ANIMAS, NEW MEXICO

A strong geothermal anomaly is present near Cotton City in the Animas Valley, Hidalgo County, southwestern New Mexico. This region is sparcely settled, arid, and only locally supports irrigated agriculture. Cotton City has fewer than 100 residents.

Three wells in T-25S, R-19W are the main indicators of a geothermal system in the area. The wells produce water form a zone about 150 to 200 feet deep, at 210 F to 240 F. Geothermometry indicates that the geothermal aquifer has a minimum base temperature of about 300 F based upon a silica content of about 140 ppm in thermal waters. Terrestial heat-flow is as much as 2.7 heat-flow units (HFU), which is double the world-wide average.

The Animas Valley appears to be an area of crustal extension and thinning within the Basin and Range geomorphic province. Basin subsidence, intermittant intrusion and eruption of igneous rocks, and normal faulting have characterized the area during Tertiary and Quaternary time.

Pleistocene volcanic necks and basalt flows younger in age than 3 million years occur within five miles south of the main thermal manifestation. A rhyolite flow or sill, of probable Quaternary age, was penetrated at a very shallow depth in drilling the three thermal wells. The rhyolite may constitute a local heat source. A larger heat source may be related to crustal extension along the western margins of the Rio Grande Rift Zone. Periodic intrusion of magmas is normal in such geologic circumstance and may occur as large deep-seated intrusions or as small, shallow bodies. These probably followed the main through-going fractures toward the surface. Periods of intrusion, ore deposition, and volcanism occurred during early Tertiary time, mainly in the form of granodiorite stocks. Again about 25 million years ago as silicis eruptions, and in a third episode beginning about 5 million years ago that may be underway yet.

Faults trend both north-northwesterly (Basin and Range grain) and east-northeasterly. The basins that developed as a result of downfaulting have filled with several thousand feet of alluvium, interbedded with lava flows. Below may be found a thick section of fractured early Tertiary volcanic and intrusive rocks and deformed Mesozoic and Paleozoic marine sedimentary rocks. There may be between 5,000 and 10,000 feet of reservoir materials, in both the Tertiary and Paleozoic Sections. The presence of effective lids of impermeable rocks above the deep reservoir is not proven, and the position and depth of granitic rocks beneath the valley also is unknown.

High mountains west and south of the Animas Valley (Peloncillo and Chiricahua Mountains) receive sufficient amounts of precipitation to provide recharge to aquifers beneath the arid valleys. A great amount of water exists in storage, and occasional wells with artesian conditions indicate not only excellent storage, but also the presence of aquifers in the subsurface.

Companies active in leasing in Anaimas Valley include Sun Oil Company, Chevron Oil Company, and Thermal Power Company. Thermal holds private leases for 1,800 acres near the hot-water wells. Competition in application for federal leases has resulted in establishment of a KGRA of at least 13,000 acres in the vicinity of the thermal wells and the rhyolite intrusion. Some 40,000 acres are shown on the accompanying sketch map as a desirable target for geothermal exploration. They include the KGRA, as well as lands to the south and east.

A ground noise anomaly is believed to be present slightly to the west of this target. On the basis of the anomaly several sections have been nominated for lease. Exploration will profit from the use of geoelectrical methods, the drilling of temperature-gradient holes, and perhaps the use of passive seismic methods. Careful photo-interpretation of geologic structure may reveal subtle indications of intrusions at depth. Data on mineralization and alteration in adjacent mountain ranges may help to localize targets for exploration. Age-dating of volcanic and intrusive bodies may also be helpful.

ANIMAS VALLEY HOT SPOT
Hidalgo Co.

New Mexico's most fascinating thermal anomaly is the "Hot Spot" in the Animas Valley, Hidalgo County. In 1948 a water-well driller, seeking an irrigation well in a sand-gravel-clay aquifer, hit a fractured rhyolite at 87 feet; and water was discharged as steam, with an initial temperature of 240°F.

The wonder is that this "hot spot" went undetected for so long. Since its discovery it has been studied by many individuals and companies and has been the target for many tests of equipment designed to identify thermal prospects--especially infrared imagery. So far, three scientific papers have been written about the area and more are in the offing.

