A MULTI-PURPOSE CRUSTAL STAIN OBSERVATORY, DALTON TUNNEL COMPLEX, SAN GABRIEL MOUNTAINS

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(September 1, 1979 to September 30, 1980)

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Contract No.:	#14-08-0001-18339
Principal Investigators:	Thomas L. Henyey Associate Professor, Geophysics
	Ta-liang Teng Professor, Geophysics
Government Technical Officer:	Karen Ward
Title of Work:	A Multi-Purpose Crustal Strain Observatory, Dalton Tunnel Complex, San Gabriel Mountains
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PROJECT STATUS

The first year U.S.G.S. contract for the Dalton Observatory, a U.S.C.-Caltech joint project, has been completed. Work on the facility has been completed. Several instruments are on line. Work on additional instrument installation is continuing. Progress is outlined below:

Facilities:

1) Permits for extended use of the tunnel and construction of on-site facilities have been obtained from the Los Angeles County Flood Control District.
2) The tunnel has been "barred down" and the loose debris removed by a commercial contractor. Low spots in the floor have been filled and the drainage improved.
3) The tunnel has been inspected by OSHA and deemed safe for general use as proposed.
4) An electronics blockhouse and access bridge have been designed and constructed. This work has been a cooperative effort by personnel at U.S.C. and outside contractors.
5) AC power has been installed.
6) Piers have been constructed.
7) Telephone data lines should be ready early in fiscal year 1981.

Equipment: Installation of equipment is proceeding according to plans (Figure 1). Present instrument status (see Table I) is as follows:

1) Lacoste tidal gravimeter - in calibration; final hook-up awaits a re-zero switch.

