Media release

Million year old water – Australia's vintage drop

12 Nov 2012

The most ancient water so far found in Australia is 1,100,000 years old and comes from a region of the Great Artesian Basin in northern South Australia.

According to the deputy director of the National Centre for Groundwater Research and Training (NCGRT) Professor Peter Cook, the age of Australia's water not only teaches us more about our ancient continent – but also how we can better conserve and manage its largest and most precious resource: water.

"The fact that we have water of such an incredible antiquity also tells us how long it will take to recharge if we use it up quickly and unwisely. Our vintage water contains a warning from deep time," he says.

"On the other hand, much of our groundwater is quite young – only a few years or decades – and this means it is being recharged constantly, and is therefore at risk of being polluted by activities and industries on the surface."

Typically, water in the southern part of the Great Artesian Basic is aged from 100,000 to over a million years, indicating it is not likely to be recharged any time soon – and must therefore be extracted and used with great care and forethought, he says.

"As a rule, the younger waters lie closer to the surface, the more ancient ones are deeper down."

A case in point is the city of Perth, which depends for part of its water supply on groundwater. While some of this is quite young and is replenished regularly by rainfall, the deeper aquifers contain water up to 35,000 years old – laid down around the time modern humans first appeared. "Clearly, you'd want to be careful not to over-extract these deeper aquifers," Prof. Cook points out.

In contrast, groundwater beneath the Darwin's outer rural suburbs is mostly less than 50 years old – and detailed measurements of its age have enabled scientists to predict its rate of recharge with precision, which in turn has helped the city to set sustainable extraction limits for householders and users.

"Dating groundwater is becoming a vital tool in managing the nation's water supply," Professor Cook explains. For example, since groundwater is connected to surface water, knowing its age can help us to better plan and manage the waters of the Murray-Darling Basin, and allocate them sustainably among the different uses like agriculture, urban areas and the environment.

"Some water in the lower Murray Basin has been dated to around 200,000 years. Many of our best wine-growing regions are using groundwater, yet we have only a sketchy understanding of its age and sustainability – which are important for the future of the wine industry."

Since groundwater comprises around 90 per cent of the nation's reserves of fresh water this knowledge is becoming increasingly vital, he adds – especially in cases where there is competition for its use, as is the case between coal-seam gas developers and farmers in some states.

"Unfortunately, there are still a lot of blank spots on the map of Australia's water ages. Very often we tap a supply of groundwater without knowing how old it is or how long it takes to recharge. From now on it is important to know this before we develop new resources – and to manage existing ones better.

"For example there is a lot of fresh water in the Pilbara, where industrial and town development is going ahead rapidly – but we still know little about the extent or age of these resources. "

The National Centre for Groundwater Research and Training is an Australian Government initiative, supported by the Australian Research Council and the National Water Commission.

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Water is dated by analysing trace chemicals in it, Prof. Cook explains. For instance atom bomb tests in the Earth's atmosphere between 1945-1980 have left a distinct trace of tritium in all the world's waters, making it easy to date waters of this age by measuring this chemical signal.

For more recent groundwater, scientists measure traces of chlorofluorocarbons – the man-made chemicals used as spray can propellants and refrigerants between about 1940 and their banning under the 1990 Montreal Protocol.

Dissolved carbonates are used by researchers to date water between 2000 and 40,000 years old using Carbon 14 dating methods.

Chlorine 36, with a half-life of 300,000 years, can be used to date waters from 50,000 to two million years old by dating the dissolved salt.

"But, as you can see, there is currently no easy way to date water aged between 2000 years and 70 years old, which is a gap we are currently working to fill," he adds.

Professor Cook says knowledge about the age of Australia's groundwater is fast becoming an essential ingredient in national sustainable management of all water.

"As a good rule, we need to understand the water, including its age, before we go ahead and develop it for various uses," he says.

"Since groundwater is connected to surface water, if we fail to do this and over-extract groundwater, it can drain rivers, lakes and wetlands at the surface, reduce supplies to our towns and industries when we most need them – and kill large areas of native Australian landscape which depend on underground moisture for survival, especially during droughts."

"Knowing how old our water is a part of sensible risk management for Australia – now and into the future," Prof. Cook says.

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