

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

TRIP REPORT

SUBJECT: 1995 Spring Meeting of American Geophysical Union.
20-5704-163

DATE/PLACE: Baltimore, MD; 30 May - 2 June 1995

AUTHOR(S): D.A. Ferrill, A. Bagtzoglou, W. Murphy, R. Pabalan, J. Stamatakos.

DISTRIBUTION:

CNWRA

W. Patrick
Directors
Element Managers
GS Staff

NRC-NMSS

J. Linehan
S. Fortuna
B. Stiltenspole
B. Meehan
J. Greeves
M. Federline
M. Bell
P. Justus
D. Brooks
S. McDuffie
J. Trapp

NRC-RES

B. Morris
S. Bahadur
F. Costanzi
J. Randall
E. O'Donnell
W. Ott
L. Kovach

SwRI

S. Rowe (SwRI Contracts)

120015

9507120166 950707
PDR WASTE PDR
WM-11

4/26/11
WM-11
NH15

delete all distribution except: CF, PDC + NRCs full text

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

TRIP REPORT

SUBJECT: 1995 Spring Meeting of American Geophysical Union.
20-5704-163

PLACE/DATE: Baltimore, MD; 30 May - 2 June 1995

AUTHORS: D.A. Ferrill, A. Bagtzoglou, W. Murphy, R. Pabalan, J. Stamatakos.

PERSONS PRESENT:

D.A. Ferrill
A. Bagtzoglou
R. Green
W. Murphy
R. Pabalan
J. Stamatakos

BACKGROUND AND PURPOSE:

The Spring Meeting of the American Geophysical Union (AGU) is an annual scientific meeting held in Baltimore, MD, that focuses on topics in the geophysical and space sciences. The 1995 Spring AGU meeting was held jointly with the Mineralogical Society of America and the Geochemical Society. More than 2000 presentations were made at this year's Spring AGU meeting. In addition to the opportunity to learn about recent research results, the AGU meeting provides the opportunity to see displays by more than 50 exhibitors and to interact with a broad variety of scientists.

SUMMARY OF PERTINENT POINTS:

Tectonic Rotations and Redbeds.

D.A. Ferrill gave an invited presentation entitled "Kinematic model of fold-thrust belt curvature: Role of vertical-axis rotation" which was co-authored by A.P. Morris and D.B. Henderson. J. Stamatakos chaired the symposium and gave an invited presentation entitled "New kinematic constraints on the structural evolution of the Cantabrian Arc" which was co-authored by J. Páres and R. Van der Voo. These presentations were part of a symposium on "Tectonic Rotations and Red Beds." This symposium was organized specifically to bring together structural geologists and paleomagnetists that work on the topics of thrust sheet rotation and the curvature of orogenic belts. This topic is important to studies of YM region tectonics because structures of the Permian fold-thrust belt are used as markers in order to piece together the ranges into a coherent reconstruction of the YM region prior to Tertiary extension and strike-slip faulting. The reconstructed Permian fold-thrust belt is generally assumed to have been relatively linear. However, most fold-thrust belts are curved in map view. Therefore, the original geometry of the Permian fold-thrust belt is a major source of uncertainty in tectonic reconstructions of the YM region.

The most significant results of the session "Tectonic Rotations and Red Beds" were the observations about kinematics from analog and numerical models and how well those observations matched new kinematics models from combined paleomagnetic and structural studies of the central Appalachians. Several points of particular significance are summarized below:

- (1) Structural and Paleomagnetic results from the central Appalachians suggest early vertical axis rotations followed by folding and thrusting without further rotations [M.B. Gray (Bucknell University, PA) and J. Stamatakos]. Interestingly, this same deformation sequence is predicted by the numerical models of D.A. Ferrill and analog sand-box models of S. Marshak (University of Illinois).
- (2) Much of the final plan-view shape of a curved fold-thrust belt depends on the geometry of the precursor sedimentary basin, displacement magnitude, and amount of shortening parallel to the transport direction.
- (3) Integration of structural and paleomagnetic data offers clearer constraints on fold and thrust belt kinematics than can be gleaned from the individual data sets alone. Paleomagnetic data are good at quantifying rotations, but provide limited information on the mechanisms of deformation. In contrast, structural data, especially strain data, provide critical information on how rotations are accommodated (i.e., deformation mechanisms and the partitioning of strain). As demonstrated by the central Appalachian talks, when structure and paleomagnetic data are linked, the combined results provide a more robust kinematic history.

Surface Geochemistry and Reaction Rates

R. Pabalan presented an invited paper on "Geochemical Controls on the Sorption of Uranium(6+) onto Mineral Surfaces" in the session on Surface Geochemistry and Reaction Rates. The paper was co-authored by F.P. Bertetti and J. Prikryl, and was a presentation of the results of U sorption experiments conducted under the Sorption Research Project. Other papers presented at the session are discussed below.

