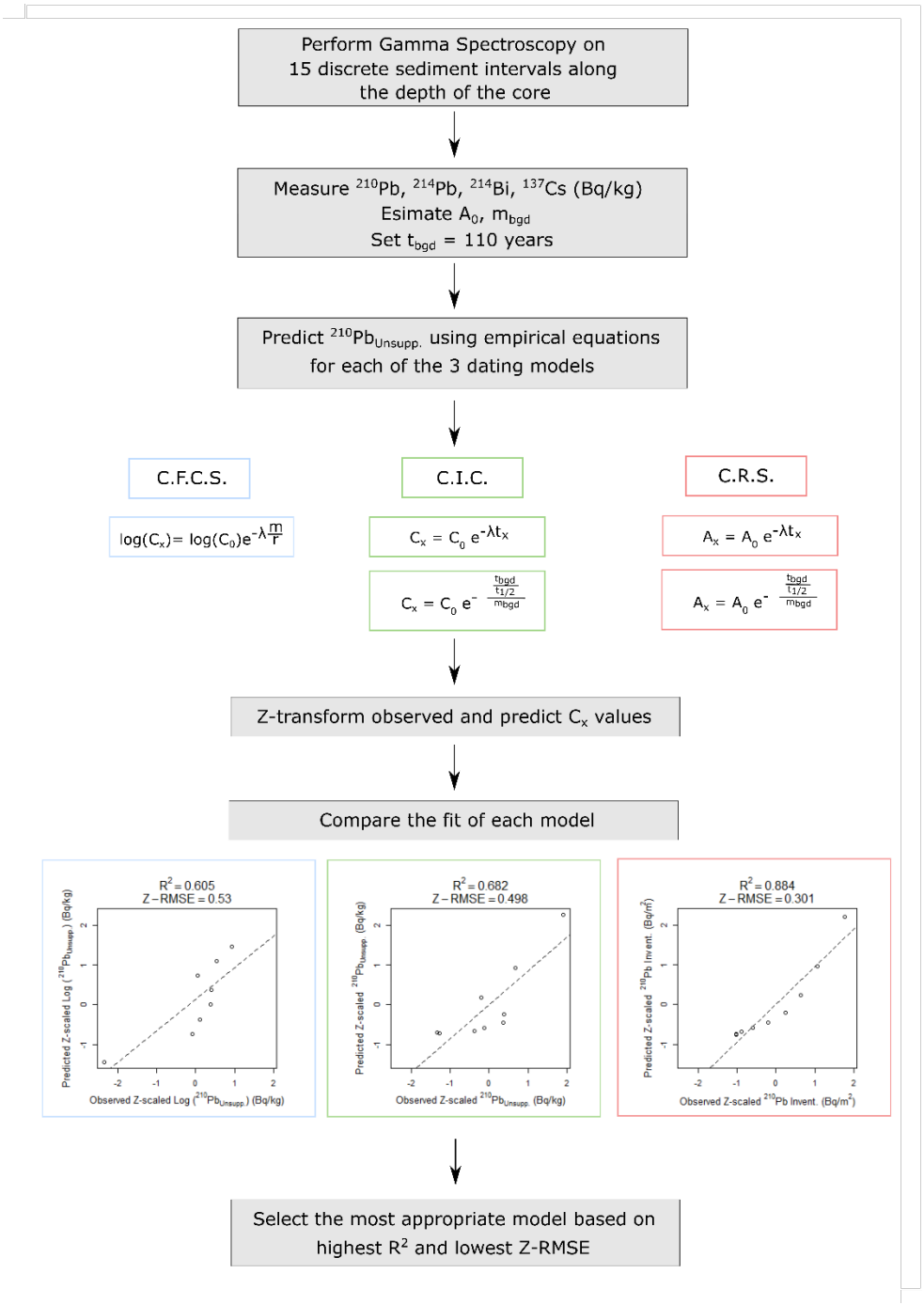

Figure S1. Model selection framework for comparing the ^{210}Pb quantities across 3 dating models using empirical equations from Appleby and Oldfield (1983).

Table S1 Land use, human impact value and data sources. Updated from Huot et al. (2019).

