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Modelling the Weddell Gateway: An Inverse Approach to Determining Volume Transport at the Lazarev Sea

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The Lazarev Sea is the deep water gateway to the Weddell Sea, with the topographic constraints of Maud Rise and Astrid Ridge having a noticeable impact upon the distribution of the hydrographic properties of the Warm Deep Water. The Lazarev Sea Krill Experiment (LAKRIS) cruises conducted by the RV Polarstern between 2004 and 2008 provide a suitable density of CTD sections to detect the variable hydrographic properties of the region. These patterns highlight key circulation features including a jet on the northern flank of Maud Rise, the Taylor column above the rise, and the apparent pooling of Warm Deep Water to the south-west of the rise.

We are developing an inverse box-model in order to infer the circulation of a given region using CTD data from cruises with multiple parallel sections: providing a grid of data. The model is based upon the multiple linear regression of mass conservation and Dunham–Margules equations for all of the boxes in the grid, where each box is composed of four neighbouring CTD stations. The model also includes observed current referencing (such as from ADCP data) to calibrate the geostrophic flow. The regression provides an estimate of the volume transport across each neighbouring station pair face and for a specifiable number of layers. The model is currently set-up to use the density data from the LAKRIS cruises, but could be adapted for other parameters, regions and programmes.

We aim to evaluate the robustness of our approach in determining the general and localised transport of regional scale ocean areas such as the Lazarev Sea and present our inverse model results for the 4 LAKRIS cruises.