Enclosure

89001328

SUMMARY OF U.S. NUCLEAR REGULATORY COMMISSION (NRC)- U.S. DEPARTMENT OF ENERGY (DOE) TECHNICAL EXCHANGE ON MINERAL STABILITY AND APPLICABILITY OF LABORATORY DATA TO REPOSITORY TRANSPORT CALCULATIONS

March 20-21, 1991
Los Alamos, New Mexico

On March 20-21, 1991, staff from the NRC, DOE, and the State of Nevada conducted a technical exchange to discuss (1) the mineralogy studies of Yucca Mountain and the assessment of mineral stability being conducted by Los Alamos National Laboratory and Lawrence Livermore National Laboratory, and (2) DOE's radionuclide transport and retardation studies and the applicability of laboratory experiments to repository-scale calculations. Also on the agenda (Attachment 1) was a discussion of NRC's Site Characterization Analysis concerns related to radionuclide transport. Attachment 2 is a list of the attendees.

One of DOE's key presentations at the technical exchange was a proposed minimum K_d approach for establishing how much credit it can take, if needed, for retardation of specific radionuclides between the repository and the accessible environment. The approach, which was outlined within the framework of the DOE geochemistry program, was positively received by those in attendance.

King Stablein 4/26/91
King Stablein, Sr. Project Manager
Repository Licensing and Quality Assurance Project Directorate
Division of High-Level Waste Management
U.S. Nuclear Regulatory Commission

Linda J. Desell 4/26/91
Linda J. Desell, Acting Chief
Regulatory Integration Branch
Office of Systems and Compliance
Office of Civilian Radioactive Waste Management
U.S. Department of Energy

Attachment 1

AGENDA

DOE-NRC TECHNICAL EXCHANGE ON MINERAL STABILITY AND APPLICABILITY OF LABORATORY DATA TO REPOSITORY TRANSPORT CALCULATIONS

March 20-21, 1991
Los Alamos Inn, Los Alamos, NM
8:30 AM

PURPOSE: The purpose of this technical exchange is (1) to familiarize the NRC with the LANL and LLNL mineralogy studies of Yucca Mountain and the assessment of mineral stability and (2) to discuss DOE's radionuclide transport and retardation studies and the applicability of laboratory experiments to repository-scale calculations.

SCOPE: This technical exchange will focus on (1) discussion of the mineralogy and alteration history of Yucca Mountain; glass dehydration/rehydration and zeolite heating experiments; conceptual models and planned work; and (2) NRC's SCA Concerns and DOE's responses, including a summary of the radionuclide adsorption workshop and resulting issues and approaches; the framework under which the transport program is conducted; conditions under which the use of K_ds is inappropriate; concepts and strategy for application of laboratory data to field scale tests; and status of natural analog studies.

Agenda topic	Discussion Leader
Opening remarks	DOE, NRC, State
o Geochemistry research program in mineral stability and radionuclide transport	CNWRA
Discussion	all
o Mineralogy and alteration history of Yucca Mountain	DOE
Discussion	all
o Glass dehydration/rehydration and alteration studies - Assessment of mineral stability	DOE
Discussion	all

DOE-NRC TECHNICAL EXCHANGE ON MINERAL STABILITY AND DEMONSTRATION OF APPLICABILITY OF LABORATORY DATA TO REPOSITORY TRANSPORT CALCULATIONS
(continued)

Agenda topic	Discussion Leader
o Short- and long-term zeolite heating experiments - Clays and Fe & Mn Oxyhydroxides - Assessment of mineral stability	DOE
Discussion	all
o Modeling of mineral alteration	DOE
Discussion	all
o Conceptual model of mineral evolution	DOE
Discussion	all
o SCA concerns related to radionuclide transport	NRC
Discussion	all
o SCA responses - Summary of radionuclide adsorption workshop - Resulting issues and approaches	DOE
Discussion	all
o Framework under which transport program is conducted - Minimum K_d concept - Information needs	DOE
Discussion	all
o Conditions when K_ds are inappropriate	DOE
Discussion	all
o Concepts and strategy for application of laboratory data to field scale tests	DOE
Discussion	all
o Status of natural analog studies	DOE
Discussion	all
Final remarks	DOE, NRC, State