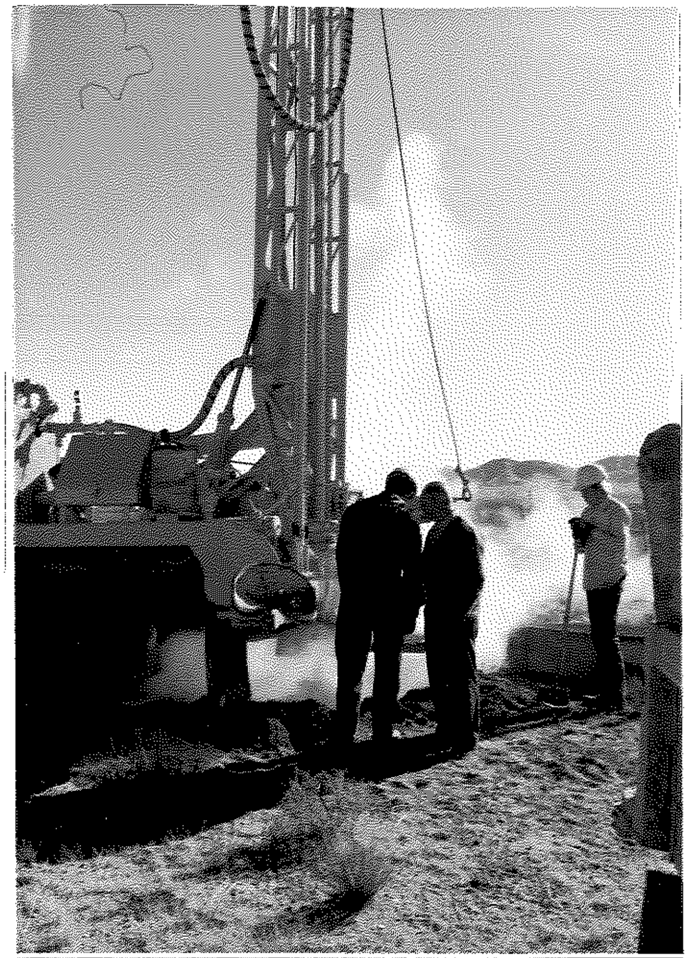
But perhaps the most significant feature of the "Hot Spot" is that it supplies a relatively complete picture of a New Mexican geothermal anomoly in a relatively simple geologic and hydrologic setting: Natural steam is injected into a relatively thin bed of saturated sand and gravel. Ground water moves through the sand and gravel from south to north, carrying the steam with it. The heat dissipates gradually into the moving ground water, so that only a mile and a half away there is no indication of the extraordinary heat. The injected steam may come from a holding chamber, or it may be leaking from a natural-steam reservoir at an economically exploitable depth.

N.Mex. Bur. Mines and Min. Res. Circ. 98, p. 8.

