



## Changes in the Global Water Cycle Linked to Global Warming

An American scientist has recently explored the possible link between global warming and the intensification of the global water cycle by reviewing the current state of science regarding historical trends in hydrologic variables. The results of this analysis suggest that global warming may have indeed intensified the global water cycle over the course of the 20th century.

There is a strong scientific evidence of the increase in the global average surface air temperature during the 20th century. Moreover, even though there are many uncertainties about the magnitude of the future climate change, most studies indicate that global warming is very likely in the future. Some authors have also anticipated that climate warming will result in increases in evaporation and precipitation, which in turn could lead to an intensification (or acceleration) of the water cycle. The intensification of the global water cycle could affect the water resources' availability and may lead to an increase in the frequency and intensity of the tropic storms, floods, and droughts, and an amplification of the global warming through the water vapour feedback.

An American scientist recently explored the possible link between global warming and the intensification of the water cycle, proposed earlier by some authors. He reviewed the current state of science regarding historical trends in hydrologic variables, including precipitation, rivers' flow, soil moisture and a number of other parameters in order to assess the response of the water cycle to past and future climatic changes. The major feature of this study is that it incorporates new insights relating to the world continental rivers' flow, tropospheric water vapour, El Nino Southern Oscillation (ENSO), glaciers mass balance, evaporation, and evapotranspiration (ET).

The author found that, on a globally averaged basis, precipitation over land had been reported to be increased by about 2% over the period 1900-1998. Furthermore, increases in precipitation over land have been associated with increases in flow in major rivers in many parts of the world. An analysis of trends in world continental flow in major rivers from 1910-1975 found an increase in flow of about 3%. A recent re-analysis of these trends for the period 1920-1995 confirmed an increase in world continental rivers' flow during the 20th century.

Moreover, the author also reports that in the second part of the 20th, century increases in the tropospheric water vapour, soil moisture, wintertime ice accumulation on mountain glaciers, and evapotranspiration have been documented. The author also noted that the extensive evidence documenting an increasing length of the plants growing season throughout the Northern Hemisphere that is consistent with the current warming trend would likely contribute to increasing evapotranspiration, further intensifying the hydrologic cycle.

Although very recent studies have suggested a linkage between trends towards warming sea surface temperature and hurricane intensity in the Atlantic, this study suggest that the empirical data to date do not consistently support an increase in the frequency or intensity of tropical storms and floods.

However, there are substantial uncertainties regarding the trends in the hydrological and climatic variables due to the very variable quality of the data (both spatial and temporal), and to the regional variations and sometimes contradictory results.

In spite of these uncertainties, the observed trend in most of the variables considered suggests that global warming may indeed have intensified the global hydrologic cycle over the course of the 20th century. Due to the potential effects of such a change on human well-being, it would be necessary to improve our capabilities to monitor and predict the consequences of changing the global water cycle. To that end, it would be necessary to improve our understanding of the complex feedbacks involving water and to manage longer periods of data collection at a larger scale.

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