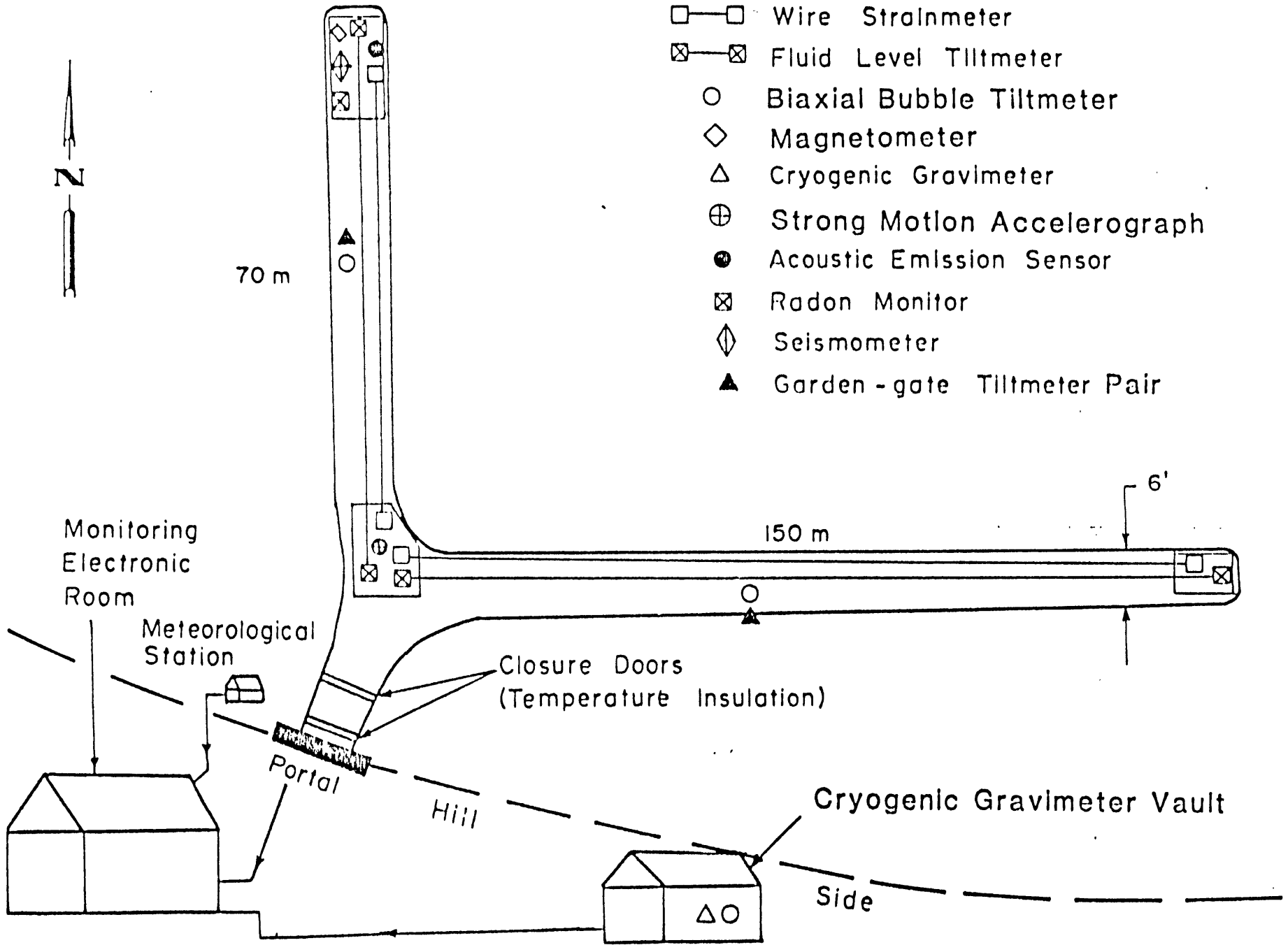


Figure 1. Schematic drawing of Dalton Observatory

TABLE I

Instruments Scheduled for Installation at
Dalton Observatory During Current Year

	Instrument	Person Responsible
1.	Acoustic Emissions Recorder	Teng
2.	Continuous Radon Counter Note: M. Shapiro is present operating a continuous β-counter at Dalton	Teng
3.	LaCoste H-7-G Gravimeter with 0.001 milligal resolution.	Henyey
4.	Drill hole with borehole water level, turbidity and temperature sensors.	Henyey
5.	Fluid level tiltmeters (orthogonal pair)	Leary Bilham
6.	Carbon fiber strainmeter (orthogonal pair)	Leary Bilham
7.	Two Press-Ewing long-period seismometers w/D.C. transducers (orthogonal pair of garden-gate tiltmeters).	Miller Ahrens
8.	Kinemetrics bubble tiltmeter	Miller Ahrens
9.	Ground thermisor array	Leary Henyey
10.	Meteorological Station	Leary
11.	Recorders: 2 TIMs 2 digital cassette recorders 1 multipoint recorder	Nickerson Manov
12.	Strong motion accelerographs - Existing units at both the observatory and Dalton Dam	CDMG

2) Acoustic emission recorder - installed.

3) Two carbon fiber strainmeters - installed.

4) Two fluid level tiltmeters - installed.

5) Two bubble tiltmeters - installed.

6) Two Press-Ewing long period seismometers w/D.C. transducers (garden gate tiltmeters) - installed.

7) Ground temperature monitoring array - installed.

8) Meteorological station - installed.

9) Borehole for water level transducer - not yet drilled, instruments standing by at U.S.C.

10) Continuous Radon monitor (α-counter) - standing by at U.S.C. (M. Shapiro of Caltech is currently monitoring Radon (β-counter) near Dalton Observatory in a shallow well).

11) Telemetry interface modules, digital and analog recorders - standing by at Caltech and U.S.C.

12) Vibrating string experiment (Bruce Clark, Leighton Assoc.) - two holes drilled, instruments being installed.

13) Dry tilt array (Art Sylvester, UCSB) - initial lines to be laid out in the fall, 1980.