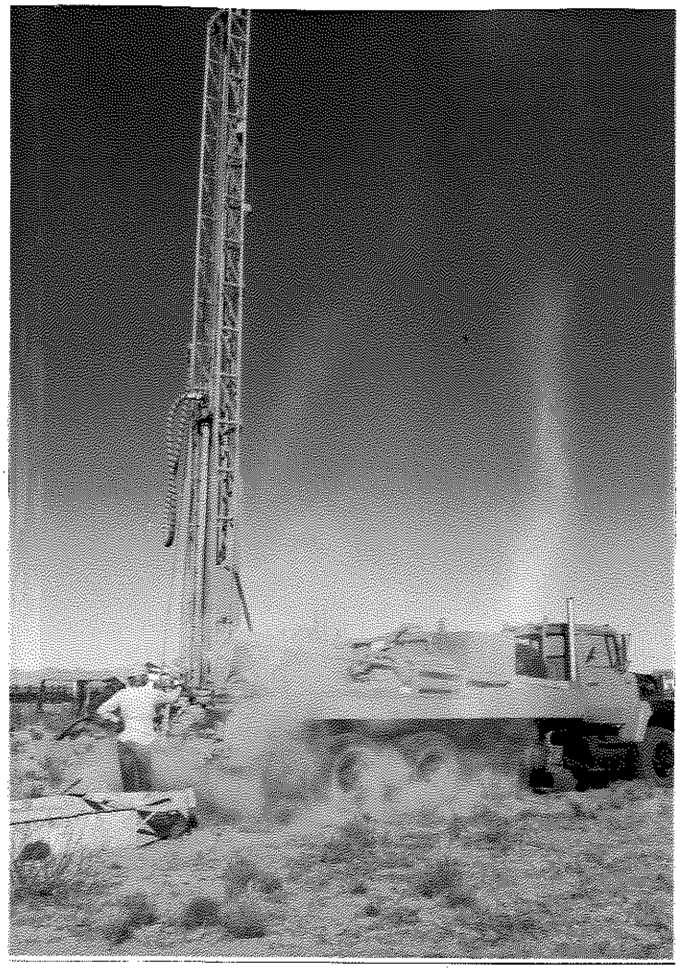
Ansmian, hot well

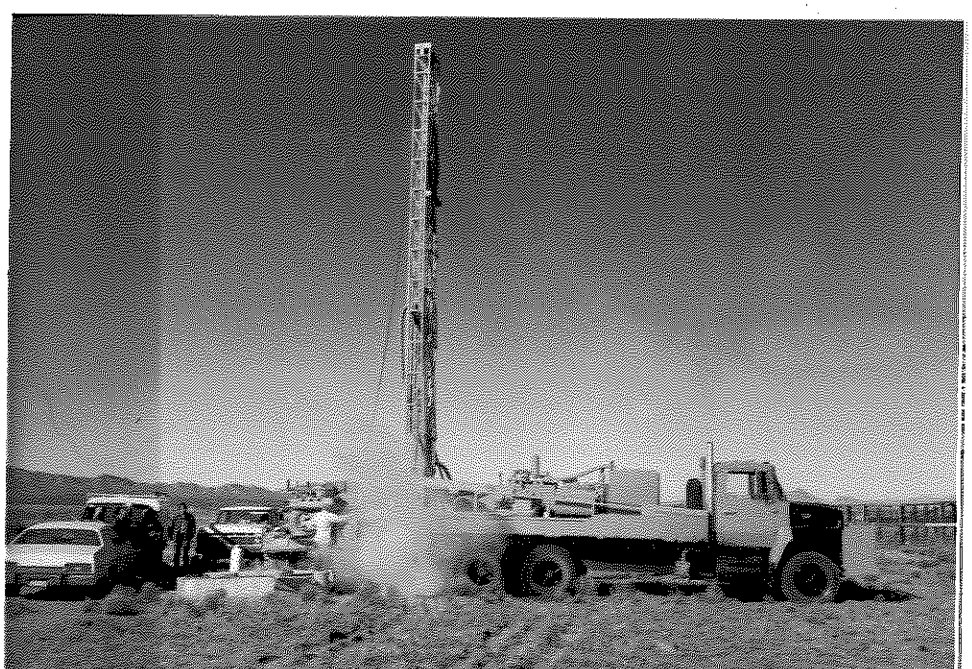
Animas

McCants



Animas
McCants

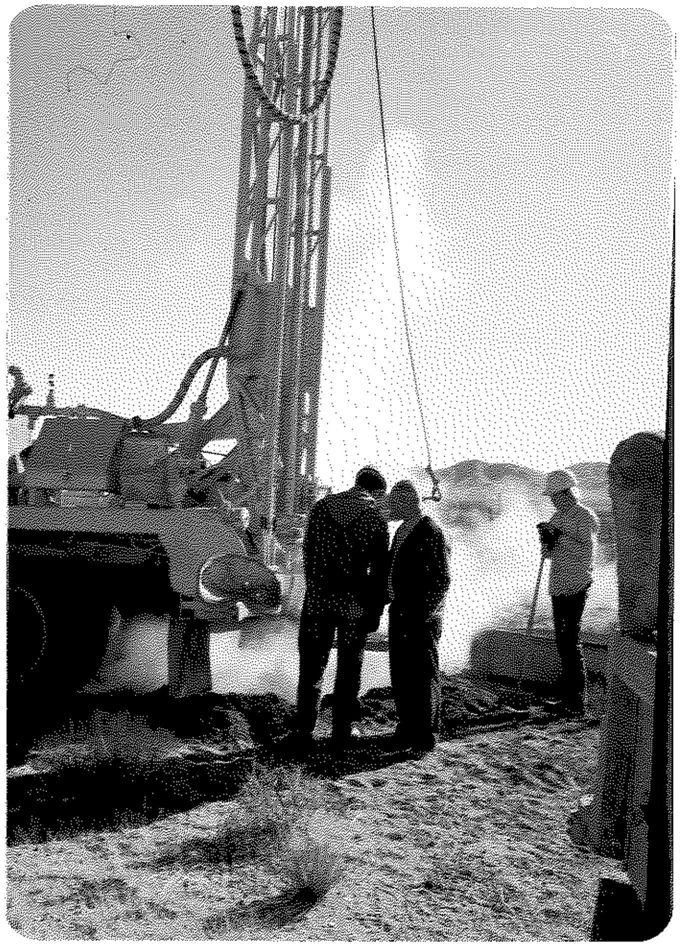




Animas Hot Wells

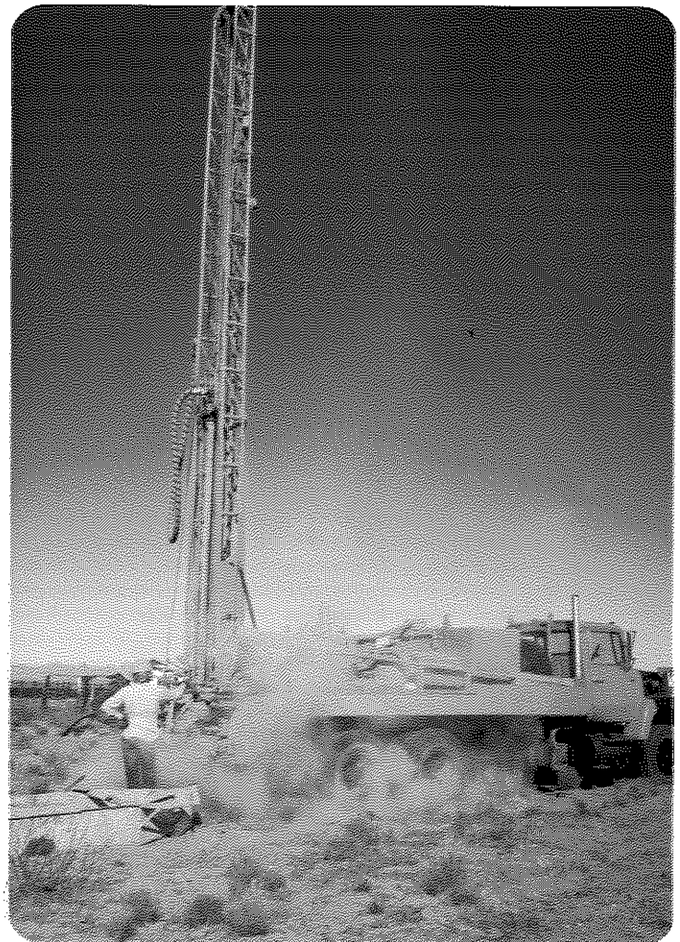
75-2:1

75-2:2



75-213

75-214



75-2:5

75-2:9

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ANIMAS, N.M.