A. Manceau (Environmental Geochemistry Group, LGIT-IRIGM, France) summarized his extensive study of sorption processes onto iron oxyhydroxides and manganese oxides using extended X-ray absorption fine-edge structure (EXAFS) spectroscopy. His studies are limited to low- or non-hydrolyzable metals such as cadmium, zinc, and selenium in order to minimize problems with the formation of multinuclear complexes and precipitation. His results demonstrate that sorbent morphology and structural defects play an important role in sorption reactions and in the reactivity of the mineral surface.

J. Kubicki (Remediation Research Lab., San Diego, CA) described a study of surface complexation of salicylic acid onto illite and montmorillonite using attenuated total reflectance Fourier-transform infrared (ATR-FTIR) spectroscopy. Measured spectra were compared with theoretical vibrational spectra derived from molecular orbital (MO) calculations. He concluded that MO calculations can accurately reproduce vibrational spectra of surface complexes and predict which bonding mechanisms are most likely to occur. This approach may provide a better understanding of the role that recalcitrant naturally-occurring organic matter on soils and sediments may play in the bioavailability and biodegradability of organic contaminants in the environment.

J. Cruz (Southern Methodist Univ., Dallas, TX) presented results of potentiometric titrations on andalusite (Al_2SiO_5). The method involved a forward alkalimetric titration to pH 10, then back titration with acid to pH 5. An apparent point-of-zero-salt-effect (PZSE) of 8.0 is calculated when corrections for dissolved aluminum and silicon are made.

William M. Murphy gave an invited presentation titled "Reaction Kinetics and Reversibility of Analcime Dissolution at pH 9 and 25°C" which was co-authored by James D. Prikryl, Roberto T. Pabalan, and Christopher J. Goulet. Analcime is a common alteration mineral at Yucca Mountain. Its dissolution rate and equilibrium solubility were determined in this study, and kinetic and thermodynamic parameters were derived from the data. Groundwaters in the vicinity of Yucca Mountain appear to be at equilibrium with analcime according to the new data. They also appear to be buffered by a silica phase. This phase may be moganite, the solubility of which was reported in a presentation by S. R. Gislason.

Coupling Regulatory Policies with Geosphere Transport Models

A.C. Bagtzoglou and T.C. Rasmussen (University of Georgia) organized and chaired a special session on Coupling Regulatory Policies with Geosphere Transport Models. The session was very well attended and lively discussions took place. The session lasted almost 2.5 hours and the majority of the audience participated throughout the session's deliberations. There were four invited presentations given.

T.C. Rasmussen gave an overview of the regulatory role of simulation modeling in hydrology. He warned that as models become more and more complex, they often have to rely on questionable assumptions, thus leading to predictions that contain large uncertainties.

S. Rojstaczer (Duke University) played the role of the devil's advocate and proposed the formal uncoupling of regulatory policies from modeling activities unless model predictions can be viewed only as qualitative, and not quantitative, tools for setting regulatory criteria. As expected, a quite interesting and lively discussion followed this presentation.

E. Behl (USEPA) gave the perspective of the EPA regarding the use and limitations of modeling in the pesticide registration process. She presented several examples where model uncertainties strongly influence the outcome of regulatory decisions (sometimes towards the wrong decision).

R.T. Green (CNWRA) gave an invited presentation entitled "Uncertainty reduction in the implementation of a geologic HLW repository performance regulation using subsurface flow models" which was co-authored by G.W. Wittmeyer and A.C. Bagtzoglou. The presentation covered the efforts conducted at CNWRA towards reducing uncertainty in the implementation of a geologic repository performance regulation, specifically the GWTT regulation. These efforts were demonstrated using three computational examples involving: (i) non-isothermal, single-phase flow in a domain which has discrete features; (ii) non-isothermal, two-phase homogeneous media; and (iii) isothermal, two-phase stochastic models. These three examples illustrated the uncertainty associated with concepts such as the disturbed zone and fastest path.

Presentations in other sessions

James A. Davis reported results of sorption studies on a sand. It was determined that sorption occurred predominantly on Fe and Al coatings on quartz grains. The data were reasonably represented using a surface complexation model for Al and Fe hydroxides with a large surface area. Silanol groups on the quartz grains were insignificant in controlling sorption.

Presentations by Sujoy B. Roy and J. E. Saiers were on colloid migration experiments in sand columns. Formation of colloids is induced by reduction in ionic strength of the aqueous phase. Cs transport was enhanced by sorption on kaolinite colloids introduced in a column. This effect increased with decreasing ionic strength.