Attachment 2

(1053)

ATTENDANCE

DOE/NRC Technical Exchange - March 20-21, 1991

Mineral Stability and Radionuclide Transport

NAME	AFFILIATION	PHONE
LINDA DESELL	DOE/RW-331	(202) 586-1462 (9620) temp
Ardyth Simmons	DOE/YMSCP	(702) 794-7998
Paul L. Clore	SAIC/Las Vegas	(702) 794-7823
William Ford	NRC/NMSS	(301) 492-0506
John Bradbury	NRC/NMSS	(301) 492-0535
King Stablein	NRC/NMSS/HLWM	(301) 492-0446
Paul Prestholt	NRC - on site rep	(702) 388-6125
MAURY MORGENSTEIN	MITHIC & ASSOC./STATE of NV	(702) 798-0402
CARL JOHNSON	STATE OF NEVADA	(702) 687-3744
Brian Viani	LLNL	415 423-2001
Kevin KNAUSS	LLNL	415-422-1372
JAN Docka	WESTON	202/646-6720
CANDACE BIDDISON	SAIC	(702)-794-7649
William M. Murphy	CNWRA	512 522 5263
David Turner	CNWRA	512-522-2139
Roberto T Pabalan	CNWRA	512-522-5304
Ines R. Triay	LANL	505-665-1755
Jon Livingston	DOE/YMP	(702) 794-7944
David Bish	LANL - EES-1	505-667-1165
Rick Hutton	SAIC/Los Alamos	505-665-1454
Bruce Robinson	LANL - EES-4	(505) 667-4318

NAME	AFFILIATION	PHONE
David Vaniman	LANL	(505) 667-1863
Carol Bruton	LLNL	415-423-1936
Barbara Carlos	LANL	(505) 667-6879
AREND MEIJER	LANL	(505) 667-0675
LARRY HERSMAN	LANL	(505) 667-2779
Ned Patera	LANL	505 665 3465
David Morris	LANL	505 667 7603
David Hobart	LANL	505 667 9313
Clarence Duffy	LANL	505 667 5154
Julie Canepa	LANL	505 667 4109
SCHÖN LEVY	LANL	505-667-9504
Don Langmuir	NWTRB	303-273-3631
Joe Bader	TESS	703-934 7600
Rick Palabrica	WESTON / UE&C	202-646-6661

3/21/90 (Additions)

