

Plate Tectonics and Radioactive Waste: New Solutions or Wishful Thinking?

When plate-tectonic theory was being developed and the existence and nature of subduction zones discovered, some began to see subduction zones as the ultimate in waste disposal. In particular, subduction zones were suggested as possible disposal sites for canisters of radioactive wastes.

The appeal of the idea is the image of these potentially hazardous materials being carried deep into the earth, there to vanish, effectively, forever (at least from a human perspective). The principal drawbacks are twofold. First, given the extremely slow rates of plate motion, complete subduction of wastes would take thousands of years at least. Unless the waste canisters were somehow emplaced well into the subducted plate, they would sit exposed to interaction with seawater in the meantime. Seawater, especially seawater warmed by decaying radioactive wastes, is highly corrosive and might breach the canisters, allowing leakage of the wastes. Second, a plate undergoing subduction does not slip quietly under the plate above like a spatula under a pancake. Subduction is accompanied by earthquakes and deformation of the plates and the sediments carried on them. Some of the overlying sediments are not, in fact, subducted but are scraped off onto the overriding plate. It is possible that some waste canisters could be ruptured or caught up in the scraped-off sedimentary pile.

Enthusiasm for this scheme has waned. However, now that the significance of plate tectonics to the formation and destruction of the sea floor has been recognized, there is interest in using the stable interiors of large oceanic plates as possible waste-disposal sites. An international committee is presently studying this idea; see chapter 15.