# Differential melting of wAP glaciers by modified upper circumpolar deep water along a latitudinal gradient

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Glaciers in the western Antarctic Peninsula (wAP) have been retreating for the last 60 years from North to South. To understand the processes leading to this retreat, we estimated ocean influence through studies in 4 fjords in central and southern peninsula. There is a higher influence of Modified Upper Circumpolar Deep Water (MUCDW) on glacier melting further South. Comparing oceanographic properties in the the fjords, Barilari (65.5 S), Flandres (64.5 S), Andvord (64.3 S) and Brialmont Cove (63 S), we find the more negative delta18O concentrations in surface waters of Barilari, associated with lowest salinity, indicative of glacier meltwater input. An estuarine circulation is observed in this fjord, coherent with high subsurface melting, similar to Alaskan fjords, where deep warm water entering fjords melts the glacier face. The meltwater rises to the surface and leaves the fjord in a surface layer ~24 m thick. From modeling we estimate ~300 m $y^{-1}$ of glacier ice is melted in Barilari Bay. Further North, the circulation is more complex: outflow is sometimes manifested as a diffuse surface layer and at other times as a subsurface meltwater plume. If subsurface, a plume is located below the summer mixed layer (23-30 m). This layer, salty and cold, is observed in Temperature-Salinity (TS) diagrams. Assuming UCDW has a delta 18O of ~0, fjord water has a high meltwater content of up to 8%, concentrated at the surface layer in Barilari and present from surface to depth in the other fjords further North. When integrating over the depth of the water column, Barilari has 5 m of meltwater in contrast to 9m-13 m in the central fjords. The difference is compensated by the residence time of seawater within fjords. We interpret the difference in processes of glacier melt along the latitudinal gradient to a decrease in oceanic influence towards the north where UCDW does not reach the glacier face.