

# CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

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## TRIP REPORT

**SUBJECT:** American Geophysical Union Meeting  
20.01402.461, 471

**DATE/PLACE:** December 15–19, 2000, San Francisco, California

**AUTHORS:** Chuck Connor, Peter La Femina, Scott Painter, Walter Illman, Ron Green

**DISTRIBUTION:**

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Element Managers

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**PERSONS PRESENT:** Chuck Connor, Peter La Femina, Ron Green, Scott Painter, Walter Illman  
(Center for Nuclear Waste Regulatory Analyses)

### BACKGROUND AND PURPOSE OF TRIP:

The American Geophysical Union Fall Meeting was held in San Francisco, California, on December 15–19, 2000. This is the premier geosciences meeting in the US, attended by approximately 8,500 people this year. Center for Nuclear Waste Regulatory Analyses (CNWRA) staff attended with the goals of presenting abstracts of recent work and accomplishments of interest to the general scientific community, learning about work in progress by others relevant to the high-level waste (HLW) program, and discussing developments in the field with colleagues.

### SUMMARY OF PERTINENT POINTS:

Numerous talks and posters were presented over 5 days.

Two CNWRA papers were presented in the electromagnetics (EM) session. Peter La Femina presented CNWRA work on the South Crater Flat fault zone. The presentation included maps of the conductivity and magnetic anomalies mapped across the South Crater Flat Fault, and detailed profiles collected using two EM methods: the EM-31 induction system for shallow depth exploration and the EM-34 system for deeper exploration. Both data sets show anomalies related to clay-content and, ultimately, the age of the alluvium near the fault zone. Magnetic data and models indicate that average fault slip is about one order of magnitude greater than estimated from trench studies across the faults. Questions mostly involved the techniques used to perform the surveys rapidly and the implications of the study for the proposed Yucca Mountain repository. Peter La Femina indicated that the results for the South Crater Flat fault do not directly impact risk estimates for the repository, but do indicate the importance of conservative assessment of fault slip data sets derived from paleoseismic investigations. Also in the EM session, Stewart Sandberg presented work performed with CNWRA staff deducing the electrical properties of basalt flowing in lava tubes at Kilauea volcano, Hawaii. Chuck Connor participated in this work as part of professional development in May 2000. Essentially, a series of EM techniques reveal details of the geometry and conductivity of basalts in the lava tubes. Because

conductivity is related to viscosity, these data can be used to model the thermo-fluid dynamics of flow in tubes. This information will likely be used to model process operating in the repository in the event of volcanic activity, as part of the Igneous Activity (IA) Key Technical Issue (KTI).

Tim Dixon (University of Miami) presented work that he performed with the collaboration of Goodluck Ofoegbu (CNWRA) in a session on modeling volcano deformation processes. This work, already submitted as a paper to the *Journal of Geophysical Research*, treats deformation in Long Valley caldera as a visco-elastic process. Ofoegbu used Abacus to model deformation data from Long Valley caldera. This was one of two volcano deformation papers presented that used finite elements to model deformation. The other, by Lisa Koenig (Arizona State University) used the ANSYS package to model deformation. Both approaches are quite similar to techniques used to model deformation at Yucca Mountain. Most other papers in this session used point source models, with analytical solutions.

There was an extensive session on volcanic ash dispersal monitoring and modeling. C. Bonadonna and G. Ernst (both at University of Bristol) presented models for tephra dispersion quite similar to those used at the CNWRA. Groups from Max-Plank Institute and Geomar (Kiel Germany) presented the ATHAM code, used to better define particle dispersal in volcanic eruption columns using a multiphase approach. This code is now being developed in a parallel version at the University of Michigan.

Dr. Connor met Peter Lichtner at the meeting. Dr. Lichtner mentioned he has now developed a code, called FlowTran, for modeling reactive transport. Dr. Lichtner suggested that FlowTran improved reactive transport modeling compared to Multiflo, but does not capture the details of flow available in Multiflo.

Dr. Connor discussed possible proposal development for transient electromagnetic soundings at St. Augustine volcano, Alaska, with staff from the U.S. Geological Survey (USGS). Dr. Green held similar discussions with USGS staff regarding thermal-hydrological (TH) modeling of volcanic activity-groundwater interactions. There seemed to be interest in developing such a proposal, possibly internally funded by the USGS.

