

How To: Search Through Station Records for Historic Seismograms and Find Information About Stations in Operation

Checking The Records

Let's suppose we wanted to check if University of California, Berkeley has records of the April 6th, 1943 Chilean Earthquake. To start, look into the *Catalogue of Earthquakes in Northern California and Adjoining Area* for the appropriate time period.

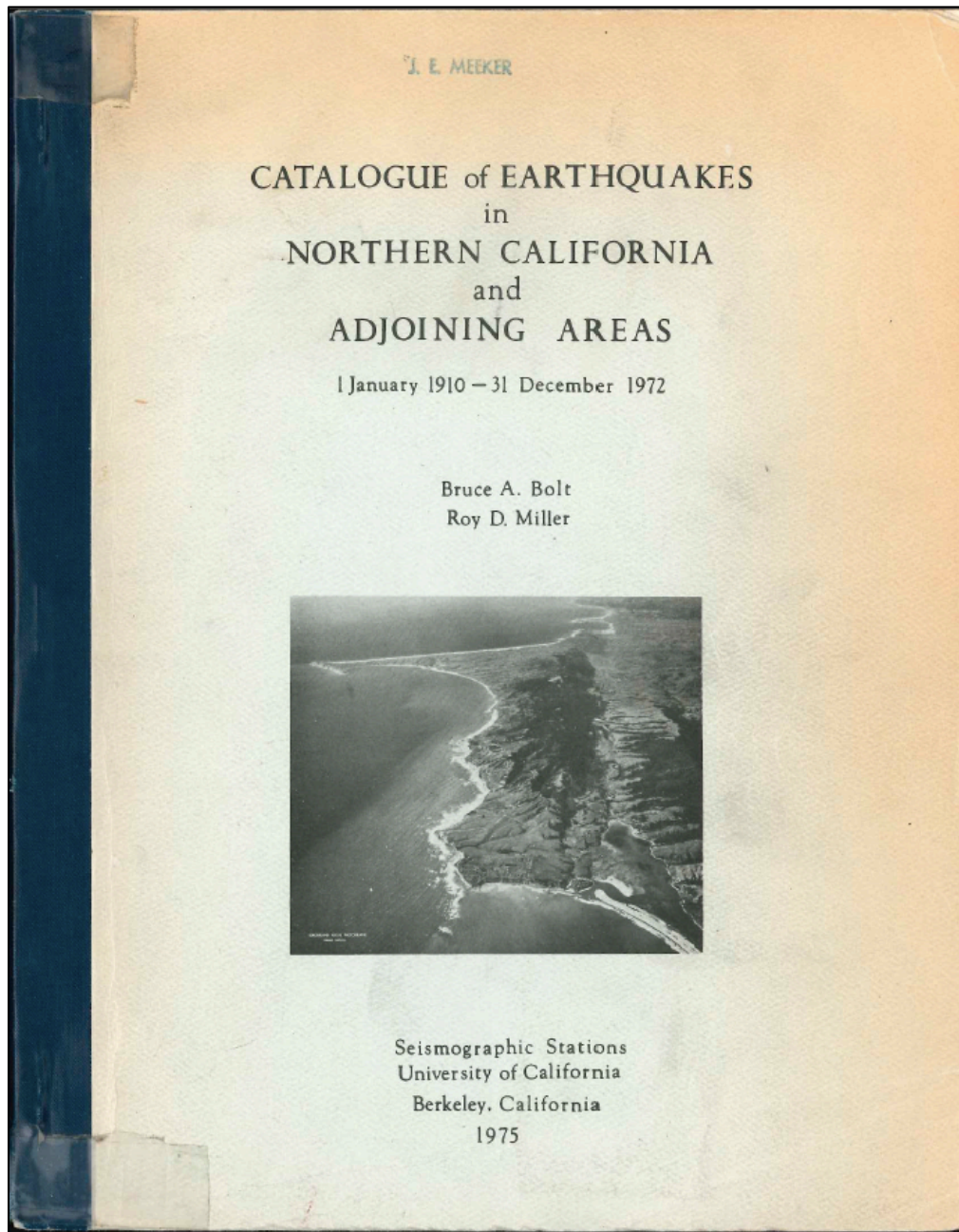


Figure 1 *Catalogue of Earthquakes in Northern California and Adjoining Area*. This catalogue will provide information about stations in operation from 1 January 1910 to December 1972.

In this catalogue you can expect to find information about known stations in operation and the registered earthquakes during the printed time period on the text (e.g. 1 January 1910 – 31 December 1972). It is advised to look at this text or the *Bulletin of Seismographic Stations* for the appropriate time period before searching or scanning any documents.

In this text you will find out if the event was recorded and by what instruments. Information about the stations: dates of operation, instruments used, components, magnification, foundation material the instrument is on, and the location (**Figure 2**) will be found.