RESULTS

Two pair of Bilham-King carbon fiber strainmeters are presently operating in southern California. One pair (an orthogonal NW-NE pair, 105 and 195 ft. long, respectively, in Dalton Canyon north of Glendora) were set up in mid-June 1980 and have given stable data since installation. The other pair (parallel; east-west orientation; 80 ft. and 60 ft. long located in a shallow mine just north of Bouquet Reservoir) has been operational since December 1978. One unit has given continuous records to the present; the second has been repaired twice.

A. Dalton Strainmeters

Dalton Tunnel (Figure 2) was equipped with massive concrete piers anchored to the tunnel walls by numerous ribs of 3/4" reinforcing steel epoxied to the rock to depths of 18". The two strainmeter mounts were fixed to the piers with stainless steel anchors and epoxied in place. The instruments have shown no tendency to drift after the first week.

Because Dalton Tunnel is still being regularly visited by persons installing instrumentation, we have not processed the long-term records. A sample short-term ($\sim$ 1 wk) record is reproduced in Figure 3. The new Hebrides earthquake excited a sizable response in the NE (195 ft.) instrument (Figure 4) but not the NW (105 ft.) instrument. Since the relative azimuth of source and receiver is NE, the preferential excitation on the NE instrument may reflect strong Rayleigh wave energy and weak Love wave energy along the azimuth.

B. Bouquet Strainmeters

Figure 5 shows the two Bouquet strainmeters tracking between December 1978 and April 1979. Subsequently BQS1 experienced an episode of E-W tension in the period covered by the trilateration anomaly of Savage. Figure 6 extends the BQS1 data through March 1980. Unprocessed records for June and July, 1980, show the extensional recovery of March 1980 to be continuing. BQS2 has experienced repeated problems with its end mounts and has not returned stable data since spring of 1979.