	GEOLOGY	WATER TABLE	COMMENTS
T-1	0-170' gravel	90'	
T-2	0-170' gravel	155'	
T-3	0-170' gravel	75'	
T-4	0-90' gravel	70'	1 sample taken
	90'-170' rhyolite		
T-5	0-170' gravel + clay	?	
T-6	0-170' gravel + clay	?	
T-7	0-140' clay and gravel	?	
T-8	0-170' gravel and clay	60'?	
T-9	0-30' clay and gravel	?	2 samples taken
	30'-170' rhyolite		
T-	0-50' clay and gravel	?	1 sample Taken
	50'-57' rhyolite		interfingering
	57'-61' clay		of clay throughout
	61'-142' rhyolite		the rhyolite
	142'-150' clay		
	150'-170' rhyolite		
T-11	0-160' clay and gravel	no water	bedrock very hard
	160'-161' bedrock (rhyolite ?)		
T-12	0-6' Basalt	150'	
	6-152' gravel		
T-13	0-170' gravel	160'	
T-14	0-152' clay and gravel	100'	
T-15	0-75' clay and gravel	none	2 samples Taken
	75'-170' rhyolite		
T-16	0-170'	none	

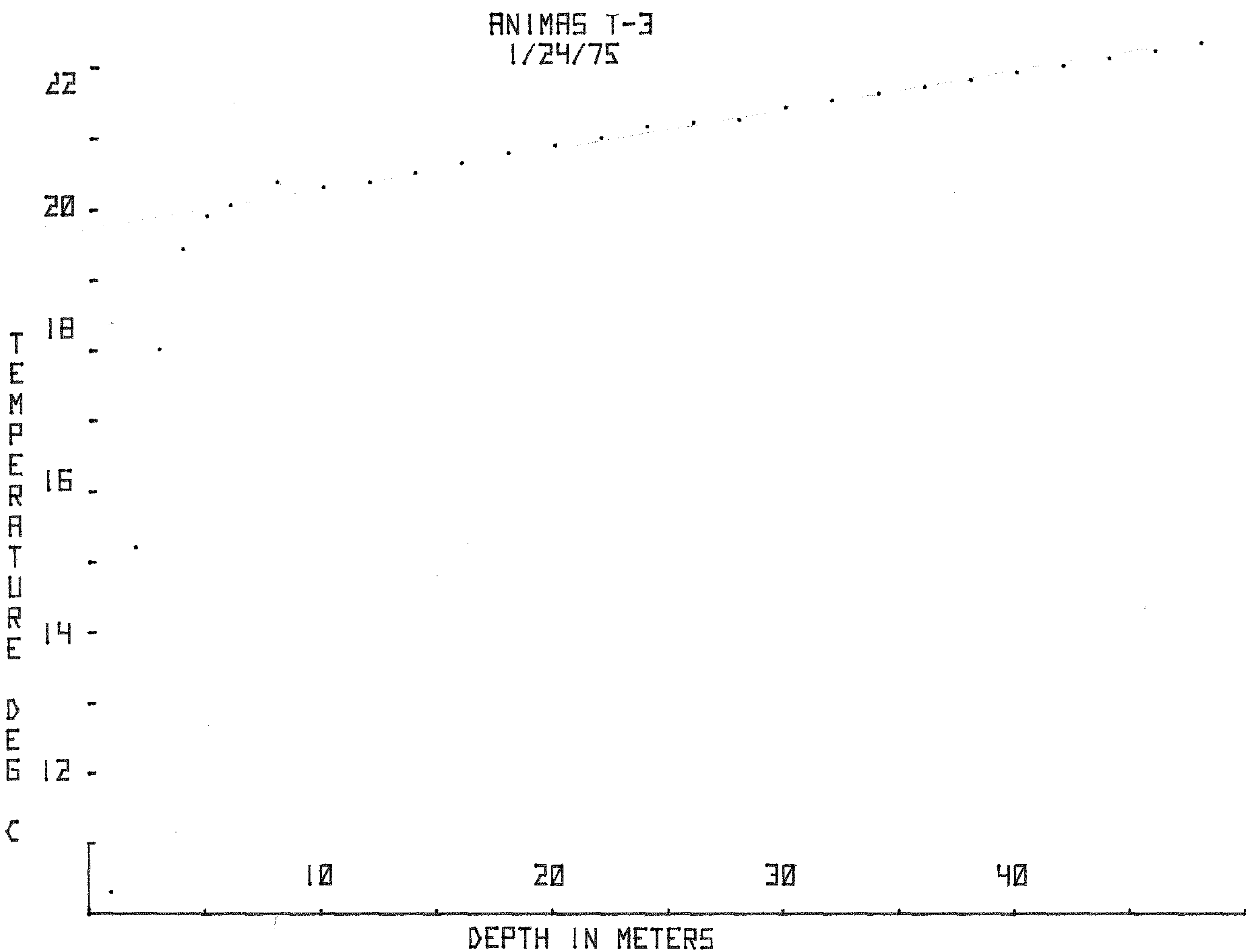
	GEOLOGY	WATER TABLE	COMMENTS
T-17	0-35' gravel	95'?	2 samples ta
	35'-95' rhyolite		
	95' - 118' gravel		
	118' - 170' rhyolite		
T-18	0-170' gravel	?	