8						
BRK						
BERKELEY (BRK), CALIFORNIA						
Established by the University of California in 1887						
37° 52'4 North 123° 14'6 West Elevation 81 meters						
Foundation material is Jurassic/Cretaceous Franciscan Sandstone						
Dates of Operation	Type of Instrument	T ₀ sec	T _g sec	Component	Magnification	
Apr1887-1910	Ewing, 3 Component	5.0		NS, EW, Z		
	Ewing Duplex	5.0		Horizontal		
	Gray-Milne Duplex			"		
15Jun06-10Nov10	Omori Tromometers	2.0		NS, EW		
30Oct10-Sep61	Bosch-Omori 100kg	15.0		NS, EW, Z	80 max	
	Wiechert 80kg	6.0			80 max	
28Aug30-01Feb65	* Wilip-Galitzin	12.0	12.0	NS, EW	1000 at T ₀	
				Z	600 at T ₀	
28Aug30-Jul62	Wood-Anderson**	1.0		NS, EW	3000 max	
19Oct33-Sep62	Benioff 100kg	1.0	0.4	Z	30,000 at T ₀	
Jan47-Mar47	Sprengnether, DH	2.0	2.0	Z		
Jan48 to 1950	Slichter	1.0		Z		
Mar48 to 1950	Slichter	1.0		EW		
01May59 to date	#Benioff 100kg	1.0	0.2	Z	25,000 at T ₀	
21Jun68 to date	Benioff 100kg	1.0	8.0	Z	Variable	
Jan68 to date	100x torsion	0.8		NS, EW	100 max	
19Jan62 to date	4x torsion	0.8		NS, EW	4 max	
01May59-29Aug62	Press-Ewing	30.0	90.0	NS, EW, Z		
Aug64 to date	Press-Ewing	15.0	30.0	Z	1,000 at T ₀	
19Jun64 to date	*Press-Ewing***	30.0	Broadband	N45°W, N45°E, Z		
Mar64-30Mar71	Press-Ewing ULP****	45.0	300.	N45°E	700 at T ₀	
# Recorded at Berkeley on Develocorder. * Recorded at Berkeley on magnetic tape. ** Changed in 1954 to T = 0.8 sec, Mag 2,800 max. Moved to BKS Jul62. *** Before 02Aug65 NS, EW, Z. **** Before 22Apr68 EW						

Figure 2 Sample page of the Berkeley (BRK) station's station information in the *Catalogue of Earthquakes in Northern California and Adjoining Area*.

Having a sense of which instruments were in operation will help in the scanning process. For example, looking at this page we can see that a Wood-Anderson and a Benioff were in operation during the 1943 event we are interested in. Benioffs and Wood-Andersons have different sensitivity ranges. Looking at the scan below (Figure 3), we can tell that this recording belongs to a Benioff because the marked event is more or less quiet except for the high frequency content marked on the seismogram. In contrast, Figure 4 shows predominately long-period waveforms, which is more characteristic of Wood-Andersons.