SUMMARY OF ACTIVITIES:

CNWRA staff gave five invited presentations and served as chairmen for 2 sessions at the 1995 Spring Meeting of the American Geophysical Union.

IMPRESSIONS/CONCLUSIONS:

This year's spring AGU meeting had smaller attendance than usual, which may be due to competition with the two week long International Union of Geology and Geophysics (IUGG) meeting that will be held in Boulder, CO, in June 1995. Sessions attended by CNWRA staff, although small, provided an opportunity to interact with other researchers and to discuss research results and planned research.

PENDING ACTION: None.

RECOMMENDATIONS:

Meetings of the American Geophysical Union continue to provide a forum for exchange of ideas related to research conducted at the CNWRA, and to provide opportunities for important peer review of Center research. CNWRA staff should continue to attend AGU meetings to interact with peers and receive comments on completed and in-progress research.

PROBLEMS ENCOUNTERED: None.

REFERENCES:

- Clyde, W., and J. Stamatakos. 1995. Magnetostratigraphy Across the Wasatchian-Bridgerian Land Mammal Age Boundary in the Green River Basin, Wyoming. *EOS Transaction of the American Geophysical Union*: 76(17). Spring Meeting Supplemental: 98.
- Ferrill, D.A., A.P. Morris, and D.B. Henderson. 1995. Kinematic Models of Fold-Thrust Belt Curvature: Role of Vertical Axis Rotation. *EOS Transactions of the American Geophysical Union* 76(17). Spring Meeting Supplemental: 95.

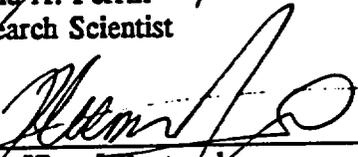
- Gray, M.B., and J. Stamatakos. 1995. History of Rotations in an Evolving Orogen: Structural and Paleomagnetic Evidence from the Eastern Pennsylvania Salient of the Appalachians. *EOS Transaction of the American Geophysical Union* 76(17). Spring Meeting Supplemental.
- Green, R.T., G.W. Wittmeyer, and A.C. Bagtzoglou. 1995. Uncertainty Reduction in the Implementation of a Geologic HLW Repository Performance Regulation Using Subsurface Flow Models. *EOS Transaction of the American Geophysical Union* 76(17). Spring Meeting Supplemental: 110.
- Murphy, W.M., J.D. Prikryl, and R.T. Pabalan. 1995. Reaction Kinetics and Reversibility of Analcime Dissolution at pH 9 and 25°C. *EOS Transactions of the American Geophysical Union* 76(17). Spring Meeting Supplemental: 102.
- Pabalan, R.T., F.P. Bertetti, and J.D. Prikryl. 1995. Geochemical Controls on the Sorption of Uranium (6+) Onto Mineral Surfaces. *EOS Transactions of the American Geophysical Union* 76(17). Spring Meeting Supplemental: 96.
- Stamatakos, J., J. Pares, and R. Van Der Voo. New Kinematic Constraints on the Structural Evolution of the Cantabrian Arc. *EOS Transactions of the American Geophysical Union* 76(17). Spring Meeting Supplemental: 96.
- Van Der Voo, R., J. Stamatakos, and B.A. van Der Pluijm. 1995. No Evidence for Prevalent Inclination Shallowing in Redbeds. *EOS Transactions of the American Geophysical Union* 76(17). Spring Meeting Supplemental: 96.

SIGNATURES:



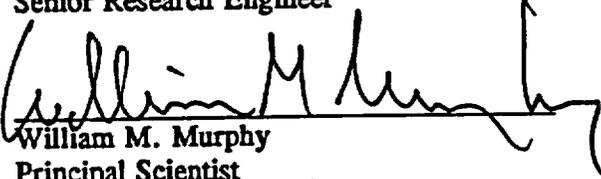
David A. Ferrill
Research Scientist

6/30/95
DATE



A.C. "Ross" Bagtzoglou
Senior Research Engineer

6/30/95
DATE



William M. Murphy
Principal Scientist

6/30/95
DATE



Roberto T. Pabalan
Senior Research Scientist

7/5/95
DATE



John A. Stamatakos
Research Scientist

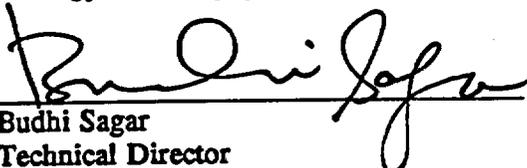
6/30/95
DATE

CONCURRENCE SIGNATURES AND DATE:



F. Lawrence McKague
Geology and Geophysics, Manager

7/6/95
DATE



Budhi Sagar
Technical Director

7/7/95
DATE

/cg