

Sunday, May 21

Ice Breaker (Wine, Beer and Hors D'oeuvres, Green Center Lobby, 5:30 PM – 7:00 PM)

**2017 GSA Birdsall-Dreiss Distinguished Lecturer
Ed Harvey – U.S. National Park Service
Water Resource Stewardship in the U.S. National Park Service
Metals Hall, 7:00 PM – 8:00 PM**

Monday, May 22

Time	Metals Hall	Petroleum Hall
8:00	Welcome and Opening Address	Opening in Metals Hall
	Featured Presentation	Featured Presentation in Metals Hall
8:05	Rich Niswonger Modeling water supply effects on the distribution and consumption of water in developed river basins	
	Simulating the Agricultural-Groundwater Connection I Chaired by: Nick Engdahl and Mary Hill	Contaminant Transport Modeling: Developments and Case Studies I Chaired by: Motomu Ibaraki and Al Valocchi
8:30	<u>John Ewing</u> , M. Jigmond Stream-Aquifer Interaction in a Regional Alluvium Aquifer	<u>Scott Hansen</u> , B. Berkowitz, D. Burnell Aurora: a partner package for MODFLOW that enables non-Fickian transport modeling of real aquifers
8:46	<u>E. Triana</u> , <u>Chris Garner</u> , G. Pohill, R. Carroll A Custom Modeling Tool to Support Evaluation of the Agriculture-Groundwater Connection	<u>Nathan Young</u> , W. Simpkins, R. Horton, R. McLaren, R. Therrien Linking FracMan and HydroGeoSphere to simulate watershed-scale nitrate transport in fractured till
9:02	<u>Randall Hanson</u> , A.B. Ritchie, S.E. Boyce, A. Galanter, W Henson Examples of Integrated Modeling of Agricultural Conjunctive-Use from the Lower Rio Grande Valley, New Mexico and Texas to the Salinas Valley, California	<u>Cheng Cheng</u> , J. Sigda, W. Linderfelt, F. Shean, E. Marcillo Embracing Hydrogeologic Uncertainty: Rapid Robustness Assessment of the Capture Well System for the EDB Plume from the Kirtland Air Force Base Fuel Release Using Analytic Element Modeling
9:18	<u>Eric Morway</u> R Niswonger, E Triana Improving simulation and understanding of third-party impacts resulting from water-right transfers	<u>Zachary Stanko</u> , T. Nishikawa, S. Paulinski Short-Term, Large-Scale Multi-Objective Optimization for Water-Resources Management, Santa Barbara, CA
9:34	S Frey, M Callaghan, H-T Hwang, Y-J Park, R McConnell, S Berg, <u>E Sudicky</u> River Basin-scale Integrated Surface-Subsurface Hydrologic Modeling to Support Agricultural Risk Management	<u>M. Takeda</u> , <u>E.J. Wexler</u> , P.J. Thompson, J.D.C. Kassenaar Characterization of Seasonal Thermal Plume Migration from a Below-Water-Table Aggregate Extraction Operation
9:50	Coffee Break	
	Featured Presentation	Featured Presentation in Metals Hall
10:10	Chris Green Forecasting Nitrate in Agricultural Groundwater	
10:30	Dave Benson Eliminating the Scale Effect from Reactive Transport: Particle-Tracking Simulation of Batch- to Field-Scale Bioremediation Experiments at Schoolcraft, MI Site	
	Simulating the Agriculture-Groundwater Connection II Chaired by: Nick Engdahl and Mary Hill	Contaminant Transport Modeling: Developments and Case Studies II Chaired by: Motomu Ibaraki and Al Valocchi
10:55	<u>Claudia Faunt</u> , J. Traum Simulating Water Availability and Sustainability in California's Central Valley	<u>Daniel Burnell</u> , S. Hansen, J. Xu, C. Faust A Practical Modeling Framework for Non-Fickian Transport and First-Order Reaction
11:11	D. Abrams, <u>Henk Haitjema</u> How Watershed Characteristics Affect Transit Time Distributions	<u>Christopher Shultz</u> , T. Gates, R. Bailey Using MODFLOW and a Coupled RT3D-OTIS Model to Simulate Best Management Practices for Water Quality Improvement in an Irrigated Agricultural River Valley