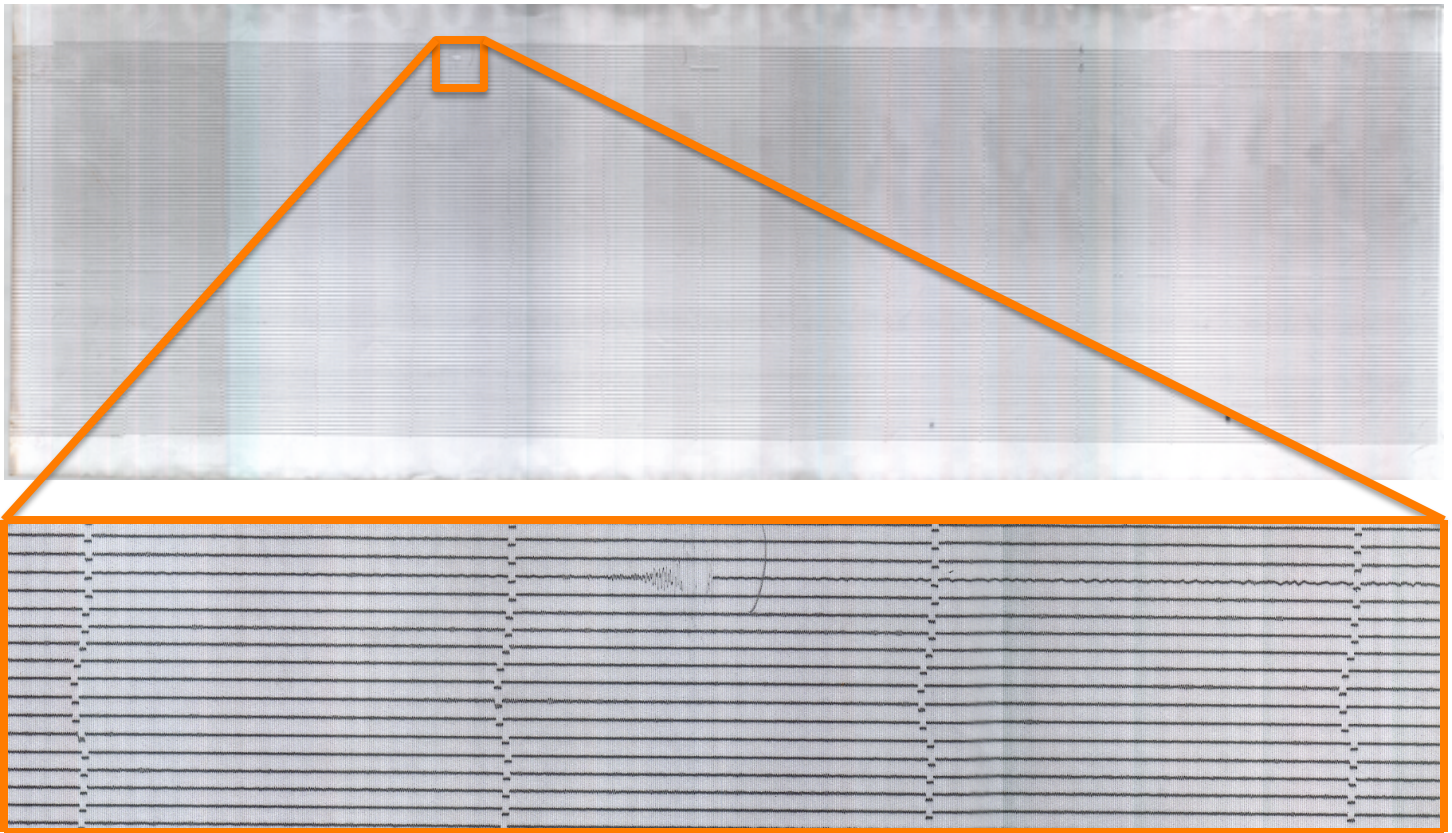


Figure 3 BRK Benioff 100kg seismogram on April 6th, 1943. Seismogram is zoomed in to view the high frequency signal.

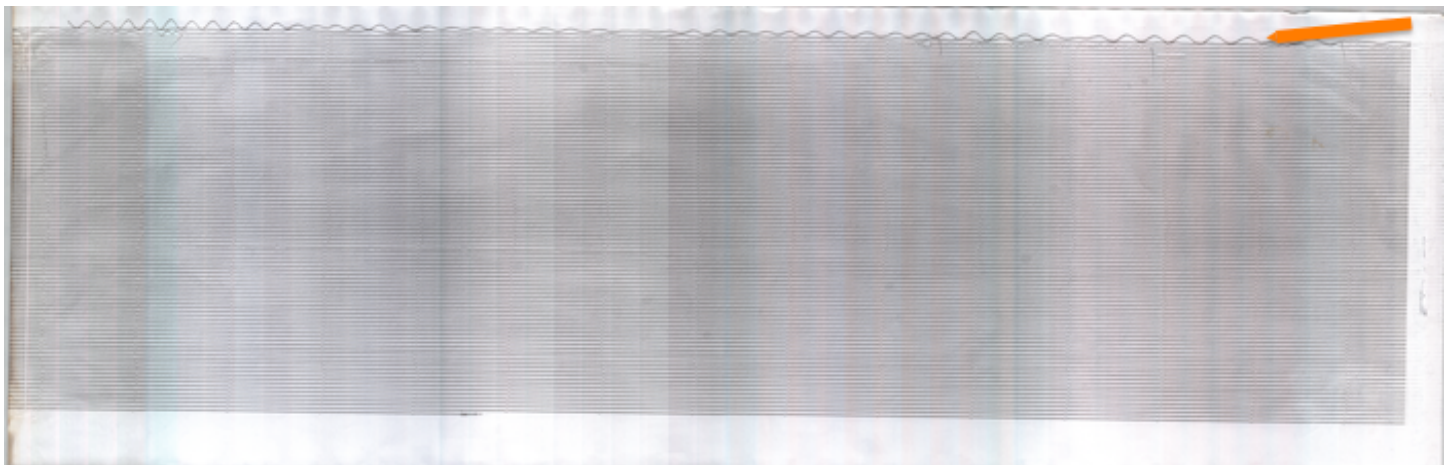


Figure 4 BRK Wood-Anderson seismogram on April 6th, 1943. Note the long-period signal on the top of the document (orange arrow).

Continue to browse through each station section to check which stations were in operation during the time of interest.

Provide scans of all pages with information pertaining to the event to the recipient. The EPS mailroom Rico printer/scanner is easier to work with given the dimensions of the file.

Knowing what stations were in operation during the time of your event, make your way to the Byerly Collection, Edwards Stadium, or the basement of Haviland Hall.

Location of Records

Historic seismograms can be found in the Edward's Stadium located in 2223 Fulton St, Berkeley, CA 94704, Haviland Hall (See map), or the Byerly Collection in the BSL Copy Room.

