

Pelletier, Greg (ECY)

From: Robert Ambrose [bobambrosejr@gmail.com]
Sent: Thursday, December 09, 2010 1:15 PM
To: Pelletier, Greg (ECY)
Cc: Ahmed, Anise (ECY); Sackmann, Brandon (ECY)
Subject: Re: discussion on base7 plots

Yes, it just seemed to me that the lower GAM1 (winter/spring assemblage) gmax worked a little better than the higher gmax. I was trying to get a little earlier start to GAM1, but not let it produce chl levels that are too high. The sensitivity range I recommended does include the higher gmax in case this doesn't hold up with the other changes.

Bob

On Thu, Dec 9, 2010 at 3:19 PM, Pelletier, Greg (ECY) <gpel461@ecy.wa.gov> wrote:

Bob,

Thanks – this is all excellent and we will use it to create the base 8 scenarios. We had one question – did you intend that the base case for GAM1 should have lower growth rate gmax than GAM2 (just checking to be sure that is should not be the reverse)?

Greg

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From: Robert Ambrose [mailto:bobambrosejr@gmail.com]
Sent: Thursday, December 09, 2010 5:54 AM
To: Ahmed, Anise (ECY)
Cc: Sackmann, Brandon (ECY); Pelletier, Greg (ECY)
Subject: Re: discussion on base7 plots

Good morning from the cold cold southeast.

Some of the simulated plots did have a slight dip of Chl in mid-summer, but I'm not sure that's a bad thing. I'm going on memory and some notes right now, but I believe that some stations showed at least a small observed fall increase in Chl. Hard to say, really.

Simulations with more pronounced mid-summer dip in Chl tended to have GAM1 T_{opt} low (12, 11 C). GAM2 growth was low until temperatures got closer to 20. That's why I recommended GAM2 T_{opt} in the range of 16 - 18 and a higher g_{max} of 2.8. I'm guessing that this will be sufficient for plenty of GAM2 growth in summer. So I don't think we'll need a new mid-summer IC to seed GAM2. In fact, I'd really like to see one 2-year run that repeats year 1 conditions. Hopefully year 2 would look much the same as year 1, especially during growing seasons. If not, then the model results would depend too much on somewhat arbitrary ICs, which is not a good thing.

The run lowering K_n to 7 for both GAM1 and GAM2 yielded slightly earlier, slightly higher spring blooms and lower DIN, NH_4 , NO_3 concentrations, especially during growing season. It seemed to me that inorganic N was too low. But you're right that lowering K_n for GAM2 would tend to boost its productivity in summer. It might indeed be worth a run where K_n for GAM1 is at base 28 $\mu g/L$ and K_n for GAM2 is somewhat lower. I was recommending a range of K_n of 24 - 32, but don't feel strongly about the actual range. What if GAM1 is 24 - 32 but GAM2 is something like 16 - 28, with a base of 24?

I'm not sure what is causing the initial NH_4 winter increase. I'd guess it's an imbalance in the nitrogen ICs, perhaps with a mineralization rate that's too high. Winter kinetics should be pretty slow with the temperature corrected rates. This is another reason to try a 2-year run or a run with more spin-up time (perhaps starting in November). I recommended sensitivity runs with k_R varying between 0.03 - 0.08. That should tell us whether respiration is causing this early blip. We could try a couple of runs varying mineralization and nitrification rate constants, too. I doubt that this will have a major effect on Chl and DO, but it doesn't hurt to check it out.

Bob

On Wed, Dec 8, 2010 at 6:47 PM, Ahmed, Anise (ECY) <AAHM461@ecy.wa.gov> wrote:

Hi Bob,

1. Because there is a dip in total chlorophyll sometime in July, I was wondering if we could use a time-series for initial condition for GAM2 with GAM2 IC being zero from Jan through July and perhaps 1 beginning in July?
2. Also, because of this dip in Chlorophyll, should we lower the K_n for GAM2 so that it would grow at lower nitrogen concentration beginning in July, given that the first dip is likely due to limiting nutrient concentrations?

3. From the ammonia plots, it would seem that an initial increase in ammonia is not supported by data (see observed data in mid Feb) . Should we decrease the DON mineralization rate and/or reduce respiration (as this adds to ammonia in the model)?
4. A mid Feb observed data for nitrate suggests that perhaps we have too much nitrogen in the system. Should we lower the nitrification rate?

Thanks

_anise

From: Robert Ambrose [mailto:bobambrosejr@gmail.com]
Sent: Wednesday, December 08, 2010 2:30 PM
To: Pelletier, Greg (ECY)
Cc: Ahmed, Anise (ECY); Sackmann, Brandon (ECY)
Subject: Re: base 6 output charts on FTP site

I've finished looking at the base7 runs, and have the following recommendations for the base8 calibration and sensitivity.

