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The Cryosphere Discussions

Interactive comment on "Speedup and fracturing of George VI Ice Shelf, Antarctic Peninsula" *by* T. O. Holt et al.

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Holt et al (2013) examination of George VI Ice Shelf is an excellent contribution providing a detailed analysis of changes in structure, flow rates and ice thickness of this ice shelf. The comments below are minor requests for clarification or elaboration.

The paper does not discuss basal crevasses. Luckman et al. (2012) made a strong case for their importance as both structural weaknesses and having associated surface features evident in satellite imagery. The identification of the basal crevasses surface representation in their Figure 5, look very similar to several of the features in your Figure 5. The authors here are not focusing on identifying the source of either fractures or rifts, but should mention the potential relation to basal crevasses.

The delineation of fractures versus rifts has left me unsure of the efficacy of the distinction used for fractures. In the literature rifts are often used for features that do not penetrate the entire ice shelf, possibly because this is difficult to discern. Glasser and Scambos (2008) examining Larsen B, put together a detailed table for features that lacks fractures. In Glasser et al (2011) examination of the Prince Gustav Ice Shelf fractures are not part of the structural terminology. Braun et al (2009) in describing features of the Wilkins Ice Shelf refer repeatedly to fractures as small, but leading to rift development. MacGregror et al (2012) also use rifts not fractures for the ice shelves of the Amundsen Sea. Luckman et al (2012) similarly use rifting instead of fracturing for Larsen C. The large rifts in Pine Island Glacier do not penetrate the ice shelf and are referred to as rifts. The current large rift on Pine Island Glacier can be seen to reach the water line, according to Operation Icebridge, though they cannot determine if it penetrates the entire ice shelf. Many of the features in Figure 5 that are labeled as fractures I have seen labeled as rifts in other papers. In Figure 9 rifts and fractures are treated as a continuum, suggesting the difficulty of distinguishing. This is a minor point to be sure, but one that needs further clarification for readers to better understand the reason for establishing fractures as category of ice shelf structural features.

375-22: After mentioning structural weakness, should rifting formation and propagation be specifically referred to as part of this?

378-5: Hence, there is limited volume loss due to surface ablation, correct?

385-19: I have submitted an annotated version of Figure 5. The upper left panel in this figure needs to be lightened. I am uncertain why the apparent rifts are not labeled as such, for the longitudinal features near B. These rifts do penetrate well into the ice from the margin and are zones of weakness and should not really be identified as the margin. The feature at Point A is not identified but is evident in the 1973 panel. The transition from features noted as fractures to rifts near Point C is where I am unclear if fractures is the correct term. In the 2010 image why are the features at the orange arrows not labeled rifts.

TCD

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390-25: This observation is almost identical to that which has been made for the thin floating tongue of Petermann Glacier, Greenland.

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MacGregor, J.A., Catania, G.A., Markowski, M.S. and Andrews, A.A.: Widespread rifting and retreat of ice-shelf margins in the eastern Amundsen Sea Embayment between 1972 and 2011. J. Glaciol.,58, 209, 2012 doi: 10.3189/2012JoG11J262, 2012.

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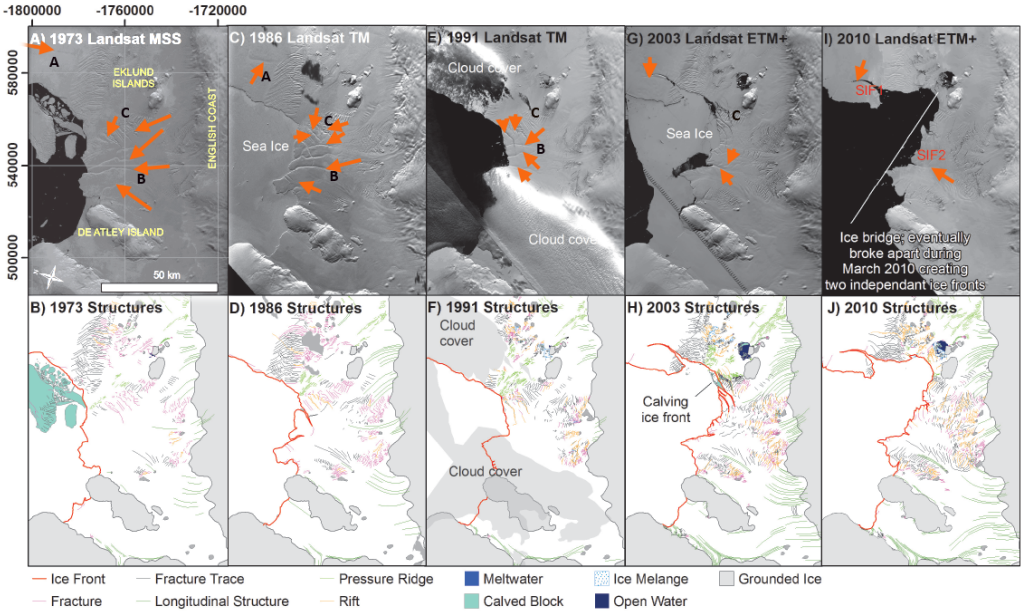
-1800000
-1760000
-1720000
580000
540000
500000
A) 1973 Landsat MSS
EKLUND ISLANDS
ENGLISH COAST
DE ATLEY ISLAND
50 km
C) 1986 Landsat TM
Sea Ice
E) 1991 Landsat TM
Cloud cover
G) 2003 Landsat ETM+
Sea Ice
I) 2010 Landsat ETM+
SIF1
SIF2
Ice bridge, eventually broke apart during March 2010 creating two independant ice fronts
B) 1973 Structures
D) 1986 Structures
F) 1991 Structures
Cloud cover
H) 2003 Structures
Calving ice front
J) 2010 Structures
Ice Front
Fracture
Fracture Trace
Longitudinal Structure
Pressure Ridge
Rift
Meltwater
Calved Block
Ice Melange
Open Water
Grounded Ice

Fig. 1.