Modeling Quarterly Review Meeting Minutes
July 11th, 2012
Joe Macknis Memorial Conference Room (Fish Shack)
410 Severn Avenue
Annapolis, MD
http://www.chesapeakebay.net/calendar/event/18508/

Participants

Lewis Linker – EPA/CBPO	Lee Currey – MDE	Gary Shenk – EPA/CBPO	David Koran – USACE	Mark Bennett – USGS
Peter Wilcock – JHU	Richard Tian – UMCES/CBPO	Kevin McIlhany – USNA	Ping Wang – VIMS	Cathy Wazniak – MD DNR
Vimal Amin – MDE	Sunghee Kim – UMD	Xin-Zhong Liang – UMD	Raleigh Hood – UMCES/CRC	Kevin Sellner – CRC/STAC
Gopal Bhatt – Penn State	Steve Gladding – NY DEC	Ted Tesler – PA	Rick Winfield– EPA Region 2	Randy Greer – DE DNR
John Sherwell – MD DNR	Carl Cerco - USACE	Arthur Butt – VA DEQ	Marjy Friedrichs – VIMS	Donald Weller - SERC
George Onyullo – District Department of Environment	Tom Schueler – Chesapeake Stormwater Network	Normand Goulet – Northern VA Regional Commission	Mary Jane Rutkowski - MDE	William Hunley – Hampton Roads Sanitation District
Amanda Pruzinsky – CRC/CBPO				

Welcome, Announcements, and Introductions – Lewis Linker

- New Members
  - Steve Gladding – NY DEC Water Quality Management Section
  - Amanda Pruzinsky – CRC/CBPO STAR Modeling Staffer

- Change of chairs: Our new co-chairs Lee Currey (Maryland Department of Environment) and Dave Montali (West Virginia Department of Environmental Protection) will be leading the Modeling Workgroup at the October Modeling Quarterly Review. Lewis Linker will be hanging up his Chair hat, but will continue to wear the Modeling Workgroup Coordinator sombrero.

- There will be a transition to focus on implementation in the upcoming months in order to meet the 2017 midpoint assessment

- Journal of American Water Resources Association Articles
  - 12 articles submitted – Thus far, about half have been accepted
  - Publication in 2013
  - Thank you to the authors, co-authors, and peer reviewers

Watershed Model Calibration - Gopal Bhatt

An introduction to Gopal's presentation by Lewis Linker, discussed how Chesapeake Bay shallow water monitoring began in 2003 and has been expanding since. In order to understand what is going on at the shallow water monitoring sites compared to shallow water simulations of the Bay, which have a simulation period ending in 2005, the Watershed, CH3D, and the Bay Water Quality Model (ICM) must be expanded. To expand the simulation period, CBP could use a more facile and easy to use precipitation dataset estimates. CBP is currently looking at the NLDAS as an easier to use system. The question is: How does it compare in its representation of precipitation dataset?

Gopal showed a comparison between the NLDAS and XYZ methods for estimating the precipitation dataset. The NLDAS provides various other datasets that are required for the Watershed Model, including but not limited to radiation, wind velocity, and temperature. The temperature datasets and other improvements related to the soil radiation allow the capture of radiation in daylight which allows accurate calculations of evapotranspiration values. Based on the NLDAS datasets, the Watershed Model was run as calibrated to the previous XYZ dataset, but the calibration was poor. This made a case for the requirement of calibration when the precipitation data is changed. In the first phase, the Watershed Model was calibrated by replacing the precipitation data. The findings are shown in the PowerPoint slides.

Slide 2: Shows an analysis of goodness of fit using the total bias for the various 287 stations that are used in the calibration with respect to the XYZ method and the NLDAS precipitation method. In summary, it was found that 106 gauging stations have an improvement in calibration, 104 are not sufficiently changed, and 77 were worse.

Slide 3: Shows the same analysis of goodness of fit using total efficiency. It was found that 50 gauging stations have an improvement in calibration, 204 are not sufficiently changed, and 33 were worse. Also, the total average efficiency is improving across the watersheds, which is better than the XYZ method.

Slide 4: Shows the same analysis of goodness of fit using logarithmic efficiency, which is more biased toward the low flow. It was found that 12 gauging stations have an improvement in calibration, 260 are not sufficiently changed, and 15 are worse. The total efficiency/total logarithmic average efficiency is also slightly poorer with the NLDAS.

