



A Water & Energy  
Community of  
Practice

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# WATERNET NETWORKING: A COMMUNITY OF PRACTICE IN ACTION

## WaterNet presentation to Danubian Countries

24th Conference of the Danubian Countries on Hydrologic Forecasting and Basis of Water Management in Bled

*Dr. Dave Matthews, Director, Hydromet DSS, LLC*

### Slovenia 2-4 June 2008

A WaterNet paper was presented showing applications from GLDAS in the Danubian Basin including daily SWE, QPE, Runoff, and Soil Moisture; and invited members of the Danubian research and water management decision-making community joined the WaterNet Community of Practice and partner in developing a European Candidate Solution Report. Over 220 representatives from 21 countries from Germany in the headwaters to Bulgaria at the mouth of the Danube including the UK and US participated in the meetings (CDCHFBWM). Many university students and professors, research and management agencies presented papers on topics from climate change impacts on the Danube to flash flood prediction, drought forecasting, and ecological aspects of Danube flows. Many of these topics fell into the 12 National Applications themes of NASA.

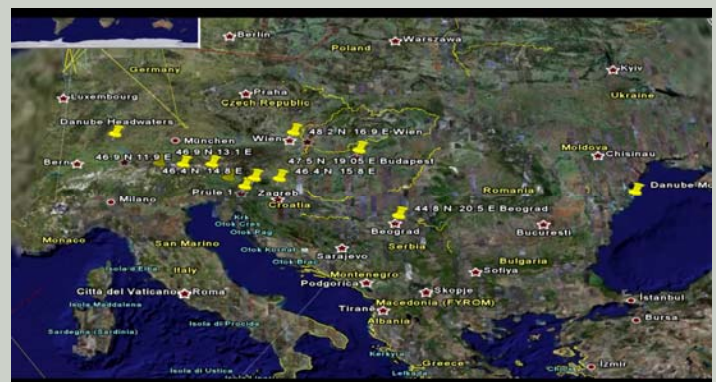
The paper entitled "WaterNet: the NASA water cycle solutions network – Danubian Regional Applications" by Matthews, Brilly, Kobold, Zagar, and Houser reviewed the philosophy behind WaterNet and NASA's solutions networks, and then presented results from GLDAS over the region focusing on the Alps, Carpathian Mountains and Hungarian Plain, and the mountains of Montenegro.

Results from the Weather Research Forecasting (WRF) model simulations of the 18 September 2007 flash flood in Slovenia were compared with GLDAS and observations

indicating the need for high resolution GLDAS modeling.

The value of GLDAS soil moisture analyses for drought monitoring was demonstrated. This 15 page paper is available on the conference proceedings CD, from the FGG, University of Ljubljana and on-line in Topic 6: Development.

New potential collaborators for WaterNet include the Croatian Meteorological and Hydrological Service (DHMZ), Zagreb; University of Natural Resources and Applied Life Sciences(BOKU), Vienna; Bavarian Environmental Agency (BEA), Munich; University of Belgrade, Serbia; VITAKU Consult, Hungary; Academy of Sciences and Arts of Vojvodina (VANU), Serbia; Ukrainian Hydrometeorological Research Institute (HRI), Kiev; Research Institute for Fisheries, Aquaculture and Irrigation, Hungary; University of Worcester (ASGA), UK.



See: [http://ksh.fgg.uni-lj.si/bled2008/cd\\_2008/index.htm](http://ksh.fgg.uni-lj.si/bled2008/cd_2008/index.htm) and

<http://hydrometdss.org/>

with photos of the conference at:

[http://www.damatthews.org/index.php?option=com\\_expose&Itemid=26](http://www.damatthews.org/index.php?option=com_expose&Itemid=26)

under Professional Activities

## SAHRA and the Salt River Project

*Hoshin Gupta, Professor, Department of Hydrology and Water Resources, University of Arizona.*

*Viviana López-Burgos, Graduate Student, University of Arizona*

*Seshadri Rajagopal, Graduate Student, University of Arizona*

*Guillermo Martínez, Graduate Student, University of Arizona*

The NSF water center SAHRA (Sustainability of semi-Arid Hydrology and Riparian Areas, University of Arizona) is partnering with the Salt River Project, a water and energy supplier in the lower Colorado River Basin, to improve the management of water reservoirs in the Salt and Verde River in Phoenix, Arizona by incorporating physically based distributed models and remote sensing observations into their DST's and planning tools (Figure 1). A candidate solution report is being prepared to describe how distributed land surface models coupled with snow cover remote sensing data and ground surface measurements can be used to improve streamflow forecast and study impacts of climate change. Other solutions being explored include the use of remote sensing products to assess sedimentation rates affecting reservoirs and predominant soil moisture conditions for forecast purposes. This set of solutions seeks to increase the knowledge base to manage reservoirs and groundwater resources in a region affected by a long term drought since 1995. These candidate solutions will be applicable and relevant for other water utility companies facing the challenges of climate change and decreasing water resources.

