Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2019-60-AC1, 2019

Biogeosciences Discussions
Open Access
EGU

Interactive comment on "Oxygen dynamics and evaluation of the single station diel oxygen model across contrasting geologies" *by* Simon J. Parker et al.

Simon Parker

simon_ecc@yahoo.co.uk

Received and published: 22 June 2019

The rationale of the paper is to start with data and avoid making assumptions about model structure. It is possible to observe (i.e. as data) when dO/dt is zero as shown in figure 4, and although it sometimes might not identify the correct point, as in Nadder fig. 5, it is a robust and reproducible way of identifying this point if you have a sufficiently high frequency of measurement. From that it is then possible to calculate the saturation deficit. The important point is that I have not assumed any model structure to do this, so this is a data-driven approach.

To the best of my knowledge, there are three model structures which are used to quan-

Printer-friendly version

Discussion paper

tify stream metabolism:

(1) dO/dt = P - R + k(DO_sat - DO_actual)

(2) As (1), but with temperature correction for P, R and k. (e.g. Correa-Gonzalez et al., 2104; Song et al., 2016, Appling et al., 2018; Richmond et al., 2016)

(3) As (2), but R is split into an ambient component and a component linked to photosynthesis (as in Schindler et al., 2017)

Most researchers use (2).

But Schindler et al.(2017) state: "The two-stage model fit oxygen data considerably better than a single-stage model in nine of 13 stream x date combinations we considered (Table 2)." (p.13)

Appling et al. (2018) justification for use of a simple model is: "More complex equations describing nonlinear relationships [...] may be useful in modeling some rivers [..however..] here we use simple models that are more resistant to overfitting and are likely sufficient for many streams" but what proportion of streams are many streams in "...likely sufficient for many streams"?

Song et al., 2016 state: "Changes in DO concentration can be generally described by [Equation 2]." But how do they know this is the case?

So the question is, how do you distinguish between choice of model structures?

That is the purpose of comparing the dissolved oxygen deficit at zero DO change with the corresponding ratio calculated using Hornberger-Kelly, because it is a metric for how far the assumptions used in a simple model deviate from a quantity which can be measured. If the deviation is large, then you should consider rejecting your choice of model structure.

It's an obvious thing to do, but it has not been done.

Interactive comment on Biogeosciences Discuss., https://doi.org/10.5194/bg-2019-60, 2019.

Printer-friendly version

Discussion paper