

Water Resources

Objective

To improve the sustainable and integrated management of water resources by Member States through the use of isotope applications.

Meeting Common Water Challenges

The Agency recorded a number of significant achievements in its efforts to bring isotope hydrology into the mainstream of national and international water related programmes in 2007. For example, the 12th symposium on 'Advances in Isotope Hydrology and its Role in Water Resources Management' was held in Vienna in May. More than 200 participants from 59 countries conducted an extensive review of isotope techniques and their applications in characterizing surface water and groundwater resources, as well as of advances in related analytical instrumentation. Roundtable discussions at the symposium indicated that recent Agency initiatives, particularly on river-groundwater interactions, were important for ongoing water management efforts and for assessing the impacts of climate change. In addition, participants emphasized the continuing role of international organizations in capacity building for isotope hydrology. The proceedings of the symposium were published by the Agency in December.¹

Groundwater with high arsenic concentrations from naturally occurring sources is the primary source of drinking water for millions of people in Bangladesh. Exposure to elevated arsenic concentrations has resulted in a major public health crisis. Following successful IAEA-World Bank cooperation over the past seven years, the Bangladesh Atomic Energy Commission, under the Agency's guidance, signed a memorandum of understanding to facilitate the use of isotopes in World Bank projects for mitigating the effects of arsenic poisoning of aquifers used for drinking water supply.

The Agency participated in the second International Joint Danube Survey held in August

and September and organized by the International Commission for the Protection of the Danube River. The main objective of the survey was to provide an assessment of the water quality and hydrological and ecological status of the 2400 km long Danube River, from its headwaters in Germany to its mouth at the Black Sea. The Agency coordinated sampling and analysis for stable isotopes of water, tritium, nitrogen isotopes and radon. This was the first time isotopes were used in the Danube survey. The results of this survey support EU Water Framework goals in identifying pollutant sources and improving understanding of groundwater and tributary inputs to the Danube River. It was also an opportunity to conduct a pilot test of a new approach based on radon-222 for identifying locations where groundwater enters rivers.

Efforts continue to be made by the Agency to assist Member States in becoming more self-reliant in the use of isotope techniques in hydrology. For example, the Agency helped to adapt a new instru-

ment for isotope analysis that uses a laser spectroscopy technique. This instrument will cost about 75% less than existing mass spectrometers,

and will perform equivalent analyses with very low operation and maintenance costs. Two training courses were held at Agency Headquarters on the use of this instrument, in which participants from ten Member States were trained on the procedure for the operation of the instrument and on evaluation of the results and quality control procedures.

Dissemination of technical information to and within Member States was made easier through a set of Internet based data management tools, which offer possibilities for presenting and analysing worldwide georeferenced isotope and hydrochemical data and will enable Member States to improve their ability to use and integrate isotope hydrology. In addition, a video on sampling techniques for isotopes and related field measurements was developed to aid practitioners in enhanced data collection for groundwater assessment in Member States.

Addressing Water Resources Issues

The Agency, in collaboration with the Global Environment Facility (GEF) and the US Geological

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¹ See http://www-pub.iaea.org/MTCD/publications/PDF/p1310_start.pdf.

Survey, organized an international study tour for members of three aquifer management teams: the Guarani in Latin America, and the Northwest Sahara and the Illumedden, both in Africa. The objective of the study tour was to enhance the management of transboundary aquifers by sharing knowledge, experience and best practices. The study tour provided the basis for building a network of professionals active in GEF supported groundwater projects and to integrate isotope techniques in these projects.

As part of its efforts to assist Member States in strengthening their capacity in the area of isotope hydrology:

- Three technical cooperation regional training programmes on field techniques, data interpretation, application of isotope and geochemical techniques, and quality assurance for chemical analyses were held in El Salvador, Uruguay and Venezuela.
- A regional training course was organized in collaboration with the Centre for Ecotoxicological Research of Montenegro for 22 trainees to study the application of isotope techniques in

hydrology. The course was offered as part of the Agency’s technical cooperation programme to address country specific water resource management issues.