This analysis provides an idea of the quality of these two datasets, but it is preliminary result. The NLDAS must be inspected in more detail (spatial analysis, temperature, evapotranspiration).

For more information the presentation is available at
http://www.chesapeakebay.net/channel_files/18508/cbp_-_gopal_bhatt_-_watershed_model_calibration.pdf

Clarification: Lewis Linker – This does not affect the Phase 5.3 Watershed Model, which is static and unchanged in its role as the tracking system for implementation progress until the 2017 Midpoint Assessment

Alternative Precipitation Data for the CBW model – Sunghee Kim

Sunghee Kim described a study that investigated the response of hydrologic calibration to replacing gauge-based with NEXRAD-based precipitation data in the Watershed Model over the Potomac River Basin. The presentation included 1) comparison of gauge-based and NEXRAD radar-based (Multisensor Precipitation Estimator, MPE) mean areal precipitation data 2) evaluation of the model's calibration accuracy using the different precipitation data sets, and 3) comparison of MPE and NLDAS precipitation data

Part 1: CBW modeling using gauge- vs. NEXRAD-based precipitation

Sunghee discussed the Multisensor Precipitation Estimator (MPE), described CBW model calibration and performance, and summarized the findings of the study.

Summary of findings:

- MPE-forced calibration of the CBW model yielded more skillful streamflow simulation than the CBP-forced
    - However, it was necessary to adjust the parameter bounds for LZSN
- The simulated surface flows are similar
    - The differences in precipitation manifest as differences in subsurface storage and flow
    - Choice of precipitation input has significant implications for WQ simulations

Part 2: MPE vs. NLDAS precipitation data (begins on slide 19)

Sunghee discussed the NEXRAD-based precipitation processing, NLDAS2 precipitation data, NLDAS precipitation processing, differences in the two processing systems, and technical considerations for use in CBW modeling. Also, a peer-reviewed paper was presented. The paper suggested the fusion of the of the MPE and NLDAS precipitation data products because both have their own strengths (Reference: Nan, Z., Wang, S., Liang, X., Adams, T., Teng, W., Liang, Y. (2010). Analysis of spatial similarities between NEXRAD and NLDAS precipitation data products. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing 3(3):371-385.)

Concerns and suggestions:

Factors to consider for data selection

- Spatial resolution (~16km2 vs. ~144km2)
- Future applications of the model
    - For example, (near) real-time hourly data are needed for real time forecasting

Pre-NEXRAD (before mid-1996) era

- NLDAS2 precipitation data can be used.
- Precipitation from NARR (1979 to mid-1996) should be evaluated before putting into the CBW model (ingredient data and information content are different)

Low bias in MPE precipitation

- Can be reduced by Post Analysis (PA) using daily gauge data

For more information the presentation is available at
http://www.chesapeakebay.net/channel_files/18508/modqr_-_sunghee_kim.pdf

Questions and Discussion

- Lewis Linker – In reference to the recommendation from "Analysis of spatial similarities between NEXRAD and NLDAS precipitation data products" (2010) – What would a fusion of the NLDAS2 and NEXRAD look like?
    - Kim Sunghee – It would be a great idea to fuse the two datasets, since NLDAS2 has data going back to 1979, but certain time periods are only modeled data. In the paper, the fusion was not actually performed, so it is entirely up to CBP
- Lee Currey – The current dataset for precipitation does not allow for updates on a real time basis (perhaps every year). Is it correct that NLDAS2 and MPE allow for that?
    - Gary Shenk – Yes, both the NLDAS2 and the MPE operate that way. The XYZ method cannot be easily operated that way
    - Kim Sunghee – For MPE, MARFC has a site to upload the data file daily
- Gary Shenk – When a new precipitation dataset is used, recalibration is necessary in order to have a reasonable model. If a particular dataset is being used for daily updates in order to make short term forecasts, the model that was calibrated with XYZ cannot be used. Or if NLDAS is being used, in order to have legitimate parameters for forecasting, would there have to be one model that is calibrated until 1996 and then separate parameters from then on out?

- Kim Sunghee – Forecasting can be performed using data assimilation methods, without recalibration of an already calibrated model using MPE or NLDAS. Answer to the second part of the question depends on the analysis of the precipitation data from NARR

    - Kevin McIlhany – The short term calibration method could change the definition of what the calibrated pieces of the model are

- Gary Shenk – What is the management driver for having daily estimates of load?