As I mentioned earlier, I'd like to see GAM1 be more of a winter/spring group and GAM2 be more of a summer/fall group. To do this, GAM1 and GAM2 constants could have the following base and sensitivity range:

GAM1

Isat = 50 W/m² (40 - 60)

Tmax = 11 C (10 - 12)

gmax = 2.2 day⁻¹ (2.0 - 2.6)

GAM2

Isat = 100 W/m² (80 - 120)

Tmax = 17 C (16 - 18)

gmax = 2.8 day⁻¹ (2.6 - 3.0)

Both

$anc = 0.1 \text{ gN/gC}$ (0.08 - 0.12)

$Kn = 28 \text{ ugN/L}$ (24 - 32)

$k_R = 0.05 \text{ day}^{-1}$ (0.03 - 0.08)

$k_D = 0.02 \text{ day}^{-1}$ (0.01 - 0.05)

It appears that foc and $fd1$ have quite minimal effects on CBOD and DO, so we can keep the base values of 0.5 and 0.75, respectively).

There are a lot of potential sensitivity combinations here, but I'd recommend something like:

GAM2 at base, run the 3 GAM1 properties to max and min independently (6 runs), then run $Isat$ and $Tmax$ both low and both high with $gmax$ low, base, and high (6 runs).

GAM1 at base, run the 3 GAM2 properties to max and min independently (6 runs), then run $Isat$ and $Tmax$ both low and both high with $gmax$ low, base, and high (6 runs).

GAM1 and GAM2 at base, run the "Both" properties to max and min independently (8 total)

This gives 1 base and 32 sensitivity runs. Other combinations of interest would be the GAM1 $Tmax$ and $Isat$ at upper end with GAM2 $Tmax$ and $Isat$ at the lower end and upper ends (2 runs) and possibly GAM1 $tmax$ and $Isat$ at lower end with GAM2 $Tmax$ and $Isat$ at lower and upper ends (2 runs).

That's all for now. I'd be glad have you react to these recommendations, adding your own take on base7 and its implications.

I have a couple of book group meetings tonight, and so will check in with you again either later tonight or early tomorrow.

Bob

Bob

On Wed, Dec 8, 2010 at 12:36 PM, Pelletier, Greg (ECY) <gpel461@ecy.wa.gov> wrote:

I will try to answer but I would like Brandon to correct anything I say that is incorrect:

- Observed DO data are from random times during daylight workday hours during the surveys. To my knowledge we don't have any continuous diel DO data. (Brandon – do we have any diel DO data?). Each station on each survey has one profile of DO that was taken at a random time during the workday depending on what time to boat arrives at each station during the survey.
- Predicted data in the time-series plots are hourly predicted values so they would show the predicted diel ranges.
- Goodness of fit calculations match the predicted and observed values to within about 30 minutes

Greg

From: Robert Ambrose [mailto:bobambrosejr@gmail.com]
Sent: Wednesday, December 08, 2010 9:16 AM

To: Pelletier, Greg (ECY)
Cc: Ahmed, Anise (ECY); Sackmann, Brandon (ECY)

Subject: Re: base 6 output charts on FTP site

I had some questions about DO. For the observed data, what time of day were they taken? Were any diel data taken at any of the stations? For the simulated DO, what time of day is output? Could we get diel DO range output?

I was wondering about this when looking at the effects of anc on productivity, including chl a and DO. Most of the stations seem to have consistent patterns of chla and DO, that is when the run lowers productivity, it either helps or hurts both of these variables. For station SS71, however, lowering simulated productivity (chla and DO) matches observed chla better, but matches observed DO worse.

Bob

On Wed, Dec 8, 2010 at 10:03 AM, Robert Ambrose <bobambrosejr@gmail.com> wrote:

I'm getting ready to start a work session examining more round 7 results. Maybe one more coffee first.

Greg, I'm glad you told me about the "observed" CBOD. It seems that those points are two steps removed from real data, so I won't worry about the simulation not matching the "observed" pattern (or, more accurately, lack of pattern). The CBOD observations should probably be shown as a single wide uncertainty band rather than individual points.

I've checked my work logbook, and so far I've used up 18 3/4 hours in Task 2, out of a total 45 hours budgeted, leaving 26 hours. Analyzing a round of sensitivity runs seems to take 4 - 6 hours, so we're good for another 5 rounds. We can adjust my level of effort in future rounds to conserve the hours, if desired. If you foresee more analysis work than this coming up, then I'd be ok with expanding Task 2 somewhat to accommodate.

Bob

On Tue, Dec 7, 2010 at 7:56 PM, Pelletier, Greg (ECY) <gpel461@ecy.wa.gov> wrote:

Thanks – this is very helpful advice. Let us know if you have additional thoughts that we can incorporate into the next round of runs. Any comments you can send us before noon EST Thursday can be used to help us decide which parameters to vary in different combinations.