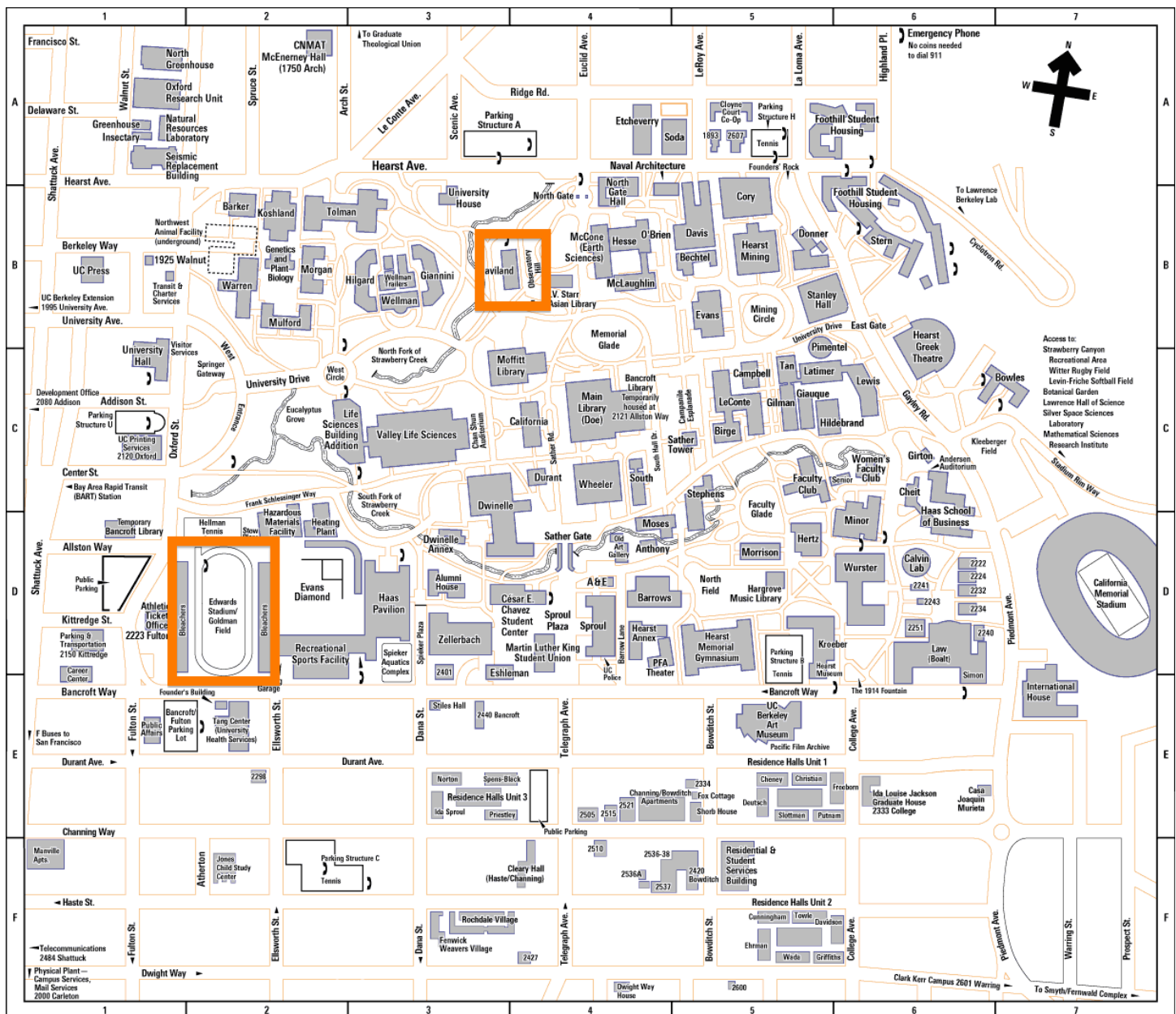


Figure 5 UC Berkeley Campus Map

Edwards Stadium

The records are located on the west facing side of the stadium, parallel to Fulton St. There is a tall, cement hall with various pillars and sports recreational equipment. Go down this hall. To your left you will see aisles labeled with different numbers. Go to Aisle 7. In Aisle 7 there is a locked door that you will need the key to. The BSL has a key for this door located in our key safe box. Bring the gate key to the site just in case.

Once inside there is a light switch to your left (I believe), turn it on. On the far left side entering the room you will see a table with a map of the different aisles.

A map, along with an index key to the aisles and rows of the room is attached at the end of this document.
(continue to next page)

Some of the seismograms are staked on tall shelves (greater than 7ft tall) and thus require a ladder to reach them. The seismograms themselves are held together by two pieces of thin wood and held in place by a string. Handling and reaching these records can be tricky so it is wise, and safer, to bring someone to help.

Haviland Hall

More records can be found in the basement of Haviland Hall in room S3. However, there are very few documents there. [Will update as more information comes forth]. In the meantime, check with the BSL Operations Manager for site and catalogue information.

Perry Byerly Collection

Located in the BSL Copy Room is a collection of seismograms starting from 1917 to 1970. These records were pulled from Haviland and Edwards. If there is an event that is particularly notable, it might be useful to check our collection before checking Edwards Stadium or Haviland Hall. There is a list to the right of the seismogram stacks in the BSL Copy Room.

Scanning

In the Berkeley Seismology Lab computer lab there is a Contex IQ 4400 scanner. The computer to the immediate right of the scanner (while facing the scanner) is connected to the scanner. The log on password for the computer is “bslonly”.

Open the NextImage program on the desktop of the PC. On the right hand side of the screen there are options for: scanning, image adjustments, output file, and account & log. (Figure 6)