Monday, May 22 continued				
11:27	<u>Michael Fiene</u> , P. Juckem, M. Parsen, M. Gotkowitz, S. Ebel, D. Masterpole	Imagining a maximum future irrigation footprint to evaluate water resources in a Wisconsin County	<u>Ahmed Ali</u> , T. Ginn, T. Le Borgne	Upscaling the equilibrium reactions in the fractal radial domains
11:43	<u>Rosemary Carroll</u> , G. Pohll, J. Benedict, R. Felling	Legal and Hydrologic Considerations to Curtail Agricultural Pumping during Extended Drought	C. Rivera Villarreyes, F. Cornaton, <u>V. Clausnitzer</u>	Partial ages: defining domain specific residence time distributions
12:00	Lunch - Friedhoff Hall			
12:40	Lunch Keynote – Friedhoff Hall Dave Gochis Operational Forecasting of the Nation's Surface Water Systems in the NOAA National Water Model/WRF-Hydro Modeling System			
	Featured Presentation		Featured Presentation in Metals Hall	
1:15	Alexis Navarre-Sitchler Physical Heterogeneity Controls on Geochemical Reaction Rates: Insights from Reactive Transport Models			
1:35	Nick Engdahl When Do We Really Need to be Modeling Transience? Examples from Residence Time Distributions and Solute Transport			
	Parameterization, Sensitivity Analysis, and Uncertainty I Chaired by: Chunmiao Zheng and Charles Andrews		Case Studies of Depleted Aquifers I Chaired by: Chris Green and Sorab Panday	
2:00	<u>Ramarao Banda</u> , V.A. Kelley, M. Lavenue	Capture Functions in a Coupled Surface Water-Groundwater Model Using MODFLOW-ADJOINT Code	<u>Tracie Jackson</u> , K. Halford	Evaluating Potential Groundwater Pumping Effects in Pahrump Valley on Water Resources in the Amargosa Wild and Scenic River, Nevada and California
2:16	<u>Jeremy White</u>	The Ensemble Smoother: Jacobians for nothing and uncertainty for free	<u>Linda Woolfenden</u> , J. Densmore	Assessment of management strategies to help mitigate aquifer depletion and subsidence in the Bicycle Basin, Fort Irwin National Training Center, California
2:32	<u>Killian Miller</u> , Y-J. Park, S. Berg, E. Sudicky	Efficient Quantification of Uncertainty in Integrated Surface and Subsurface Hydrologic Simulations	<u>Alastair Black</u>	Case study: Surface-Groundwater modelling to guide the revocation or reduction of abstraction licences in the UKs primary Sandstone aquifer
2:48	<u>Phil Hayes</u> , C. Nicol, V. Puech	Data drought to data surplus – the value of traditional groundwater data sets and extensive hydrogeophysics to make model predictions including uncertainty	<u>James Schneider</u> , D. Ahlfeld, C. Spalding, B. Dunnigan	Addressing non-linear model response in the application of the Republican River Compact groundwater model to estimate relative contributions to streamflow depletion in a highly stressed aquifer
3:04	Coffee Break			
	Featured Presentation		Featured Presentation in Metals Hall	
3:24	Otto Strack Vertically integrated flow for complex aquifer systems as a modeling tool			
3:44	Henk Haitjema Horizontal Flow Models that are not			
	The Analytic Element Method: Developments and Applications Chaired by: Henk Haitjema and Otto Strack		Case Studies of Depleted Aquifers II Chaired by: Chris Green and Sorab Panday	
4:09	<u>Charles McLane</u> , M. Kauffman, M. Moore, T. Pryshlak	AEM Modeling to Support Site Conceptual Model Development and Remediation	T. Griffiths, S. Kudlas, N. Jones, <u>A. Lemon</u>	Implementation of the Subsidence and Aquifer-System Compaction Package to Model Land Subsidence in Virginia's Chesapeake Bay Area Using a Hydrogeologic-Unit Flow Based SEAWAT Model
4:25	<u>Charlie Fitts</u>	Modeling Vertical Leakage and Storage Changes with Spatially-Variably Area Sinks	<u>Alan Lemon</u> , N. Jones, S. Kudlas, T. Griffiths, H. Tran	Living Groundwater Models: Case Study for a Continually Updated Groundwater Models
4:41	<u>Jacob Fullerton</u> , N. Jones, M. Bakker	Analytic Element Modeling on the Cloud: Tethys and TimML	<u>Sophie Sigstedt</u>	Conjunctive Use Analysis with the Enhanced Snake Plain Aquifer Model (ESPAM)
5:00	SOFTWARE DEMOS & POSTERS Wine Beer and Hors D'oeuvres - Friedhoff Hall			

Poster Session
Monday, May 22, 5:00 – 7:00 PM

<u>Natural and Managed Aquifer Recharge</u>	
1. David Bean, J. Parker, M. Anderson	Water Banking on the Kern River Alluvial Fan
2. Alastair Black, M. Lagi	Surface Water Accounting Model, SWAcMOD. A MODFLOW-USG Pre Processor for recharge and surface water systems
3. Alan Laase	Estimating Evapotranspiration and Recharge Rates Using a Remote Sensing Algorithm
4. Aaron Pruitt, P. Bannister, T. Flynn	Solving the Water Supply Puzzle: MODFLOW and Uncertainty in the Context of Mitigated Water Rights
<u>Case Studies of Depleted Aquifers</u>	
5. Jacob Bauer	Equation for Stream Accretion Timing from a Line Source Oriented Perpendicular to a Stream
6. Charles Heywood, M. Lindaman, J. Lovelace	Simulations supporting management of saltwater movement in the aquifers of the Baton Rouge area, Louisiana
7. Thomas Mack	Post-Assessment and Upgrade of a Groundwater Flow Model of the Seacoast Bedrock Aquifer, New Hampshire
8. Madeline Nyblade, T. Russo, L. Zikatanov, K. Zipp	Numerical Modeling of the agricultural-hydrologic system in Punjab, India
9. Hai Pham, F. T.-C. Tsai, K. Pohlman	Grid generation and model calibration for complex fluvial aquifer system including geological faults
10. Andrew Rich	Future Baseline Modeling for the Sustainable Groundwater Management Act: Prediction Uncertainty Resulting from Uncertainty in Climate Change and Land Use Change
<u>Past, Present, and Future of Mining and Groundwater</u>	
11. Seann McClure, P. Bannister	Groundwater Modeling to Support Wetland Restoration of a Former Peat Mine
12. Will Minchin, S. Brown	Use of MODFLOW-USG and Connected Linear Networks (CLN) to represent Deformation and Fracturing above a Longwall Mine
13. Christopher Pantano, D. Edington, G Meza-Cuadra	Bridging the gap: Coupling of geotechnical and groundwater models in the mining industry
<u>Past, Present, and Future of MODFLOW</u>	
14. Ned Banta	Upgrading Your Model to MODFLOW 6
15. Sahila Beegum, J. Šimůnek, A. Szymkiewicz, K. P. Sudheer, I. M. Nambi	Integration of Solute Transport and Water Flow Models for Unsaturated and Saturated Soil Zones using the HYDRUS Package for MODFLOW and MT3DMS
16. Steffen Mehl, H. Morel-Seytoux, C. Miller	Rescaling Riverbed Conductance to Improve Approximations of Stream/Aquifer Leakage
17. Azucena Rodriguez Yebra, A. Hughes, A. Butle, D. Peach, C. Jackson	Generation of Source Reliable Output diagrams of Adited Groundwater Sources using models: An example from the UK
18. William Witterick, T. Lewis, R. Soley, T. Power, M. Sumbler	Borehole-scale simulations from a regional groundwater model using Connected Linear Networks and Ghost Node Correction