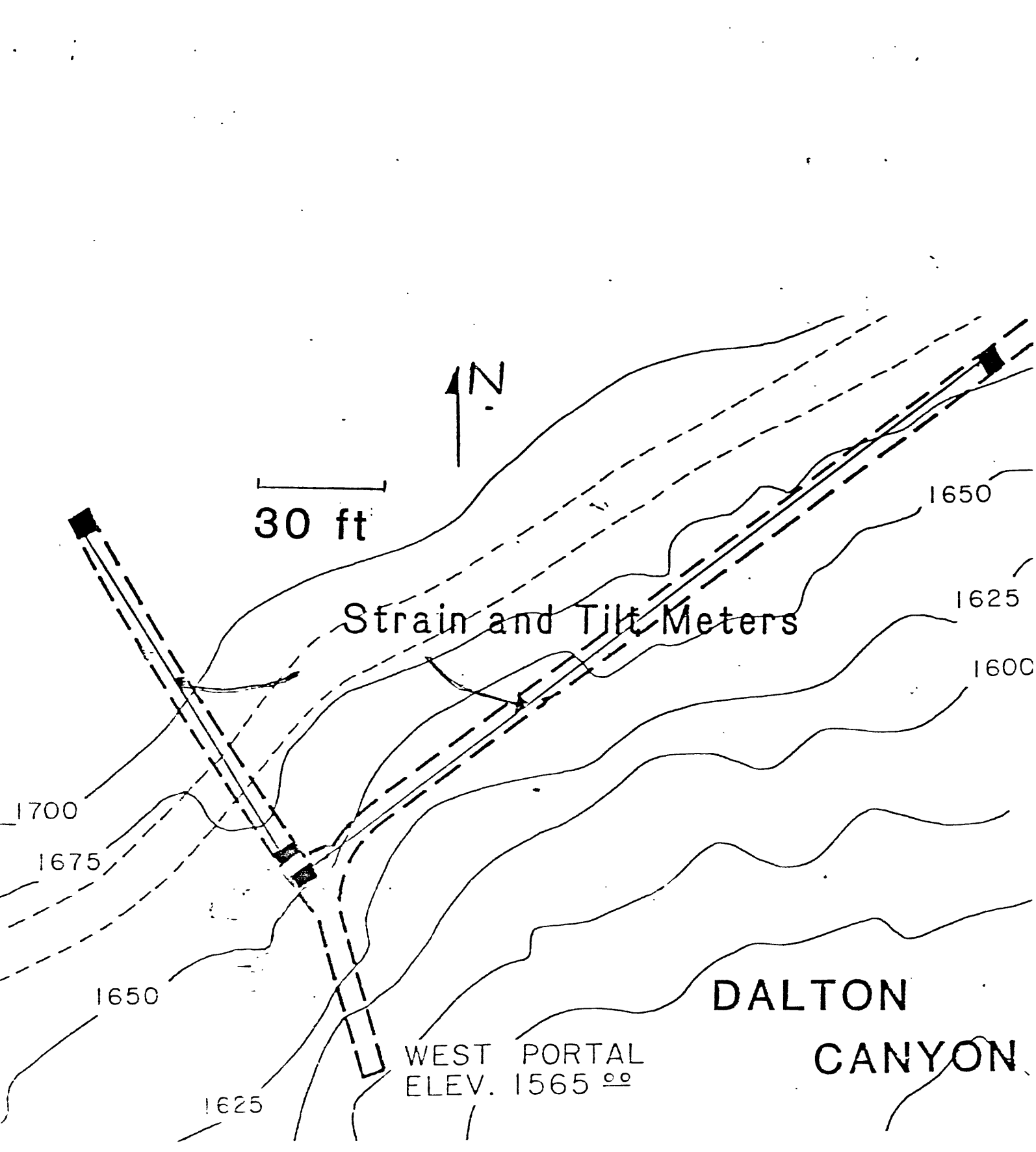

N
30 ft
Strain and Tilt Meters
1650
1625
1600
1700
1675
1650
1625
WEST PORTAL
ELEV. 1565 ±0
DALTON
CANYON