Joe V. Meigs 2/14/75

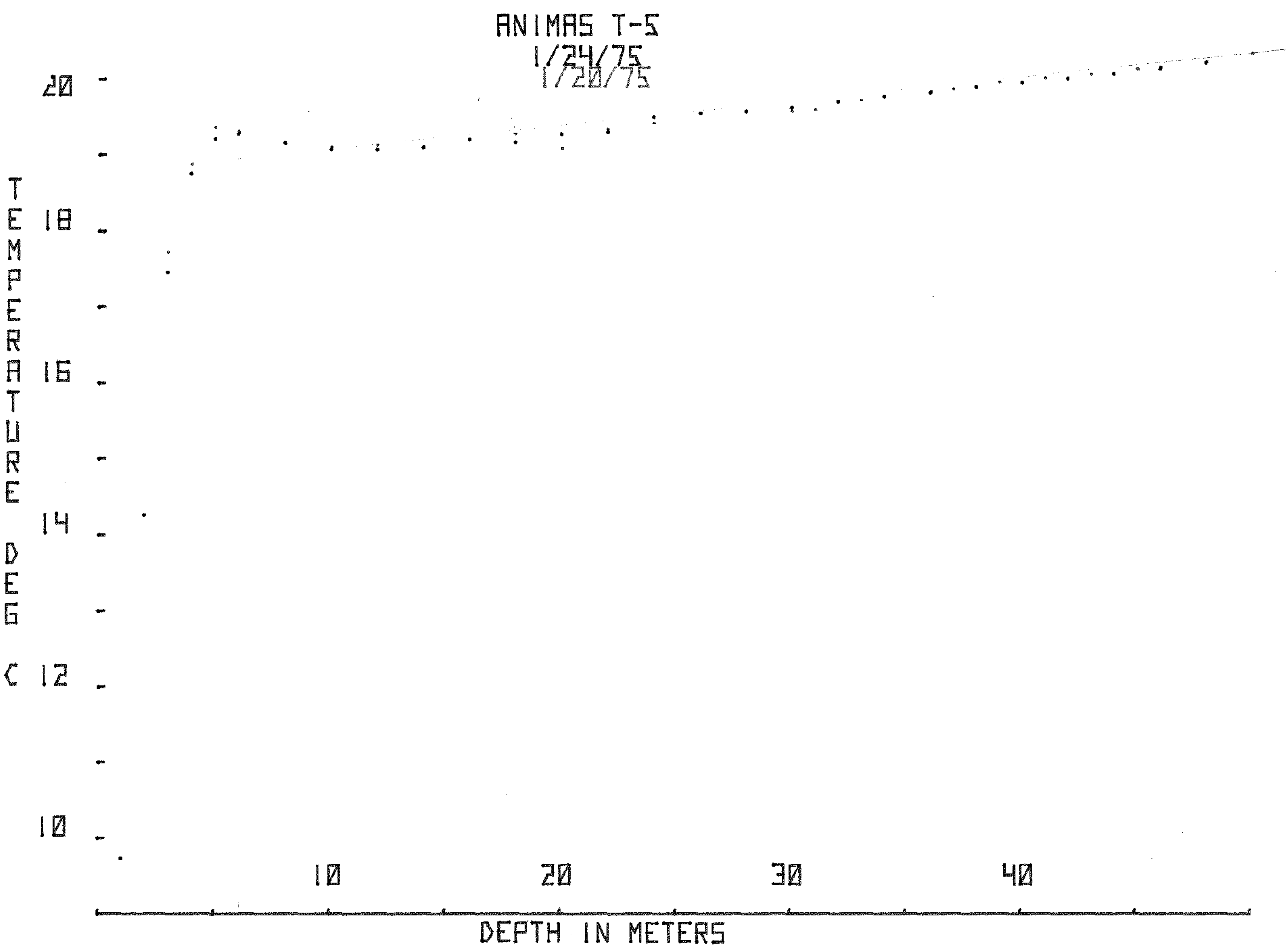
NOTE:

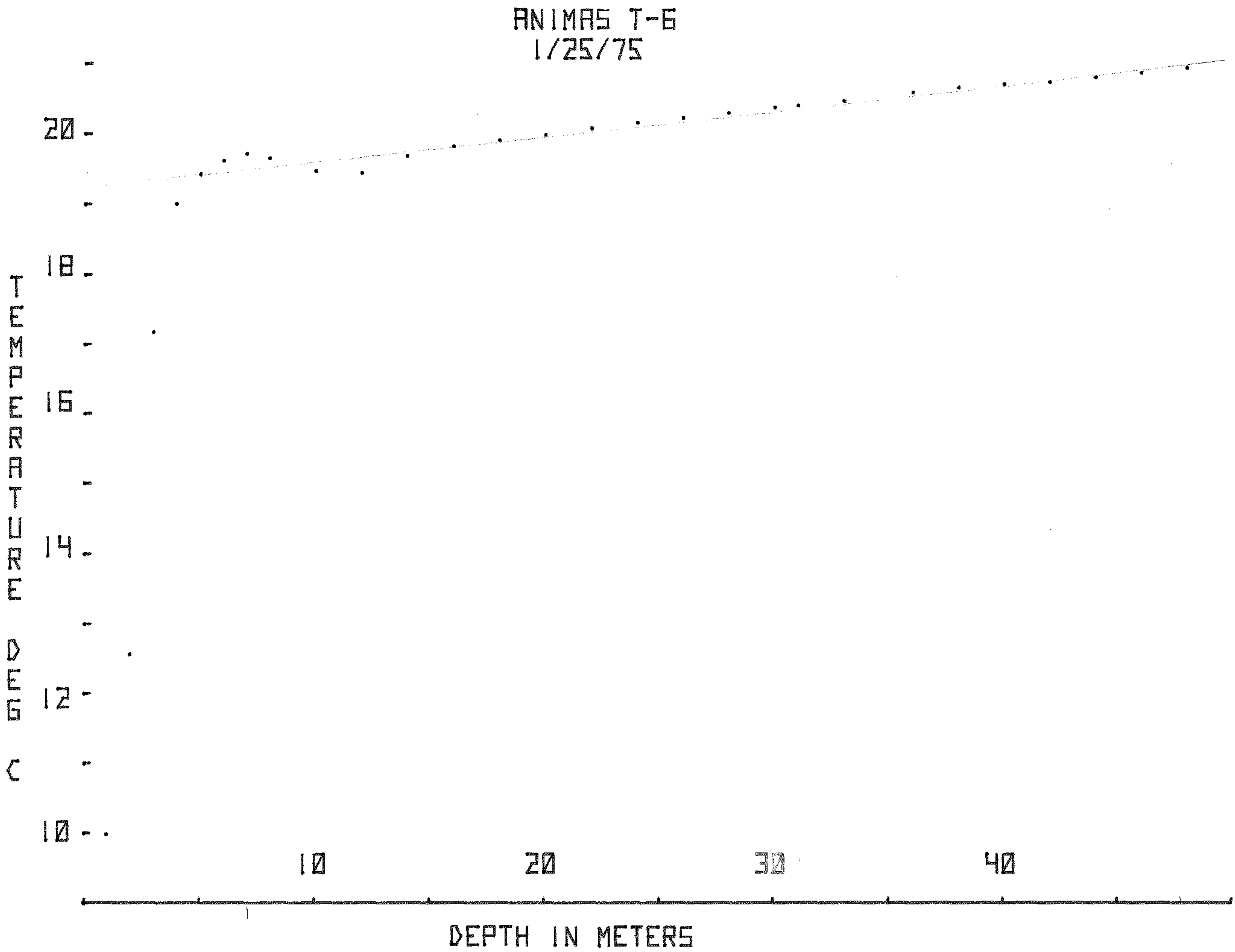
gravel + clay - higher % of gravel

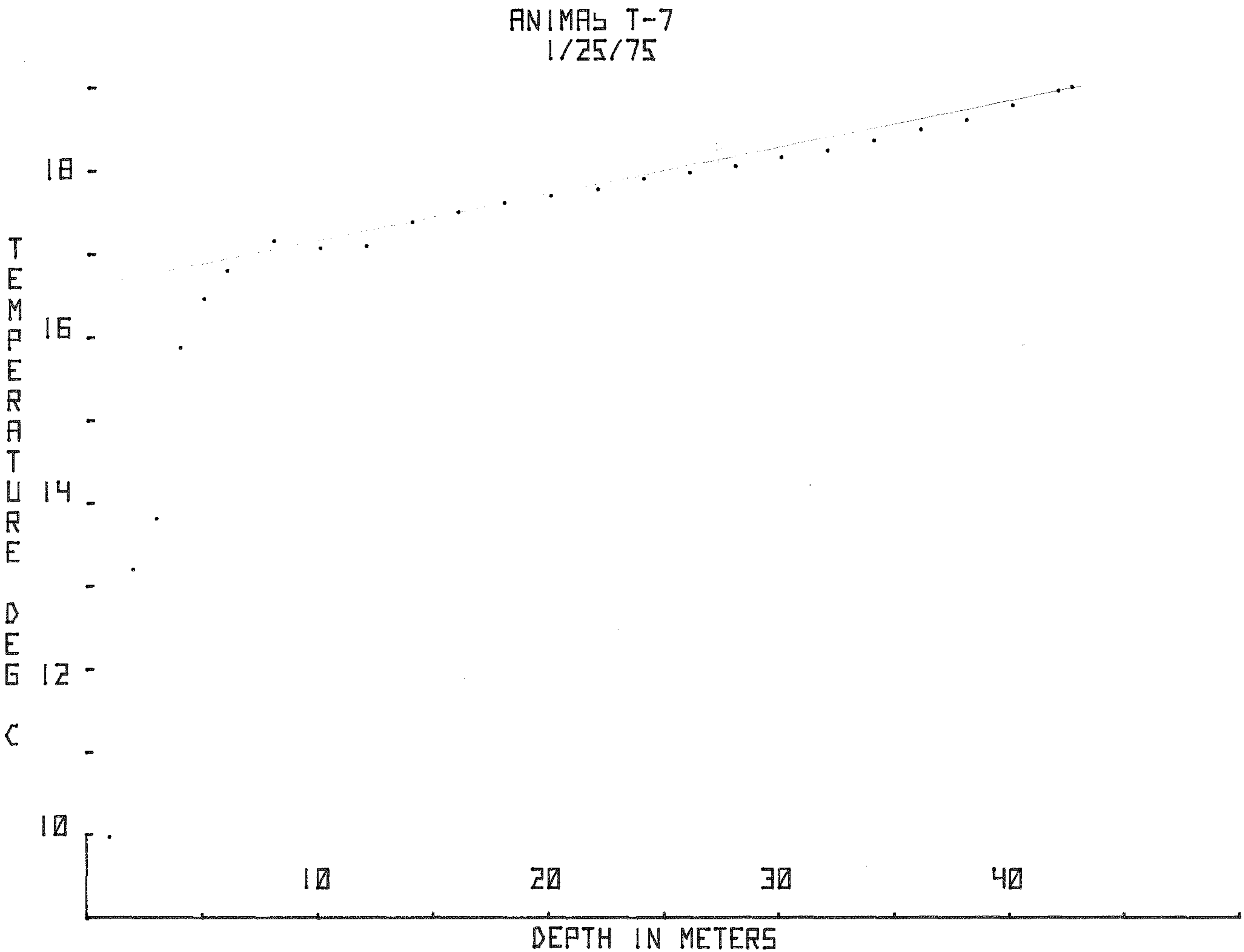