    - Lee Currey – For management purposes, 6 months or annual estimates have been requested. It could also be beneficial for understanding and reporting

- Mark Bennett – XYZ is built on a 5km grid, but it isn't being used on a 5 km grid. If there is any interest in continuing the use of XYZ, the Modeling Workgroup should consider modifying the format

- Lewis Linker – The understanding of what is happening in the mountainous regions is credible, but it might be useful to consider that HSPF has snow simulation for regions where there is relatively permanent snowpack. It seems to correspond to the areas that are showing differences. Question: How does NEXRAD deal with issues such as snow? TBD

- Don Weller – Inadequacy in the precipitation data is not at the top of the list when considering issues with the Watershed Model that limit its application in decision making. An example of what may be at the top, is simulation of BMPs. Should issues surrounding precipitation data be the highest priority to pursue when modifying the model?

    - Lewis Linker – That is a very good point. It would be beneficial to what Lee commented on (understanding and reporting) and also in order to advance in shallow water, the entire model system must be expanded. The XYZ method is less efficient. The immediate utility of modifying the precipitation data methods is not so much an improvement in the model, but instead a more facile way to expand the model.

Multiple Model Workshops – Marjy Friedrichs

Marjy Fredericks described the outcome of a recent STAC workshop on the potential for multiple model representation of shallow waters of the Chesapeake and the water quality standards that are applied there.

For more information the presentation is available at
http://www.chesapeakebay.net/channel_files/18508/quarterly_-_marjy_friedrichs.pdf

Questions and Discussion

- Lewis Linker – State of the science in shallow water is evolving rapidly. A multiple modeling approach could advance the assessment of water quality standards in shallow water. EPA is considering funding multiple models for shallow water with FY13 funds, but the opportunity costs must be identified, particularly in implementation

  General Timeline
  - After funding is identified then an RFP must be written
  - Earliest possible start date is not until 2013
  - 2 years of application
  - Preparation for 2017 Midpoint Assessment

- Kevin McIlhany – Clarification of Slide 9: Will the final product be a patch work of many different models that are the best at modeling specific domains?

  - Marjy Fredericks – No, the opinion of the workshop is that a study of multiple models would be used to find one model that runs well in all of the various environments

  - Kevin Sellner – It would also be operationally impossible to run it as a patchwork

  - Xin-Zhong Liang – No model is perfect. Multiple models are required to draw conclusions about uncertainty and the likely hood of the predictions

    - Raleigh Hood – This reflects the practical restraints that the Chesapeake Bay Program is under. Multiple models will be run to increase credibility and reduce uncertainly, but in a management context the Bay Program is not currently in a position to run multiple models simultaneously

Multiple Model Workshops - Don Weller

Don outlined plans for an upcoming STAC workshop on the application of multiple models for Chesapeake Bay management including a list of the steering committee, logistics, and objectives. STAC is currently identifying case studies, presenters, and attendees, so please send any input and suggestions to Don.

For more information the presentation is available at http://www.chesapeakebay.net/channel_files/18508/modeling_quarterly_review_-_don_weller.pdf

Questions and Discussion

- Lewis Linker – This is an important workshop to the Chesapeake Bay Program. As the largest and only regional TMDL, the CBP needs input from Chesapeake Bay Program managers at the partner states and Federal agencies, as well as council from Region 3 and Headquarters.

- Gary Shenk – New Modeling Workgroup member, Steve Gladding, was heavily involved with the TDML in New York which used multiple models in the approach that CBP is considering

    - Steve Gladding – Expressed interest in giving a presentation of his results

- Kevin McIlhany – People may begin to use their local models to challenge the Bay Model

    - Don Weller – Limotech is an example. One thing that will hopefully come out of this workshop is a more proactive approach to other models

    - Lewis Linker – CBP works with 7 sovereign governments that are all involved in a partnership in order to implement changes. How to work an agreement with one model has been demonstrated. How to work an agreement with multiple models is an open question

- Peter Wilcock – Running multiple models for management is very important. There is tendency to narrowly define what is to be predicted by the multiple models. With this there is a possibility of leaving out alternative approaches. If the better information is not useful for making management decisions, then it is questionable

    - Kevin Sellner – Yes, which is why CBP is considering "multiple models for management." A multiple model approach without the management aspect is simple, but that is not what CBP is working with

Chesapeake Modeling Lab Action Team Status – Mark Bennett

Mark Bennett discussed the results of the first meeting of the team formed to respond to the NAS recommendation for a Chesapeake Modeling Laboratory will be described.

