



**Supplementary Figure 1.** Remotely-sensed climate measurements taken from the Metop Advanced Scatterometer freely available through the EUMETSAT Polar Systems Program ([www.eumetsat.int](http://www.eumetsat.int)), extracted at the northern edge of the submarine canyon to the north of Powell Island (see Fig 1). Spatial resolution is 12.5km, and for simplicity and ease of comparison we show time-series data from a single point. Red vertical dashed lines bracket the downwelling period identified using in situ data. A) 3 hourly wind direction measurements (black lines) and wind speed (blue lines) modelled using the same methods as the Base Orcadas weather station data. Coastal wind speeds estimated by the ASCAT processing algorithm tend to be underestimated due to contamination by proximity to land or precipitation (rain or snow). Remotely sensed wind direction during the 2016 season is in broad agreement with measurements taken in situ, however the prolonged period of winds in excess of 10m/s are not seen using satellite data (see Fig 1 for comparison). B) One day rolling mean UI modelled from raw scatterometer data in the same manner as in situ data (see methods). Given that the satellite data did not resolve the strong easterly winds, it is unsurprising that the short, strong downwelling signal recovered from the in situ data could not be replicated here.