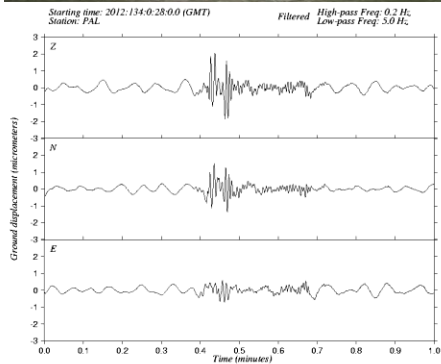


Lessons from a Rock Fall

Dr. William Menke, Lamont-Doherty Earth Observatory, May 16, 2012



A 500 foot high sliver of the Palisades Cliff (left) came crashing down last Saturday night (05/12/2011 at 7:28 PM), jiggling on our seismometer (below) at the Lamont-Doherty Earth Observatory a few micrometers. Weighing about 10,000 tons, the rock smashed trees along the Hudson River and covered over a hiking trail, but fortunately caused no injuries. The Hudson Palisades Cliffs are composed of a volcanic rock that was formed 200 million years ago during the age of the dinosaurs. I am tempted to think of them as having been there forever, or nearly so. I suppose that some sort of ridge has existed for a very long time, for the volcanic rock is much tougher than the more easily eroded sedimentary rocks of the adjacent lowlands, and the differing rates of erosion are what makes topography. But the spectacular cliffs, themselves, are much younger, having been sharpened by the great glaciers that swept down the Hudson Valley only

twenty thousand years ago. The fjord that was revealed as the glaciers melted back, and which has slowly faded into the Hudson River estuary as we know it today, must have been truly spectacular. Over the years, its deep waters have been clogged by mud and gravel and its walls have crumbled a bit. Still, most of its majestic cliffs remain. Yet gravity will eventually erase the cliffs; every year the pile of rocks at the base of the cliff grows larger and the proportion of vertical cliff face grows smaller. Several lessons are learned. One is that our world is in disequilibrium. This is especially evident in the Northeast, which is so dominated by the aftereffects of the Ice Age. But it is equally true in many other unexpected parts of the world, such as the Sahara Desert, which was covered with lakes just a scant 7000 years ago. Another lesson is that houses are best not built beneath a cliff. Gravity will eventually pull the cliff down, possibly to your or my detriment. Still, the odds are in an individual's favor. These cliffs have experienced only a few rock falls every decade, involving only tiny percentage of the overall length of the cliff, so the odds of a single house experiencing damage over the course of a lifetime are tiny, too. The Kearney house, built in 1760 at the base of the Hudson Palisades Cliffs at what is now the Alpine Boat Basin, survives unscathed to this day – although sustaining a near miss on April 18, 1896. A final lesson, sort of a corollary of the second, is that one should create cliffs, say by blasting and bulldozing a mountainside, only advisedly. Their appearance of permanence is illusory. Every cliff that you make will eventually come crashing down, and woe to the person standing beneath!