## Assimilation of GRACE data into the Chesapeake Bay Watershed Model for Improved Representation of Groundwater Storage

*Alimatou Seck, Graduate Research Assistant, Dept. of Civil and Environmental Engineering, University of Maryland Baltimore County (UMBC)*

*Claire Welty, Professor of Civil and Environmental Engineering, UMBC*

The Chesapeake Bay watershed is 64,000 mi<sup>2</sup> (166,000 km<sup>2</sup>) in area and includes parts of New York, Pennsylvania, West Virginia, Virginia, Delaware, Maryland and the District of Columbia. Nearly 16 million people live in the watershed. Nutrients and sediment transported to the Bay are major pollutants. As the use of the land has changed and the watershed's population has grown, the amount of nutrients and sediment entering the Bay has increased tremendously. Since 1982, watershed models have been developed as management tools, in order to better understand the pollution processes and test the effects of current and prospective management actions to reduce pollution. These management actions are principally land management measures and are setting Total Maximum Daily Loads for the watershed tributaries.

A study conducted by the U.S Geological Survey in 1999 suggests that groundwater contributes more than 50% to the total annual flow of streams in the Chesapeake Bay with a range of 16 to 92%, depending on the streams considered (Phillips et al., 1999). According to that study, 48% of the nitrogen load of streams entering the Bay is from groundwater. Groundwater also contributes to river flow or the amount of fresh water flowing from rivers and streams into the Bay. The amount that reaches freshwater tributaries can affect salinity, dissolved oxygen and other aspects of water quality at a substantial level. Additionally, groundwater is used as a drinking water supply by many communities throughout the watershed and water quality is of a great concern in the region. Contamination of that resource can be problematic for those communities.

The Chesapeake Bay Community Phase 5 watershed model, developed by the U.S. Environmental Protection Agency, is the most recent version of the HSPF-based model that is used as a Decision Support Tool (DST) to simulate the river flows and associated transport and fate of nutrients and sediments (USEPA, 2007). We believe that the GRACE data set has the potential of improving current estimates of groundwater storage in this model.

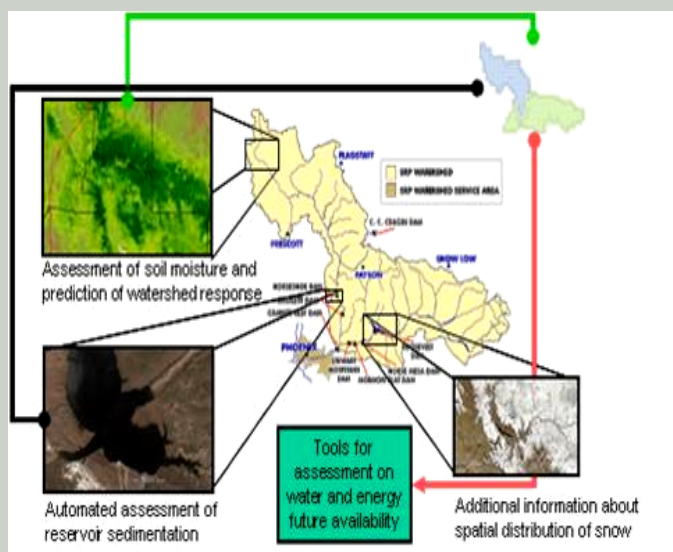


Figure 1: Integration of information through physically based distributed models

The Gravity Recovery and Climate Experiment (GRACE) data set will be used to provide a solution for improvement of the Chesapeake Bay Watershed Model (CBWM). In order to better represent groundwater storage in the watershed model, GRACE data will be used as a calibration target for groundwater storage in the CBWM. This solution is in alignment with the EPA Chesapeake Bay Program modeling efforts to provide an improved understanding of hydrologic and water quality processes within the Chesapeake Bay watershed. This candidate solution will benefit society by improving water quality models that will enhance decision-making strategies related to land management and setting TMDLs (Total Maximum Daily Loads) for Chesapeake Bay tributaries.

### NASA Research Results

The Gravity Recovery and Climate Experiment (GRACE) is a mission jointly launched by NASA and the German Aerospace Research Establishment (DLR). Various studies have explored the potential of GRACE for providing groundwater data in different regions and at different scales (e.g. Rodell et al., 2007); Strassberg et al., 2007; Yamamoto et al., 2007; Yeh et al., 2006).

To corroborate the GRACE data, field groundwater measurements from the USGS National Water Information System (NWIS) will be used. GRACE data can be compared to water level elevation changes scaled by the specific yield of the aquifer. Figure 1 shows wells distribution throughout the CBW.

This solution provides the opportunity to quantify groundwater storage characteristics throughout the Chesapeake Bay Watershed and implement its variations in the model. Improvement of groundwater representation is one of the recurrent comments that has been made by the Chesapeake Bay Watershed Phase 5 Model review committee (Band et al., 2008); utilization of GRACE data is one step toward addressing this comment. This solution presents the advantage of being usable in the current version of the model, with minor manipulations.

