An analysis of long-term isotope records from the global network of isotopes in precipitation (GNIP)

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Arithmetic (unweighted) means of isotope ratios in 1960-2000 precipitation from nearly 410 stations of the IAEA/WMO's global network of isotopes in precipitation (GNIP) are described by the equation: $\delta^2\text{H} = 8.07(\pm 0.02)\ \delta^{18}\text{O} + 9.9\ (\pm 0.1)$ (n=3426; R^2=0.98). Isotope data from 31 stations with a continuous record for 1960-2000 were evaluated for the periods 1960-1978, 1979-1987, and 1987-2000. Although the relationship between isotopes at these stations are slightly different than the global relationship based on all GNIP data, there is no major trend of isotope variations from 1961 to 2000.

gIsotope records from stations with at least one year of monthly observations have been interpolated to provide a grid-based data set for use in climate models. A statistical analysis of horizontal variability in precipitation isotopes and climate parameters indicates that a truly global network may require about 14,000 stations to reliably simulate natural distributions. However, given that the GNIP data are obtained as monthly means, a terrestrial network with about 980 active stations distributed more or less uniformly over the globe may be sufficient to study variations and changes in the hydrological cycle on an inter-annual or decadal scale.