Poster Session continued
Monday, May 22, 5:00 – 7:00 PM

<u>Parameterization, Sensitivity Analysis, and Uncertainty</u>	
19. Daniel Abrams, G. S. Roadcap	Tools for the hands-on MODFLOW modeler
20. Martinus Brouwers, P. Martin, D. Abbey	Modelling Uncertainty Analysis for Contaminant Risk Assessment
21. Linzy Foster, J. White	Quantifying predictive uncertainty of groundwater/surface-water exchange in the lower San Antonio River basin, Texas
22. Eve Kuniansky, J. Bellino, K. Halford	Use of transmissivity observations with MODFLOW and PEST: Application to the Floridan Aquifer System
23. Andrew Leaf, R.J. Hunt, D.E. Christiansen, A.E. Haj	Promise and peril of calibrating a high resolution gridded regional watershed model
24. Tung Nguyen, J. C. Adam	Soil and geologic controls on recharge and groundwater flow response to climate change: A case study of the Yakima River Basin
25. Philip Nienhuis, P. Kamps	Generating initial fresh/saline groundwater distributions for a 3D Modflow SWI model using 2D cross-sectional Seawat model as proxy
26. Anna Ryken, R. Maxwell, D. Gochis, K. Williams	Identifying Controls on Carbon Exchanges in High Altitude Headwaters to Improve Representation in Earth System Models
27. Jeremy White	PESTPP-OPT: model-independent groundwater-management optimization under uncertainty
28. William Wingle	ZoneTable Plug-In for FEFLOW
29. William Wingle	Automated Transient Element Activation Plug-In for FEFLOW
<u>Using Models to Identify Data Needs and Guide Data Acquisition</u>	
30. S.M. Helalur Rashid, J. Ewing, T. Jones, G. Ruskauff	Importance of Characterizing River-aquifer Interaction in Building Groundwater Flow and Transport Model
<u>Simulation Code Verification, Benchmarking, and Intercomparisons</u>	
31. David Moulton, E. Siirila-Woodburn, D. Dwivedi, C. Steefel, D. Svyatskiy, R. Maxwell, L. Condon	Integrated Hydrology Model Intercomparison using High-Resolution Data at the East River Colorado
32. Chris Nicol	Benchmarking and Inter-comparison of MODFLOW-USG's Block Centred Transport (BCT) Package
33. Kurt Zeiler, J. Weaver, A. Moore, M. Halstead	Application of the Partition Stress Boundary Capability with MODFLOW-NWT in a Large-Scale Regional Groundwater Flow Model

Software Demonstration Session

Monday, May 22, 5:00 – 7:00 PM

1. **PEST.cloud** by Doug Hayes (S.S. Papadopoulos & Assoc., Inc.)

PEST.cloud is a service developed by S.S. Papadopoulos and Watermark Numerical to facilitate the use of PEST in the cloud. It makes it easy for users to quickly and confidently calibrate their models in the Microsoft Azure Cloud. Users simply register, package their model and all supporting files in a ZIP file, and then follow the instructions to upload this package, choose the number of compute nodes, and deploy. While PEST is executing, users can monitor its progress by reviewing output files, like the REC. Once the calibration is complete (or the pre-authorized maximum cost is consumed) the results can be downloaded. Users can interrupt and cancel PEST.cloud processes as needed.

2. **GroundWater Desktop** by Marinko Karanovic (S.S. Papadopoulos & Assoc., Inc.)

GroundWater Desktop (GWD) is a program for visualizing and analyzing environmental data and groundwater models in two or three-dimensions. Originally, GWD was developed to visualize input and output from MODFLOW and related programs (MODPATH, MT3D) including the latest unstructured grid capabilities encompassed within MODFLOW-USG. Recently it was advanced to include KT3D_H2O and BIOSCREEN.