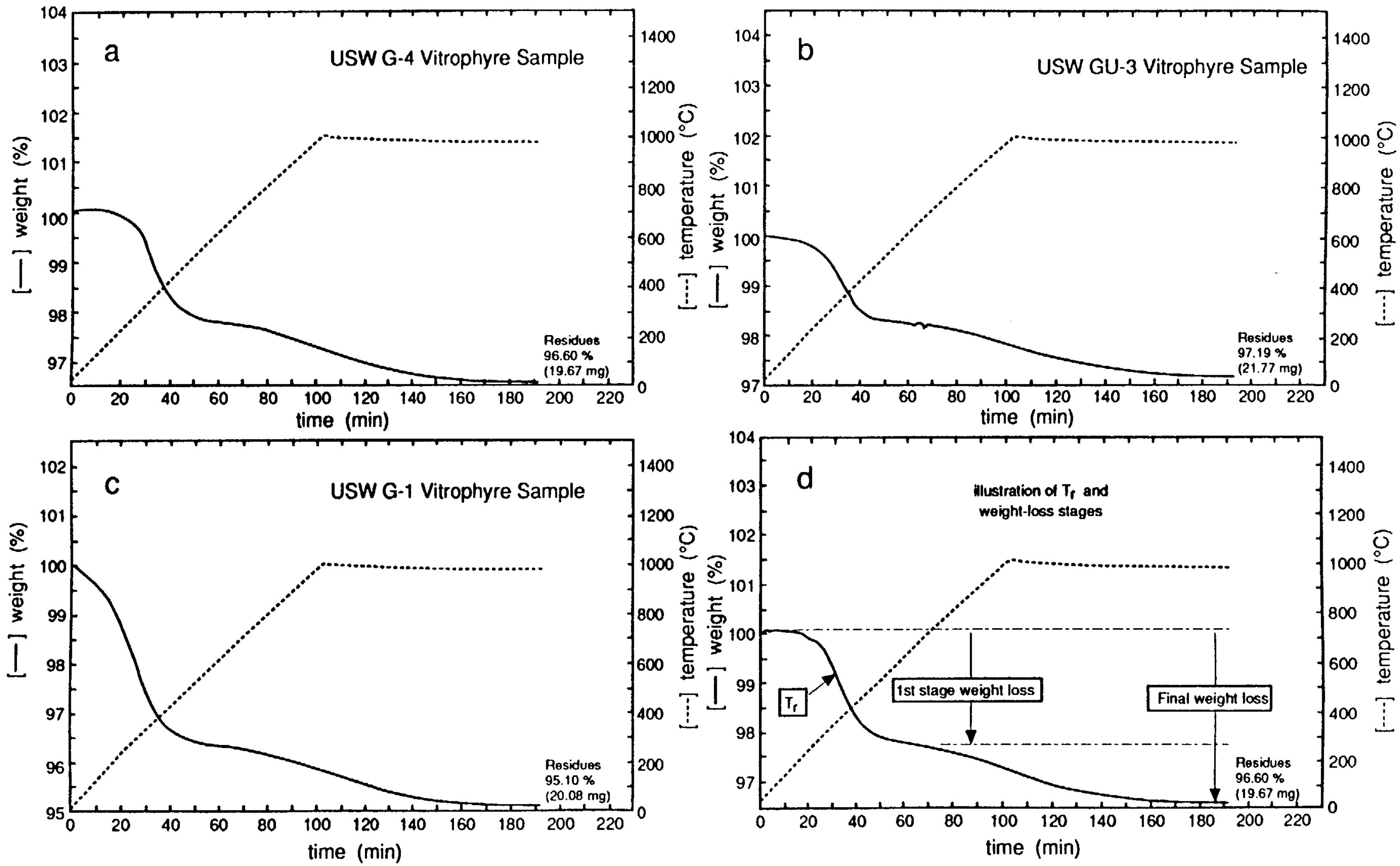
Dave Broxton	LANL	(505) 667-2492
RICHARD KNAPP	LLNL	(415) 423-3328
Greg Valentine	LANL	505-665-0259
David Hobart	LANL	(505) 667-9313
ERIC RYDER	SNL	(505) 846-9644
Ken Eggert	LANL	(505) 667 5200
Michael Ebinger	LANL	505-667-3147
Everett P. Springer	LANL	505-667-9836
June Fabryka-Martin	LANL	505-665-2300

This was the only presentation for which copies of the viewgraphs were distributed.

