Pelletier, Greg (ECY)

From: Robert Ambrose [bobambrosejr@gmail.com]
Sent: Friday, January 07, 2011 5:37 PM
To: Pelletier, Greg (ECY)
Cc: Ahmed, Anise (ECY); Sackmann, Brandon (ECY)
Subject: Re: Analysis of Base 8 & 9
Attachments: base10_v3-rba.xls

I've put together some combinations here that I think would be interesting. They should give us enough to go on if certain combinations in the base 10 don't interact as expected.
Bob

On Fri, Jan 7, 2011 at 8:16 PM, Pelletier, Greg (ECY) <gpel461@ecy.wa.gov> wrote:

P.S. I've added a few more. Feel free to delete any of mine if you have a better idea.

From: Pelletier, Greg (ECY)
Sent: Friday, January 07, 2011 5:00 PM

To: 'Robert Ambrose'
Cc: Ahmed, Anise (ECY); Sackmann, Brandon (ECY)
Subject: RE: Analysis of Base 8 & 9

I added a few possible runs in the attached revised file, but I am very flexible if anyone has better ideas. We can do up to 56 runs in a batch. Also I added the ktg1/ktg2 suboptimal/superoptimal temperature parameters. Note that anc is global for both GAM1 and GAM2

From: Pelletier, Greg (ECY)
Sent: Friday, January 07, 2011 4:41 PM

To: 'Robert Ambrose'
Cc: Ahmed, Anise (ECY); Sackmann, Brandon (ECY)
Subject: RE: Analysis of Base 8 & 9

I agree with your recommendations. I started a spreadsheet (attached) of possible combinations. So far I only have two runs identified – the two alternative base cases you suggested for the next batch. Could you suggest some alternative combinations of other parameters that would make the most sense for the rest of the runs for the next batch?

From: Robert Ambrose [mailto:bobambrosejr@gmail.com]
Sent: Friday, January 07, 2011 3:58 PM

To: Pelletier, Greg (ECY)
Cc: Ahmed, Anise (ECY); Sackmann, Brandon (ECY)
Subject: Re: Analysis of Base 8 & 9

Greg and colleagues,

Here I'll summarize my analyses of Base 8 (mainly) and Base 9 sensitivity analyses, and discuss recommendations for the base and sensitivity for the next round. In my comments, keep in mind that some stations are reacting differently than others.

One of the things I wanted to accomplish in Base 8 was to allow clear seasonal differentiation between GAM1 and GAM2. This was accomplished, with a species shiftover around July. It looks like Base 8 generally resulted in too much production, giving chla and DO values that are too high, especially in summer and late fall/winter. Several of the sensitivity combinations helped the shapes and statistics, basically by lowering productivity overall, or seasonally.

Doubling GAM1 w_s from 0.5 to 1.0 affected the spring bloom, making it later and lower. This was better at some stations, worse at others. Doubling GAM2 w_s from 0.1 to 0.2 lowered the fall production slightly (good) but not by a lot because the value is low anyway. It seems to me that GAM1 w_s of 0.5 is reasonable and 1.0 is too high. GAM2 w_s could reasonably be increased to 0.2, depending on selection of other model parameter values.

Because the Base 8 spring bloom was generally too early and high, I next looked at increasing Isat and Topt. Sure enough, changing these two from 50-11 to 60-12 improved the spring dynamics, making them later. Changing GAM1 gmax from 2.2 to 2.6 resulted in spring blooms that were too early and high; changing gmax to 2.0 resuted in spring blooms that were too late and low. So for spring GAM1, I like 60-12-2.2.

The Base 8 fall and winter productivity was generally too high, so I next looked at increasing Isat and Topt. Changing these two from 100-17 to 120-18 gives lower chla, and DO in summer, fall, and winter, improving the simulation at most stations. Lowering GAM2 gmax from 2.8 to 2.6 slightly improved the fall and winter by lowering production at most of the stations. So for fall GAM2, I like 120-18-2.6.

When you take the GAM1 and GAM2 with the higher Isat-Topt combinations and then double w_s, the results deteriorated some. What we need is a drop in GAM1 during late spring and early summer, which could be achieved by increasing the Topt dropoff constant (not a part of the present sensitivity analyses).

Next, I looked at the effect of the Kn parameter, which was set to 28 for GAM1 and 24 for GAM2. I looked at the different combinations, and found that decreasing Kn resulted in increased productivity, not good. Increasing Kn resulted in slightly decreased productivity, especially in fall-winter. The higher Kn had more influence on GAM2 than GAM1. Bottom line, I liked the results best when Kn for both GAM1 and GAM2 is set to 28.