Figure 2

Figure 3

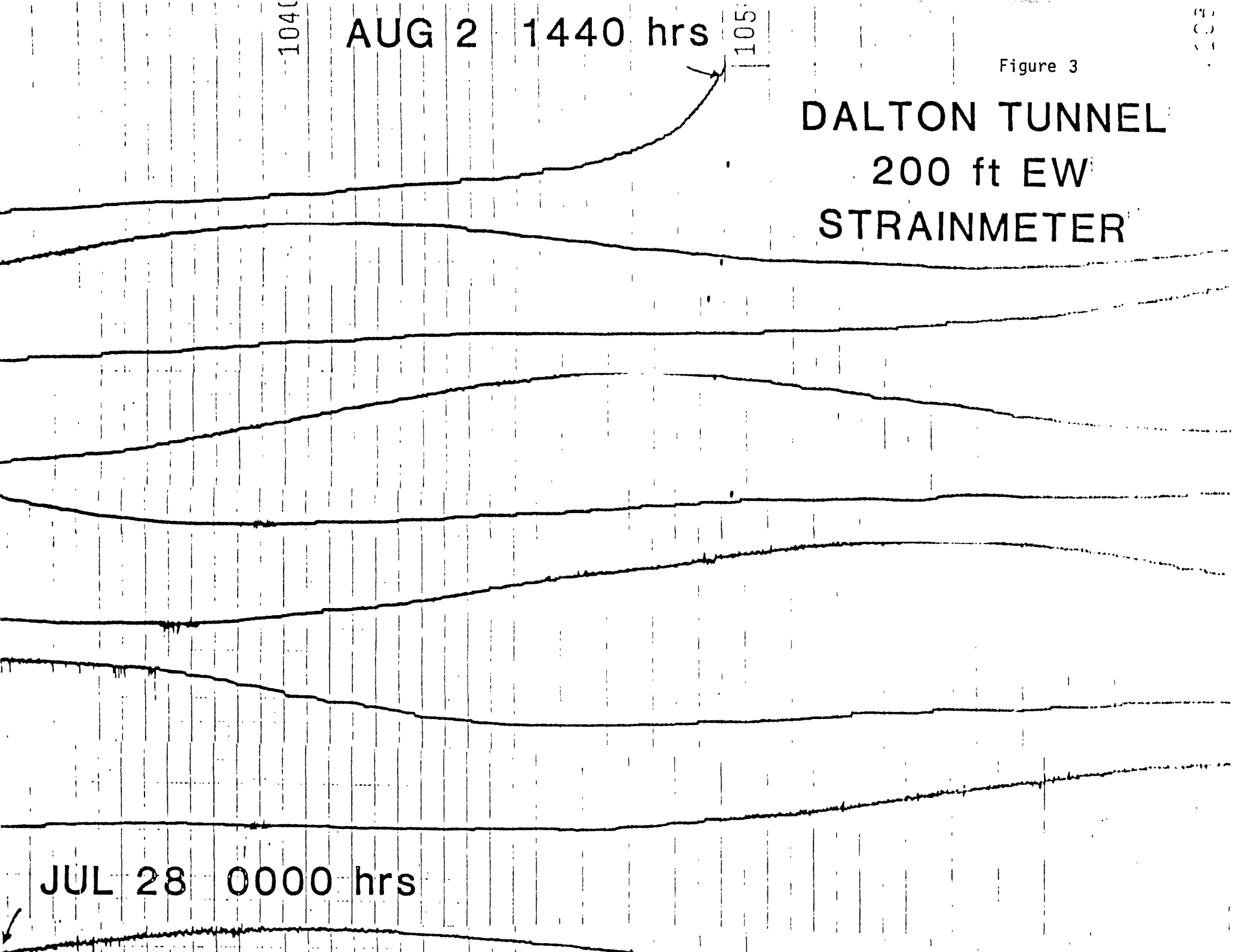