A day-long special session on “An Integrated View of Subsurface Heterogeneity” brought together researchers working on theory, numerical approaches, and field measurements of subsurface property variations and the resulting effects on flow and contaminant dispersion. Scott Painter presented an invited talk that focused on CNWRA-developed geostatistical tools that are more realistic than the classical models used by stochastic hydrologists. Several other presenters discussed work on subsurface heterogeneity modeling that was motivated by the same considerations. S.P. Neuman presented a talk titled, “Observation and Analysis of a Pronounced Permeability and Porosity Scale-Effect in Unsaturated Fractured Tuff”. Walter Illman was one of the coauthors of this presentation. B. Berkowitz and D. Benson gave talks on alternatives to the advection dispersion equation that may be more appropriate in highly heterogeneous aquifers.

There were three topical sessions on “Radioactive and Mixed Waste in the Vadose Zone”, two oral sessions and one poster session. The session organizers were associated with the Hanford Project and over half of the presentations addressed Hanford. The Hanford talks investigated flow and transport below the SX Tank Farm in the 200 West Area. Presenters gave the impression that the level of effort at Hanford has recently increased providing added resources to the investigators working on the project. The talks during the first half of the first session were mostly informational. Thereafter the scope of the projects discussed increased. About half of the presentations addressed vadose zone hydrology, reflecting the interest of Glendon Gee/PNNL, one of the session chairs. Several projects investigated the challenges of using subsurface

geophysical tools to characterize a vadose zone with additional sources of gamma radiation and limited access. The afternoon session contained several integrated talks on a joint reactive transport modeling investigation of the SX Tank Farm. The modeling team consists of Karsten Pruess/LBNL, Carl Steefel/LANL, Peter Litchner/LANL, and Steve Yabusaki/PNNL. They presented early results of a coupled process model directed at the non-isothermal transport of multiple species through the unsaturated sediments below a tank. The full effect of the nonisothermal history of the mixed tank waste have not yet been fully incorporated. Early transport results using FLOWTRAN are promising, although some discrepancies remain. There were several talks on colloidal transport at Hanford.

There were three talks on Yucca Mountain. George Moridis/LBNL discussed his all-encompassing coupled processes model of flow and transport of radionuclides through the vadose zone at Yucca Mountain. This is the same model he discussed at the Radionuclide Transport (RT) Technical Exchange in early December. Ron Green presented recent results of modeling the Drift-Scale Heater Test. The temperature predictions agreed with temperatures recorded after one year of heating. Eric Sonnenthal/LBNL presented recent results of reaction-transport modeling of the Drift-Scale Heater Test. The TH model used in the reaction transport calculations by Eric had been prepared by Yvonne Tsang/LBNL. Eric's model now indicates vertical asymmetry, with a silica cap formed above the outer portions of the outer wing heaters and dissolution below the heater test horizon. Eric noted that he has not yet resolved the chemistry of the water samples collected from borehole 59-4. These are the samples that contained high levels of chloride but low concentrations of silica. One interesting comment by a LBNL staff during the poster session was that he greatly appreciated that the U.S. Nuclear Regulatory Commission was providing an independent model of the Drift-Scale Heater Test. He considers it imperative that the U.S. Department of Energy models provided by contractors, such as LBNL, be independently tested. It was his hope that additional resources be made available for these efforts.

#### **IMPRESSIONS/CONCLUSIONS:**

AGU continues to provide an excellent venue for CNWRA presentations.

#### **PROBLEMS ENCOUNTERED:**

None.

#### **PENDING ACTIONS:**

None.

#### **RECOMMENDATIONS:**

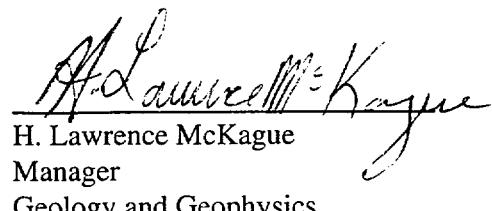
None.

SIGNATURES:



Chuck Connor  
Principal Scientist  
Geology and Geophysics

1/3/01  
Date



H. Lawrence McKague  
Manager  
Geology and Geophysics

1/3/01  
Date

CONCURRENCE:



Budhi Sagar  
Technical Director

1/4/2001  
Date

/rae