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Long-term stable water isotope data from large river basins: preliminary analysis of the Global Network of Isotopes in Rivers (GNIR)

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In 2002 the International Atomic Energy Agency (IAEA) launched an international observation program for the collection and measurement of stable water isotopes and tritium in rivers. The Global network of Isotopes in Rivers (GNIR) now serves as a world-wide repository for contributed riverine isotope data, and expedites public dissemination of isotope data for water research purposes. Currently, the GNIR database contains about 21,000 stable water isotope records from 750 locations in 35 countries, in database format. Basic statistical descriptions are available for 252 observation sites that have isotope records for a minimum of two years.

Here, we provide a summary of the GNIR stations established and the data compilations. Because the river locations are from different hydrological settings and climatic zones, the evaluation of the data gives a wide perspective of the global and temporal variations in the isotopic compositions of water in medium-size and large river basins. This synopsis reveals the useful application of stable water isotopes to assess the origin of water sources, mixing with precipitation, glacier and snow melt water, tributaries, the contribution of groundwater to baseflow, as well as, the impact of damming and irrigation return. In addition, the compiled isotope data give insights into temporal and spatial variations in the deuterium-excess and thereby provides independent information to estimate the relevance of evaporation in the water balance of large river basins.

This preliminary analysis of the GNIR summarizes moreover, the experience gained from establishing large scale monitoring network stations and stable water isotope data collection within different environments. The GNIR program will be expanded and enhanced into the future with the addition of other biogeochemical isotopes, such as nutrients, particulate organic matter, and sediments. This will enhance gaining further scientific insights and information into water security and quality issues.