KT3D_H2O is a tool developed for advanced kriging of water level data and chemistry in 2D and 3D, including capture analysis. KT3D_H2O was developed especially for hydrogeological evaluations - it includes several hydrologic drift terms to incorporate the effects of pumping wells and streams etc.

GWD includes an enhanced version of the EPA screening-level solute transport model BIOSCREEN, called BIOSCREEN-AT. Enhancements include the use of an exact analytical solution, 2D and 3D simulations, and multiple sources with different inflow concentrations.

3. **AnAqSim (Analytic Aquifer Simulator)** by Charlie Fitts (Fitts Geosolutions)

Flow modeling software for a range of needs from the simplest 2D capture zone simulation to moderately complex 3D and transient simulations. It employs the analytic element method (AEM) in a unique way that allows fully transient modeling, multi-level aquifer systems, anisotropy, fresh-salt interface aquifers, and a full suite of line boundary types. Most key head or discharge inputs can be transient. The layering scheme can vary from one part of model to another (e.g. 4 levels in the area of interest, transitioning to a single layer in the far-field). The seamless user interface allows easy and intuitive input and a wealth of plot and analysis tools.

4. **ModelMuse, StreamExtractor, ModelArchiver** by Richard B. Winston (U.S. Geological Survey)

ModelMuse: A public-domain graphical user interface for MODFLOW, SUTRA, and PHAST.

StreamExtractor: Program to extract stream networks from digital elevation models.

ModelArchiver: Program to help create model archives of USGS models.

5. **FEFLOW** by Volker Clausnitzer (DHI WASY GmbH)

FEFLOW is widely recognized as one of the most comprehensive software packages for subsurface flow and transport simulation. FEFLOW's unique mesh (structured and unstructured) provides the highest degree of flexibility in all modelling processes at different contexts. The software is used by leading research institutes, universities, consulting firms and government organisations all over the world. FEFLOW's scope of application ranges from simple local scale to complex large scale modelling. Application areas include water management, mine water, saltwater intrusion, geothermal energy, and variably saturated media.

In this short software demonstrations you will get the chance to see the latest FEFLOW developments, discuss closely with member of the FEFLOW team, as well as see our new graphical capabilities for including virtual reality in the context of groundwater modelling.

6. **Groundwater Vistas** by James Rumbaugh (Environmental Simulations, Inc.)

Groundwater Vistas Version 7 is being released around the time of the conference. This software demonstration will illustrate the new model versions supported and new features added to this latest release.

7. **LAKE3D, ZoneTable and other FEFLOW Plug-Ins** by Bill Wingle (AquaGeo)

AquaGeo has developed an integrated set of plug-ins to extend FEFLOW. LAKE3D facilitates the simulation of lakes in 3D FEFLOW models. ZoneTable simplifies the setup and editing of material properties, and allows import of contacts of hydrogeologic units allowing efficient configuration of complex models. Other FEFLOW plug-ins to be demonstrated include: (1) complex transient scheduling of element activation/deactivation and specified-head boundary conditions, which can be used, for example, to simulate transient filling of a tailings impoundment, and (2) extraction of certain computed information like water levels and budgets.

Software Demonstration Session Continued

Monday, May 22, 5:00 – 7:00 PM

8. HydrogeoCloud 3D Groundwater Modeling by Benny Bian (China International Center for Groundwater Modeling)

HydrogeoCloud 3D Groundwater Modeling is a groundwater modeling platform. It takes advantage of the latest technology advancements of cloud computing and big data processing. The platform provides services of wrapping traditional software modules such as MODFLOW code from USGS into a standard cloud API and links it to hydrogeological domain data. Data processing steps are connected to form a computing workflow. It manages links between data and tooling, and handles computing resources allocation in the cloud environment. The computing workflow engine in HydrogeoCloud automatically produces provenance for all data processing steps. Furthermore, the platform can be used as a research platform to easily explore different algorithms in a workflow and as a project collaboration platform by sharing data and project in cloud.

9. MMA U.S.G.S. Program for Multi-Model Analysis by Judith Schenk (Colorado School of Mines)

The U.S.G.S. Multi-Model Analysis (MMA) computer code is used to evaluate results from alternative models of a single system, rank models, calculate posterior model probabilities, and model-average predictions for a set of models calibrated with the same observation data. Default Information Criteria (IC) equations from both a frequentist origin (AIC, AICc) and a Bayesian origin (BIC, KIC) are included in MMA. MMA provides flexibility for a user to define an IC equation that is not in the basic set of IC equations. MMA can be used for multi-model analysis in any scientific discipline. The demo focuses on the practical application of MMA for a set of different groundwater models calibrated to the same observation data using UCODE_2014. The demo presents how to set up required input files, run MMA, and interpret MMA output. A practical spreadsheet file with MMA output information is provided via a handout that summarizes the demonstration and provides a link to the files.

