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CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

TRIP REPORT

SUBJECT: DOE/Geomatrix meeting on probabilistic volcanic hazards assessment. 20-5702-441

DATE/PLACE: May 16-17, 1995. Las Vegas, Nevada.

AUTHORS: Brittain E. Hill

PERSONS PRESENT: B.E. Hill (CNWRA); J. Trapp, S. McDuffie, J. Kotra (NRC-NMSS). Attendance list attached.

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BACKGROUND:

The DOE has contracted Geomatrix Consultants to conduct an expert elicitation regarding probabilistic volcanic hazards assessment (PVHA) for the Yucca Mountain Region (YMR), Nevada. This meeting is the third in a series of four public meetings regarding the PVHA elicitation.

SUMMARY OF MEETING:

Prior to the meeting, the expert panel members met with the Methodology Development Team (MDT) to discuss the application of YMR data to the various probability models. The panel developed an influence diagram for the probability models (Appendix B), to determine which data are necessary for each specific model. Apparently the panel members will not run the data through the various models, but will instead tell the MDT the range of data they think best represents the physical processes controlling volcanism in the YMR. The MDT will then run the data through the models and provide the model outputs to the panel members. The apparent emphasis is that differences between models are not "significant" if there are no apparent differences in model outputs or data sensitivities.

The morning of the first day's meeting consisted of an elicitation training session by B. Judd (Strategic Decisions Group). Handouts for his and other speakers presentations are in Appendix C. Judd's presentation focused on recognizing and minimizing biases during an elicitation, and how uncertainties in probabilities can be estimated. A common problem is that experts tend to anchor their initial estimates then adjust uncertainties outward from that estimate, rather than bounding the uncertainty first. Several exercises showed some of the pitfalls common to estimating probabilities and uncertainties, and how these problems can be minimized during an elicitation. The afternoon session focused on the geologic setting of the YMR. G. Yogodzinski (UNLV) presented a summary of published and unpublished isotopic data for the area around Yucca Mountain. Pliocene and Quaternary basalts in the YMR have unique Sr ($^{87}Sr/^{86}Sr > 0.707$) and Nd ($\epsilon_{Nd} < -8.0$) isotopic characteristics, relative to most other contemporaneous volcanic fields in the western Basin and Range Province. However, basalts in the Greenwater and Black Mountains areas also have the same isotopic characteristics as the YMR, indicating that they were produced from the same type of mantle and had similar evolutionary trends. The implication is that the YMR magmatic system may extend into the Death Valley area, rather than end in the Amargosa Valley as currently assumed. M. Sheridan (SUNY) described the geologic evolution of western North America

since about 20 Ma, focusing on the general relationship between extension and basaltic volcanism. D. Champion (USGS) discussed how secular variations in the earth's magnetic field can be used to place temporal constraints on eruption ages. Using data from numerous late Holocene volcanoes in western North America, he concluded that small differences (5-10°) in rock magnetization orientations are consistent with ^{14}C and stratigraphic relationships indicating eruption durations of up to about 100 years. Pliocene and Quaternary volcanoes in the YMR occasionally show small differences in rock magnetization orientations, which support the conclusion that large intervals of time did not occur between eruptions. M. Sheridan gave the final talk of the first day, in which he described some spatial characteristics of basaltic fields in the southwestern Basin and Range and compared them with the YMR.

The second day's presentations began with the discussion of several topics by G. Walker (Univ. HI). Walker talked about the level of neutral buoyancy and associated effects on magma ascent, moderate-scale flood basalt provinces and a lack of analogy with the YMR, and common features of blocky lava flows. W. Duffield (USGS) gave an overview of the Coso Volcanic Field, which focused on the local tectonic setting and development of basaltic and rhyolitic volcanism in the field. G. Thompson (Stanford) presented new data on strain accumulation in the YMR, indicating that strain was lower than current detection limits over a 10 year observation period (i.e., 0.01 ± 0.02 mm/km/yr). Thompson also discussed evidence that dikes are larger at depth than at the surface, and that dikes may underlie zones of closely spaced normal faults. He also indicated that the DOE will conduct a low-level aeromagnetic survey at Paiute Ridge in the near future, to resolve subsurface structures associated with the dike-sill complex. B. Crowe (LANL) gave a presentation on the Lunar Crater Volcanic Field, which summarized work that was presented in Crowe et al. (1986). Crowe also discussed some of the Miocene basaltic igneous centers in the YMR, and presented an overview of his divisions between older and younger post-caldera basalt. F. Perry (LANL) gave a brief overview of regional and YMR isotopic characteristics, which emphasized the distinct isotopic compositions found in the YMR.

The remainder of the second day's presentations focused primarily on the tectonic setting of the YMR. J. Steward (USGS) gave an overview of the tectonic history of the Walker Lane Belt, which is a broad zone of predominantly strike-slip faulting that marks the transition in the YMR between the Sierra Nevada and the Basin and Range provinces. J. Wesling (Geomatrix) presented data on seismicity and neotectonics in the YMR. Numerous trench studies show that Quaternary faults in the YMR have relatively low slip rates (10^{-2} to 10^{-3} mm/yr) with long recurrence intervals. Many faults exposed in YMR trenches contain basaltic ash, all of which is reworked to some extent. During questions on this talk, B. Turrin (USGS) presented new $^{40}Ar/^{39}Ar$ dates of 1.0 Ma for the basaltic ash in Solitario Canyon trenches T-1 and T-8, which contradicts preliminary U/Th and thermoluminescence dates of less than about 0.1 Ma. J. Faulds (Univ. IA) discussed the structural framework of Crater Flat, based on his mapping and modeling (Faulds et al., 1994). J. Geissman (Univ. NM) showed that a small but complex group of roughly 110 ka basaltic volcanoes near Albuquerque recorded the same geomagnetic direction with very little dispersion. He also discussed the paleomagnetic data in Crowe et al. (1995), which he concludes show no resolvable difference between major lava-flow sequences.

IMPRESSIONS AND CONCLUSIONS:

The third workshop focused on the general geologic setting of the YMR and its relationship to other analogous volcanic and tectonic settings. The elicitation training session was well received by the panel members, and focused on recognizing and overcoming biases. There were a lot of data presented at this meeting, most of which are not variables in the current volcanism probability models but still are critical towards understanding the tectonic and magmatic setting of the YMR. In post-meeting discussions with

K. Coppersmith (Geomatrix), it appears that the panel members will be allowed to not consider probability models that they feel are too complex. This is troubling when combined with earlier statements regarding a focus on differences in probability model results rather than their accuracy in representing igneous processes.

PENDING ACTIONS: None.

RECOMMENDATIONS:

The DOE plans to use the results of these workshops in licensing. As such, CNWRA attendance at these workshops should continue. Appendices are with original copy. The author will supply upon request.

PROBLEMS ENCOUNTERED: None.

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