Canyon Circulation Connecting Fram Strait to Glaciers of North-East Greenland

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Warm ocean waters of Atlantic origins contribute to glacier melt off Greenland, but few insights exist on how these waters cross generally broad and shallow continental shelves to reach coastal fjords and glaciers. From 2014 through 2016 we instrumented ~80 km wide Belgica Trough that cuts across the shelf from Fram Strait to the coast near at 78 N latitude. Data from an array of ocean current and property sensors documents vertical and horizontal current shear from tidal to interannual time scales. Our measurements resolve and reveal strong flows near both sloping sides of the canyon. Most dramatic is a ~15 km wide bottom-intensified jet that carries warm Atlantic water from Fram Strait towards the glaciers off North-East Greenland. Mean shoreward flows reach 0.1 m·s⁻¹ that rival current variability dominated by wave motions with periodicities longer than 4 days. The wave motions modulate the mean flow and are most pronounced in winter when the entire shelf is covered by sea ice that is generally immobile. We speculate that vertical stratification, topographic slopes, and the earth rotation all contribute to both wave and mean motions while local winds and friction are negligible.