10. GFLOW by Henk M Haitjema (Haitjema Consulting, Inc.)

GFLOW is a single layer Dupuit-Forchheimer model based on the analytic element method. It supports conjunctive surface water and groundwater solutions and features a MODFLOW model extract option to import the GFLOW model into MODFLOW

11. FREEWAT by Laura Foglia (UC Davis)

FREEWAT (www.freewat.eu) is an open source and public domain GIS integrated modelling environment for simulation of water quantity and quality in surface water and groundwater with an integrated water management and planning module. FREEWAT aims at promoting water resource management by simplifying the application of the Water Framework Directive and related Directives. Specific objectives of the project are: to coordinate previous EU and national funded research to integrate existing software modules for water management in a single environment into the GIS based FREEWAT and to support the FREEWAT application in an innovative participatory approach gathering technical staff and relevant stakeholders (policy and decision makers) in designing scenarios for application of water policies. The open source characteristics of the platform allow to consider this an initiative "ad includendum", as further institutions or developers may contribute to development. The platform currently includes specific modules for: 1) water management and planning to help managing and aggregating the distributed data coming from simulation scenarios; 2) calibration, uncertainty and sensitivity analysis; 3) solute transport in unsaturated zone; 4) crop growth and water requirements in agriculture; 4) tools for groundwater quality issues; 5) tools for analysis, interpretation and visualization of time series and hydrogeological data.

Tuesday, May 23

Time	Metals Hall		Petroleum Hall	
8:00	Opening Comments		Opening in Metals Hall	
	Featured Presentation		Featured Presentation in Metals Hall	
8:05	Nicole DeNovio Droughts, Floods, and Groundwater Management, Oh My!			
	<u>Unconventional Applications of Groundwater Models I</u> Chaired by: Suzanne Pierce and Dave Benson		<u>Effective Presentation of Modeling Results</u> Chaired by: Alexis Navarre-Sitchler and Reed Maxwell	
8:30	<u>Randy Hunt</u> , D. Feinstein, W. Selbig	Beyond hydrology: Application and uncertainty analysis of watershed heat transport	<u>Keith Halford</u>	Complex Models Require Looking and Comparing
8:46	<u>Scott Painter</u> , A. Jan, E.T. Coon	Using fine-scale simulations to develop subgrid representations of microtopography effects in integrated hydrology models	<u>Sophia Lee</u> , B. Bader	Difficulties in Modeling Systems with Extreme Climate Records: Is a Model of a Groundwater System During a Drought Unrepresentative or Conservative?
9:02	<u>William Hutchings</u>	Perspectives on the Potential Migration of Fluids Associated with Hydraulic Fracturing in Southwest Florida	<u>Rishi Parashar</u> , D.M. Reeves	Generalized Responses of Fractured Rock Aquifers to Pumping and Episodic Recharge
9:18	<u>Pytrik Graafstra</u> , T. Janse, F. Smits, J. Beemster, J. Stoffels, E. Bekking, A. Visser, I. van Wielink	Incorporating insights from time series analysis in groundwater model calibration for the urban area of Amsterdam	<u>Brian Clark</u>	The use of non-groundwater software in visualization and presentation of groundwater-flow modeling studies
9:34	<u>Shawn Leppert</u> , A. Wunsch, R. Farnsworth	Conceptual Model Simulation for the Establishment of Remedial System Performance Criteria	<u>Blythe Reiha</u>	Beyond the Model: Communicating Results to the Decision Maker
9:50	Coffee Break			
	Featured Presentation		Featured Presentation in Metals Hall	
10:10	Suzanne Pierce Interactive and Intelligent Decision Support for Groundwater Systems: Delivering data, models, dashboards and cyberinfrastructure to facilitate adaptive response			
10:30	Stefan Kollet Groundwater-to-atmosphere simulations over the European continent including human water use			
	<u>Unconventional Applications of Groundwater Models II</u> Chaired by: Suzanne Pierce and Dave Benson		<u>Advancements in Data Discovery, Retrieval, and Visualization</u> Chaired by: Nicole DeNovio and Rich Niswonger	
10:56	<u>Peter Vermeulen</u> , B. Minnema, J. Verkaik, J. Hughes	Large scale high resolution modelling	<u>Benny Bian</u> , W. Li	HydrogeoCloud 3D Groundwater Modeling, A Cloud Computing Hydrogeology Application
11:12	<u>Mary Michael Forrester</u> , R. Maxwell, L. Bearup, D. Gochis, A. Porter	The role of hydrology in meteorological modeling: A case study on insect-induced forest disturbance and its feedbacks from groundwater to atmosphere	<u>Louis-Charles Boutin</u> , M. Claprood, G. MacMillan, M. Brewster, A. Walter	Canada's Oil Sands Innovation Alliance Regional Groundwater Solutions Project for the Southern Athabasca Oil Sands - Spatial Visualization of a Global Transient Misfit Quality Indicator
11:28	<u>Daniel Feinstein</u> , M. Fienen, H. Reeves	What makes a MODFLOW-derived metamodel useful in decision support?	<u>Kurt Zeiler</u> , A. Moore, M. Halstead, Z. Wengrovius, J. Weaver, M. Lindburg, P. Dupre	Development of Colorado's South Platte Decision Support System Alluvial Groundwater Model Using a Data-Centered Approach

