Hydrological Processes in the Upper Motueka River Valley, New Zealand

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Aim
To find out how the hydrological system works, and contribute to improved management of land and freshwater in the catchment.

Abstract
Water sources, residence times, and river/groundwater interaction have been investigated in a riverine valley setting. δ18O and chemical measurements, and neural network modelling, show that the groundwater is predominantly sourced from the rivers. The mean residence time of water was 1-4 months in the rivers, and 2-14 months in the groundwater from δ18O measurements. The underlying Moutere Gravel does not transmit significant amounts of water.

Background
The study area encloses 50% river valley with inflowing and outflowing rivers, and 50% steep hill country between the valleys. Bedrock is low-permeability Moutere Gravel of Pleistocene age derived from greywacke, which underlies the valleys and forms the hills. Shallow permeable river gravel of late Quaternary and Holocene age fills the valleys and is tapped by groundwater bores.

Results
Mean δ18O values of Upper Motueka catchment waters.

<table>
<thead>
<tr>
<th>Bore</th>
<th>Mean δ18O (‰)</th>
<th>River : rainfall contribution</th>
<th>MRT (months)</th>
<th>Simulation std.dev. (‰)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quinney</td>
<td>-7.18 ± 0.15</td>
<td>92 : 8</td>
<td>7</td>
<td>0.13</td>
</tr>
<tr>
<td>Higgins</td>
<td>-7.17 ± 0.33</td>
<td>53 : 44</td>
<td>4</td>
<td>0.16</td>
</tr>
<tr>
<td>Hyatts</td>
<td>-7.55 ± 0.27</td>
<td>88 : 12</td>
<td>2</td>
<td>0.09</td>
</tr>
</tbody>
</table>

Simulation of the δ18O values of groundwaters based on recharge from rains and rivers. The river:rainfall ratios and mean residence times (MRT) giving the best fits are shown.

Conclusions
The system is river-dominated. The rivers and groundwater have short mean residence times. The basement (Moutere Gravel) does not contribute to the groundwater or rivers.

References

www.gns.cri.nz