

## **BGD-9-10513-2012 for *Biogeosciences Discussions***

**Title:** Determination of the molecular signature of fossil conifers by experimental palaeochemotaxonomy – Part 1: The Araucariaceae family.

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**Comments:** The present paper contains detailed descriptions of terpenoid biomarkers in specific conifer plant (family Araucariaceae) materials formed by artificial maturation, and gives interesting and valuable findings for organic biogeochemistry concerning plant chemotaxonomy, paleontology and diagenesis. I agree that such experimental simulations provide important information for diagenetic alteration of plant-producing lipids and fill gaps in geochemical understandings between biomarkers in living plant and its fossil. However, the present paper did not show quantitative data of concentration (or yield) of the plant terpenoids, so that the biomarker trends can be roughly understood (as Table 2). For a lack of the quantitative data, the discussion in the paper is superficial for interpreting the variations in inter- and intra-species and diagenetic processes of bioterpenoid. Moreover, class distributions (compositional data) of these terpenoids should be added as a table and figure(s), as well as discussion for these because the class distribution data can give more significantly variability in inter- and intra-species for Araucariaceae. Hence, I do not recommend publication of this manuscript until a **moderate** revision is undertaken. The following points should be accommodated in the revision:

1. Table 1; P10522, L3-L5: The authors should give a detailed explanation for plant parts (leaf or twig) of individual Araucariaceae samples using the experiments. The terpenoid biomarker trends are known to vary in parts of a single plant species. Also, for example, conifer cone fossil is thought to be easier for morphological identification of its fossil species and comparison with the other cone fossils. Do the authors have the terpenoid data for the cone of Araucariaceae?
2. Table 2: As mentioned above, the quantitative data for concentrations (or yields) of sesqui- and diterpenoids in Araucariaceae after the experimental simulation should be added. In addition, the class distributions of these compounds based on the concentration (or yield) data should be shown in a table and figure(s). It can be expected that the class distributions vary within genus *Agathis* and *Araucaria*, despite of similarity of kinds of compounds detected, and can be more valuable data for paleochemotaxonomy.
3. P10529, L1-L2: If possible, data for polar functionalized terpenoids such as phyllocladanol and kauran-16-ol detected in extant fresh plant samples should be shown. There were few detailed descriptions of polar bioterpenoid in living plant, precursor of geoterpenoid, in

biomarker geochemistry. I think that the pathways of diagenetic alterations from tetra-cyclic bioditerpenoids to phyllocladane-type geoterpenoids are still unclear, although those from abietanoic acid to abietane-type geoterpenoids are relatively well known.

4. The following terms using often in the present paper should be changed;

- 1) 'diagenetized' -> 'diagenetic'.
- 2) 'infra-generic' -> 'intra-generic'.
- 3) 'palaeofloristic' -> 'palaeofloral'.
- 4) Figure caption *etc.*: 'pyrolysis products' -> 'pyrolysates'.

5. More specific corrections are the followings,

- 1) P10514, L3: 'invested' -> 'investigated'
- 2) P10514, L7-L9: 'Such knowledge is ..... and environmental studies.' -> Is this sentence necessary? This sentence should be omitted.
- 3) P10514, L10-L11: 'using gas chromatography-mass spectrometry' should be omitted.
- 4) P10514, L12: 'tetracyclic diterpenoids.' -> 'tetracyclic diterpenoids including phyllocladane and *ent*-kaurane.'
- 5) P10514, L14: 'compounds of the cadalane-type compounds' -> 'the cadalane-type compounds'
- 6) P10514, L16: 'the labdane-type, isopimarane, abietane-type' -> 'the labdane, isopimarane and abietane-types'.
- 7) P10515, L15: 'palaeoflora' -> 'palaeofloral'.
- 8) P10515, L25: 'anthropic' -> 'anthropogenic'.
- 9) P10516, L1: 'diet habits' -> 'dietary habits'.
- 10) P10516, L4: 'some part' -> 'some parts'
- 11) P10516, L24-L25: 'on palaeoflora, palaeoclimatic reconstruction, archaeology, environmental research.' -> 'on palaeofloral and palaeoclimatic reconstruction, archaeology, as well as environmental research.'
- 12) P10533, L18, L25: 'by the sesquiterpenoids' -> 'by the high abundances of the sesquiterpenoids'

Please feel free to identify me as a reviewer of this manuscript.

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