

**A multi-tracer study in the Surat Basin, Australia: “wrong ages” in Hutton Sandstone give deeper insights into aquifer structure and effective deep recharge, and chasing the fate of the fresh water of Precipice Sandstone.**

A. SUCKOW<sup>1</sup>, M. RAIBER<sup>2</sup>, A. DESLANDES<sup>1</sup>, K. MEREDITH<sup>3</sup>, P. DAVIES<sup>1</sup>, A. TAYLOR<sup>1</sup>, F. LEANEY<sup>1</sup>

<sup>1</sup>CSIRO Land and Water, 5045 Urrbrae, South Australia

<sup>2</sup>CSIRO Land and Water, 4102 Dutton Park, Queensland

<sup>3</sup>ANSTO, Lucas Heights, NSW 2234, Australia

Groundwater depressurisation to release coal seam gas (CSG) in the Walloon Coal Measures (WCM) in the Surat Basin, Australia, may influence aquifers both over- and underlying the formation. The Gubberamunda Sandstone aquifer, overlying the WCM, is a starting point of the Great Artesian Basin (GAB) flow system and is well studied. In contrast, the Hutton and Precipice Sandstone aquifers, both underlying the WCM, have received much less attention even though these aquifers are the main supply of stock and domestic water for the cattle industry in the area.

Two multi-environmental tracer studies were undertaken, comprising <sup>18</sup>O, <sup>2</sup>H, <sup>3</sup>H, CFCs, SF<sub>6</sub>, <sup>85</sup>Kr, <sup>39</sup>Ar, <sup>14</sup>C, <sup>36</sup>Cl, <sup>81</sup>Kr and stable noble gases. Groundwater flow velocities within the Hutton Sandstone, derived from exponential decrease of <sup>14</sup>C and <sup>36</sup>Cl concentrations with distance from recharge areas, differ by a factor of ten and therefore do not indicate the real groundwater flow velocity. Accounting for double porosity the tracer data lead to a single groundwater flow velocity that is consistent with observed data. Advective velocity in this double porosity model differs from face value flow velocities derived from <sup>14</sup>C and <sup>36</sup>Cl by a factor of 4 and 40 respectively. The deep Hutton Sandstone receives only ~3% of the recharge previously estimated using the Chloride Mass Balance approach at the intake beds. The remaining ~97% are assumed to be rejected recharge, which discharges through spring complexes in the Surat Basin and contributes to base flow of the Dawson River.

The second study focussed on the underlying Precipice Sandstone which supplies the freshest water in the area. It is found only in Queensland and its connections to other parts of the GAB are unknown. Samples from the Precipice were taken March/April 2017 and first results will be reported.