Tuesday, May 23 continued

11:44	<u>Jon Stam</u> , K. Belitz, C. Carlson, L., Desimone, L. Kauffman	MODFLOW-based meta-modeling for estimating regional residence-time distributions	<u>Norm Jones</u> , K. Liang, J. Goodall, M. Morsy, J. Sadler, D. Tarboton, A. Lemon, M. Kennard	HydroShare: A Community Repository for Sharing MODFLOW Models
12:00	Lunch - Friedhoff Hall			
1:00	Keynote – Metals Hall Charles Andrews Safe or Sustainable Yield: Aquifer versus Well			
1:20	Audience/Panel Discussion – Metals Hall Is Sustainable Groundwater Use a Myth? Panel members: Mary Hill, Laura Condon, Graham Fogg Each member will make a 4 minute comment before we open to general discussion			
2:30	Coffee Break			
	Featured Presentation		Featured Presentation in Metals Hall	
2:50	<u>Sorab Panday</u> A Hydraulic Head Formulation for Density Dependent Flow and Transport			
3:10	<u>Chirs Langevin</u> MODFLOW 6: An Object-Oriented Version of the U.S. Geological Survey's MODFLOW Model			
3:30	Transition			
	<u>Past, Present, and Future of MODFLOW</u> Chaired by: Rich Niswonger and Chris Langevin		<u>Past, Present, and Future of Mining and Groundwater</u> Chaired by: Henk Haitjema and Otto Strack	
3:35	<u>Joseph Hughes</u> , C. Langevin, S. Panday, E. Banta, A. Provost, R. Niswonger	Use of the Advanced Packages and Demand-Based Boundary Flows in the MODFLOW 6 Groundwater Flow Model	<u>Eduardo De Sousa</u>	Fast assessment of pore pressures and inflows in open pit slopes using smart models
3:51	<u>Alden Provost</u> , C. Langevin, J. Hughes	The "XT3D" option for simulating fully three-dimensional anisotropy on regular and irregular MODFLOW 6 grids	<u>Dirk Kassenaar</u> , E.J. Wexler, P.J. Thompson, M.G.S. Takeda	Assessing the Cumulative Effects of Groundwater Withdrawals for Oils Sands Production on a Watershed Scale
4:07	<u>Scott Boyce</u> , R.T. Hanson, I. Ferguson, T. Reimann, W. Henson, S. Mehl, S. Leake, T. Maddock	MODFLOW-OWHM v2: New Features and Improvements; The Next Generation of MODFLOW Conjunctive Use and Sustainability Simulation	<u>Alan Jang</u> , H. Liu, J. Xiang	Comparison on Groundwater Model Simulations of an Open Pit Mining using Three Numerical Codes: MODFLOW-USG, MODFLOW-SURFACT, and MINEDW
4:23	<u>Jana Glass</u> , C. Stefan, R. Junghanns, J. Sallwey, A. Fatkhutdinov	Free MODFLOW-based web modeling framework for planning and assessment of managed aquifer recharge schemes	<u>Christopher DeMarco</u> , M. Weikel, L. Vittorio	Simulation of High Quality Wetland Protection Measures Concurrent with Surface Mine Dewatering Utilizing GMS-MODFLOW
4:39	<u>Jaco Nel</u> , A. Johnstone, N. Rapantova	Application and challenges of MODFLOW USG to simulate tunnel inflows	Gareth Price	Past, present and future predictions of mine dewatering rates in the Pilbara region of Western Australia
4:55	Transition			
5:00	POSTERS AND BARBECUE DINNER – Wine Beer and Hors D'oeuvres Stratton Commons and Green Center Porch			

Poster Session
Tuesday, May 23, 5:00 – 7:00 PM

<u>Sustainable Groundwater Quality: Challenges and Tradeoffs</u>	
1. Jie Yang, T. Graf, T. Ptak	Influences of a weir construction on freshwater resources of a coastal aquifer in Germany under sea level rise
<u>Unconventional Applications of Groundwater Models</u>	
2. Steven Berg, H-T. Hwang, Y-J. Park, S. Frey, E. Sudicky, N. Grosso, M. Sherrier	Simulating Complex Surface Water/Groundwater Interactions during Flood Events with a Fully-Integrated Physics Based Hydrologic Model
3. Loring, Crowley, E. Rehwoldt	Design of Infiltration Basins for Cooling Tower Water Bleed and Pool Water Backwash
4. Maksym Gusyev, J. Magome, D. Abrams	Coupling MODFLOW and distributed hydrologic model BTOP in the Fujikawa River basin
5. Rodrigo Herrera, J. Lagos, T. Opazo	Using MODFLOW-USG to simulate the rise of an existing tailing storage facility and estimate transient seepage
6. Kara Marsac, A. Navarre-Sitchler	Evaluating Non-potable Water Usage for Oil and Gas Purposes in the Permian Basin
7. Zachary Stanko, M. Fienen, C. Faunt	Metamodel analysis of California's coastal groundwater basins to identify undesirable results of management actions
<u>The Analytic Element Method: Developments and Applications</u>	
8. Charlie Fitts	Handling Dewatered Domains in Analytic Element Models
<u>GUIs and You</u>	
9. Laura Foglia, R. Rossetto, I. Borsi, M. Cannata, S.W. Mehl, E. Vazquez-Sunez	FREEWAT, a HORIZON 2020 project to build open source tools for water management: a European perspective
10. Richard Winston, J.P. Pope	StreamExtractor: A New Tool to Help Generate Topographically Consistent Input for the Stream and Streamflow Routing Packages in MODFLOW
<u>Advancements in Data Discovery, Retrieval, and Visualization</u>	
11. Jessica Barros, M. Sellwood, A. Wilson, E. Schwartz, L. Hovey	Novel Modeling Approach for Sites with Complex, Well-Characterized Geology
12. Dan Puddephatt	MFtools: An R Library for Reading MODFLOW and MT3DMS Files
<u>Contaminant Transport Modeling: Developments and Case Studies</u>	
13. Evan Christianson, D. Dahlstrom, J. Carter, A. Janzen, R. Wuolo	Strategies for simulating the complete transport pathways of atmospherically dispersed contaminants
14. Nazmul Hasan, S. Mehta	System-Level Modeling for Waste Management Area C Performance Assessment at the Hanford Site in Southeast Washington, U.S.A.
15. Skuyler Herzog, C.P. Higgins, J. McCray	Engineered streambeds for improved water quality: Comparison of MODFLOW and STAMMT-L representations of performance data from constructed flume experiments
16. Katrina Marini, K. Lindstrom, D. Dahlstrom, J. Mohr	Using uncertainty analysis for groundwater flow and transport modeling to inform remedial design and monitoring
17. Amena Mayenna, S. Mehta	Evaluating Enhanced Attenuation of Uranium at the 300 Area of Hanford Site, Washington
18. Melissa Mitton	Understanding CH4 leakage from pipelines as affected by soil heterogeneity and moisture
19. David Moulton, D. Svyatskiy, E. Coon, C. Steefel, S. Molins, G. Hammond, D. Dwivedi	Integrated Hydrology with coupled Surface/Subsurface Reactive Transport
20. Assaf Wunsch, S. Leppert	Use of Groundwater Modeling in Assessment of Corrective Actions for Contaminated Groundwater Short-Circuit