Land Use type	Human impact value	Data source
Urban	1	AAFC Annual Crop inventory 2017; AAFC Land Use 2010; NRCan CanVec Manmade features; USDA NASS Cropland Data Layer 2017; NALCMS Landcover 2010
Mines/Excavation	1	NRCan CanVec Resource Management Features
Agriculture	1	AAFC Annual Crop inventory 2017; AAFC Land Use 2010; USDA NASS Cropland Data Layer 2017; NALCMS Landcover 2010
Pasture	0.5	AAFC Annual Crop inventory 2017; AAFC Land Use 2010; USDA NASS Cropland Data Layer 2017
Recent clearcuts (2012 to 2017)	0.5	Year of gross forest cover loss event (2012 to 2017) from: Hansen et al. 2013; NRCan Natural Burned Area Composite (2010 to 2017)
Natural landscapes	0	NRCan EOSD forest cover map, AAFC Annual Crop inventory 2017; AAFC Land Use 2010; USDA NASS Cropland Data Layer 2017; NALCMS Landcover 2010

Table S2. Class definition and simplified land use categories

Class	Definition	Category simplified
0	No Data	NA
1	Water	Water
10	Exposed Land / Barren / Rock / Snow / Ice	Natural Landscape
20	natural landscape (unclassified)	Natural Landscape
21	Bryoids	Natural Landscape
22	Shrubland	Natural Landscape
23	Herb / Grassland	Natural Landscape
24	Coniferous	Natural Landscape
25	Broadleaf	Natural Landscape
26	Mixedwood	Natural Landscape
27	Forest (undifferentiated)	Natural Landscape
30	Wetland	Natural Landscape
40	Forest Loss (2012-2017)	Forestry
100	Urban / Developed	Urban
101	Sod	Urban
200	Greenhouses	Agriculture
201	Agriculture (undifferentiated)	Agriculture
202	Pasture / Forages	Pasture
203	Too Wet to be Seeded	Agriculture
204	Fallow	Agriculture
205	Cereals	Agriculture
206	Barley	Agriculture
207	Other Grains	Agriculture
208	Millet	Agriculture
209	Oats	Agriculture
210	Rye	Agriculture
211	Spelt	Agriculture
212	Triticale	Agriculture
213	Wheat	Agriculture
214	Switchgrass	Agriculture
215	Sorghum	Agriculture
216	Winter Wheat	Agriculture
217	Spring Wheat	Agriculture
218	Corn	Agriculture
219	Tobacco	Agriculture
220	Ginseng	Agriculture
221	Oilseeds	Agriculture
222	Borage	Agriculture
223	Camelina	Agriculture

224	Canola / Rapeseed	Agriculture
225	Flaxseed	Agriculture
226	Mustard	Agriculture
227	Safflower	Agriculture
228	Sunflower	Agriculture
229	Soybeans	Agriculture
230	Pulses	Agriculture
231	Peas	Agriculture
232	Beans	Agriculture
233	Lentils	Agriculture
234	Vegetables	Agriculture
235	Tomatoes	Agriculture
236	Potatoes	Agriculture
237	Sugarbeets	Agriculture
238	Other Vegetables	Agriculture
239	Fruits	Agriculture
240	Berries	Agriculture
241	Blueberry	Agriculture
242	Cranberry	Agriculture
243	Other Berry	Agriculture
244	Orchards	Agriculture
245	Other Fruits	Agriculture
246	Vineyards	Agriculture
247	Hops	Agriculture
248	Herbs	Agriculture
249	Nursery	Agriculture
250	Buckwheat	Agriculture
251	Canaryseed	Agriculture
252	Hemp	Agriculture
253	Vetch	Agriculture
254	Other Crops	Agriculture
300	mines/excavation	Mines

