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Antarctic ice shelf open ocean corridors with large swell available

Nathan Teder[1], Luke Bennetts[1], Rob Massom[2,3], and Phil Reid[3,4]

[1]Adelaide University, Mathematical Sciences, Adelaide, Australia (nathan.teder@outlook.com)
[2]Australian Antarctic Division, Hobart, Australia,
[3]Australian Antarctic Program Partnership, Hobart, Australia
[4]Australian Bureau of Meteorology, Hobart, Australia

Over the last three decades there have been two catastrophic disintegrations events on the Antarctic peninsula, the Larsen A ice shelf in 1995 and the Larsen B in 2002, alongside the Wilkins ice shelf which underwent multiple partial disintegrations between 1998—2009. Previous research into these events indicated that there had been prolonged periods where the Larsen and Wilkins Ice Shelves were without a sea-ice buffer to protect them from ocean swell in the leadup to their respective disintegrations. Swell potentially acted as a trigger mechanism to each shelf to disintegrated, as they had already been destabilised by surface flooding, fracturing, thinning and other glaciological factors.

This study will focus on the algorithm we developed which calculates the time where an ice shelf is without a local sea ice buffer (“exposure”), the size of the ocean which could directly propagate waves into the shelf (“corridor”) and the maximum wave height of swell which is directed towards the shelf in the corridor. An analysis of the last forty-one years showed that there was a large variation over individual ice shelves for both exposure and the available swell, due to the impact of polynyas, ice tongues and fast-ice growth which can protect the ice shelf. On a regional scale, the East Antarctic Ice Shelf and West Antarctic Ice Shelf had opposing trends, with the West Antarctic Ice Shelf recording a weak increasing trend of exposure and available swell.