

Impacts on velocity in the transition of the Thwaites Ice Tongue to mélange

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Thwaites Glacier is likely to make substantial contributions to global sea level in the coming decades. How conditions evolve at its ice-front will be important in determining the rate of these future sea level contributions. Here, we investigate changes at the ice-front of Thwaites Glacier in response to ocean-induced thinning over the past 20 years. We show that between 2006 and 2012 its ice tongue transitioned from a structurally intact floating tongue capable of producing large tabular icebergs to a mélange of fused icebergs and sea-ice. We link the structural weakening of the Thwaites Ice Tongue as it transitioned to mélange to increases in the velocity of Thwaites Glacier over the same time period. Through utilising the high-temporal resolution velocity monitoring capabilities (up to every 6 days) of the Landsat-8 and Sentinel-1 satellites between November 2013 and September 2018, we show that despite the weakening of the Thwaites Ice Tongue to mélange, it still provided some buttressing to the Thwaites Glacier through the interaction with its Eastern Ice Shelf. Importantly, the transition to mélange conditions increases the sensitivity of ice ice-front to future landfast sea-ice break-up events. This may have important implications for the stability of its remaining floating ice.