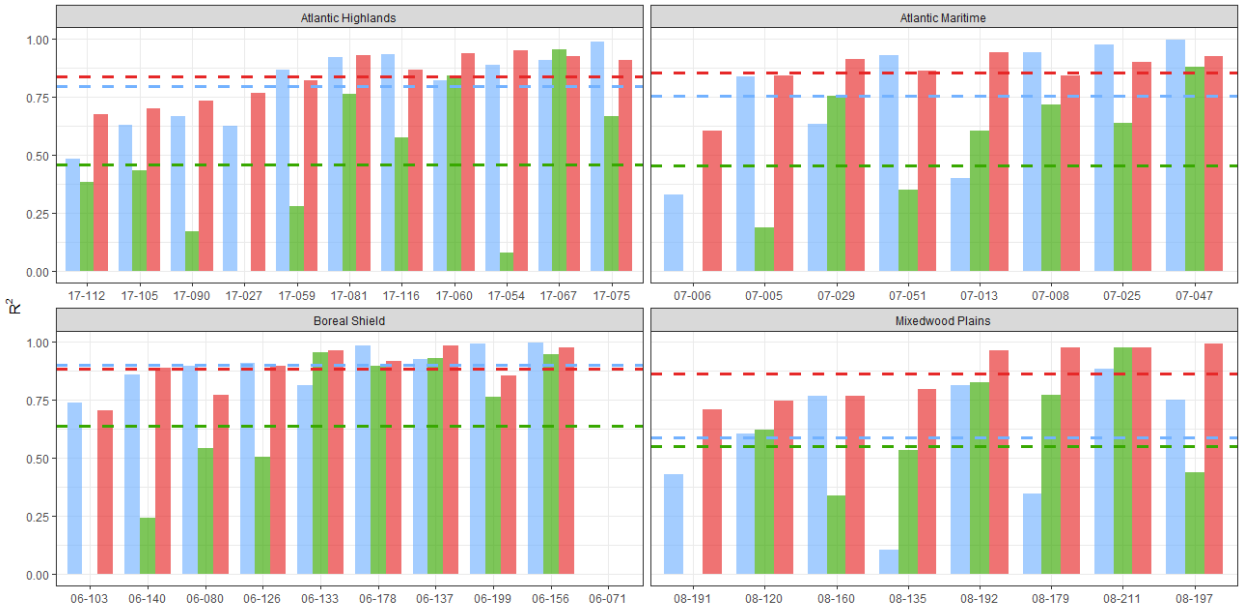

Figure S2. Distribution of predicted and observed R^2 fit across different dating model for all lakes, by ecozone. In blue is the C.F.C.S., green is C.I.C. and red C.R.S. model fit. Lakes are ordered by increasing selected R^2. The colored horizontal dashed lines indicate the mean R^2 for each dating model across each ecozone.

