

## ***Interactive comment on “Biomass uptake and fire as controls on groundwater solute evolution on a southeast Australian granite: aboriginal land management hypothesis” by J. F. Dean et al.***

**J. F. Dean et al.**

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We would firstly like to thank the reviewer for their constructive comments on this manuscript. We have responded to each main point individually, as well as all the specific points. The technical corrections suggested are all accepted. All alterations arising from this review have been made in the final manuscript that we will submit to Biogeosciences for consideration for publication. Here we respond to each paragraph in the order that they are written in the original reviewer comment, and address each specific point as numbered in the review.

General Comments:

C1664

Regarding details of the rainfall chloride composition, Additional text has been added to answer the questions raised here. The temporal variability of the rainfall composition is shown by the variability of the analyses in Table 3.

It is correct that some part of the elements exported in smoke could be re-imported into the system via dry deposition, and a statement to this effect has been added in the discussion. However, the proportion of the exported elements returned to the groundwater in this way will be minor

A discussion of the likely changes in rainfall composition caused by an increase in aridity ~20,000 years ago has been added. However, because the ion/chloride ratios of rainfall were probably little changed by the increase in aridity, the results of the mass balance calculations will not be significantly affected, due to the fact that the mass balance involves normalising the concentrations of all ions in groundwater and surface water to rainfall Cl<sup>-</sup>. This is explained in the text.

More explanation of the export of elements from the catchments has been added to the text. The elements are exported within particles of smoke, and any import as dry deposition is minor. Surface runoff occurs commonly following heavy rainfall in the study area, and export of nutrients has been documented.

Specific comments:

p. 1836, l. 28: The Zr composition has been added to Table 4 and the isocon slope added to Fig. 5.

p. 1842, l. 26 ff. / Table 10: The fire frequencies do consider 100% of elements stored in biomass are exported during fire. A comment has been added to make this clear; the fire frequency values calculated are maxima.

Table 9: Caption changed to clarify calculation.

p. 1844, l. 18 ff.: The statements here and in the abstract have been changed to clarify that results are less likely to be applicable to more soluble rocks.

C1665

Tables: Regarding homogenous units, although  $\text{mol L}^{-1} \times 10^5$  is difficult to visualise, it is the best unit for the calculations, and makes the comparison between tables 3, 5, 6 and 7 very easy. This unit has also been used in many previous mass balance studies. For this reason the units in these tables have been left as they were.

Table 5:  $\text{HCO}_3^-$  is highly unconservative, but is nevertheless included for completeness.

Technical corrections:

All corrections here are accepted and will be incorporated into the submission.

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Interactive comment on Biogeosciences Discuss., 11, 1827, 2014.

C1666