ISOTOPE HYDROLOGY: UNDERSTANDIN

1 Development is intricately linked to water whether concerning issues of health, food and agriculture, sanitation, the environment, industry, or energy. The IAEA, through its Water Resources Programme provides its Member States with science-based information and technical skills to improve understanding and management of their water resources.

2 Water consists of hydrogen and oxygen isotopes, distributed throughout the hydrological cycle. Each water drop's journey causes small, important and measurable changes in the relative abundance of the different isotopes. Water in different environments develops characteristic isotopic 'fingerprints' that allow it to be distinctly identified. It is possible to trace the source of the water or estimate its age in the hydrological system.

3 Isotope techniques can determine the origin, age and renewal rate of groundwater, and whether it is at risk of contamination. It allows rapid and reliable mapping of non-renewable groundwater resources, the majority of which are trans-boundary aquifers. Isotopes like Krypton-81 are used for dating deep and very old groundwater aquifers.

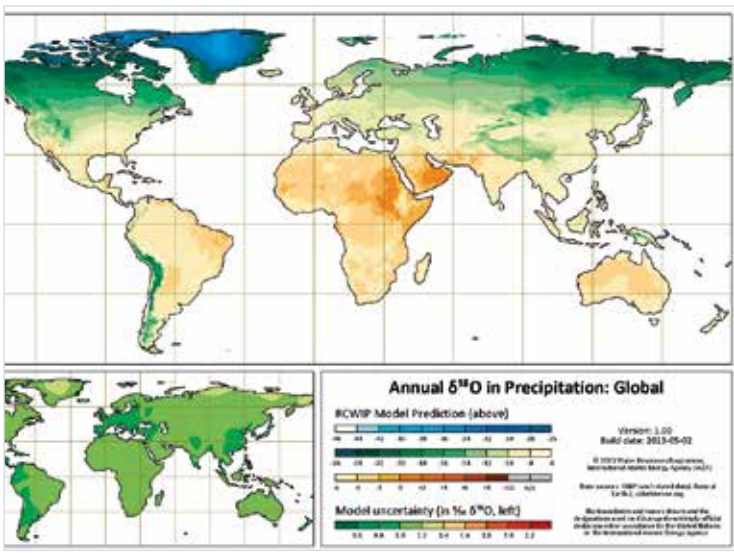
4 Isotopic techniques help understand surface water movement and inter-action with groundwater, dam leakages, and the impact of climate change on water resources development and management. Pictured is a sampling device for measuring noble gases and isotopes in groundwater.

IG AND MANAGING WATER RESOURCES

5 One of the ways scientists conduct carbon isotopic assays in water, rocks, CO_2 and dissolved carbon is through laser absorption spectrometry (LAS). As its name implies, LAS uses lasers to determine the types and concentration of isotopes it has by measuring the way it interacts with a test subject.

6 The process of taking LAS measurements of water stable isotopes is made more efficient through the use of an auto-sampler. Automating processes not only save time and effort for the scientists, but also insures greater consistency in procedure for a very sensitive technique.

7 The IAEA offers its Member States training courses in LAS for water sampling.



8 Gathered results from regions around the world are eventually compiled and turned into a global model, in this case derived from oxygen-18 data. These large predictive models reveal the patterns of global precipitation, giving greater insight for decision makers and are an invaluable tool for water management.

Text: Michael Madsen, IAEA Division of Public Information; Photos: Isotope Hydrology Section, IAEA