Climate Change and the Shifting Trajectory of the Arctic Freshwater Cycle

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The freshwater cycle plays a major role in the dramatic changes reported in the Arctic in recent decades. Precipitation at high latitudes is increasing, river discharge is rising, permafrost is warming, glaciers and the Greenland Ice Sheet are melting, and the sea ice cover of the Arctic Ocean is declining. Over the same period, the Nordic Seas and Subpolar Basins experienced a remarkable freshening. Half of the total freshening occurred rapidly during the early 1970s but the freshening continued at a lesser rate until the late 1990s. These many changes in the freshwater system were largely synchronous with freshwater from excess precipitation and melting sea ice contributing importantly to ocean freshening. The changes correlated with the increase in the North Atlantic Oscillation (NAO) index and rising air temperatures that characterized the period 1950-2000. Changes in the freshwater cycle are continuing and climate model predictions, while still quite variable, indicate that the changes could affect ocean circulation and North Atlantic climate during this century.