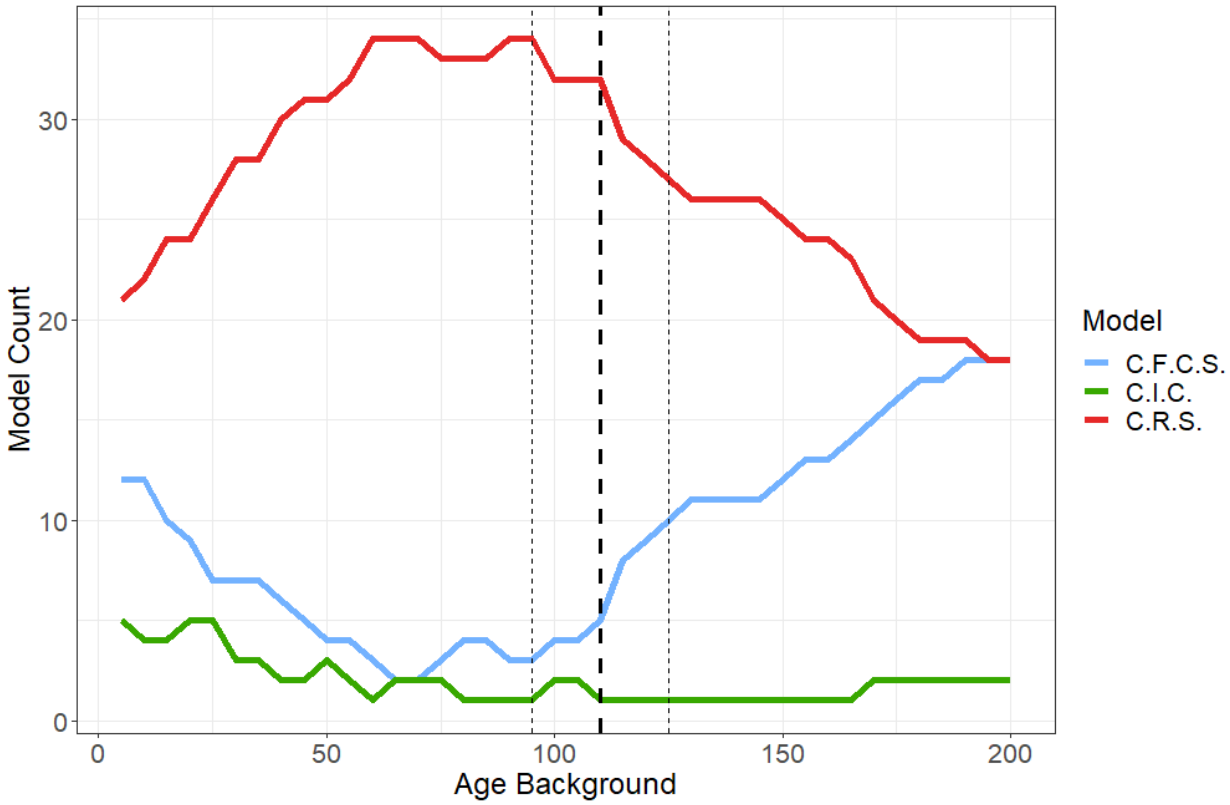

Figure S3. Sensitivity analysis of Age background (= t_{bgd}) parameter used for dating model selection. While t_{bgd}must have environmental significance in accordance with the natural decay of ^{210}Pb (80 – 130 years), represented here by the thin dashed vertical lines, this figure shows the mathematical bias that exists when investigating t_{bgd}outside of this range as well as the model selection stability present within this natural range. The selected t_{bgd} of 110 years is indicated by the thicker dashed line.

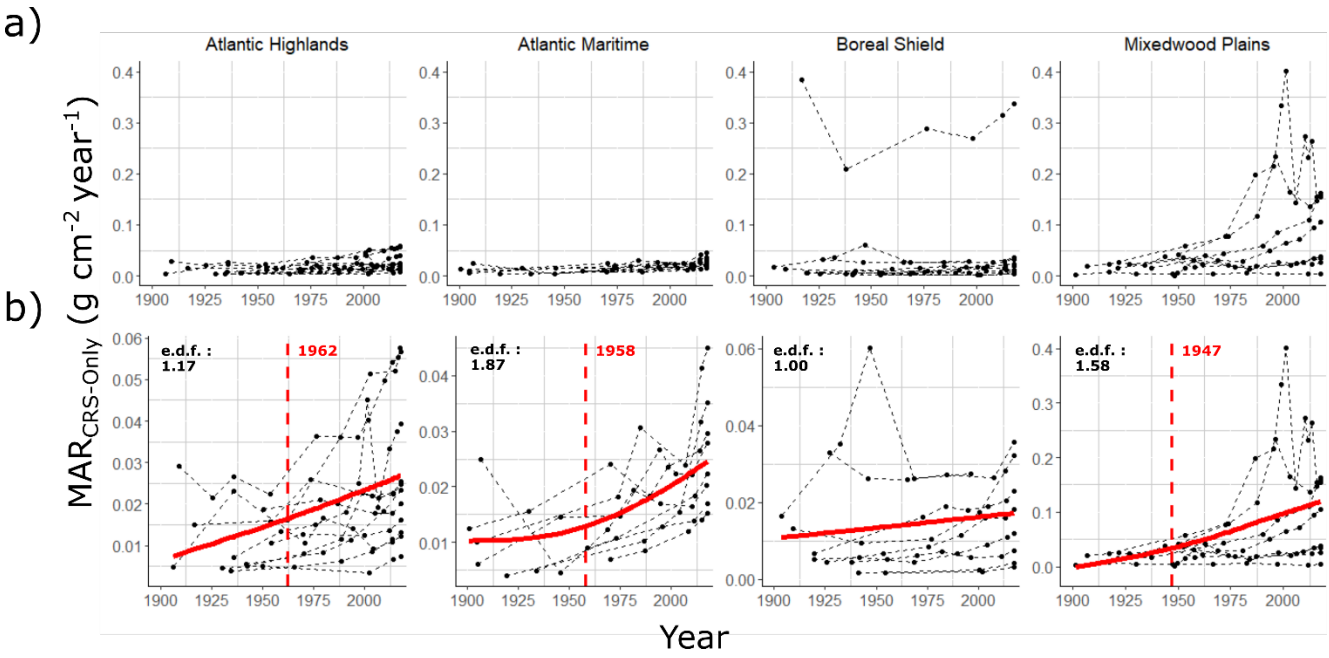

Figure S4. Temporal variation in sediment dry weight mass accumulation rate across the four ecozones of Eastern Canada as determined using only the C.R.S. dating model. The upper panel displays the raw measured sedimentation rates across the 37 lakes. In the lower panel are reported the general additive model (GAM) trends of ecozone specific MAR temporal variation. The estimated degrees of freedom (e.d.f.) associated with the GAM is also reported, as is the estimated onset of the MAR acceleration across each ecozone based on a breakpoint analysis. Lake 06-103 from the Boreal Shield was identified as having anomalously high MAR and was also found to be a site in a floodplain, and thus was removed from our GAMM analyses and all subsequent analyses.