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Correction of katabatic winds in ERA40 and its effect on polynya and shelf water in Antarctica

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In the southern Ocean, the katabatic winds drive sea-ice offshore the Antarctic continent and are likely to influence the formation of Shelf Water. This paper investigate this issue from a modelling study of the climatological variations over the last 50 years. Most used wind stress fields (ERA40 and NCEP) to drive OGCM over this period have a lack in the representation of katabatic winds. A dynamical downscaling of ERA40 at high southern latitudes during 10 years (1980-1989) was carried out with the mesoscale atmospheric model MAR to elaborate a correction of ERA40 wind stress close the coast during the periode 1958-2001. Validation of this correction was made with the regional ocean/sea ice model PERIANT at 1/2° (Δx=20km at 65°S). The results of this correction show greater polynyas and stronger ice formation in polynya. This fact leads to an increase of density, to a decrease of the stratification in polynya and also to an increase of water exported out polynya below 200 m (4 Sv with wind stress correction against 2.5 Sv without). This correction has been implemented in a global ocean/sea-ice DRAKKAR model at 1/4° (Δx=10km at 65°S) for a 40 years interannual simulation (1958 2001) confirming the pertinence of the correction.