

Global hydrological isotope networks and databases

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Abstract

Isotopes of light elements present in the water molecule are powerful tracers of the water cycle at different spatial and temporal scales, often providing unique and valuable information on hydrological, climatological and ecological processes. Basic data on spatial and temporal distribution of isotopes at varying scales in the different components of the water cycle are required for a meaningful application of these tracers. A major source of this basic isotope data on a global scale has been provided since the 1960s by the International Atomic Energy Agency (IAEA), which collects and disseminates isotope data and related hydrological information obtained as part of global or regional monitoring programmes and isotope hydrology studies. Available isotope data on the global scale are gathered and compiled through global isotope networks like the Global Network of Isotopes in Precipitation (GNIP); Global Network of Isotopes in Rivers (GNIR); and Moisture Isotopes in the Biosphere and Atmosphere (MIBA) network. In addition, an extensive data set containing isotope composition of samples collected in Antarctic snow pits and ice cores global called GNIP-Antarctica as well as several datasets containing isotope data from surface waters and groundwaters across the globe are also being compiled and made available through the IAEA's web page. New methods and applications, providing improved capabilities to analyze and visualize temporal and spatial isotope variability have been recently developed. These developments offer new opportunities for a broader application of environmental isotopes in several disciplines. The current status of data compilation efforts and the basic information provided by these global hydrological networks and databases are briefly described in this review.