clay + gravel - higher % of clay

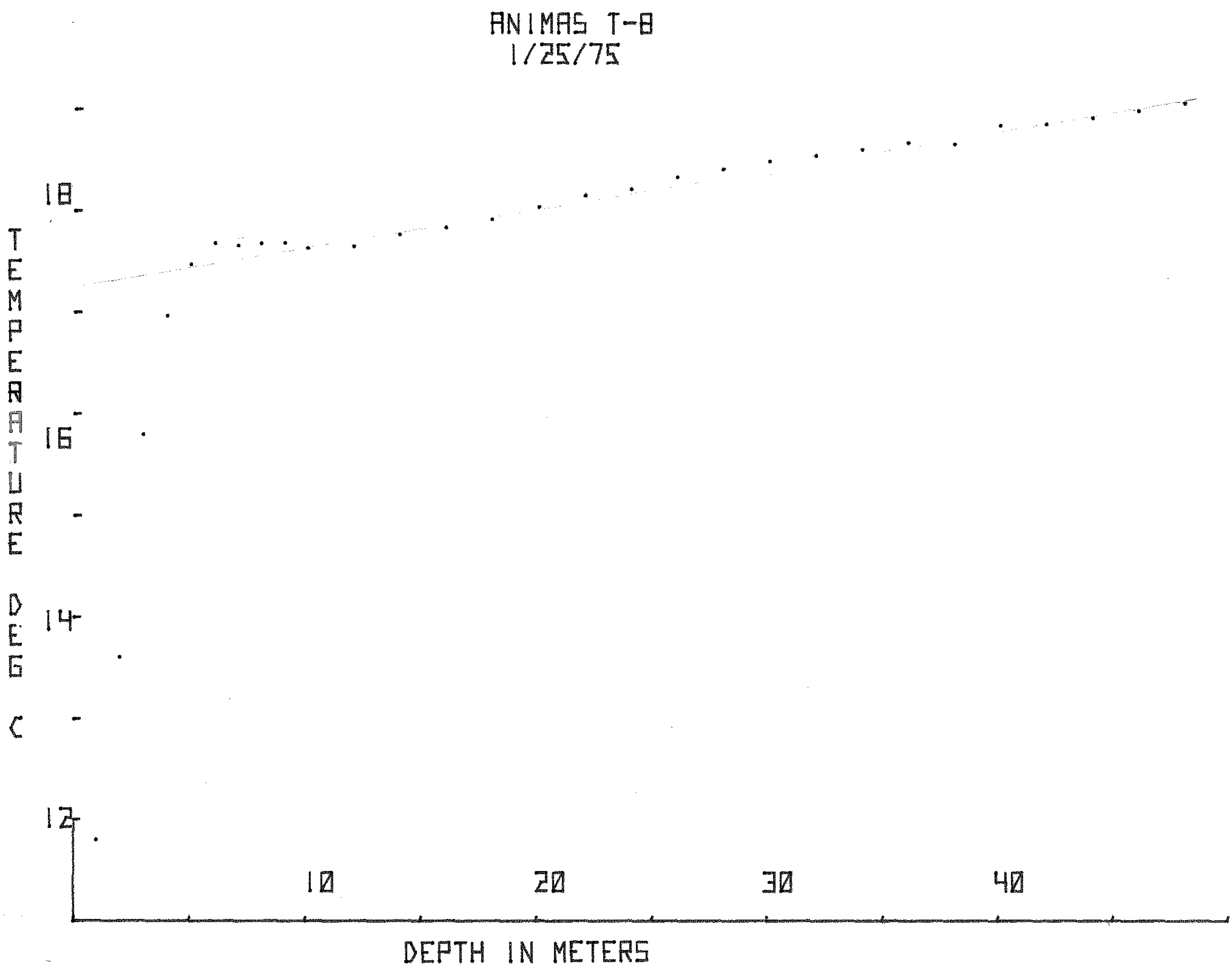


