

Future projections of the Greenland ice sheet surface mass balance simulated by the regional climate model MAR forced by three CMIP5 global models

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As part of the ICE2SEA project, the regional climate model MAR was forced by the global models HadCM3 and ECHAM5 for making future projections of the Greenland Ice Sheet (GrIS) Surface Mass Balance (SMB) over 1980-2099 at a resolution of 25km. However, the comparison with MAR forced by the ERA-40 reanalysis over 1980-1999 shows that MAR forced by these GCMs is not able to represent reliably the current SMB due to biases in the general circulation and in the free atmosphere summer temperature modelled by these GCMs around the GrIS.

That is why, we present here first results of MAR forced by the next generation of GCMs from the CMIP5 data base (CanESM2, NorESM1 and MIROC5 here). The comparison with the ERA-INTERIM forced MAR simulations over current climate is a lot of better, which increases the reliability and the interest of these new MAR projections. In addition, the new scenarios (RCP 2.6, 4.5, 6.0 and 8.5) of the next IPCC Assessment Report (AR5) are used here. These new simulations show notably that the response of SMB to rising temperature is not a linear function of the temperature anomalies due to the positive albedo feedback which enhances the surface melt. For 2100, in case of extreme rising temperature (RCP 8.5 scenario), MAR simulates a surface GrIS mass loss corresponding to a cumulated sea level rise (SLR) of about 15 cm since 2000! Mainly the changes in SMB and in surface energy balance will be discussed here and estimations of the GrIS surface melt contribution to the SLR using all the CMIP5 outputs will be given.