Poster Session continued
Tuesday, May 23, 5:00 – 7:00 PM

<u>Simulating the Agriculture-Groundwater Connection</u>	
21. Laura Condon, R. Maxwell	Assessing the impact of groundwater pumping on the integrated hydrologic cycle
22. Annette Hein, R. Maxwell	Drought on the North American high plains: modeling the effects of vegetation, temperature, and rainfall perturbations on regional hydrology
23. Christopher Peters	Development of a Wellfield Operating Plan for a Vineyard in Peru using MODFLOW's Groundwater Management Process: A Case Study
24. Steven Peterson, J. Traylor	A New Model to Assess Groundwater Availability of the Northern High Plains Aquifer
25. Jonathan Traylor	Estimating future irrigation and recharge for the Northern High Plains aquifer using multiple climate and land use forecasts
26. E.J. Wexler, P.J. Thompson, M.G.S. Takeda, S. Malott, S.J. Shifflett, J.D.C. Kassenaar	Development and Application of an Irrigation Demand Module for the USGS GSFLOW Model
27. Kurt Zeiler, A. Moore, M. Halstead, Z. Wengrovius, J. Weaver, M. Lindburg, P. Dupre	Updates and Improvements to Colorado's South Platte Decision Support System Alluvial Groundwater Model
<u>Effective Presentation of Modeling Results</u>	
28. Lynette Brooks	Groundwater Development and Surface Water: Capture Maps of Streamflow Depletion
29. Martin Helmke, T. Farney, D. Lynch, P. Girafalco, L. Cole, and A. Pfahler	Breaking the Mould: Using Streamlined, Stochastic Groundwater Models to Improve Acceptance by Regulators, Clients, and the General Public
30. Howard Reeves	Regional groundwater-flow modeling to assess tradeoffs and consequences of groundwater development
31. Harsh Vardhan Singh, B. Faulkner, A. Keeley, K. Forshay	Using MODFLOW and MODPATH to assess the changes in hyporheic flow during pre and post-restoration periods
32. Peter Vermeulen	Interactive Pathline Simulation
<u>Unsaturated Zone and Multiphase Flow Modeling</u>	
33. Bo Gao, K. Smits	Coupled Porous-Medium and Free-Flow Across Wavy Surfaces
34. Zhen Li, K. Smits	Upscaling Thermal Properties in Heterogeneous Soils