DEHYDRATION AND REHYDRATION OF THE LOWER VITROPHYRE, TOPOPAH SPRING MEMBER, PAINTBRUSH TUFF

D. Vaniman, D. Bish, S. Chipera

Attachment 3

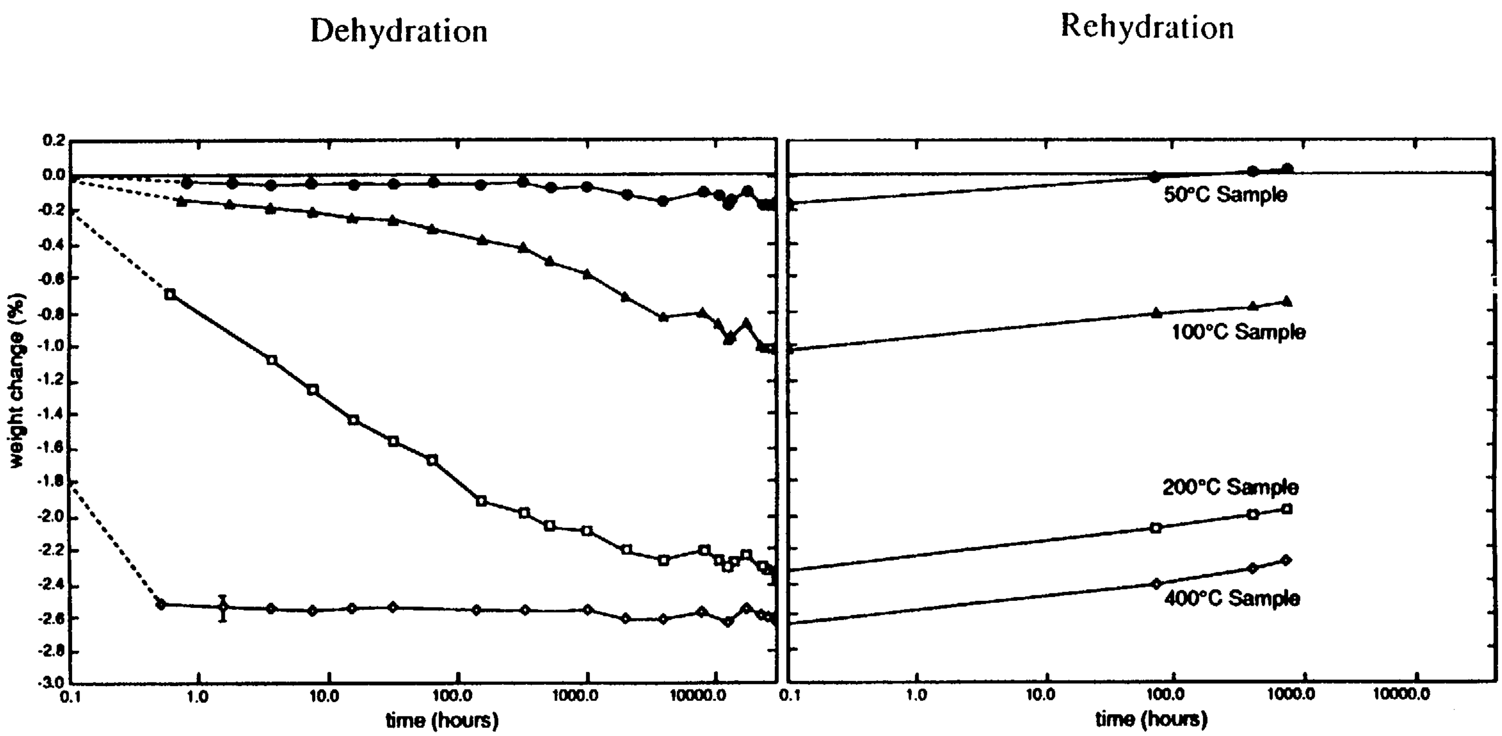


a
USW G-4 Vitrophyre Sample
Residues 96.60 % (19.67 mg)
b
USW GU-3 Vitrophyre Sample
Residues 97.19 % (21.77 mg)
c
USW G-1 Vitrophyre Sample
Residues 95.10 % (20.08 mg)
d
illustration of T_r and weight-loss stages
T_r
1st stage weight loss
Final weight loss
Residues 96.60 % (19.67 mg)
[—] weight (%)
[---] temperature (°C)
time (min)

Table 3
Summary of TGA Data; 10°C/min Runs to 1000°C with 90 min Isothermal at 1000°C

Sample	Adsorbed Water	T_r	1st Stage Loss	Final Weight Loss
USW G-4	0.09%	341.2°C	2.47%	3.69%
1330.7-1330.9 ft		347.5°C	2.29%	3.40%
		343.2°C	2.38%	3.70%
		351.4°C	2.37%	3.27%
Averages:		346 ±5°C	2.38 ±0.07%	3.52 ±0.21%
USW GU-3	0.09%	330.3°C	1.75%	2.81%
1226.8-1227.25 ft		331.8°C	1.85%	2.75%
Averages:		331 ±1°C	1.80 ±0.07%	2.78 ±0.04%
USW G-1	0.35%	283.4°C	3.41%	4.90%
1319 ft		272.2°C	3.06%	4.35%
Averages:		278 ±8°C	3.59 ±0.13%	4.63 ±0.39%

Note: the types of measurements compared in this table are described in Figure 3d. Adsorbed water was measured separately in TGA runs held at 110°C for 30 min; T_r denotes the temperature of most rapid first-stage weight loss.