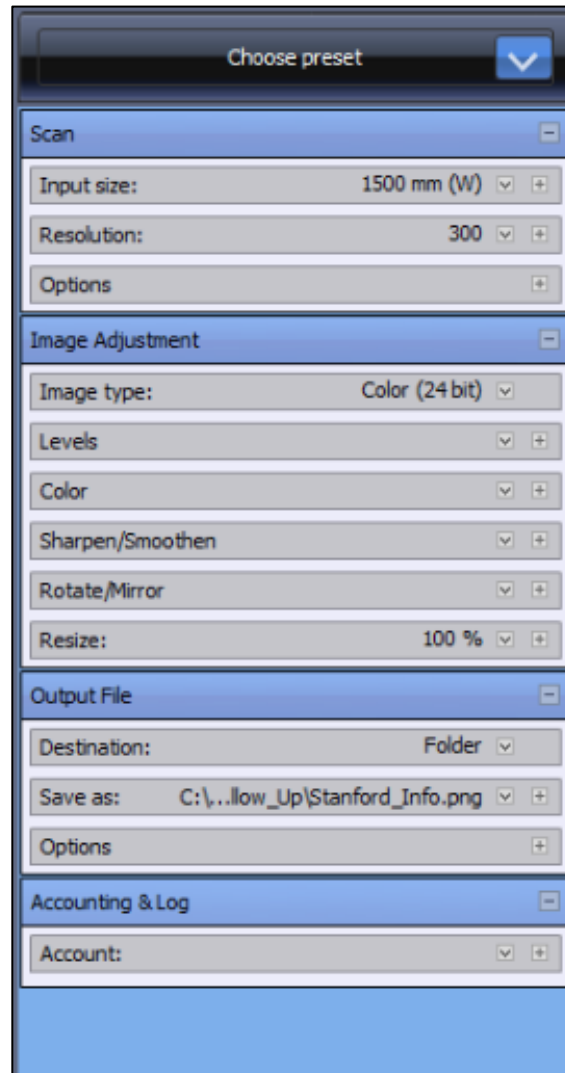


Figure 6 Preset scanning options for NextImage.

Place the document face up. Slowly move the document toward the scanner’s input. The Contex IQ 4400 will automatically “grab” the document from you. There are two arrows on the scanner that allow you to move the document into or out of the scanner. Use these arrows to check whether or not the document will jam. (This is a wise test to perform for older documents which may be wrinkled or old).

When the document is inserted and ready to go, click on the bright green “Scan” button. (Figure 7)

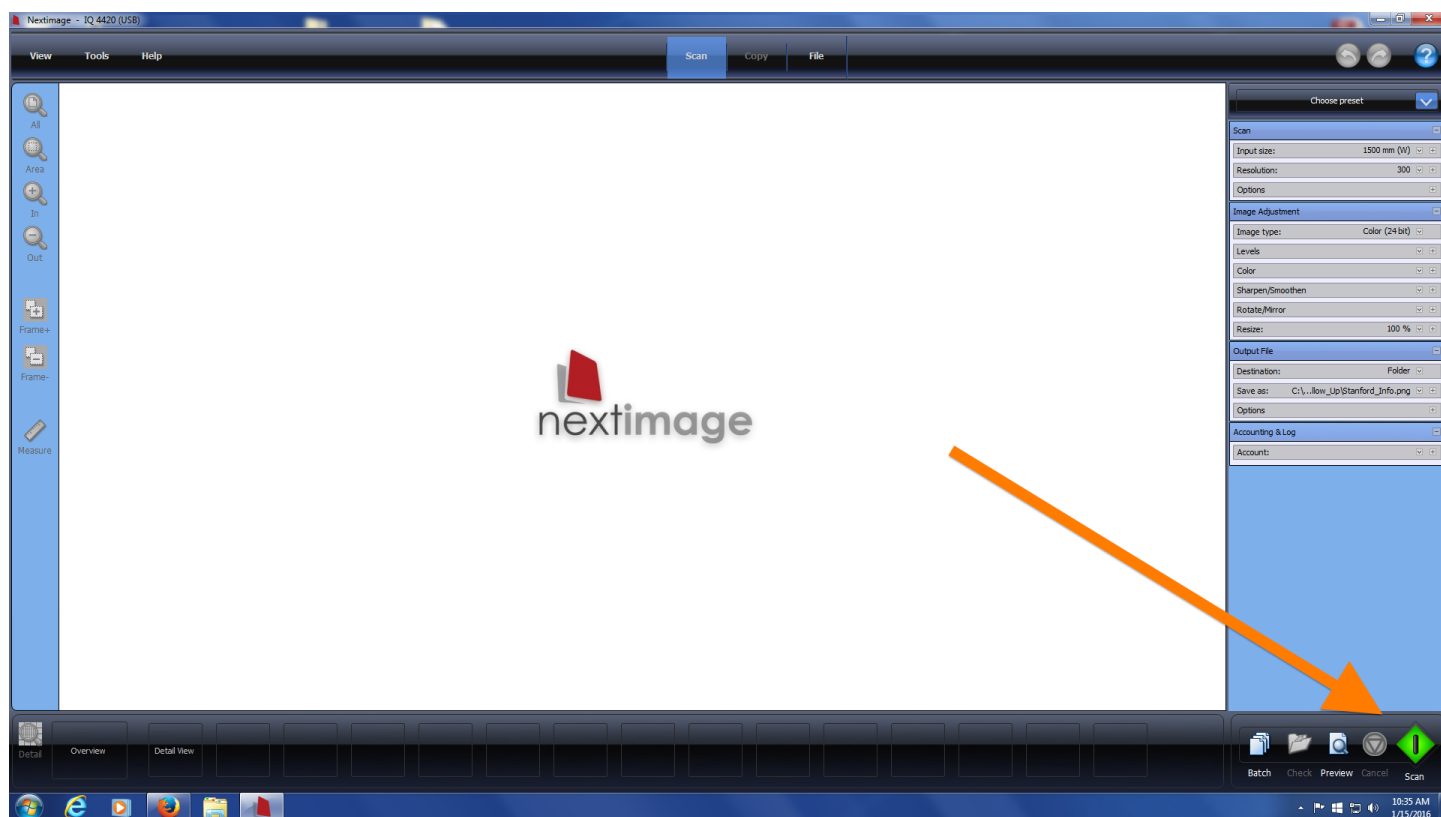


Figure 7 NextImage scanning program interface.