First Modeling Lab Action Team face-to-face meeting was held on June 21st, 2012
Next steps: Conference call July 23rd, 2012 and face-to-face August 28th, 2012

For more information the presentation is available at
http://www.chesapeakebay.net/channel_files/18508/modeling_workgroup_7-11-12_-_mark_bennett.pdf

Slide 1 Modeling Lab Action Team Members – Clarifications

- Jurisdictions: To date, New York and Washington have not named representatives
- Academic: Bill Boicourt is not able to continue as a representative. His replacement is Theo Dillaha
- Federal Agencies: To date, the USDA has not named a representative

Questions and Discussion

- Xin-Zhong Liang – Maryland University has been running the Chesapeake Bay Forecast System (CBSF) system. Why have CBFS type model systems not been considered in the past?
    - Gary Shenk – CBP has hosted many presentations from CBFS over the years and also their Watershed Model was basically a spreadsheet version of the CBP Watershed Model output. CBP may have decided to go a different direction since the forecast system seems to be considering short term effects only, but communication has been slow lately and that is why you are here today

Expert Team Assessments of BMP and Management Action Refinements – Tom Schueler

Tom Schueler described the work of expert groups in stormwater management and stream restoration that are recommending long range plans for potential refinements to the 2017 watershed assessment and tracking tool.

The definition of a "best management practice" has drastically changed over the years. It is no longer a one size fits all rate, but rather a geographically specific method that is used to derive a rate based on the BMPs characteristics.

Current expert panels

- Stormwater Retrofits Panel and New State Stormwater Standards Panel – Official reports could be released this summer
- Urban Fertilizer Management Panel and Stream Restoration Panel – Official reports could be released this fall

Future expert panels

- Enhanced Erosion & Sediment Controls
- Elimination of Illicit Discharges
- Reconvene Street Sweeping Panel
- Urban Tree Planting
- July 25 Floating Island Research Webcast

Urban BMP Verification

- Working on 14 broad principles for reporting, tracking and verifying urban BMPs
- Working on more detailed verification protocols for each approved urban BMP
- Double counting issue

Urban Chesapeake Bay Watershed Model Refinements

- Finer characterization of pervious land categories (e.g., fertilized, non-fertilized, high risk, low risk, compacted, non-compacted)
- Better accounting for urban nitrogen sources at river basin segment scale (septics, stormwater, illicit discharges, other sources
- Improved urban stream erosion sediment dynamics
- Variability in pervious and impervious nutrient loads across the watershed
- Better tools to show local progress in load reductions over time
- Changes in CAST to reflect new urban BMP recommendations

For more information the presentation is available at
http://www.chesapeakebay.net/channel_files/18508/quarterly_-_tom_schueler.pdf

Questions and Discussion

- Kevin Sellner – What is meant by geographic specific flexibility?
    - Tom Schueler – A locality reports to the state the geographic coordinates of the BMP and the removal rate that it is supposed to achieve. Phase 5.3.2 will generate the load and capture the load reduction using that rate
    - Kevin Sellner – Would there need to be a different algorithm for each plot?
    - Gary Shenk – Yes, but the algorithms are simple reduction efficiencies
- Lewis Linker – When dealing with the retrofits, for example, going from a dry pond to a wet pond, is there also detailed information on the sediment that is removed from an initial design method? Could the retrofit sites be used to also get information about the amount of sediment that is trapped within the systems to better understand loads from urban areas?
    - Tom Schueler – Moving forward in verification of BMPs would require that type of information. There is a large interest in nutrient content of sediments across the urban landscape
- Tom Schueler – Many of the new stormwater performance standards require low impact development and runoff reduction practices that should over time reduce the amount of downstream bank erosion, but the current Watershed Model does not offer credit for it

- Tom Schueler – During the Urban Stormwater WG meeting on August 5th members will be expanding on a list of modeling recommendations and prioritizing the recommendations with the help of the Modeling Team

- Lee Currey – Has there been much discussion on the variability of the pervious surface?