Dehydration
Rehydration
weight change (%)
time (hours)
time (hours)
50°C Sample
100°C Sample
200°C Sample
400°C Sample

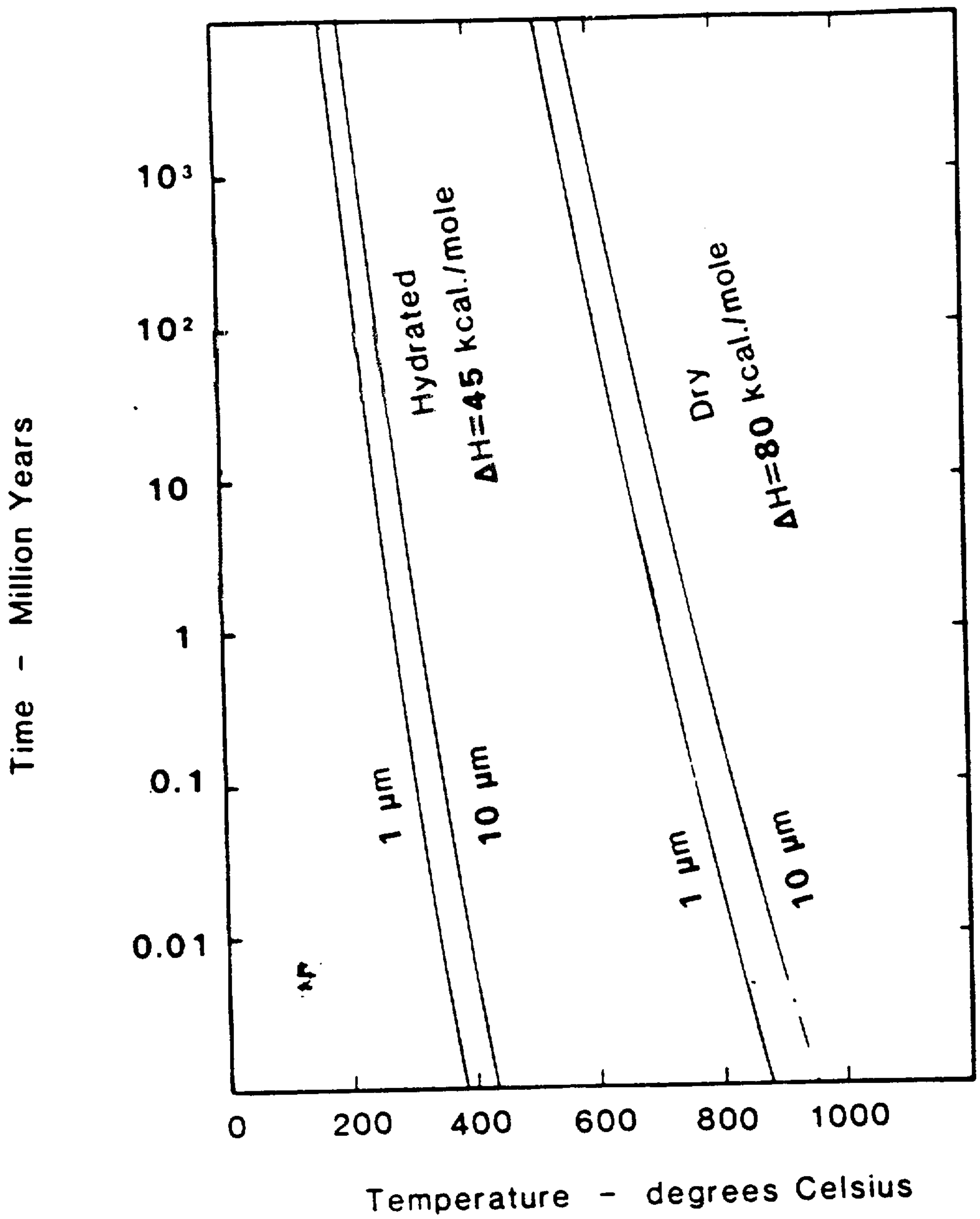
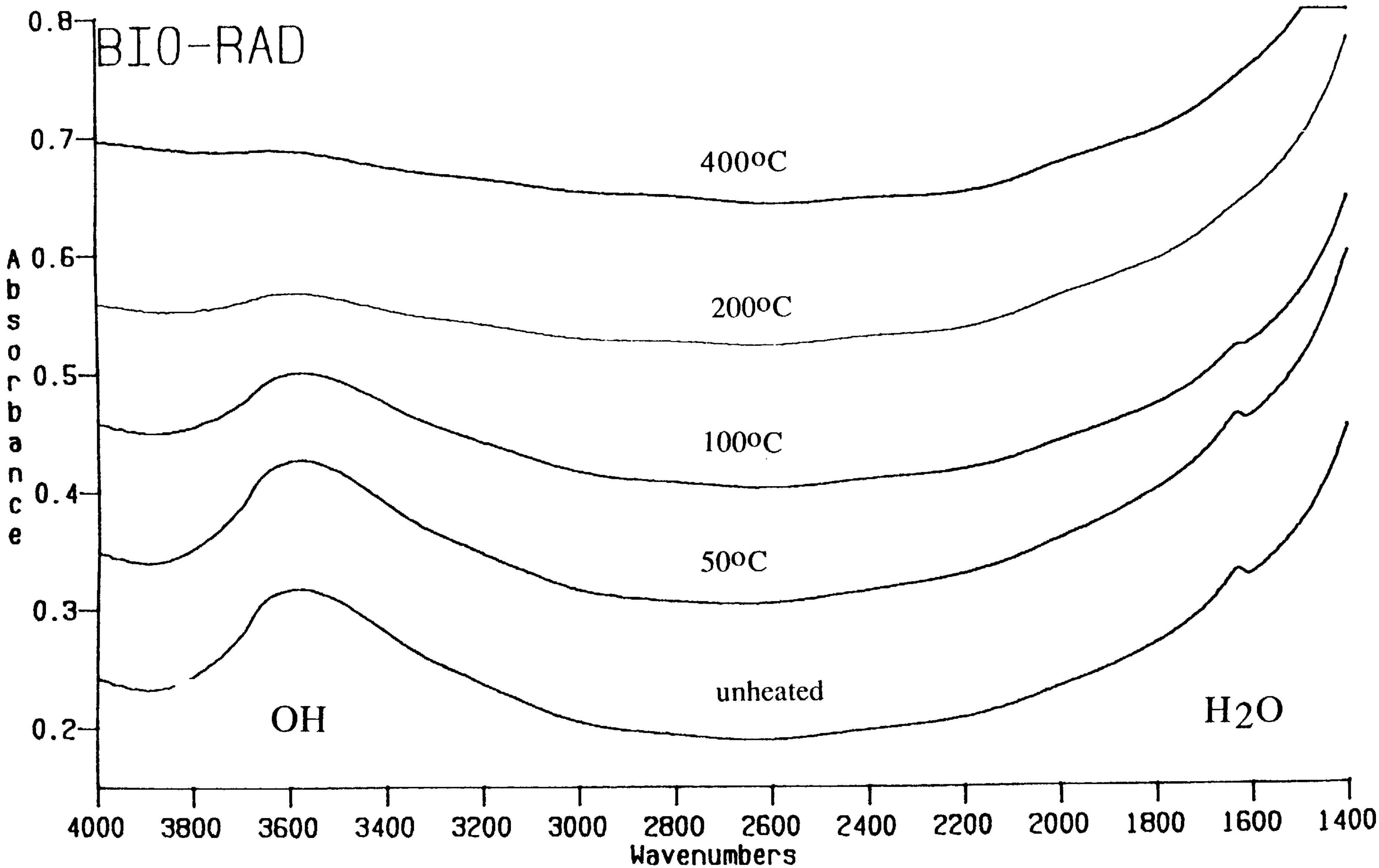


