The General Circulation of the Southern Ocean is known to consist of a series of strong, narrow, generally eastward jets (sometimes known as fronts). These jets are transient, undergoing splitting, merging and large latitudinal shifts in position. They do, however, show a particular, quasi-stable feature: jets are tied to particular subsurface topographic features. For example, a particular jet may deviate from a zonal path to detour around a subsurface plateau.

Recent observations of the Southern Ocean obtained from satellite altimetry and fixed moorings have indicated that jets will suddenly change “preference” of topographic feature. A jet that previously skirted a plateau to the north will, almost instantaneously, shift to skirt the plateau to the south and obtain a new quasi-steady state. Shifts in the latitudinal positions of jets of more than 10 degree have been observed. As jets are associated with sea-surface temperature fronts, shifts of this magnitude can result in large changes in local climate. The dynamics of this phenomenon are unclear.

We will present a theoretical investigation of this phenomenon, utilising a numerical ocean model with idealised topography. Topography consists of a smooth meridional ridge with a variable number of “canyons”, zonally oriented gaps in the ridge, which act to organise the jets. Under particular conditions, jets are shown to shift their position. We explore the role of wind forcing and topography on the jet behaviour and present a candidate explanation for this phenomenon.