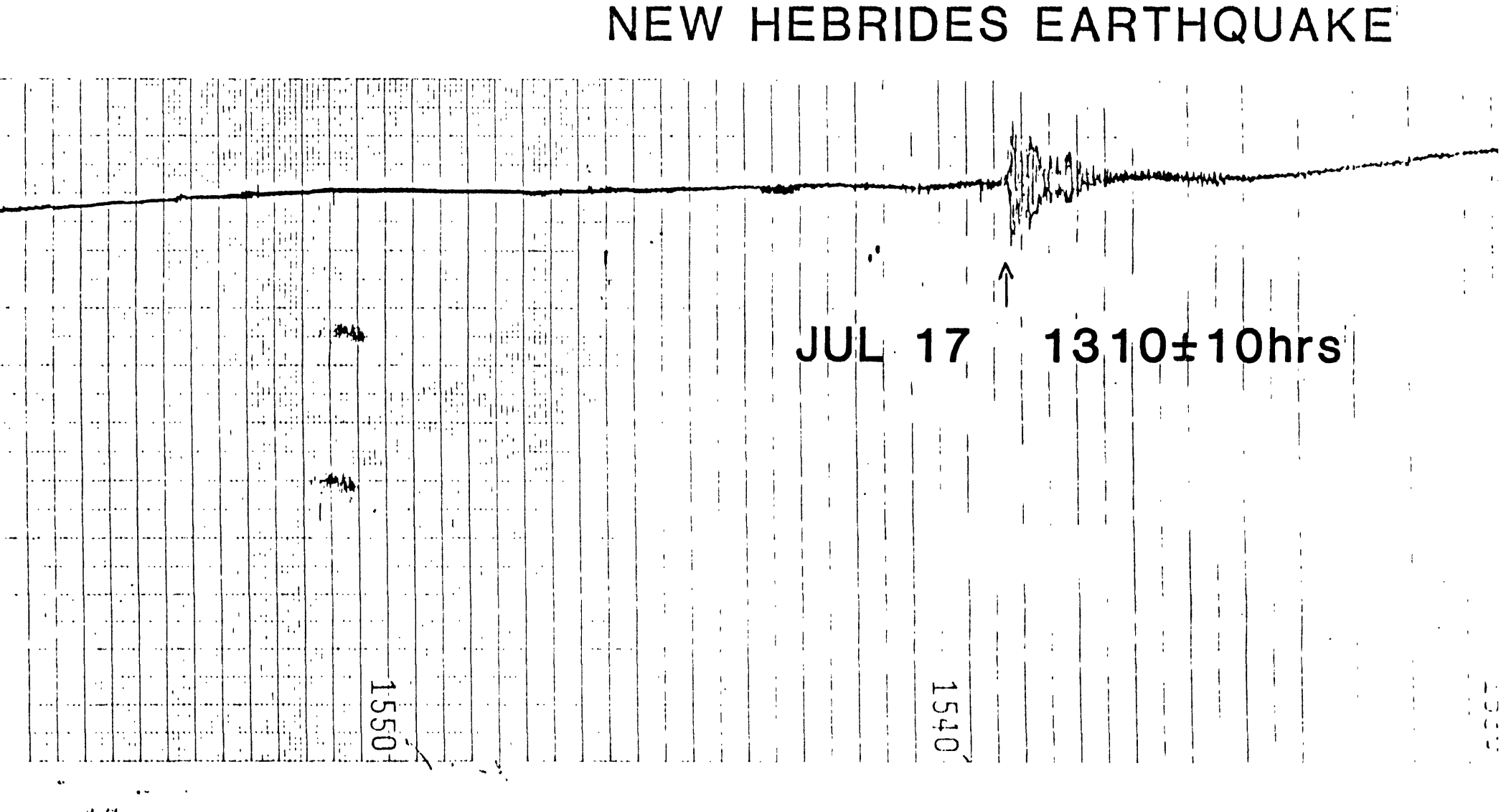