    - Tom Schueler – There is constant debate from various states and local users. Rather than trying to come up with a loading rate and multiplying that by an efficiency, the panels are using an efficiency and a geographic address. Therefore, if the model should change in the future and have less loading rates, it won't change the scientific view of how the BMP is working

- Lee Currey – Has there been any thought about going back to a maximum implementable scenario for urban?

    - Tom Schueler – No, but that is a great idea. Currently there are a lot of BMP options and the states are not sure which ones will advance them in their targets

- Peter Wilcock – With the scalar reduction method there wouldn't be input about the soil type, slope, or other local properties?

    - Gary Shenk – It is a scalar reduction. The outcome is a reduction percentage based on the percent impervious, the size of the pond, and so on, but the loads are different for different areas. The loads should be driven by soil type, slope, and other local properties, but since monitoring data is collected in rather sparse locations it is mostly driven by monitoring data on a larger scale

- Mark Bennett – Most of the data that was used to calculate the urban loading rates is from the NPDS concentration information. Is it of concern that most of the urban erosion and stream bank records would be below where the concentrations are collected

    - Gary Shenk – There is a base loading rate that was based on EMCs from the Phase 1 stormwater national data set. Differences are estimated by differences in rain fall events and then it is calibrated to the regional factors of the watershed model. There were both in stream and out fall data there. The loads that were calculated using that data set fit very well with what SpaRRoW saw as the average load from urban land

- Gary Shenk – It is interesting to note that the only time the Modeling Workgroup has funded any watershed research is to answer the question: What are urban loads and how do different characteristics around the watershed change the loads?

From the data available, no conclusion was obtained. It is a difficult, but important question

- Ted Tesler – Pennsylvania is looking at advancing a flood plain restoration BMP related to mill ponds restoration (legacy sediments)

    - Tom Schueler – Franklin and Marshall members that are on the panel are working on legacy sediments and urban sediment transport

Solicitation for Jurisdictional Modeling Refinement Requests – Gary Shenk

Gary Shenk discussed the role of the Modeling Workgroup through the TMDL and WIP process and the evolving role of the Modeling Workgroup as CBP moves forward toward the 2017 Midpoint Assessment will be discussed. Initiating this new work will be a request to the Bay Program partners by the Water Quality Steering Committee (WQGIT) to compile a specific list of modeling refinement requests prior to a September face-to-face meeting of the WQGIT.

For more information the presentation is available at http://www.chesapeakebay.net/channel_files/18508/modqr_-_gary_shenk_-_role_of_the_modeling_workgroup_in_cbp_modeling.pdf

Slide 1: The groups outlined in orange are groups that are involved in modeling (STAC, Management Board, WQGIT, and STAR). Gary showed the way that these groups interact theoretically and described a more detailed interpretation, which also included individual partners, the CBPO Modeling Team, the Modeling Workgroup, and WQGIT and its workgroups.

Slide 2: This graphic shows Gary's interpretation of who controls the different parts of the modeling at CBP.

Slide 3: Open ended questions about the future role of the Modeling Workgroup

- How does the Modeling Workgroup decide between priorities?

- What is the appropriate division of responsibilities between the Modeling Workgroup and WQGIT in the Watershed Model and Scenario Builder?

- How should the Modeling Workgroup relate to STAR, WQGIT, Management Board, other groups?

Questions and Discussion

- Raleigh Hood – The complexity of the Watershed Model is driving the complexity of the organization

- Lee Currey – When the public has a concern with the "model," the concern is not necessarily talking about modeling. For example, if the concern is land use, that is an input to the model and not a model issue. This is not an issue that the Modeling Workgroup has control over, so therefore concerns with the Watershed Model could be completely handled by the WQGIT. Responsible parties must be identified and "modeling" concerns must be prioritized

- Lewis Linker – The WQGIT is an important group for modeling. It facilitates both technical and political aspects. The new chairs of the Modeling Workgroup, Lee Currey and Dave Montali, are both members of the WQGIT. As of now, the lines of communication are direct and effective between the Modeling Workgroup and the WQGIT. The question is: How will the Modeling Workgroup prioritize the different refinements that the partners suggest?

- Lee Currey – The role of the Modeling Workgroup should not only be to refine the model, but also to understand the model. For example, what is happening with the model and what is the interpretation of the outputs?

