

A 20-year study of melt processes over Larsen C Ice Shelf using a high-resolution regional atmospheric model: Part 2, Drivers of surface melting

E. Gilbert^{1,2}, †, A. Orr¹, I. A. Renfrew², J. C. King¹, and T. Lachlan-Cope¹

¹ British Antarctic Survey, High Cross, Madingley Road, Cambridge CB3 0ET, United Kingdom.

² School of Environmental Sciences, University of East Anglia, Norwich NR4 7TJ, United Kingdom.

Corresponding author: Ella Gilbert (ella.gilbert@reading.ac.uk)

† Present address: Department of Meteorology, University of Reading, Whiteknights Road, Reading RG6 6ET, United Kingdom.

Contents of this file

Tables S1 and S2

Introduction

This supplement includes additional tables relating to the available model outputs and foehn clearance.

Table S1. Indicator variables, thresholds and regions used in diagnosing the conditions used for compositing. Conditions are defined in the main text, where the acronyms "SAM", "ENSO" and "ASL" refer to the Southern Annular Mode, El Niño Southern Oscillation and Amundsen Sea Low, respectively. The regions used are indicated in Figure 1.

Condition	Indicator variable	Threshold	Region
Low melt	Meltwater production	< 25 th percentile	Region "LCIS"
High melt	Meltwater production	> 75 th percentile	Region "LCIS"
Sunny	SW _↓	> 75 th percentile	Region "LCIS"
Barrier wind	V wind	5.0 m s ⁻¹	Region "B"
Foehn	U wind, T _{air} , RH, potential temperature	≥ 6 3-hour periods of foehn at 3 AWSs (see main text for details).	
ASL	Hosking et al. (2013) index	-5.0 hPa	N/A
SAM+	SAM index	+1 σ (+1.36)	N/A
SAM-	SAM index	-1 σ (-1.36)	N/A
ENSO+ (La Niña conditions)	Nino3.4 index	+0.5	N/A
ENSO- (El Niño conditions)	Nino3.4 index	-0.5	N/A

Table S2. Co-occurrence of ‘sunny’, ‘cloudy’, ‘clear’, ‘high LWP’ and ‘low LWP’ conditions with ‘foehn’ conditions during each season (labelled ‘overlap’). The values shown represent the percentage of time during which the conditions overlap with foehn conditions, that is, of the times that foehn conditions are occurring, what percentage of the time the conditions in question also occur. Also shown are the mean E_{melt} anomalies averaged over the ice shelf area during the conditions in question (labelled ‘anomaly’).

	DJF		MAM		JJA		SON	
	overlap	anomaly	overlap	anomaly	overlap	anomaly	overlap	anomaly
Sunny	31.5%	1.00 W m ⁻²	26.7%	0.80 W m ⁻²	-	-	28.5%	0.38 W m ⁻²
Cloudy	59.4%	0.02 W m ⁻²	34.5%	1.02 W m ⁻²	58.3%	0.02 W m ⁻²	56.4%	0.31 W m ⁻²
Clear	9.8%	0.52 W m ⁻²	13.0%	-0.10 W m ⁻²	9.1%	0.00 W m ⁻²	9.3%	-0.02 W m ⁻²
High LWP	20.2%	-0.32 W m ⁻²	11.7%	2.03 W m ⁻²	12.2%	0.08 W m ⁻²	13.2%	0.54 W m ⁻²
Low LWP	29.7%	0.70 W m ⁻²	30.9%	-0.14 W m ⁻²	25.3%	0.00 W m ⁻²	26.2%	-0.13 W m ⁻²