**Mat Williams thoughts**

Looking at your slide 22, it seems that the constant parameters work fine for all but the 1000L pot - I wonder why that is (if I read this right)? You have to convince yourselves that adding in all those extra parameters (x3) is worth it.

* That’s a good point to raise. However, if we look at very closely to the root C stock and leaf storage pool (see figure below) where we have minimum data points, the constant parameters are struggling a bit to fit the data points (even for potted seedlings, see the table below where I zoom in on 10, 15 and 35 L pots).

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| **Constant parameters** | **Linear parameters** | **Quadratic parameters** |
| **C pools** | | |
|  | **../output/figures/Cpools/Measured_vs_Modelled_Carbon_pools_2_vol_10_par_2.png** | **../output/figures/Cpools/Measured_vs_Modelled_Carbon_pools_2_vol_10_par_3.png** |
|  | **../output/figures/Cpools/Measured_vs_Modelled_Carbon_pools_3_vol_15_par_2.png** |  |
| **../output/figures/Cpools/Measured_vs_Modelled_Carbon_pools_6_vol_35_par_1.png** | **../output/figures/Cpools/Measured_vs_Modelled_Carbon_pools_6_vol_35_par_2.png** | **../output/figures/Cpools/Measured_vs_Modelled_Carbon_pools_6_vol_35_par_3.png** |

* From these modelled C stocks, it is certain that linear variations over time would be good enough for the parameters if we consider fitting the measurements and compare the final values of log likelihood, AIC, BIC (below figure).



* However, we could further reduce the model uncertainty using quadratic variation of parameters. For simplicity, below I show the modeled parameters for grouped treatments (e.g. combine all potted treatments in one single group). These diagrams show clear reduction in parameter uncertainty when we consider quadratic parameters.

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| **Linear parameters** | **Quadratic parameters** |
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A few thoughts - the model adjustments are sensible - but note we have added a storage pool to DALEC in other publications (e.g. Bloom et al 2016 - for leaf flushing).

* Yes, Bloom et al (2016) uses a labile pool for foliage in the DALEC model and here we are proposing to extend the storage pool for all plant organs (stem and root as well). From experimental data, we find stem and root have significant storage portions (16 and 9% respectively) that we would like to consider in our model formulation.

We have also explored in DA how parameters vary over time (Rowland et al. GCB 2013) and [10.1016/j.agrformet.2014.08.009](http://dx.doi.org/10.1016/j.agrformet.2014.08.009).  In these cases we used different approaches - in the first we split dry and wet seasons; in the second we used an EnKF, which includes parameters as state variables, so they vary over time.

The quadratic approach you use with the MCMC is interesting, I have not seen that. In some sense it is like what we call ecological and dynamical constraints (EDCs) - you allow some evolution of parameters with time, but it must be smooth and limited.

* We think of this in similar way as EDC.