The Yucca Mountain Project: a Major Earth Science Investigation

Studies of Yucca Mountain, Nevada, as a potential site for the long-term disposal of high-level radioactive waste began in the late 1970s. Although initial studies anticipated disposal below the water table, the focus quickly shifted to the unsaturated zone because of the potential advantages. Millions of man-hours in every field of geoscience have been spent investigating the site. This presentation will highlight only a few of the more significant findings.

Yucca Mountain lies within a region of extension with currently active seismicity and volcanism. A system of normal faults that have a well-documented Pleistocene slip, cut and bound the mountain, but the hazards from tectonic processes has been shown to be low. Yucca Mountain consists of late Tertiary silicic pyroclastic rocks. The principal focus of study has been on the Paintbrush Group, which includes two zoned and welded ash flows separated by non-welded tuffs that comprise an important hydrologic unit.

The region that includes Yucca Mountain is semi-arid with only ephemeral stream flow. Water within the unsaturated zone (up to 500-m-thick) moves through both fractures and pores. Both types of flow are important to assessing radionuclide releases from a potential repository and their transport to the saturated zone. The potentiometric surface beneath Yucca Mountain is relatively flat, and water movement is slow, thereby enhancing the potential for dispersion of any radionuclides that reach the saturated zone. Geochemical retardation by exchange with minerals such as zeolites provides the last of the natural barriers contributing to the long-term waste isolation.