Sincere apologies to the authors and editor for my delay here.

**General comments**

This manuscript describes a model-fitting and evaluation exercise that is unusual in a number of respects—in particular, the concurrent use of lab and field data, and the variety of models along a spectrum of complexity that were evaluated. This is an interesting and important topic, given our uncertainty about how disturbance affects soil carbon cycling and how best to model it. The ms is generally well written and interesting, and technically strong.

There are some problems. I’m confused by some points of the methods (see specific comments below); the text could do a better job of citing previous published work on a number of key points; and some of the figures and tables need better (more complete) captions.

Still, overall this is a very strong and interesting manuscript—nice job!—and these are only moderate changes that should help improve the clarity of the text.

**Specific comments**

- Lines 21-22: might mention fungi as an addition source
- 39: and to benchmark the models themselves, of course
- 45-52: Famiglietti et al. (2020)
- 62 and 254: “corroborated” isn’t the word you want, I don’t think. “tested against”? 
98: “incubation data” didn’t measure; reword
Table 1: define all parameters (Cs, etc)
114: “assume”
114: Eq. 1 says that $f_w$ is volumetric soil water (% so 0-100). First, this implies that respiration increases endlessly with increases in water, which can’t be true, as soil anoxia will start to limit Rs at higher values. Second, I’m confused why $f_w$ doesn’t appear in any subsequent equation. I see “$f$” in Table 2 but it’s described simply as a scaling parameter.
200: “to reduce”
201: “we filtered” means you included, not excluded? Somewhat confusing given that the second part of the sentence describes excluding data
Figure 5 caption: define “edge hitting”
Figure 7: what do the grey lines show?
331: “patterns of...compensating for”
348: Sulman et al. (2018) http://dx.doi.org/10.1007/s10533-018-0509-z might be an appropriate and useful citation here