**SUPPLEMENTAL MATERIALS TO:**

**Quantifying dissolution rates of Antarctic icebergs in open water**

**Olav Orheim¹, A. Barry Giles², T.H. (Jo) Jacka³ and Geir Moholdt⁴**

¹Formerly Norsk Polarinstitutt, 9296 Tromsø, Norway.

²Formerly Antarctic Climate and Ecosystems Cooperative Research Centre (ACE CRC), now Institute for Marine and Antarctic Studies (IMAS), University of Tasmania, Private Bag 80, Hobart, Tasmania 7001, Australia

³Formerly Antarctic Climate Program, Australian Antarctic Division, 203 Channel Highway, Kingston, Tasmania 7050, Australia

⁴Norsk Polarinstitutt, 9296 Tromsø, Norway.

**Further information on Figure 6 and the size relationship of 302 observed icebergs >1 km length.**

The linear relationship shown in Fig.6 has a power law slope of -2.17 +/- 0.14. We provide here some additional comments for clarification.

In this investigation, icebergs >10 km length were grouped in length batches of 10-15, 15-20, 20-30, 30-40 km in order to avoid unrealistic spikes in length observations caused by some observers rounding off observed sizes. We make two observations in this connection:

1) While the total number of observed icebergs 1-10 km length was 284, only 18 were observed >10 km. This relatively small number suggests that statistics of the largest bergs should be treated with caution.

2) In the plotting of the arithmetic mean for a group, this is placed where it would be observed in a power law distribution. As an example, when the total for 10-15 km is 7, then the mean for each km-step, 1.4 (7/5), is plotted at 12.1, not 12.5 km.

**Table S1. THE STEP-BY-STEP CALCULATIONS BEHIND THE SIMULATED ICEBERG NUMBERS**



**a.** The calculations behind the simulation approach adopted for cascading numbers of varying sized icebergs. Here, only the first few segments (6-8) are shown. The remainder are shown in Table S1b.

The normalized observations are given in N4-8. The calculations to derive simulated numbers after crossing two segments, e.g. from 4 to 6, are based on applying the boundary conditions described in section 3.5 to the normalized observations, i.e. in N4. The simulated numbers, i.e. S6, are then shown next to the normalized observations. The calculations are done in steps of two segments to reduce Table size. The main calculations are as follows:

1. Reduction in length from attrition = 60 x average daily rate x 2, given attrition from both (all) sides. i.e., for segment 4-6 the average rate is 0.205 m d⁻¹, which means e.g. for size class 2 icebergs, a reduction in numbers of 24.6/150=16.4% during drift from segment 4 to 6, assuming the sizes are evenly distributed within the length range. Icebergs removed by attrition from one size class are added to the one below.

2. Fracture leads to double numbers of icebergs of half the length. When the number is odd, the number of fractured icebergs is taken as x+1/2. 30 d half-life for icebergs <4 km means 75% are fractured after 60 d. The double numbers are added to the appropriate size class below.

3. One iceberg of size 4-8 km is shattered completely into <1 km size icebergs on each segment crossing from segment 5 to 13, marked with \* above. The new icebergs are added to the 0.5-1 km size class.

4. The number of fractures x 3 are added to icebergs size class 10-50 m as a byproduct from splitting.



**b**. The calculations of simulated numbers of icebergs for segments 10-16. These follow the same procedures as described above.