To prevent confusion and save time, scan both sides of the seismograms. The handwriting on the back of the seismograms can be difficult to decipher. Also, working with large volumes of documents can lead to some confusion if labeled incorrectly.

Repeat this process until all the seismograms (front and back of the document) are scanned.

Additional Station Information

Located in the mailroom between the scanner and the mailbox is a metal filing cabinet. Our final copy of *Bulletin of the Seismographic Stations* (Figure 8) can be found in the drawers of the filing cabinet. Make sure to return the document back to its original place when done.

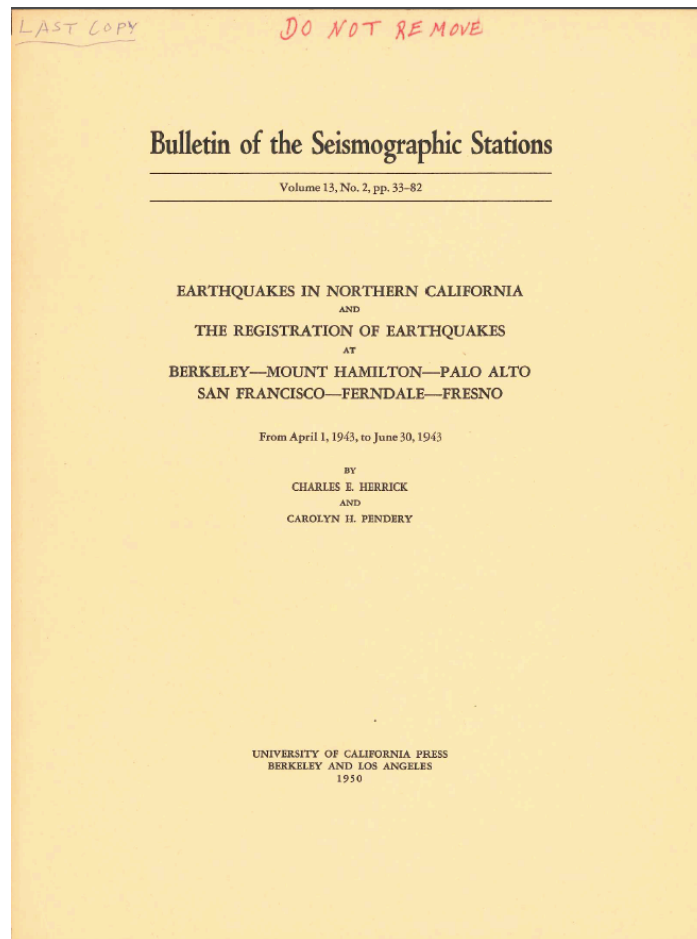


Figure 8 Front cover of *Bulletin of Seismographic Stations* from April 1, 1943 to June 30 1943.

What stations were in operation during this time period?

In this document you will find earthquakes in Northern California and the registration of earthquakes at the stations listed on the cover page. In the above example you can see there is information on the Berkeley, Mt. Hamilton, Palo Alto (Stanford), San Francisco, Ferndale, and Fresno stations in this document.

Description of the **earthquake intensity scale** and **earthquake magnitude scale** can be found immediately following the index.

Was the event recorded on any station?

To check whether a given event was recorded on any of the stations listed on the cover page, check the page titled “Earthquakes in Northern California” following the “Earthquake Intensity Scale” page.

This page will include the **date of the event**, **time of origin**, **Richter magnitude**, **north latitude**, and the **west longitude** of all events for the given time period. (April 1, 1943 to June 30 1943 in our case).

Did station "X" record the event?

To find out whether a specific station recorded the event, refer to the section called "The Registration of Earthquakes" which follows the "Earthquakes in Northern California" section. Here you will first find a page, which lists the character of the seismogram and the nature of motion (Figure 9)

40.	
SYMBOLS AND NOTATIONS EMPLOYED	
1. <u>Character of the Seismogram</u> --	
I. Perceptible.	II. Moderately Strong. III. Strong
d (terrae motus domesticus)	Local shock (origin less than 100 kilometers distant).
v (terrae motus vicinus)	Near shock (origin from 100 to 1,000 kilometers distant).
r (terrae motus remotus)	Distant shock (origin from 1,000 to 5,000 kilometers distant).
u (terrae motus ultimus)	Very distant shock or teleseism (origin more than 5,000 kilometers distant).
2. <u>Nature of the Motion</u> --	
i (impetus)	Sudden beginning of the motion.
e (emersio)	Gradual beginning of the motion.

Figure 9 Symbol key used to describe shaking intensity, distances of event, and the nature of the motion.

