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J. Linehan

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Chief, Regulatory Publications Branch
Division of FOI and Publications Services
Office of Administration
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

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Dear Sir,

In the following, I detail my comments on, Technical Position on Tectonic Models in the Assessment of Performance of High-Level Radioactive Waste Repositories. These comments supplement my letter of August 16, 1989. I am told, by King Stablein (NRC) that, although the formal comment period has not been extended, additional comments are anticipated from the Department of Energy (DOE) and the U.S. Geological Survey (USGS). Thus, comments from members of the public, such as myself, will also be accepted after the close of the comment period. These comments, like those made previously, are my personal comments and do not represent those of any federal agency, business, academic or other institution.

As in my letter of August 16, I am concerned with the over-reliance on tectonic geometric or conceptual models at the expense of tectonic mechanical models. In the following, I discuss the recent use of a geometric model to generate estimates of the recurrence interval for moderate (M6.5 - M7.5) earthquakes in California. I believe that this example will be useful to illustrate some of the pitfalls that arise when geometrical but not mechanical considerations are used to construct tectonic models.

In Namson and Davis (1988), the authors use a method of balanced cross-section construction to estimate that earthquakes occur on the average, at 57-113 year intervals, to account for the constructed crustal shortening. This recurrence interval is, as stated by Namsom and Davis, an order or magnitude greater than a previous estimate.

In my opinion, the construction method of Namson and Davis misstates the amount of shortening and the earthquake recurrence interval because it requires the unrealistic assumption that lengths of lines do not change during deformation. By comparison of such a geometric construction with the result of a mechanical model, one can show that the geometric construction produces fold limb dips twice as steep, for the same amount of shortening, as the mechanical model. Thus, the construction method is not well-suited for estimating shortening or earthquake recurrence interval.

In generating alternative conceptual tectonic models for Yucca Mountain, NV, that can be supported by the available data,

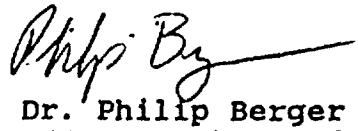
one must keep in mind the available mechanical models. Although there are a myriad of proposed, apparently reasonable conceptual models, most are poorly constrained by investigation of the mechanical processes implied by the conceptual model. If DOE were to collect data to evaluate every conceptual model, the number of parameters needed could be overly large. In my opinion, it would be more prudent to require DOE to collect data to evaluate every alternative mechanical model. In this manner, the number of alternative models to be evaluated could be reduced to a more manageable number. In my opinion, for example, some of the conceptual models for the Las Vegas shear zone would fail to be reproduced by a mechanical model.

In summary, I believe that any alternative conceptual tectonic model to be evaluated by DOE during site characterization must pass a test. I propose that the test be the reproduction of observed structural geometries by a mechanical model that specifies a rheology and boundary conditions and yields a solution that strictly satisfies the equations of conservation of mass and energy. Any conceptual model that does not meet the test requirements would be deferred until such a time that it can be shown to be mechanically possible.

Reference:

Namson, Jay and Davis, Thom, 1988, Structural transect of the western Transverse Ranges, California: Implications for lithospheric kinematics and seismic risk evaluation, Geology, V. 16, p. 675-679.

Sincerely,



Dr. Philip Berger
4754 Mussetter Rd.
Ijamsville, MD 21754