The information it can provide about groundwater contribution to the water budget could be a valuable step towards the improvement of this community budget and thus more accurate pollution simulations for use in decision making.

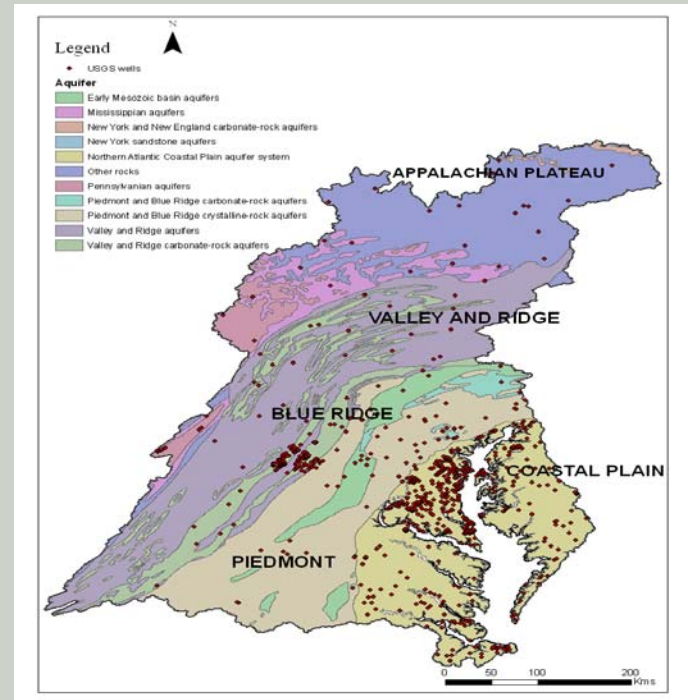


Figure 1. Chesapeake Bay watershed physiographic provinces and USGS wells monitored during 2002-2006.

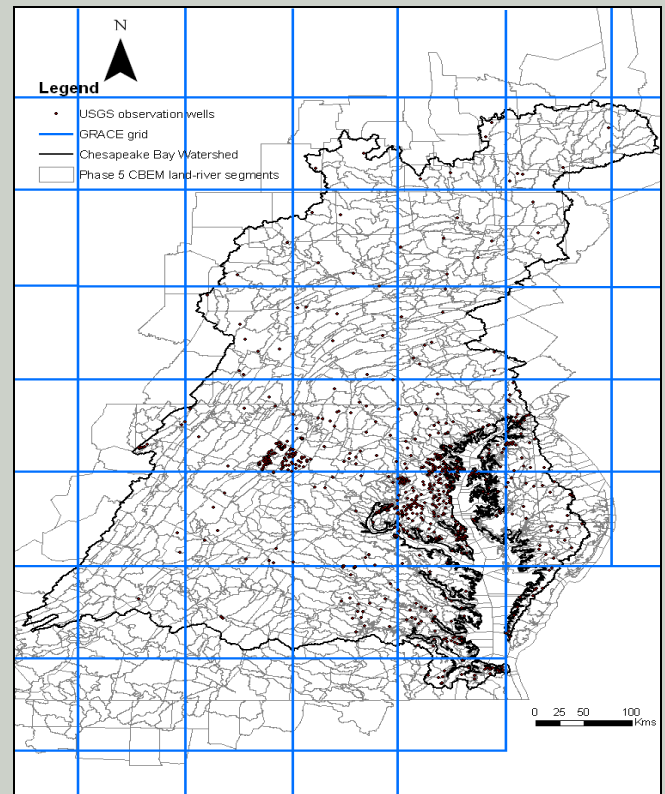


Figure 2. Chesapeake Bay Watershed Management segmentation and GRACE 1 degree grid.



## Acronyms and References

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BEA	Bavarian Environmental Agency	HSPF	Hydrological Simulation Program
CBW	Chesapeake Bay Watershed	NASA	National Aeronautics and Space Administration
CBWM	Chesapeake Bay Watershed Model	NWIS	National Water Information System
CDCHFBWM	Conference of the Danubian Countries on the Hydrological Forecasting and Hydrological Bases of Water Management	NSF	National Science Foundation
DST	Decision Support Tool	QPE	Quantitative Precipitation Estimation
EPA	Environmental Protection Agency	SAHRA	Sustainability of semi-Arid Hydrology and Riparian Areas
EU	European Union	SRP	Salt River Project
GLDAS	Global Land Data Assimilation System	SWE	Snow Water Equivalent
GRACE	Gravity Recovery and Climate Experiment	TMDLs	Total Maximum Daily Loads
HMT	Hydrometeorological Testbed	USGS	U.S Geological Survey
HRI	Hydrometeorological Research Institute	WRF	Weather Research Forecasting

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