For each station there is an overview of the constants of the station and the seismographs. As the example shows below, the Berkeley station in 1943 has a **latitude** and **longitude** of 37 ° and 122 °, is recorded in **Universal Time** (U.T.) and has an altitude of 81 meters above **mean sea level** (in orange). This page also provides the **instrument type** and **components** (E, N, or Z). Abbreviations for the instrument type can be found at the bottom (highlighted in blue):

BERKELEY

THE BERKELEY STATION, UNIVERSITY OF CALIFORNIA
BERKELEY, CALIFORNIA

CONSTANTS

CONSTANTS OF THE STATION

Latitude and Longitude:

$\phi = 37^{\circ} 52' 13''$ N.
 $\lambda = 122^{\circ} 15' 16''$ W.

Time -- All determinations are reduced to Universal Time.

Altitude -- 81 meters (266 feet) above mean sea level.

CONSTANTS OF THE SEISMOGRAPHS

Apparatus	Component	V		T_0	ϵ	$\frac{r}{T_0^2}$	
Bosch-Omori 100 kg. ..	E	45		12	10	0.001	
	N	45		12	10	0.001	
	Z	44		4	5	0.005	
Wiechert 80 kg.							
Wood-Anderson	E	3000		0.9	15		
	N	3000		0.9	15		
		K	T	T_1	μ^2	A_1 (cm)	l (cm)
Galitzin	E	112	12	11.8	0.00	115	11.3
	N	122	12	12.4	0.03	119	11.2
	Z	109	12	11.9	0.01	131	14.9
		V		Coupled Period		ϵ	
Benioff	Z			0.7		5	

The letter G before a reading designates that the seismogram was from the Galitzin instrument; W, Wiechert, B, Bosch-Omori; A, Wood-Anderson; H, Benioff.

Figure 10 Summary of seismic station latitude, longitude, altitude and time standard along with instrument specifications.

Following the index of the Berkeley Station constants there is a list of all events (Figure 11) registered between the time interval marked on front cover page. Looking at the first column, we see that the April 6th earthquake was the "No. 7" registered by the Berkeley station. The "Time" column (column 5) shows the event was recorded at 16:19:41 U.T. on the Wood-Anderson(A) and Benioff(H). The location of the event is noted here under the "Remarks" column (column 6).

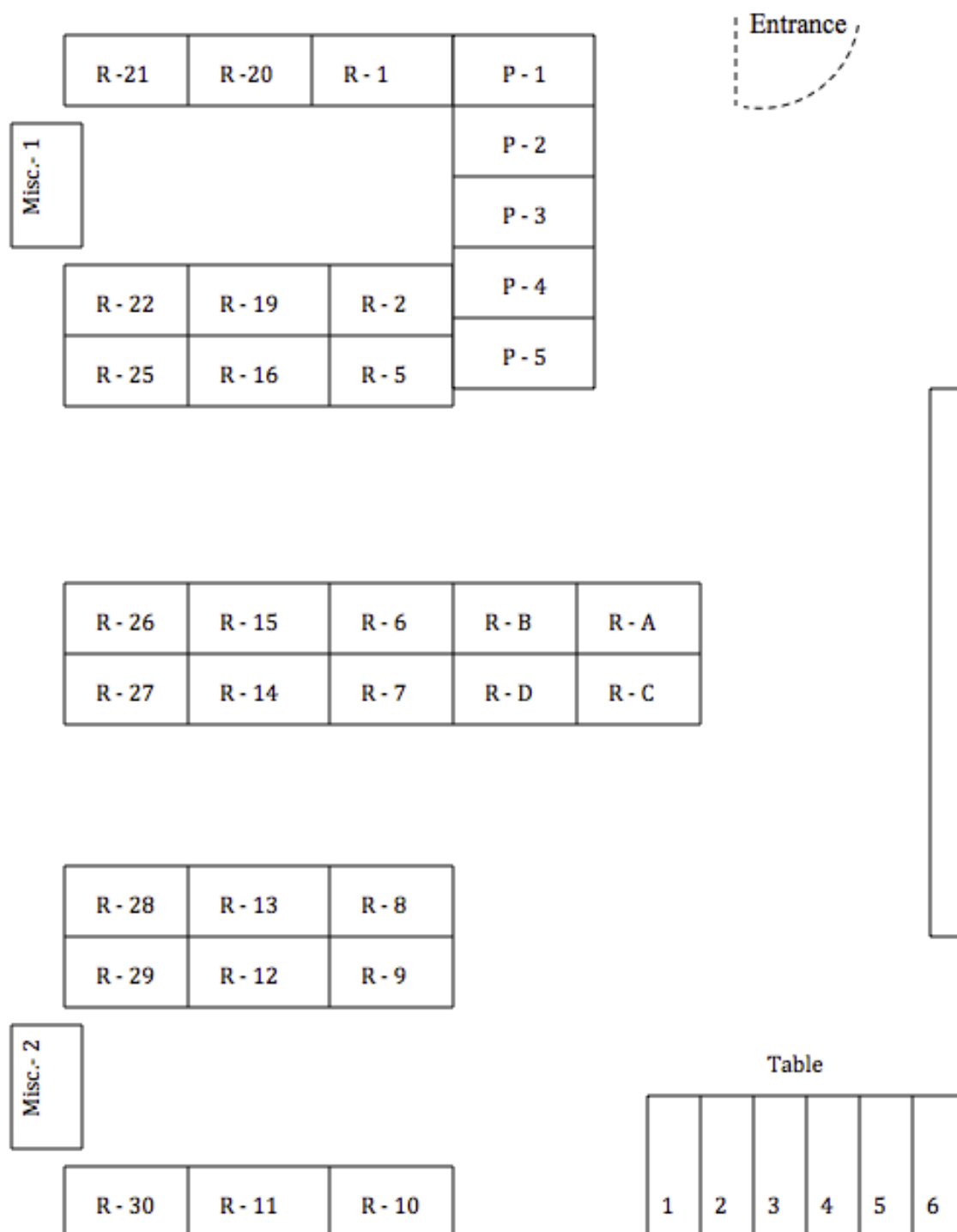
42.

