

EXPLANATION

200-400

Radioactivity boundary
Solid where well defined, dashed where transitional.
Numbers indicate general range of radioactivity levels in counts per second

300-400 450-650 400-500

Single line traverses made in inaccessible areas
Hooks point toward lower level of radioactivity

Boundary of area surveyed

1000	600
900	500
800	400
700	300
650	200

Approximate upper level within area of similar radioactivity
Numbers indicate counts per second

EXPLANATORY TEXT

The survey was made with scintillation detection equipment (Davis and Reinhardt, 1957) installed in a twin-engine aircraft. Parallel northeast-southwest flight traverses spaced at one-mile intervals were flown at a nominal altitude of 500 feet above the ground. Single line traverses were flown along roads in areas where rough topography prevented systematic surveying. The flight path of the aircraft was recorded by a gyro-stabilized continuous-strip-film camera. The radioactivity data were compensated for deviations from the 500-foot surveying altitude, and for the cosmic-ray component.

The effective area of response of the scintillation equipment at an altitude of 500 feet is about 1,000 feet in diameter, and the radioactivity recorded is an average of the radioactivity received from within that area. The scintillation equipment accepts only pulses originating from gamma radiation with incident energies greater than 50 kev (thousand electron volts). A cesium-137 source is used during periodic calibrations to assure uniformity of equipment response.

The gamma-ray flux at 500 feet above the ground has three principal sources: cosmic radiation, radionuclides in the air (mostly radon daughter products), and radionuclides in the surficial layer of the ground. The cosmic component is determined twice daily by calibrations at 2,000 feet above the ground, and is removed from the radioactivity data.

The component due to radionuclides in the air at 500 feet above the ground is difficult to evaluate. It is affected by meteorological conditions, and a tenfold change in radon concentration is not unusual under conditions of extreme temperature inversion. However, if inversion conditions are avoided, the air component may be considered to be fairly uniform on a given day in a particular area, and will not affect the discrimination of the radioactivity levels that reflect changes in the ground component.

The ground component comes from approximately the upper few inches of the ground. It consists of gamma rays from natural radionuclides, mostly members of the uranium and thorium radioactive decay series and potassium-40, and fallout of radioactive nuclear fission products. Locally the amount of fallout must be small, because the lowest total radiation measured is 150 cps (counts per second) in areas not affected by absorption of gamma rays by water. The distribution of fallout in the area surveyed is assumed to be uniform.

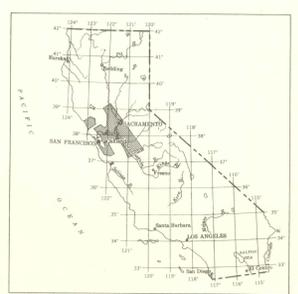
Range in natural radioactivity within the areas flown is moderate, from 0 to 200 cps north of San Pablo Bay to 800 to 1000 cps in the Mt. Diablo region.

In general, the aeroradioactivity is highest over igneous rocks or soils derived from igneous rocks and is lowest over marshy areas due to the masking effect of water. The greatest variation is in the Coast Range areas where the rocks are lithologically more complex.

A detailed study of the San Francisco aeroradioactivity survey is published separately (Books, in press).

Davis, F. J., and Reinhardt, P. W., 1957, Instrumentation in aircraft for radiation measurements: Nuclear Sci. and Eng., v. 2, no. 6, p. 713-727

Books, K. G., in press, Aeroradioactivity survey and related surface geology of parts of the San Francisco region, California (ARMS-II): U. S. Atomic Energy Comm. Rept. CEX-58, 4, 5



INDEX MAP OF CALIFORNIA SHOWING AREAS SURVEYED FOR THIS REPORT

1965 MAGNETIC DECLINATION VARIES BETWEEN 17'00" AND 18'00" E.

Base from Army Map Service 1:250,000 series: Chico, 1958; Sacramento, 1945; San Francisco, 1956; San Jose, 1945; Santa Rosa, 1944; and Ukiah, 1957

Aeroradioactivity survey made at 500 feet above the ground under the direction of J. A. Pitkin, J. L. Meuschke, and G. E. Andersen

NATURAL GAMMA AERORADIOACTIVITY MAP OF PARTS OF THE SAN FRANCISCO REGION, CALIFORNIA

By
Kenneth G. Books