Fig. 2. A plot of devitrification of rhyolite glass as a function of time in millions of years and temperature in degrees Celsius. Curves are given for hydrated and "dry" glasses. The curves labeled 1 μm are plotted assuming that the devitrified glass will consist of crystals 1 μm in length, while the curves labeled 10 μm are for devitrified glass containing 10 μm crystals. In all cases the areas to the right of the curves define fields where the glass will be devitrified, while the areas to the left of the curves define fields where the glass will remain undevitrified.


BIO-RAD
0.8
0.7
0.6
0.5
0.4
0.3
0.2
Absorbance
400oC
200oC
100oC
50oC
unheated
OH
H2O
4000
3800
3600
3400
3200
3000
2800
2600
2400
2200
2000
1800
1600
1400
Wavenumbers

POSSIBLE CONSEQUENCES OF LONG-TERM VITROPHYRE HEATING:

1) Reaction of warm waters with vitric tuff
2) Creation of a zone of dehydrated glass below the repository

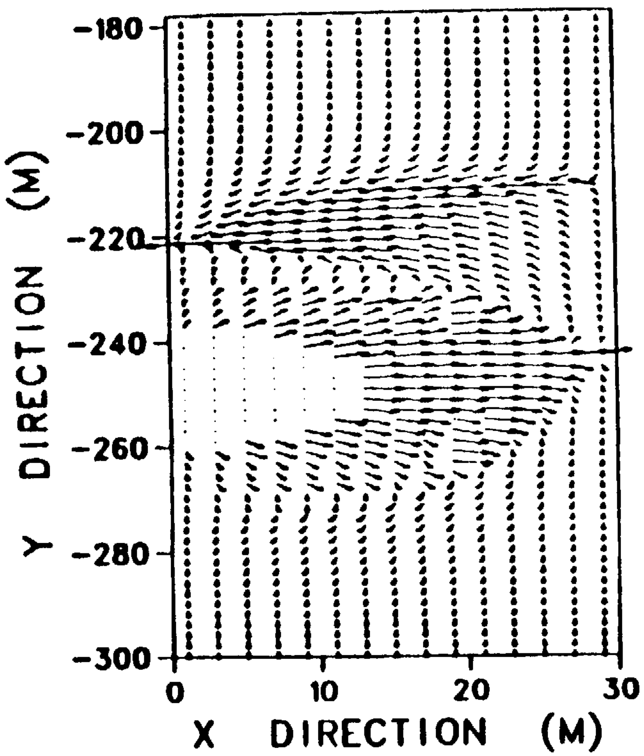


Fig. 8. Water velocity field at 100 years.