1	2	3	4	BERKELEY 5	6
No.	Date	Char- acter	Phase	Time (U.T.) h. m. s.	Remarks
	1943				
1	Apr. 1	Id	iPZ eSN F	H 13 41 02.1 A 06 13 42	
2	Apr. 1	II	eE	G 14 43 54	
3	Apr. 1	Iv	ePZ F	H 21 07 15.1 21 10	Aftershock of quake of March 29, 1943, 23 59 47 G.C.T.
4	Apr. 2	Id	iPZ iSZ F	H 13 40 05.5 H 12.5 13 41	See list, p. 37 In addition to those listed, 4 foreshocks and 8 after- shocks were recorded.
5	Apr. 3	Id	iPNZ iSN F	AH 00 17 58.2 A 18 04.4 00 19	Aftershock
6	Apr. 5	ID	iPZ eSN F	H 06 24 58.0 A 25 05 06 26	See list, p. 37
7	Apr. 6	Iu	ePNEZ iPZ iPN eSN eSE iSN iSZ iSSN eLN eLE F	AH 16 19 41 G 41 G 44 A 29 59 A 30 01 G 04 G 10 G 34 50 A 47.1 A 48.2 20 00	U.S.C.G.S. 32°S, 70°W Pas: 30-3/4°S, 72°W
8	Apr. 6	Id	iPZ iSNE F	H 16 21 58.8 A 22 00.0 16 23	
9	Apr. 7	Id	iPNEZ iSNE F	AH 00 15 10.1 A 16.0 00 17	See list, p. 37
10	Apr. 7	Iu	iPZ iSE F	G 13 19 37 G 29 52 14 44	Aftershock of quake of April 6, 1943, 16-19-14 G.C.T.

Figure 11 The date, character, phase, time, and comments of events registered at the Berkeley (BRK) station between April 1st, 1943 to June 30th 1943.

Sending Scans Through Gmail

Given that the size of .png files run rather large, sending multiple documents through Gmail, Yahoo! Mail, etc. in one sweep is unlikely. Luckily, services such as Google Drive allow users with Gmail accounts to share photos. You can upload multiple photos or a file directly into Google Drive or by attaching them in an email. In the latter case, Gmail will automatically upload your files onto your Google Drive once it recognizes you are over the 25MB message limit. There is a built-in zip file extractor in Google Drive which allows you to decompress files if you upload your files as a ZIP file.



Map of Edwards Field Room 7

Index to Map

	Records
R – 1	1910 – 1929
R – 2	1929 – 1932
R – 3	1933 – 1935
R – 4	1935 – 1937
R – 5	1937 – 1939
R – 6	1939 – 1941
R – 7	1941 – 1943
R – 8	1943 – 1945
R – 9	1945 – 1947
R – 10	1947 – 1948
R – 11	1949 – 1950
R – 12	1950 – 1951
R – 13	1951 – 1952
R – 14	1952 – 1953
R – 15	1953 – 1954
R – 16	1954 – 1955
R – 17	1955 – 1956
R – 18	1956 – 1957
R – 19	Misc. Bundles
R – 20	1958 – 1958
R – 21	1959 – 1960
R – 22	1960
R – 23	1960 – 1961
R – 24	1961
R – 25	1961 – 1962
R – 26	1962
R – 27	MHC 1910 – 1934
R – 28	MHC 1935 – 1948
R – 29	MHC 1949 – 1955
Misc. – 1	1958 – 1959
Misc. – 2	Misc. records from top shelves
Table 1	Berkeley 1968
Table 2	Helicorder 1968
Table 3	Aux Station 1968 Jul – Dec
Table 4	Aux Station 1968 Jan – Jun
Table 5	BKS WWSS
Table 6	Helicorder 1969
R – A	1964 – 1965
R – B	1965 – 1966
R – C	1963 – 1964
R – D	1962 – 1963
P – 1	BKS WWSS Aux Sta Nov – Dec ‘66
P – 2	Helicorder and BKS 1967 ‘67
P – 3	Aux Station Jul – Dec 1967
P – 4	Aux Station Jan – Jul 1967
P – 5	BKS WWSS 1967

Notes:

1. Records from 1910 through 1959 are in bundles by stations by quarters
2. Records from 1960 are in bundles by either one of two months and either identified by Helicorder records, Berkeley records, Aux Station records, or BKS WWSSS records for each year.
3. All MHC records 1910 – Jun 1962 are located R – 27, R – 28, R – 29, and R – 30. All MHC WA records from Jul 1962 will be found with Aux Station records.
4. Berkeley records consist of ULP, WA and 100x/4x paper records.
5. Aux Station records consist of all paper records from out station e.e. MHC, ARC, MIN, JAS.
6. If records/bundles are missing from their proper rack then look on either Misc 2 or R – 19
7. Be especially careful to leave log out slips in the proper place.