- Mark Bennett – There are many different workgroups in the WQGIT. How involved is the WQGIT in the activities of the WTWG? For example, STAR has many different workgroups that report to STAR, but the workgroups are working very independently throughout the CBP

    - Lee Currey –WQGIT is very involved in the workgroups activities. For example, the land use decisions for the Phase 5.2 Watershed Model.

    - Gary Shenk – Agreed, that the chain of command is strong in the WQGIT. Use Tom Schuler's presentation as an example. Panels send recommendations to the workgroups for comments and revisions, then the workgroups take the revised recommendations to the WQGIT, and this process continues on to the Management Board

- Kevin McIlhany – It is important to determine who is involved in the regulation

- Ted Tesler – With the TMDLs and the new pressures that CBP is facing, a reorganization may be necessary

    - Gary Shenk – This is a fairly new organization and the immediate objective is to clarify goals instead of reorganizing

James Chlorophyll Study – Arthur Butt

Arthur Butt discussed ongoing work in the multiyear study of chlorophyll in the tidal James River using augmented monitoring and modeling approaches

- Contracts are in place for both the modeling and monitoring

- Monitoring started in May and June

The study includes many different aspects

- Monitoring both the Microcystis algal blooms in the tidal fresh areas of the James as well as different blooms in the lower part of the James (particularly cochlodinium)
- Data flow from the mesohaline down to the oligohaline on a weekly/bi-weekly basis
- Bioassay and toxicity testing
- August – Sediment Oxygen Nutrient Exchange (SONE) studies to help with modeling component
- Phytoplankton pigmentation studies
- Feeding studies

Questions and Discussion

- Kevin Sellner – For this study, will the CH3D ICM Model be adapted or will another modeling be used?
    - Arthur Butt – VIMS is working on adapting the model to incorporate a different method for modeling shallow water habitat and developing new algorithms for species that are not currently represented in the USACE model
    - Kevin Sellner – The idea is that chlorophyll will be separated from the other pigments, so that this study can show that chlorophyll standards are being met and it is/is not dependent on the bloom species?
    - Arthur Butt – The chlorophyll criteria must still be met, but the goal of studying chlorophyll is to determine what portion of that chlorophyll is composed of what functional groups
- Lewis Linker – Using the Potomac Model and the 5 functional groups, is there any interest or need for using the pH and phosphorus component of the Potomac Model?
    - Arthur Butt – The SONE studies will be looking at linkages between the sediment, water column, and pH issues. It has not been identified as a trigger in the James, but it is something that needs to be studied
    - Kevin Sellner – If there are Microcystis blooms in the upper part of the James, the pH will be driven to sufficiently high levels to get flux of phosphorus and nitrogen in the sediments

- Arthur Butt – That is why this study includes averages from the tidal fresh areas as well. It has not been done in the past, so this is fairly "cutting-edge"

- Cathy – Are there continuous monitors for these studies or all fixed?

  - Arthur Butt – There are several continuous monitors. There is one in the polyhaline. There will be two in the Lafayette. Normal monitoring stations are located through the Bay mid-channel James stations network. Additional monitoring will be in the tidal fresh areas, but only one continuous monitoring at the VCU Rice Center

- Kevin Sellner – STAC would like to invite you to give a presentation at their next quarterly meeting. STAC will send an official presentation soon

A Chesapeake Watershed, Hydrodynamic, & Water Quality Model – Xin-Zhong Liang

Xin-Zhong Liang described the development of new integrated watershed, hydrodynamics and water quality models of the Chesapeake. He specifically discussed the Climate-Weather Research Forecasting (CWRF) Model.

The discussion included an summary of SWAT, CWRF physics options, weather forecasting and climate prediction modeling, CWRF climate predictions, a defense of a multiple model approach, CMAQ, PSWAT, CBFS, and how all of this could apply to CBP.

