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On the role of katabatic winds in the formation of Antarctic Bottom Waters

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In the Southern Ocean, the katabatic winds drive the sea ice offshore the Antarctic continent and are likely to influence the formation of Antarctic Bottom Waters. This paper investigates this issue. Two different wind-stress fields are used to drive a 1/2 degree resolution global ocean/sea-ice circulation model. The first one is provided by the recent ECMWF re-analysis ERA40. The second is a merging of ERA40 from 90N to 50S with a dynamical downscaling of ERA40 in the 50S to 90S latitude band carried out with the mesoscale atmospheric model MAR. ERA and MAR winds are compared around the Antarctic, the later showing stronger katabatic winds but similar time variability. The ocean/sea-ice model response to both wind fields is investigated. Important discrepancies are noticed in the sea ice cover simulated with the MAR winds and the ERA40 winds, which are the greatest near the coasts. MAR winds also generate convection offshore due to advection of warmer water from lower latitudes. ERA40 does not describe this phenomenon. Vertical temperature sections near Adelie Land and in the Australian Antarctic basin show an increase of the volume of cold water at depth in the MAR simulation, indicating a greater production of Antarctic Bottom Water.