October 17, 9:19:21 p. m. to 9:20:48 p. m.; also October 18, 5:08 a. m. small tremors on horizontal, lasting until 7 p. m.; largest maximum double amplitude 2 mm. direction southeast.

October 21, 10:57:11 p. m. to 11:02:30 p. m.

The disturbance of October 21 is the sixteenth seismic record obtained by Father Ricard and his assistant Mr. A. Newlin at Santa Clara, since the installation of the Weichert 80 kg. astatic horizontal and vertical seismograph. The first record was obtained June 9, 1910.

NOTES ON THE RIVERS OF THE SACRAMENTO AND SAN JOAQUIN WATERSHEDS FOR OCTOBER, 1910.

By N. R. TAYLOR, Local Forecaster.

Sacramento watershed.—No important changes occurred in any of the streams of this watershed after September 30, and, in most cases, the low-water mark was reached in all of the main water courses during the last decade of September or the 1st of October.

The Sacramento River itself, while unprecedentedly low for the month, averaged slightly higher than during the month preceding, due to the rains that were more or less general throughout its drainage area from the 10th to 13th, inclusive. In the vicinity of the month of the Pitt River the Sacramento averaged 0.8 foot higher than during September. At Red Bluff the average stage, 1.1 foot, was 0.1 foot above that of September and the same amount higher than that of October, 1908, the year of extreme low water. At Colusa the river averaged 1.4 foot, which is 1.2 foot below the October normal stage and 0.7 foot below the lowest previous average for the month. At Knights Landing there was an average stage of only 0.3 foot, which is 0.9 foot below the October normal and 0.7 foot lower than the previous lowest average for the month. At Sacramento City the river averaged 5.7 feet, which is 1.5 foot below the average that has been maintained at this point during the past ten years, and 0.2 foot below the low water of October, 1908. Below Sacramento City there was little departure from the usual October stages.

The rainfall had little effect on the general averages of the streams in the Yuba-Feather territory, the Yuba at Marysville being lower than ever before recorded during any month, and the Feather at Oroville being the same as that recorded during the two preceding months.

The stage of the American River at Folsom, Fair Oaks, and Sacramento City averaged practically the same as that recorded in September and slightly higher than that of August, 1910. It was, however, lower than the lowest ever before known in October.

San Joaquin watershed.—While more rain fell in this watershed than in that of the Sacramento, the effects of the rainfall on the streams were less noticeable. The San Joaquin itself averaged generally lower than during the two preceding months, and while some of its tributaries, notably, that of the Tuolumne, responded slightly to the rainfall, all streams by the close of the month had receded to the extreme low-water mark.

The following paper appeared in the Pacific Rural Press, San Francisco, October 29, 1910, and is republished by the courtesy of the Editor:

SIXTY YEARS OF RAINFALL IN CALIFORNIA.

By A. G. MCADIE.

In no portion of the habitable globe are seasonal rainfalls more closely watched and studied than in California. There are many sections of the United States where departures from normal conditions are followed with interest; but there is no district where an excess or deficiency in rainfall means more or is more directly and vitally connected with the welfare of the community than in our own California. The history of each year's rainfall is written in the crop yield and in our material prosperity. If rain falls in sufficient amount within seasonal limits and is well distributed as to time and amount, a good year based upon abundant crop yield may be anticipated. On the other hand, scanty rainfall, or even an average rainfall badly distributed means poor harvests and their consequences. As agriculture underlies commercial prosperity, it is plain that the activities and industries of the State are bound up with and directly dependent upon the seasonal rainfall and the resulting supply of water.

Not without reason then do our people in California at the beginning of each rainy season take an interest in the frequency and intensity of the rains and try to estimate the character of the impending season.

The accompanying diagrams of seasonal rainfall first came into prominence during a period of drought, the dry seasons of 1897–98, and 1898–99, when there was a widespread uneasiness among our people and a general misapprehension that the climate was permanently changing. The charts conclusively show that such dry periods were only incidental and gave no true indication of a permanent change. Indeed, it was made plain that there was every reason for expecting a return to normal conditions.

It is not possible to forecast with any degree of certainty the coming season; but the careful student can detect in these records certain seasonal trends. He can also more intelligently refute the hasty conclusions put forth now and again by eager but poorly informed persons who think they have found the secret of seasonal forecasting.

It is plain that there is no regular sequence of wet and dry seasons, and this is as it should be, because while law is supreme in meteorology as elsewhere and our storms develop, move, and disappear in accordance with physical laws, understood in part, there are too many independent variables entering into the problem of rain formation and the condensation of the water vapor of the air to allow us to hope for a regular and easy solution of the problem. It is plain from the charts that an abnormal wet month is not necessarily followed by another of the same character; or in other words, rainy periods are of unequal length. No one can predict from the existence of one dry month in winter that the balance of the season will be dry. All that we can say at present is that wet seasons and dry seasons come and go in a very irregular way. Nor is there any determinable period between abnormal conditions. The chart herewith covers the rainfall for sixty years at two stations, San Francisco and San Diego, more than 500 miles apart. If we divide the sixty years in decades, we have:

SAN FRANCISCO.

	Inches.
10 seasons, 1849–1859	227.47
10 seasons, 1859–1869	257.85
10 seasons, 1869–1879	227.00
10 seasons, 1879–1889	234.23
10 seasons, 1889–1899	218.81
10 seasons, 1899–1909	210.28

The mean rainfall for ten seasons is 229 inches.

It is interesting to note that during the month of January, 1862, 24.36 inches fell, i. e., more rain fell in one month than the normal annual rainfall.

SAN DIEGO.

	Inches.
9½ seasons, 1850–1859	81.05
10 seasons, 1859–1869	97.04
10 seasons, 1869–1879	84.71
10 seasons, 1879–1889	119.21
10 seasons, 1889–1899	88.54
10 seasons, 1899–1909	97.24

Allowing for the missing half season, we make the average rainfall for each ten seasons 95 inches.

Note that in February, 1884, there was a rainfall of 9.05 inches; or almost as much as the normal rainfall of an entire season.

One will often hear it stated, especially in southern California, that a dry October presages a dry winter, but the records show that little dependence can be placed in statements of this character. One of the heaviest seasonal rainfalls, that of 1873–74, followed a dry October. A wet fall is, however, frequently followed by a wet winter.

Let it be also remembered that the State of California extends from latitude 32° 40′ to 42° 0′ N. It has a mean length of nearly 800 miles, with an average width of 200 miles and an estimated area of a hundred million acres. Naturally in so large an area there must be great diversity in the character of the rain. At some localities in the State the seasonal rainfall does not average one inch. While at others it exceeds 80 inches. In general, seasons of heavy rainfall in the north are also seasons of good rainfall in the south. But exceptions can be found even to this. There is one type of storm, the Sonora, which, causing heavy rains in the south, leaves the northern counties practically without rain. On the other hand, many of the northern storms pass eastward without resulting rains in the southern counties.