

Interactive comment on “Investigation of groundwater-surface water interaction using hydrochemical sampling with high temporal resolution, Mangatarere catchment, New Zealand” by M. R. Guggenmos et al.

M. R. Guggenmos et al.

michael_guggenmos@urscorp.com

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Overall author’s response: Both referees have referred to major (known) limitations surrounding the quantification of surface water and groundwater interaction using mass balance calculations. These limitations include the lack of consideration for evapotranspiration and bank storage, and the high uncertainty and error surrounding the calculation of discharge from foreign linear rating curves. Although attempts were made to address these issues, we do not believe we have been able to adequately achieve this

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given the paucity of the data used to formulate the mass balance equations. Considerations for evapotranspiration were easily included in the mass balance calculations, however without obtaining additional field observations for surface water discharge it is not possible for us to reduce the uncertainty surrounding the calculation of discharge datasets from stream stage. As a result we have decided to remove the mass balance calculations from this research. Despite the removal of Section 4.5, this research would benefit from quantification of groundwater and surface water investigation using an accurate mass balance approach and it is recommended that

Additional responses in regards to each individual referee comment are provided below:

Anonymous Referee Number 1 Comments received 10th January. 8, C5655–C5656, 2012

1. Figure 3, equation B1 and subsequent interpretation are inconsistent. From Figure 3, Mangatarere stream appears to gain water between GWRC and Upstream gauging stations. Therefore, recharge of groundwater from stream water would be impossible to infer for this reach.

Response: Figure 3 does not present any data from the GWRC gauging station, therefore I believe the referee is confusing this figure with Figure 7 from the mass balance equations? Data series from the GWRC (Mangatarere at Gorge) and the upstream surface water gauging station were incorrectly labelled in the Figure 7 legend. As a result it appears the upstream surface water gauging station displays a higher discharge than that recorded further upstream at the GWRC (Mangatarere at Gorge) gauging station. However, as mentioned above, mass balance calculations and therefore Figure 7, have been removed from this manuscript and therefore are no longer an issue.

2. Mixing analysis presented in equation B2 is unsound. Groundwater input to downstream flow is not the sum of upstream and downstream flow. Furthermore, if the intention was to balance the reach between Upstream and Downstream gauging stations,

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then a mixing analysis is unnecessary.

Response: Following this comment it was found that a simple water balance could be used to achieve the same outcomes as the original mixing analysis, in particular due to gaps within the available dataset. However, as mentioned above mass balance considerations have been removed from this manuscript and therefore this is no longer an issue.

Specific comment: Second order polynomial fits water level- discharge relationship, including high discharge point, better.

Response: The application of a second order polynomial curve to the current dataset was attempted, however calibration of the model found the resulting equation significantly over estimated both baseline and high discharge events. With the removal of mass balance calculations, this comment is no longer relevant.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 10225, 2011.