Geophysical Research Abstracts
Vol. 18, EGU2016-2173, 2016
EGU General Assembly 2016

Future increases in Arctic precipitation linked to local evaporation and sea ice retreat

Richard Bintanja and Frank Selten
Royal Netherlands Meteorological Institute (KNMI), De Bilt, the Netherlands (bintanja@knmi.nl)

Projected end-of-the-21st-century precipitation trends show an increase of over 50% in the Arctic regions. This marked increase, which is among the highest globally, has previously been attributed primarily to enhanced poleward moisture transport from lower latitudes. Here we use state-of-the-art global climate model output in standardised forcing simulations to quantify 21st-century trends in the Arctic moisture budget, revealing that the projected increase in Arctic precipitation (peaking in late fall and winter) is in fact due mainly to strongly intensified local surface evaporation (maximum in winter), and only to a lesser degree to enhanced moisture inflow from lower latitudes (maximum in late summer/fall). Moreover, we show that the enhanced surface evaporation results mainly from retreating winter sea ice, signalling an amplified Arctic hydrological cycle. This demonstrates that increases in Arctic precipitation are firmly linked to Arctic warming and sea ice decline. As a result, the Arctic mean precipitation sensitivity (4.5% increase per degree temperature warming) is much larger than the global value (1.6 – 1.9%/K). The associated seasonally varying increase in Arctic precipitation will reinforce river discharge, enhance ice sheet mass balance and thereby affect global sea level, and may even impact global climate through Arctic Ocean freshening and subsequent modulations of the Atlantic Meridional Overturning Circulation.

Bintanja, R. and F.M. Selten, 2014: Future increases in Arctic precipitation linked to local evaporation and sea ice retreat. Nature, 509, 479-482, doi:10.1038/nature13259.