CORRESPONDENCE

The Editor,
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SIR,

Correction to: force, mass, and energy budgets of the Crary Ice Rise complex, Antarctica

In the course of continued research on the mass balance of Crary Ice Rise, several errors were found in the field-data analysis we reported in "Force, mass, and energy budgets of the Crary Ice Rise complex, Antarctica" (*Journal of Glaciology*, Vol. 33, No. 114, p. 218-30). The effect of these errors does not invalidate our conclusions, but it does modify several of the derived quantities in our paper. The correct mass flux through the closed contour surrounding the ice rise is reduced substantially below the value reported in the paper. As a result, the correct net thickening rate (minus basal melting rate) of the ice-rise area is only 32% of the value reported previously. Corrected values of the other derived quantities are not substantially different from those reported previously.

Two code errors were found in the computer programs that perfomed the data analysis. One error caused a systematic misorientation of measured velocities and strain-rates in the local rectangular coordinate system centered on the ice rise. This misorientation varied from station to station and ranged between -10° and $+14^\circ$. The second error affected the calculation of the advective mass-flux uncertainty, and led to a spurious decrease of the uncertainty by a factor of 2.

Two additional errors were made in transcribing field measurements from data reports to the computer-data files used as input to the data-analysis routines. The value of e_{22} for station I_{11} should have been $-2.47 \times 10^{-11}\,s^{-1}$; and a 1 km segment of the boundary contour Γ was assigned inadvertently a zero ice thickness. In addition to correcting the errors described above, we incorporated several measurements acquired or revised since the publication of our paper. These new data are listed in Table I.

Several typographical errors noted in the paper are: (i) strain-rates for stations G_4, G_3, F_9, and Edge were reported with incorrect units ($10^{-4}\,a^{-1}$ are correct, not $10^{-11}\,s^{-1}$ as reported); (ii) e_{11} and e_{22} of station P_{14} were incorrectly listed (and are 2.88×10^{-11} and $-1.39 \times 10^{-11}\,s^{-1}$, respectively); (iii) the latitude of station C_1 is 83°53′00″; (iv) station F_9 was incorrectly labeled F_8 in table I of the original paper; and (v) the summation signs of Equation (A-5) should appear within the parentheses.

Correct derived budgets are provided in Table II (which replaces table IV of the above-referenced paper). In the light of the revisions, one of the conclusions previously drawn must be qualified. The revised net mass balance of Crary Ice Rise (area contained within Γ) implies an area-averaged thickening (minus basal melting) rate of $0.14 \pm 0.09\,m\,a^{-1}$. This value is substantially smaller than the incorrect thickening rate ($0.44 \pm 0.06\,m\,a^{-1}$) reported previously. Other conclusions are not changed appreciably. Resistance generated by the ice rise, for example, ranges in magnitude (depending on the flow law) between 50 and 55% (as opposed to 45 and 51% reported previously) of the back-pressure force on the ice streams. The figures (figs 5 and 8 of the paper) displaying (i) the dynamic drag as a function of position along Γ, and (ii) the comparison of effective resistance to extra back-pressure force, are not changed sufficiently to warrant re-drafting.

Our suggestions that (i) the ice rise may have formed as a consequence of recent ice-stream acceleration, and (ii) its continued growth may eventually reverse this trend of ice-stream discharge, are still supported by our data. The speed of continued ice-rise growth implied by the revised mass balance, however, is reduced. If discharge from Ice Stream B exceeds that required for mass balance by $10-20\,km^3$/year (as reported previously), then approximately 8–16% of the excess discharge could be accumulating within the ice-rise complex (or balanced by basal melting there). Our revised analysis therefore supports the hypothesis that the current imbalance of Ice Streams A and B is building ice rises on the Ross Ice Shelf.

We attribute the errors in our original analysis to deficient checks of our calculations. To check the revised analysis, we applied two additional tests beyond those used previously: (i) our calculation algorithms were tested with imaginary field data for which the derived budgets would be known in advance, and (ii) a separate calculation of the mass balance was made using an independent and simpler algorithm.

We thank E. Roberts for discovering the errors in our computer program, and apologize to the readers of the *Journal of Glaciology* for any inconvenience or confusion our mistakes may have caused.