Next I looking at the effect of the anc parameter, which was set to 0.1 for the base. Varying anc from 0.08 to 0.12 significantly decreased production. The lowered chla and DO improved the simulation at most stations. So, an anc value of 0.12 could certainly be justified in the next base. However, there is a potential combinatorial problem if we also change the other parameters to lower production. Specifically, the recommended changes in Isat-Topt, gmax, and Kn would lower productivity at certain times of the year. If we also raise anc, we might get a new base with too little productivity. My tentative recommendation would be to keep it the same for the new base, but include the higher 0.12 value in an alternate combination of parameters for an alternate base. Just a thought.

Next I looked at the effect of raising k_R from a base of 0.05 to 0.08. This results in lowering productivity, particularly in early spring and late fall. This improves the seasonal trend, I believe, so I recommend that the new base center on k_R of 0.08.

Next I looked at the effect of raising k_D from a base of 0.02 to 0.05. This lowered chla and productivity year round, much like the increased settling did. Results were generally better, though not so at a couple of stations. Because we will be lowering productivity through other parameter changes, I recommend keeping k_D at the present base, but investigating higher value in a sensitivity run.

In summary, my recommendation for a new base is:

GAM1: Isat=60, Topt=12, gmax=2.2, k_R=0.08, Kn= 28, anc=0.1, k_D=0.02

GAM2: Isat=120,Topt=18, gmax=2.6, k_R=0.08, Kn=28, anc=0.1, k_D=0.02

	GAM1	GAM2
gmax	2.2	2.6

Isat	60	120
Topt	12	18
k_R	0.08	0.08
k_D	0.02	0.02
K_n	28	28
anc	0.1	0.1
w_s	0.5	0.2

I'd like to see the GAM1 Topt dissipation parameter be increased slightly, especially on the high side though it would probably be best to keep symmetry above and below Topt (for simplicity at least).

As I said, an alternate base could be set up around anc of 0.12. In that case, I'd leave gmax, Isat, Topt the same as above, change k_R back to 0.05 and GAM2 w_s back to 0.2.

Greg, I believe your recommendation about getting the IC from the snapshot of base 9 XPI13 is good.

Again, I believe we're making good progress now. I guess the next iteration will be a reality check on whether we really are understanding this system better. I'm sure we'll learn either way.

That's about all I can assimilate for now, though I'll be glad to react in correspondence prior to initiation of the next base. This iteration took a little more than the past, 9.5 hours. Total cumulative for Task 2 is 36.75.

Bob

On Fri, Jan 7, 2011 at 5:51 PM, Pelletier, Greg (ECY) <gpel461@ecy.wa.gov> wrote:

P.S. base 8 and 9 also show a general increase in bottom DO in South Puget Sound with increasing loading of DIN based on comparing scenario Wzero_Rhalf (zero load from WWTPs and half of current load from rivers) with W2_R2 (double current load from WWTPs and rivers). Also Budd Inlet bottom DO is still overpredicted.

From: Pelletier, Greg (ECY)
Sent: Friday, January 07, 2011 2:22 PM
To: 'Robert Ambrose'

Cc: Ahmed, Anise (ECY); Sackmann, Brandon (ECY)

Subject: RE: Analysis of Base 8 & 9

I agree with your conclusion. It is also interesting that the combination you suggested was the second best run overall based on the RMSE stats summary. The first-best based on RMSE was an oddball, but the second best looked very good.

Also it looks like the higher settling velocity in base 9 was better than base 8. Maybe we should explore settling velocity more in the next rounds too.

What do you think about also using anc=0.12 and k_D=0.05 for the next base case? These two variations off of the base 8 and 9 were very good and also scored very well in the RMSE summary.

From: Robert Ambrose [mailto:bobambrosejr@gmail.com]
Sent: Friday, January 07, 2011 11:59 AM
To: Pelletier, Greg (ECY)
Cc: Ahmed, Anise (ECY); Sackmann, Brandon (ECY)
Subject: Analysis of Base 8 & 9

Hi, Greg and colleagues. I've finished examining the present results, and am encouraged. Some combinations seem to work well. I'm going to take a break to clear my head, then send you my recommendations for the next base plus sensitivity variations. But first, a couple of quick points. Looking at the sensitivity to start up time (July 06 versus Jan 07), it appears that the more internal stations are indeed affected by the ICs (those would be SS08, SS52, and SS71). In particular, the spring bloom timing seems to be affected there. So we need to find a way to spin the model up, then dump a snapshot of January 1 conditions to use as IC's for the model runs.

While the Base8 base run was not as good as Base7, combinations featuring the following are actually better than Base7:

GAM1: Isat=60, Topt=12, gmax=2.2, k_R=0.08, Kn= 28, anc=0.1, k_D=0.02

GAM2: Isat=120,Topt=18, gmax=2.6, k_R=0.08, Kn=28, anc=0.1, k_D=0.02

I believe I'll be recommending this as the new base. We don't actually have this exact set of runs, so combinatorial effects might bite us. But if we run reasonable combinations, I believe we'll zoom in to a pretty good calibration in the next iteration, or maybe the one after.

Bob