

# Supplement

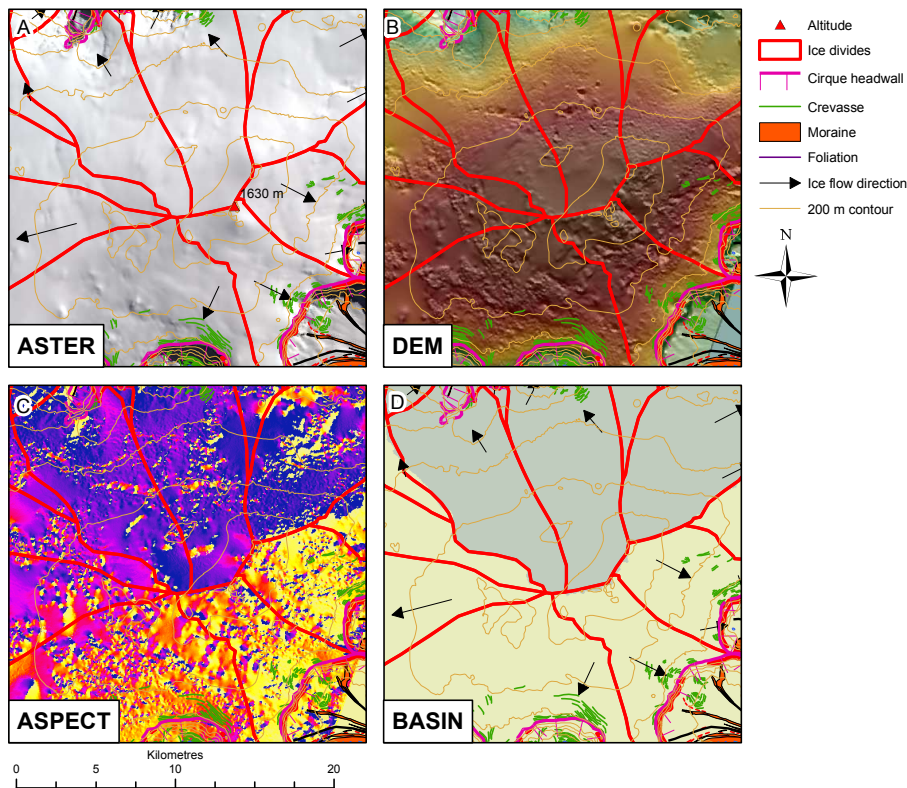
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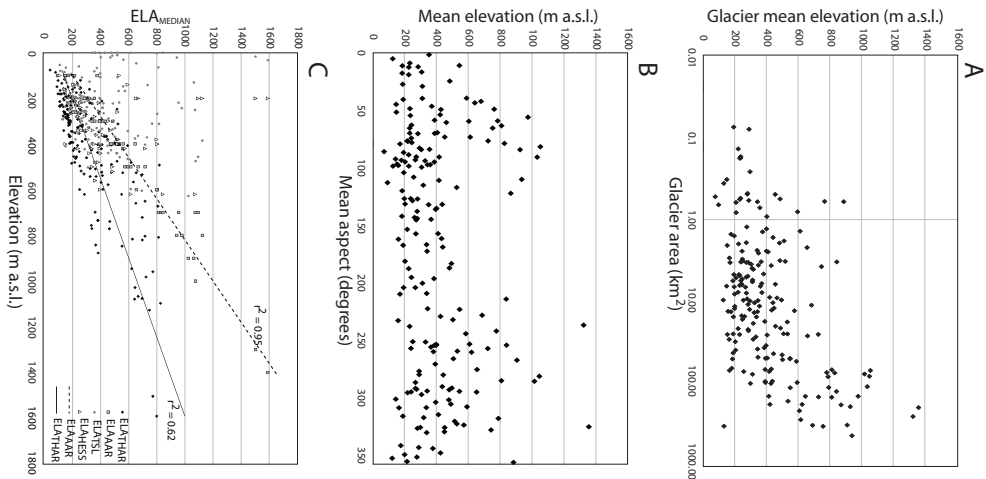
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**Fig. S1.** Delineation of ice divides on the centre of James Ross Island, Mount Haddington Ice Cap. Delineation of ice divides used a combination of structural glaciological mapping from ASTER and SPOT-5 images (a), analysis of ASTER images and (b) the 2006 SPIRIT DEM showing high and low points and topographic divides, models of aspect (c) and slope, and (d) automatic drainage basin delineation using hydrological tools.