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TABLE I. ADDITIONAL OR REVISED DATA

Station	*Velocity*	*Azimuth of velocity*	*Strain-rates* $\dot{e}_{11}$	$\dot{e}_{22}$	*Azimuth of* $\dot{e}_{11}$
	m/a	°true	$\times 10^{-11}\,s^{-1}$	$\times 10^{-11}\,s^{-1}$	°true
O	369	304			
G_2	275	327			
G_4	264	342			
J_3	385	329			
K_1			5.31	−3.90	13.3

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TABLE II. DERIVED BUDGETS (REVISED)

Budget	*Variable*		*Value(s)*		*Units*
			Contour Γ		
Form drag	$F^f{}_x$		9.64 ± 0.62		10^{13} N
	$F^f{}_y$		8.49 ± 0.19		10^{13} N
	$\lvert F^f \rvert$		12.85 ± 0.65		10^{13} N
		Flow law #1	*Flow law #2*	*Flow law #3*	
Dynamic drag	$F^d{}_x$	0.17 ± 0.03	0.15 ± 0.03	0.34 ± 0.02	10^{13} N
	$F^d{}_y$	0.99 ± 0.02	0.86 ± 0.02	0.65 ± 0.02	10^{13} N
	$\lvert F^d \rvert$	1.00 ± 0.04	0.88 ± 0.04	0.73 ± 0.03	10^{13} N
Effective resistance	$(F^f + F^d - F^w)_x$	1.21 ± 0.07	1.19 ± 0.07	1.38 ± 0.07	10^{13} N
	$(F^f + F^d - F^w)_y$	1.90 ± 0.02	1.78 ± 0.02	1.57 ± 0.02	10^{13} N
	$\lvert F^f + F^d - F^w \rvert$	2.26 ± 0.07	2.14 ± 0.07	2.09 ± 0.07	10^{13} N
Energy dissipation	W	6.57 ± 0.07	5.05 ± 0.07	1.32 ± 0.07	10^{8} W
Advective mass flux	Q		0.13 ± 0.27		10^{5} kg s^{-1}
Snow accumulation	A		0.33 ± 0.06		10^{5} kg s^{-1}
Net mass balance	M		0.46 ± 0.28		10^{5} kg s^{-1}
Apparent thickening rate			0.14 ± 0.09		m a^{-1}
			Contour Γ*		
Form drag	$F^f{}_x{}^*$		3.63 ± 0.14		10^{13} N
	$F^f{}_y{}^*$		36.65 ± 1.33		10^{13} N
	$\lvert F^f \rvert^*$		36.72 ± 1.34		10^{13} N
		Flow law #1	*Flow law #2*	*Flow law #3*	
Dynamic drag	$F^d{}_x{}^*$	−0.03 ± 0.02	−0.04 ± 0.02	−0.00 ± 0.02	10^{13} N
	$F^d{}_y{}^*$	0.08 ± 0.05	0.09 ± 0.05	0.18 ± 0.04	10^{13} N
	$\lvert F^d \rvert^*$	0.08 ± 0.05	0.10 ± 0.06	0.18 ± 0.04	10^{13} N
Extra back-pressure force	$(F^f + F^d - F^w)_x^*$	0.36 ± 0.02	0.36 ± 0.02	0.40 ± 0.02	10^{13} N
	$(F^f + F^d - F^w)_y^*$	4.06 ± 0.14	4.07 ± 0.14	4.17 ± 0.14	10^{13} N
	$\lvert F^f + F^d - F^w \rvert^*$	4.08 ± 0.14	4.08 ± 0.14	4.18 ± 0.14	10^{13} N
Energy dissipation	W^*	1.64 ± 0.02	1.62 ± 0.02	1.64 ± 0.02	10^{9} W
Work done against $F^f + F^d$ (not included in original paper)		1.36 ± 0.00	1.36 ± 0.00	1.36 ± 0.00	10^{10} W
Ice discharge	Q^*		13.60 ± 0.52		10^{5} kg s^{-1}
			Contour Γ^c		
Form drag	$F^f{}_x{}^c$		3.89 ± 5.22		10^{12} N
	$F^f{}_y{}^c$		−2.24 ± 4.66		10^{12} N
	$\lvert F^f \rvert^c$		4.49 ± 7.00		10^{12} N
		Flow law #1	*Flow law #2*	*Flow law #3*	
Dynamic drag	$F^d{}_x{}^c$	−4.97 ± 5.95			10^{11} N
	$F^d{}_y{}^c$	9.11 ± 4.99			10^{11} N
	$\lvert F^d \rvert^c$	10.37 ± 7.77			10^{11} N
Effective resistance	$(F^f + F^d - F^w)_x{}^c$	−0.08 ± 1.13			10^{12} N
	$(F^f + F^d - F^w)_y{}^c$	0.67 ± 1.00			10^{12} N
	$\lvert F^f + F^d - F^w \rvert^c$	0.67 ± 1.51			10^{12} N

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