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Variability of the Antarctic Slope Front in the northwestern Weddell Sea

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The dense water outflow from the Southern Ocean continental shelf is closely associated with the strength and position of the Antarctic Slope Front (ASF). Here we explore the short-term variability of the ASF system and the mechanisms that regulate cross-slope exchange processes using high temporally and spatially resolved measurements from 3 ocean gliders deployed in 2012. Sampled along the eastern Antarctic Peninsula and west of the South Orkney Islands, 22 sections are grouped regionally and composited by isobaths. There is consistency in the front position around the Powell Basin but high variability in the velocity field. The along-slope transport of the Antarctic Slope Current (upper 1000 m) varies between 0.23 and 5.97 Sv and does not exhibit a regional pattern. The high eddy activity at the slope region is important on the variability of the Slope Current. In most of the study area the flow is bottom-intensified, even in the absence of bottom water. Common to all sections within the Powell Basin is an isopycnal potential vorticity gradient. The vertical buoyancy gradient makes the main contribution to the potential vorticity field, and is enhanced in the dense waters layer. It was also identified a susceptibility of the flow to baroclinic instabilities over the slope, mainly in presence of the dense flow. Glider transects west of the South Orkney island indicate a northward flow, opposite to the previously assumed regime. This study provides some of the first observational confirmation of the high frequency variability associated with an active eddy field that has been suggested by recent numerical simulations in this region.