A sea ice-mixed layer model has been used to investigate regional variations in the surface-driven formation of Antarctic shelf sea waters. The model captures well the expected sea ice thickness distribution, and produces deep mixed layers in the Weddell and Ross shelf seas each winter (1985-2011). By deconstructing the surface power input to the mixed layer, we have shown that the salt/fresh water flux from sea ice growth/melt dominates the evolution of the mixed layer in all shelf sea regions, with a smaller contribution from the mixed layer-surface heat flux. An analysis of the sea ice mass balance has demonstrated the contrasting mean ice growth, melt, and export in each region. The Weddell and Ross shelf seas experience the highest annual ice growth, with a large fraction of this ice exported northwards each year, whereas the Bellingshausen shelf sea experiences the highest annual ice melt, despite the low annual ice growth. Current work (not shown) is focused on atmospheric forcing trends and the resultant trends in the sea ice and mixed layer evolution using both ERA-40 hindcast forcing and HadGEM2 future climate projections.

1. Introduction

2. Introduction

3. CICE-Mixed Layer Model

4. Mixed Layer/Sea Ice Results

5. Surface Power Input to the Mixed Layer

6. Sea Ice Mass Balance