Water Resources

Objective

To enable Member States to use isotope hydrology for the assessment and management of their water resources, including the characterization of climate change impacts on water availability.

Enhancing Groundwater Resources Availability

In 2017, the Agency successfully concluded a four year technical cooperation project, entitled 'Integrated and Sustainable Management of Shared Aquifer Systems and Basins of the Sahel Region', aimed at obtaining a broad overview of groundwater supplies in Africa's drought prone Sahel region. The Agency trained scientists from the 13 participating Member States in carrying out detailed examinations of groundwater using tritium, a naturally occurring radionuclide, to map shallow, recently recharged groundwater. By identifying the origin and composition of the water, the participating Member States are now in a position to develop strategies to protect the groundwater from anthropogenic sources of pollution. Among the findings of the technical cooperation project, published in May, was that there are significant reserves of good quality water in the region that are not yet threatened by pollution.

The Agency used the IAEA Water Availability Enhancement (IWAVE) Project methodology to design the second phase of the technical cooperation project in the Sahel region. Use of this methodology will help establish requirements for the routine use of isotope hydrology in groundwater assessments aimed at increasing water availability.

Water Resource Assessment

To develop more effective means of building Member State capacity in isotope hydrology, the Agency conducted a series of training courses at its Headquarters in Vienna throughout the year. In March and November, it held two interregional training courses, with 26 participants from 25 Member States, highlighting the latest developments in isotope data interpretation for hydrology and climate change studies (Fig. 1). It also provided training in the analysis of low levels of environmental tritium and stable isotope analyses through laser absorption spectroscopy to 26 scientists from 10 Member States.

In June, the Agency organized a Technical Meeting to review key public health issues resulting from water scarcity, water pollution and vector borne diseases in urban areas. The meeting assembled a team of experts from ten Member States working in health and various environmental fields to explore the synergies between health and water. The participants evaluated the use of environmental isotopes for assessing sources, pathways

FIG. 1. Field training using groundwater sampling for analysis of noble gas isotopes in Costa Rica.

and interactions between water bodies in urban environments as a way to better manage water resources used for domestic supply in cities.

In September, a Technical Meeting was held in Vienna to examine the current knowledge and gaps regarding nitrogen compounds in the atmosphere, practices for monitoring them, and their impact on water resources and aquatic systems. Experts from 11 Member States explored the use of isotopes to better understand nitrogen sources such as fertilizers, human waste and industrial discharges, as well as natural atmospheric deposition, to develop more effective policies aimed at preventing the degradation of water sources.

Understanding Climate Change

Climate change adaptation is driven by knowledge and technology; through its water resources management activities, the Agency seeks to advance both. During the year, the Agency completed a coordinated research project entitled 'Stable Isotopes in Precipitation and Paleoclimatic Archives in Tropical Areas to Improve Regional Hydrological and Climatic Impact Models'. Participants from 13 Member States used laser spectroscopic technology to collect precipitation isotope data, either daily or on an event basis. The data were then compared with isotope data obtained from various paleoclimate archives, and the results were used to improve predictive regional and global climate and water balance models.

Analytical Capacity and Services

The Agency published the results of the Water Isotope Interlaboratory Comparison (WICO) 2016 test, involving analysis of stable isotopes of hydrogen and oxygen in eight water samples. A record number of 235 laboratories participated in the test. The results showed that approximately 75% of the laboratories produced reliable isotope data suitable for use in water resource investigations; however, around 25% underperformed owing to systemic errors, mistakes and poorly performing instrumentation. Several strategies to improve and correct analytical problems were recommended, such as the use of new data evaluation strategies and screening runs for contamination, and the inclusion of additional control standards.

The Agency also completed laboratory trials with a new laser based system and sample preparation procedure for analysing the stable isotopes nitrogen-15 and oxygen-18 in nutrient contaminants such as nitrates, a common pollutant in surface and groundwater. The new system provides Member States with a lower cost analytical option for evaluating nitrate pollution of water sources, and is being used for training counterparts.