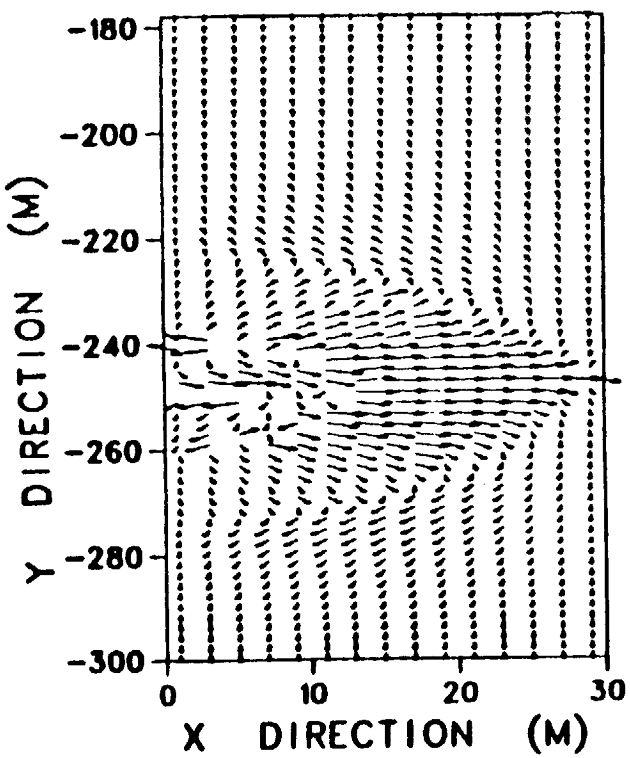


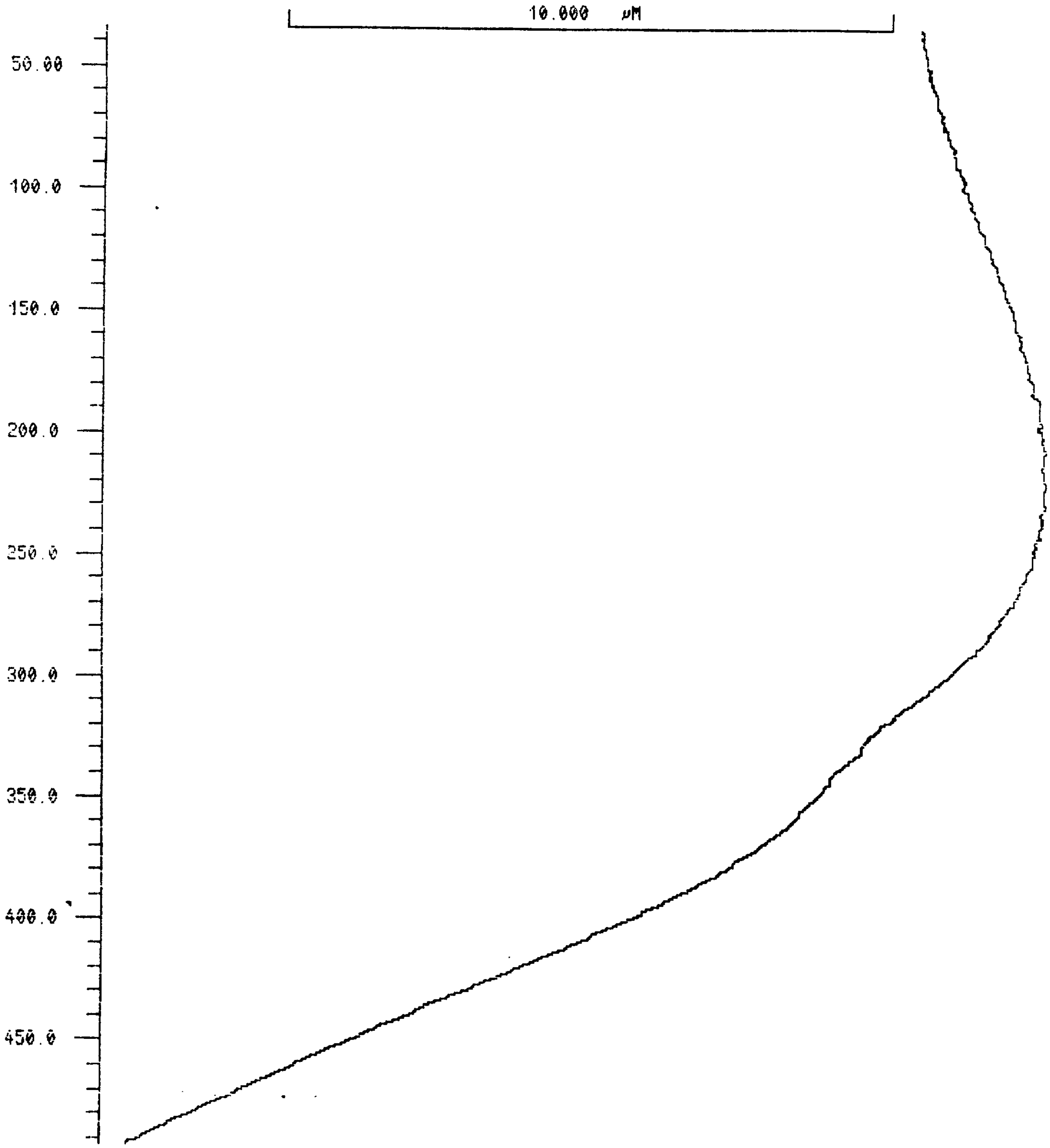
Fig. 9. Vapor plus air velocity field at 100 years.

SCREEN
DYN/ISO 1. 1
START 35
END 500
BASELINE TYPE 1
PLOT CM 20
PLOT MODE 1

7x7x3 mm sample

END TEMP. °C 492.3

TEMPERATURE °C LENGTH EXPANSION-->



METHOD NO. 1

17-JUN-82 12:45

IDENT. NO. 2.1664

LENGTH mm 3.6711

9x x7 mm
sample