

Interactive comment on “Overview of areal changes of the ice shelves on the Antarctic Peninsula over the past 50 years” by A. J. Cook and D. G. Vaughan

D. Benn (Referee)

doug.benn@unis.no

Received and published: 24 August 2009

This is a very useful paper, which presents the first homogeneous dataset on AP ice shelf area changes, and a major review of previous work on this important topic. The paper is likely to be very widely cited, and should be published with only minor revision. My specific comments on the ms. are as follows:

583.21: why tilde (~) in front of 9823? Remove.

587.28: the reference to ‘amount of meltwater and hence the rate of fracture’ is the first mention of the hydrofracture hypothesis of ice shelf break-up, and is too brief to be clearly comprehensible. The mechanism is only discussed in detail on pages 592

C152

and 597. I suggest that the mechanism is briefly introduced on page 581 (perhaps around line 5, where ‘several specific mechanisms’ are alluded to, but not listed). The reference to hydrofracture on p. 587 should be amended, since fracturing is not a simple consequence of meltwater availability, but also strain rate (as is made clear elsewhere).

590.13 - 18: The ideas here are not presented as clearly as they could be. I suggest these sentences are replaced by something like: ‘Most of this ice flows towards Alexander Island to the west (Pearson and Rose, 1983), creating strong uniaxial compression over large portions of the ice shelf. In the absence of extensional strain, surface ponding appears to be insufficient to cause fracturing.’

594.2: ‘stable growth and calving’ needs to be explained more clearly. Does this mean a stable cycle of front advance and intermittent calving retreat?

594.7 Given the caveats discussed on pages 604-5, the reference to the ‘climatic limit of viability’ should be replaced by ‘the -9° MAT isotherm’.

598.16: The sentence ‘See Sect. 4.2.3 for a fuller explanation’ is intrusive and unnecessary. Omit.

603.1: The reference here to the compressive arch idea is confusing. The idea of the ‘compressive arch’ is that it encourages front stability, and that disruption of the arch leads to instability – not what is stated here. Actually, I am very skeptical about the whole idea of the ‘compressive arch’ (also discussed on pages 597-8) and its role in calving front processes. I think that the view of a calving bay as an arch actually inverts the true picture – the bay exists in response to an arcuate zone of extension (normal to the ice front), reflecting longitudinal extensional strain near the centreline and shear strain near the margins. Thus, the ‘arch’ is a response to the strain conditions, and not vice versa. The present paper is not the appropriate place to criticize the arch concept, but references to the idea should be clear and consistent.