**Fig. S2.** Glacier inventory data. See Table 5 for p values. (a) Mean elevation and glacier area (log). (b) Correlation between ELA<sub>MEDIAN</sub> and different methods of ELA calculation. (c) Mean aspect and mean elevation.

**Table S1.** SPOT-5 and ASTER scenes used in the analysis of glacier change and estimates of cloud cover (visually estimated). TP = Trinity Peninsula. JRI = James Ross Island. VI = Vega Island.

Sensor	Date	Region	Scene ID	Path/Row	Cloud cover
SPOT-5	23/01/2006	JRI	GES 08-025 James Ross Island		5%
SPOT-5	07/0/2006	TP	SPI-09-049 Antarctic Peninsula		5%
ASTER	06/02/2009	Sjögren Glacier	AST.L1A0032070439415, AST.L1B00302062009130938	216/105	10-20%
ASTER	03/03/2009	JRI	AST.L1A0032071357944, AST.L1B00303032009130328	216/105	0%
ASTER	03/03/2009	Joinville Island	AST.L1A0032071358554, AST.L1B00303032009130319	216/104	30%
ASTER	13/12/2008	Joinville Island	AST.L1A0032068532209, AST.L1B00312132008130309	216/104	0%
ASTER	23/03/2008	JRI and eastern TP	AST.L1A0032072667022, AST.L1B00303232008130815	216/105	10%
ASTER	29/12/2002	JRI	AST.L1A0032010352317, AST.L1B00312292002130340	216/105	50%
ASTER	29/12/2002	Joinville Island	AST.L1A0032010352317, AST.L1B00312292002130340	216/104	40%
ASTER	05/03/2002	Northern TP	AST.L1A0032006163082, AST.L1B00303052002132218	216/105	20% in NE corner
ASTER	18/01/2002	JRI and eastern TP	AST.L1A0032005839335, AST.L1B00301182002131108	216/105	30% over western TP
ASTER	08/01/2001	JRI	AST.L1A0032004102903, AST.L1B00301082001131449	216/105	0%
ASTER	14/02/2001	TP	AST.L1A0032005033375, AST.L1B0030214200113238	216/105	20% over the sea
ASTER	15/11/2001	Southern TP	AST.L1A0032005556226, AST.L1B00311152001131252	216/105	Up to 50%
ASTER	26/09/2001	Western TP	AST.L1A0032004337049, AST.L1B00309262001132645	216/105	10%

**Table S2.** Method for calculation of mean glacier aspect from a DEM using automatic methods in ArcGIS 9.3

Step	Tool	Method and notes
1.	3D Analyst → Surface analysis → Aspect	Create a new model of aspect from the DEM ("apis_aspect")
2.	Data Management Tools → Raster → Raster Dataset → Create Raster Dataset	Create a new blank raster (e.g. "apis_blank")
3.	3D Analyst → Reclassify	Reclassify each pixel value to 1 and save, e.g., "apis_reclass"
4.	Spatial Analyst → Raster Calculator	Apis_reclass = sin([apis_aspect] div deg). Export to geodatabase ("sine_aspect")
6.	Repeat for cosine	Create cosine model with mean values for each glacier. Join the tables.
7.	Add field ("sine_div_c") → Field Calculator	Calculate mean_sine / mean_cos
8.	Add Field ("angle") (set as double) → Field Calculator → "Advanced"	<i>Pre-VBA Script Code:</i> Dim arctan as double. Arc-tan = Atn ([sine_div_c]). angle = arctan * 180 / 3.141592654. <i>Value Output:</i> angle
9.	Add Field (aspect_ang). Set as double. Field Calculator → "Advanced"	<i>Pre-Logic VBA Script Code:</i> If [mean_sine] > 0 And [mean_cos] > 0 Then angle = [angle]. ElseIf [mean_cos] < 0 Then angle = [angle] + 180. ElseIf [mean_sine] < 0 And [mean_cos] > 0 Then angle = [angle] + 360. Else angle = -1. EndIf. <i>Value Output:</i> angle
11.	Join table to glacier polygons	No fields should have a value of -1 (which is used as a check). Check by displaying angles as orientated arrows (Display - Quantities - Graduated Symbols).