AUG 2 1440 hrs
DALTON TUNNEL
200 ft EW
STRAINMETER
JUL 28 0000 hrs

Figure 4



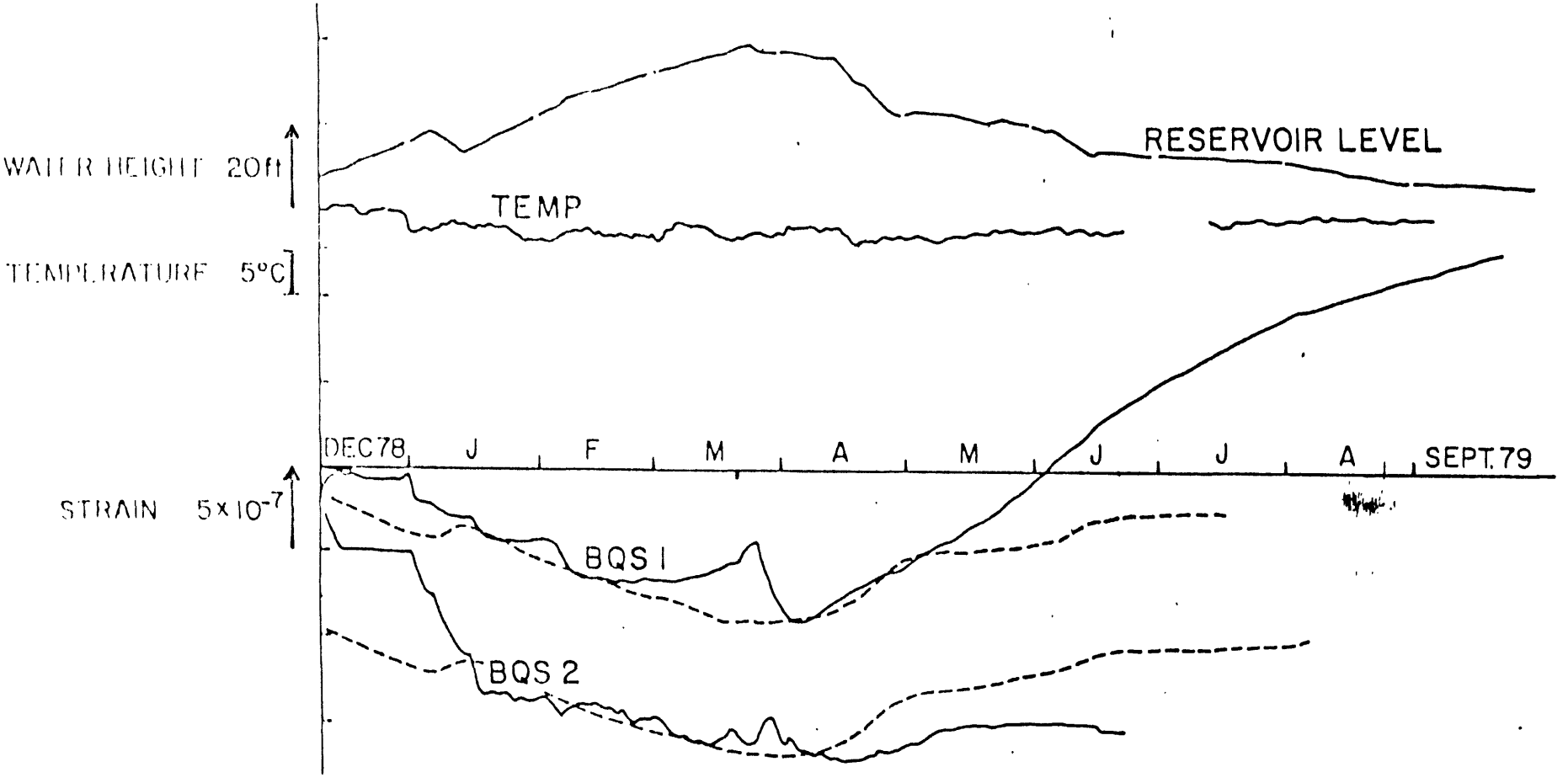
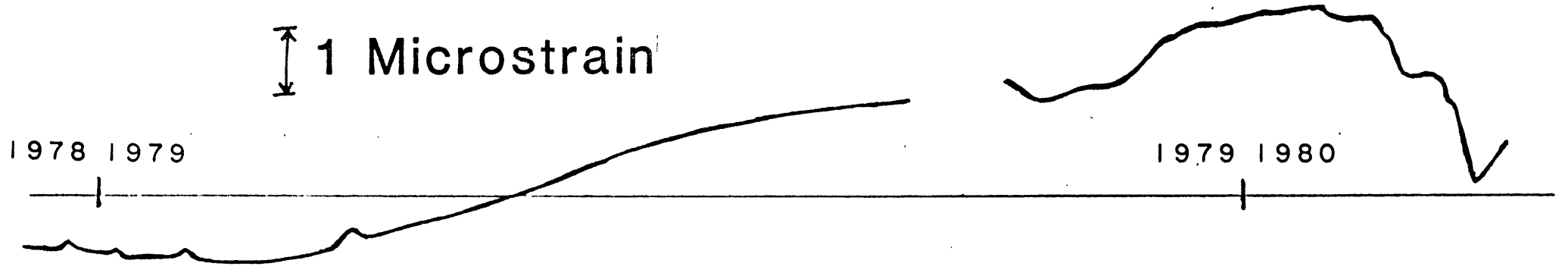


FIGURE 5

Bouquet Reservoir carbon fiber strainmeter data between December 1978 and September 1979. Upper lines are reservoir water level and strainmeter-site temperature. Lower lines are strainmeter data (solid lines) compared with scaled, inverted water level data (dashed line).



BOUQUET RESERVOIR STRAINMETER

Figure 6