

Interactive comment on “Impacts of an Intense Wildfire Smoke Episode on Surface Radiation, Energy and Carbon Fluxes in Southwestern British Columbia, Canada” by Ian G. McKendry et al.

Anonymous Referee #2

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Review of 'Impacts of an Intense Wildfire Smoke on Surface Radiation, Energy and Carbon Fluxes in Southwestern British Columbia, Canada' by McKendry et al.

The study concerns an important problem of wildfire plume effect on solar radiation, energy partitioning and carbon fluxes. Although the topic is interesting and relevant, I doubt the results reported in this study, because the period of smoke is very short (3 days) and the results sound contradictory. Please find the list of comments below.

Specific comments: 1. Average NEE at Burns Bog on the 7th July (plume) almost triples its value as compared to that on the 3rd July (clear sky). The authors state it is due to DRF effect (P. 15, Lines 3-4). However, majority of studies, involving different

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ecosystems, report GPP or NEE under diffuse light at most twice that large as it is under low aerosol and clear sky conditions (e.g. review of Kanniah et al., *Progress in Phys. Geogr.*, 2012, 36, 209-237). Also significant leaf area index and canopy height are needed for GPP increase, so it is not clear why diffuse radiation can be an important factor for wetland NEE.

2. AOD is larger than 2 during the whole day on 6 July (Fig. 3). Similarity of incoming radiation at all the sites on that day (Fig. 5) suggests similar AOD for all the sites. However, Buckley Bay and Burns Bog are strong carbon sinks on this day, which is in contradiction with Fig. 7 and the corresponding discussion about other authors' results (P. 15, Lines 18-23).

3. According to Table 2, Buckley Bay was a strong carbon source on 4 July, i.e. before the plume arrived. In fact, it is a stronger source on the 4th July than it was on 5 July under the plume influence. Therefore, it is not clear if this forest became a carbon source on 5 July due to radiation effects (P.12, L. 26-29).

4. About the impact on partitioning of turbulent fluxes: Burns Bog did not experience the same severe radiation conditions as Buckley Bay did on 5 July (Fig. 4). Therefore, one can not conclude that the forest's Bowen ratio is more affected by the plume than the wetland's one (P. 14, L. 25-30). The plume has a moderate influence on the Bowen ratio of the forest ecosystem (similarly to wetland) on all days, except 5 July.

5. The last paragraph in Subsection 3.2 has a lot of contradictions with the numbers reported in Table 2 (the greatest reduction of Q_H at Burns Bog was on 5 July, not on 6 July; at Van Sunset minimum in Q_E was on the 7th July, not on 6 July; beta is reduced only on 5 July at Burns Bog; it is not clear what 90% reduction (?) at Burns Bog refers to).

6. In the abstract, the authors announce analysis for 'four land-use types', but the energy fluxes are reported for three sites and the carbon flux - for two sites. Also in the introduction (p. 4 lines 5-10), the authors mention '...turbulent fluxes and ecosystem

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responses of four distinct land-use types' which they do not report. This is misleading, because energy and carbon fluxes are the important components of the study.

7. In the introduction, the energy partitioning problem is not addressed. It is DRF effect that is discussed in the abstract, introduction and conclusion, but there are no figures showing NEE/GPP and diffuse radiation in the manuscript.

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