Wednesday, May 24

Time	Metals Hall	Petroleum Hall		
8:00	Opening Comments	Opening in Metals Hall		
	Featured Presentation	Featured Presentation in Metals Hall		
8:05	Stefan Finsterle Boundaries, Interfaces and Discontinuities: Where Things Happen!			
8:25	Willem Schreuder Effective Utilization of Parallel Resources			
8:45	Transition			
	Parameterization, Sensitivity Analysis, and Uncertainty II Chaired by: Stefan Kollet and Willem Schreuder		Using Models to Identify Data Needs and Guide Data Acquisition Chaired by: Nicole DeNovio and Stefan Finsterle	
8:51	<u>Willem Zaadnoordijk</u> , J. Gunnink	Improving parameterization of top layer for groundwater models by means of a 3D geologic voxel model	<u>George Roadcap</u> , D. Abrams, D. Hadley, D. Mannix	One Model to Rule them All: The Illinois Groundwater Model
9:07	<u>Willem de Lange</u> , H. Kooi, J.H. Hoogewoud	Parameter values in the DRAIN package for a "groundwater weir" near a canal in reconstruction	<u>Peter Andersen</u> , J. Ross, J. Fenske	The Evolution of a Groundwater Flow and Transport Model Over Two Decades of Updates and Applications
9:23	<u>Judith Schenk</u> , E. Poeter, W. Navidi	Demystifying Information and Fisher Information: Observation Data Reveals the Good and the Bad of Our Models	<u>Adriana Palma Nava</u> , F. Gonzalez Villarreal, R.T. Hanson, S.E. Boyce	Mexico Valley Aquifer's Transition from a University Simulation Model to MODFLOW for Water Resource Assessment and Subsidence Modeling
9:39	<u>James Ross</u> , P.F. Andersen	The Ensemble Kalman Filter for Groundwater Plume Characterization: A Pilot Study	<u>Douglas Hayes</u> , J. Doherty, C. Muffels	PEST.cloud: Cloud-based Model Calibration
9:55	Coffee Break			
	Featured Presentation	Featured Presentation in Metals Hall		
10:15	Motomu Ibaraki Performance analysis of the χ MD matrix solver package for MODFLOW			
10:35	Transition			
	Parameterization, Sensitivity Analysis, and Uncertainty III Chaired by: Stefan Kollet and Willem Schreuder		Simulation Code Verification, Benchmarking, and Intercomparisons Chaired by: Stefan Finsterle and Chris Langevin	
10:41	<u>John Doherty</u>	PEST_HP: A Version of PEST Optimized for Highly Parallelized Computing Environments	<u>Noel Merrick</u> , D. Merrick	Does MODFLOW-USG / AlgoMesh Give the Same Results as MODFLOW-SURFACT?
10:57	<u>Haruko Wainwright</u>	Global Sensitivity Analysis for Supporting Long-Term Monitoring during Sustainable Remediation	<u>Xiaofan Yang</u> , Y. Mehmani, D. Barajas-Solano, M. T. Balhoff, A. M. Tartakovsky, T. D. Scheibs	Intercomparison of Hybrid Multiscale Methods in Simulating Subsurface Flow and Reactive Transport
11:13	<u>Neil Manewell</u> , V. Shapoori	Comparison of predictive uncertainty methods to quantify iron ore dewatering impacts	<u>Robert Reinecke</u> , L. Foglia, S. Mehl, P. Döll	Building a Global Groundwater Model - Case Study: Comparison to the Central Valley Hydrologic Model
11:29	<u>Damian Merrick</u> , N. Merrick	AlgoCompute: Large-Scale Calibration and Uncertainty Analysis Made Easy in the Cloud	<u>Christopher Muffels</u>	mod-PATH3DU Version 2: New Features, Verification and Intercomparisons
11:45	Lunch – Friedhoff Hall			

Wednesday, May 24 continued

12:25	Lunch Keynote – Friedhoff Hall <u>James Eklund</u> Title: TBA			
1:00	Transition			
	Featured Presentation		Featured Presentation in Metals Hall	
1:05	Al Valocchi Computationally Efficient Methods for Modeling Diffusion and Reaction in Low Permeability Zones in Field-Scale Simulations using MODFLOW/MT3D/RT3D			
1:25	Transition			
	Natural and Managed Aquifer Recharge Chaired by: Charles Andrews and Reed Maxwell		Unsaturated Zone and Multiphase Flow Modeling Chaired by: Alexis Navarre-Sitchler and Chunmiao Zheng	
1:30	<u>Melissa Masbruch, C. Rumsey, S. Gangopadhyay, D. Susong, T. Pruitt</u>	Analysis of infrequent (quasi-decadal) large groundwater recharge events: A case study for northern Utah	<u>Ahmad Jan, S. Painter, E. Coon</u>	Evaluating a mixed-dimensional spatial structure for integrated thermal hydrology models of permafrost-affected landscapes
1:46	<u>Robert Wykoff, J. Weaver, J. Wright</u>	Simulating Managed Aquifer Recharge and San Pedro River (Arizona) Baseflow Augmentation using MODFLOW-NWT	<u>Caitlin Collins, R. Maxwell, A. Visser</u>	Using an Integrated Hydrologic Model to Assess the Ecohydrologic Impacts of Change on a Mountain Headwaters Critical Zone
2:02	Laura Condon, R. Maxwell	Assessing the impact of groundwater pumping on the integrated hydrologic cycle	<u>Fred Ogden, M.B. Allen, C. C. Douglas, W. Lai, M. Seo; J. Zhu</u>	The Soil Moisture Velocity Equation: Reliable, Accurate, and Fast 1-D Unsaturated Zone Flux Calculations
2:18	Transition			
	Featured Presentation		Featured Presentation in Metals Hall	
2:25	Chunmiao Zheng HEIFLOW: A Hydrological and Ecological Integrated Flow Model for Sustainability Assessment			
2:45	Mary Hill A Food-Energy-Water Calculator, with initial application to Western Kansas			
3:05	Closing			
3:15	Coffee and Refreshments			
4:00	RAFFLE and Student Awards			
5:00	2017 NGWA Henry Darcy Distinguished Lecturer <u>Kamini Singha – Colorado School of Mines</u> A Tale of Two Porosities: Exploring Why Contaminant Transport Doesn't Always Behave the Way It Should Metals Hall, 5:00 to 6:00pm			