From your notes below it looks like the next “base case” should have the GAM1 and GAM2 Tm, Isat, Gmax as you noted below.

Let us know if there are other particular parameter value combinations that we should try varying around this base case...

On the CBOD data, we are not sure it really should be flat as the “observed data” show. The observed data are not really observed – they are based on an empirical equation for DOC from salinity from the Strait of Georgia which is in Canada north of Puget Sound. None of our actual lab data for DOC were usable.

From: Robert Ambrose [mailto:bobambrosejr@gmail.com]
Sent: Tuesday, December 07, 2010 3:04 PM
To: Pelletier, Greg (ECY)
Cc: Ahmed, Anise (ECY); Sackmann, Brandon (ECY); Goldsmith, David

Subject: Re: base 6 output charts on FTP site

OK, some interim thoughts from examining the phytoplankton dynamics this morning.

We have two groups of phytoplankton to better capture seasonal dynamics. In the present base case, however, GAM1 dominates most of the year (I think my comments yesterday transposed GAM1 and GAM2... sorry about that). We should try to find a set of constants that lets GAM1 capture the timing and size of the spring bloom (from, say, Feb - May), and lets GAM2 capture the summer-fall productivity (June - Oct). I believe this is best done by matching prevailing light and temperature conditions with the dominant phytoplankton I_{sat} and T_{opt} .

From the present set of runs, it seems that the best properties for GAM1 are something like $I_{sat} = 50 \text{ W/m}^2$, $T_{opt} = 13 \text{ C}$, combined with a slightly lower maximum growth rate $k_{Gmax} = 2.19 \text{ day}^{-1}$.

GAM2 uses the theta temperature correction option, which yields lower growth rates below 20 C. Mid-summer temperatures, however, are less than 20, and so GAM2 with its lowered growth rates doesn't compete well with GAM1 even in summer. I believe the seasonal dynamics will work better if we set GAM2 properties to $T_{opt} = 17 \text{ C}$, combined with I_{sat} of 100 W/m^2 and a maximum growth rate constant of 2.86 day^{-1} .

In some stations we have too much surface productivity. Perhaps we could try slightly increasing respiration or death rates for GAM1 and GAM2.

I will look at more runs tomorrow, focusing on CBOD and DO. I'm not sure how to keep CBOD relatively flat, but maybe the present set of runs will give me a hint.

Bob

On Tue, Dec 7, 2010 at 4:16 PM, Pelletier, Greg (ECY) <gpel461@ecy.wa.gov> wrote:

P.S. if you have any interim thoughts you could send by tomorrow morning that would be helpful also to get those ASAP...

From: Pelletier, Greg (ECY)
Sent: Tuesday, December 07, 2010 1:15 PM
To: 'Robert Ambrose'
Subject: RE: base 6 output charts on FTP site

Bob,

Your comments are very valuable to us. Please use as much time as you think is necessary to glean as much info as you can to help guide us on the next round of runs. If possible we would like to start the next round this week (before Thursday). If you can get us more comments later today or tomorrow that would be ideal. We are especially interested in what you think would be the best changes to make to the base case and which parameters and ranges of values would be best to explore.

If we run out of money in your budget for calibration guidance we can add more to the budget. Let me know when/if this could be needed and what the next increment of additional budget could be.

Greg

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From: Robert Ambrose [mailto:bobambrosejr@gmail.com]

Sent: Monday, December 06, 2010 11:49 AM

To: Ahmed, Anise (ECY)

Cc: Sackmann, Brandon (ECY); Goldsmith, David; Pelletier, Greg (ECY)

Subject: Re: base 6 output charts on FTP site

I've looked over the base today for an hour or so. It seems that GAM2 dominates most of the stations most of the year. If we are to use 2 (or more) phytoplankton classes, we'll want to define their properties so that each will be significant somewhere in space and time. I'll be interested to see if GAM1 is more present when using theta_G of 1.04 (will look tomorrow). I'll also be interested in whether GAM2 can grow more in winter/early spring with Isat of 50.

I did notice that at some stations (SS08, for example), the chla in Dec was much higher than the Jan IC of 1.0. This shows that the model ICs are not spun up to the internal dynamics at that station.

Bob

On Thu, Dec 2, 2010 at 6:11 PM, Ahmed, Anise (ECY) <AAHM461@ecy.wa.gov> wrote:

Hi Bob,

We have completed running and postprocessing base7 water quality scenarios. We simulated 56 model runs and they can be found at the following link.

<ftp://www.ecy.wa.gov/eap/sps/index.html>

We would appreciate your feedback on these results as we build the next set of model runs, i.e. base8 and perhaps base9 (if possible). We are planning to start some model runs by the middle of next week.

_anise