For more information the presentation is available at http://www.chesapeakebay.net/channel_files/18508/quarterly_-_xin-zhong_liang.pdf

Slide 4: Soil and Water Assessment Tool (SWAT) was initially designed for assessment and not for prediction. SWAT was originally chosen over HSPF because it had a larger more stable development group

Slide 7: CWRF Physics Options http://cwrf.umd.edu

Slide 8: Weather and climate prediction must both be considered. There are many physical properties that must be simulated. There is no perfect model for any system, but multiple models can be used to increase credibility of predictions

Slide 9: Simple physics such as the soil moisture of the top of a hill compared to the valley below have not been considered in most models even though it will greatly affect the amount of water being channeled. The CWRF uses high resolution scalable parameterization to capture these types of physical properties

Slide 15: Lower left hand corner = Observed data, Lower right hand corner = Combined MKF and MGR models

Slide 16: Why multiple models? The physics ensemble mean substantially increases the skill score over individual configurations, and there exists a large room to further enhance that skill through intelligent optimization

Questions and Discussion

- Kevin Sellner – Has CWRF used historical data from the Chesapeake Bay to predict/estimate the nutrients for the future years?
    - Xin-Zhong Liang – CWRF has not worked on this for the Chesapeake Bay, but 30 years of data was used to conduct this in the Mid-West. With some work it can also be done for the Chesapeake Bay
- Peter Wilcock – A challenge for HSPF (and also SWAT) is how to incorporate sub-grid scale information that is averaged. Also, if many processes are to be appropriately modeled it has to be an ever finer scale, which suggests that there is a limit to the predictability when using these methods of modeling. This suggests that CBP may need to find some new way to approach modeling in the Chesapeake Bay, so CWRF may not offer changes to the watershed model that would offer a step forward
    - Xin-Zhong Liang – First, the data provided for validation must be considered. There is no end to how fine the scale will become as more information is included in the model. In that regard, CWRF incorporates a 3D scalable parameterization. However, if a basin size scale is considered it may not be necessary
    - Peter Wilcock – At the smaller scales, it is not apparent that SWAT or PSWAT would be a step forward from the current HSPF model
    - Xin-Zhong Liang –SWAT is not necessarily better than HSPF. No matter which model is being used, the program can deliver some of the input information that is better, such as high quality precipitation prediction and nitrogen deposition. No matter switch watershed model is being used, this information is needed
- Gary Shenk – Reservoir operations is something that the current model struggles with. How was this information obtained for CWRF?
    - Xin-Zhong Liang – SWAT includes the whole nation's reservoir information, which includes individual reservoir histories. But currently UMD is working on a paper that will simulate based on the current information of the reservoir's volume, weather conditions, and demand in order to predict when and how much the levies will open. In that case, histories will not be necessary

Water Quality Sediment Transport Model (WQSTM) Test of Winds Influence on CB Anoxia – Ping Wang

Ping Wang presented an analysis using the Water Quality and Sediment Transport Model that examines the influence of prevailing winds on Chesapeake hypoxia.

For more information the presentation is available at http://www.chesapeakebay.net/channel_files/18508/quarterly_-_ping.pdf

Slide 3: The top graph shows the observed data from CB4 for DO with hourly measurements each day. The total depth was 11 meters and the data was collected at 9.4 meters. The purpose of the graph is to show variation in DO over a short time period. The bottom graph is a DNR monitoring station in the Lower Potomac

Slide 4: 8 m/s winds were simulated for 1 ¾ days starting at hour 5 for August 10th, 1996. Outside of that time period, a no wind scenario was simulated.

Slide 5: Top right graph = Same graph as slide 4. Top right graph = Oct 30th, 1996 with a wind speed of 6 m/s (shows seasonal differences). Lower left graph = Wind speed of 2 m/s on August 10th. Lower right graph = Observed wind speed with forced direction

Slide 6: Shows the locations of the different cross sections used in the testing

Slide 7: The top graph shows the bottom DO along the channel for August 10th, 1996 at the end of imposed wind. The bottom graph shows ds/dZ.

Slide 9: This is a snapshot of the cross section of natural circulation effect (top picture). The other pictures are to compare with different wind directions. This is a complicated analysis that is difficult to capture with one snapshot.

Slide 10: The picture on the right is showing the effect of wind. This is a current speed of 10 m/s and wind speed of 8 m/s. The model results use an average. The top left graph shows surface flow speed (N/S) and the bottom left graph shows surface flow speed (E/W).

Slide 11, 13 – 14, 16 – 17: Shows salinity variations for a cross section by wind direction

Slide 12, 15: Shows DO variations for a cross section by wind direction

Questions and Discussion

Ping Wang and Harry Wang are currently working on a paper that will discuss these results in detail.