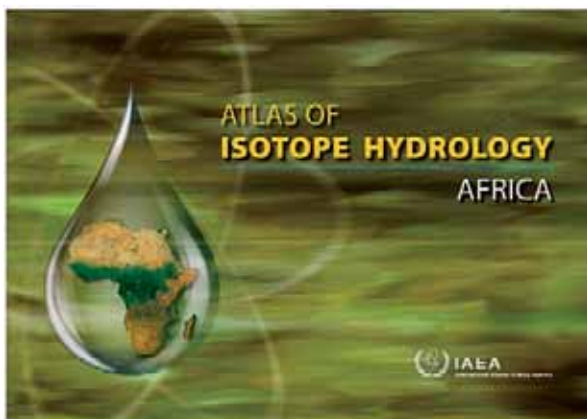
- Three scientists from Ethiopia, Sudan and Uganda were supported by the Agency, within the framework of the IAEA–UNESCO/Joint International Isotopes in Hydrology Programme, in the completion of MSc programmes in isotope hydrology at UNESCO’s Infrastructural, Hydraulic and Environmental Engineering Institute for Water Education in Delft, the Netherlands.

Nutrient pollution (nitrates and phosphates) from agricultural use is a priority issue for water quality management in river basins. The Agency convened a technical meeting to review relevant isotope methodologies and to produce a guidebook on isotope techniques for river basin managers. This guidebook will facilitate the integration of isotope techniques in river basin management.

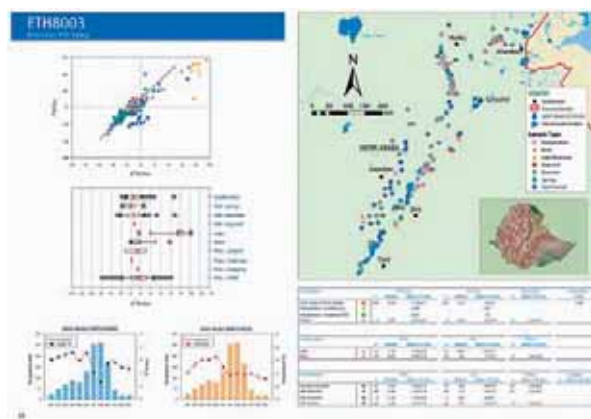
Two demonstration projects in Austria were completed on the use of the tritium/helium-3 isotope methodology – one to determine groundwater

NEW ISOTOPE HYDROLOGY ATLAS

Environmental isotopes are important in regional studies of water resources to obtain temporally and spatially integrated characteristics of groundwater systems. Isotope data were collected from 1973 to 2007 for 26 African countries. This information was used to prepare a special publication entitled *Atlas of Isotope Hydrology – Africa*. Intended for use by scientists, practitioners and policy makers engaged in the field of hydrology, the atlas features data from nearly 10 500 isotope records gathered from about 80 Agency projects. For each country, a digital elevation map showing project areas, major water bodies and locations of stations in the IAEA–WMO Global Network of Isotopes in Precipitation is presented. Summary pages for each project include a higher resolution map of the study area showing sample types and locations as well as isotope data tables and plots. The information presented in the atlas can be downloaded through the on-line application WISER from <http://www.iaea.org/water>.



Cover page of the atlas.



Example of a project page in the atlas.

age in a nitrate contaminated aquifer and the other to determine the sustainability of aquifers and rivers under conditions of increased water use and climate change. The results of these projects will allow the Agency to assist more Member States in the use of this isotope technique for river basin and groundwater management.

Two new reference materials were produced for stable oxygen and hydrogen isotope measurements

of water samples to replace the material that had been in use for the past 30 years. These new standards, Vienna Standard Mean Ocean Water 2 (VSMOW2) and Standard Light Antarctic Precipitation 2 (SLAP2), ensure the continued consistency of measurements performed in isotope laboratories worldwide.