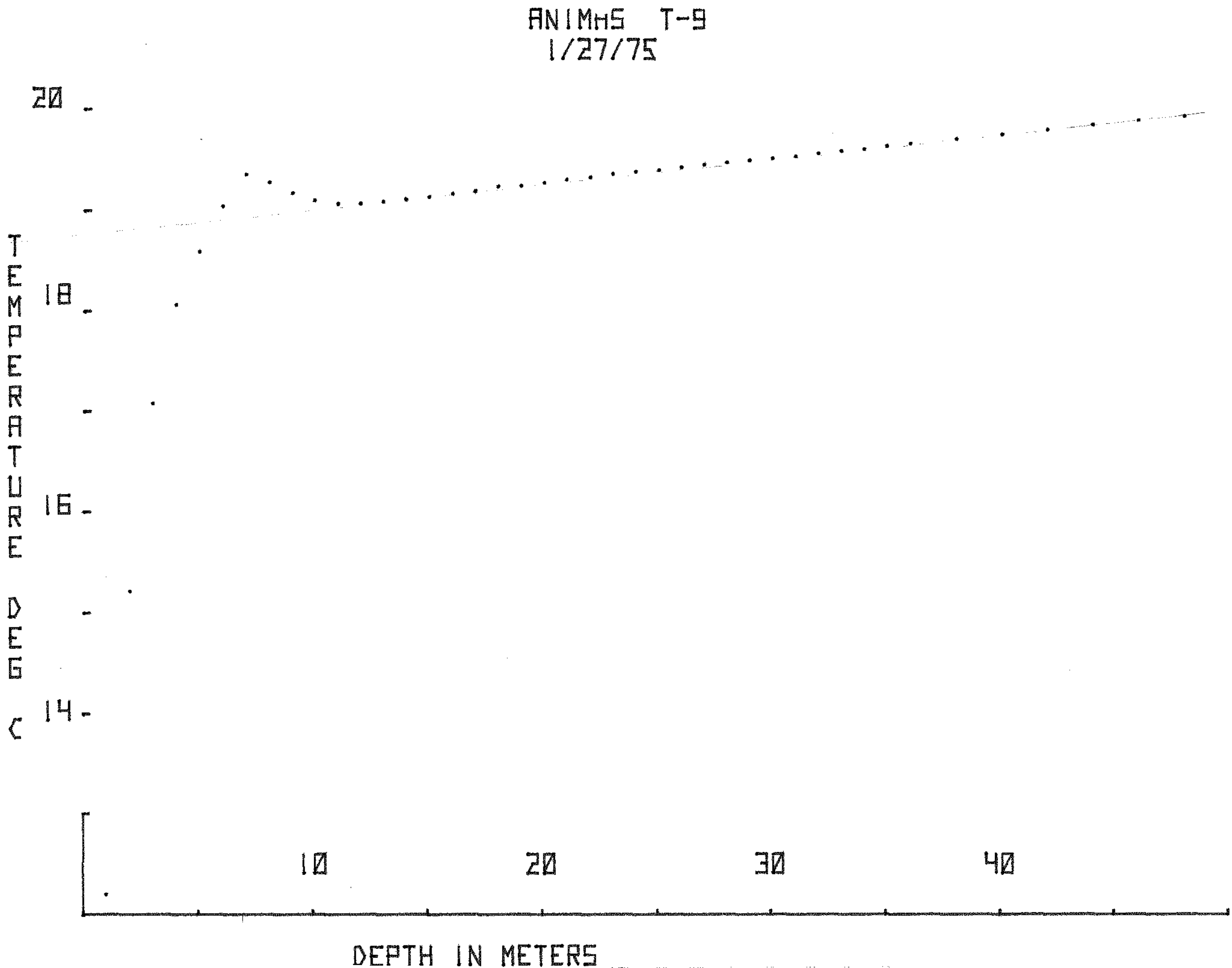
ANIMAS T-3
1/24/75
22
20
18
16
14
12
TEMPERATURE DEG C
10
20
30
40
DEPTH IN METERS

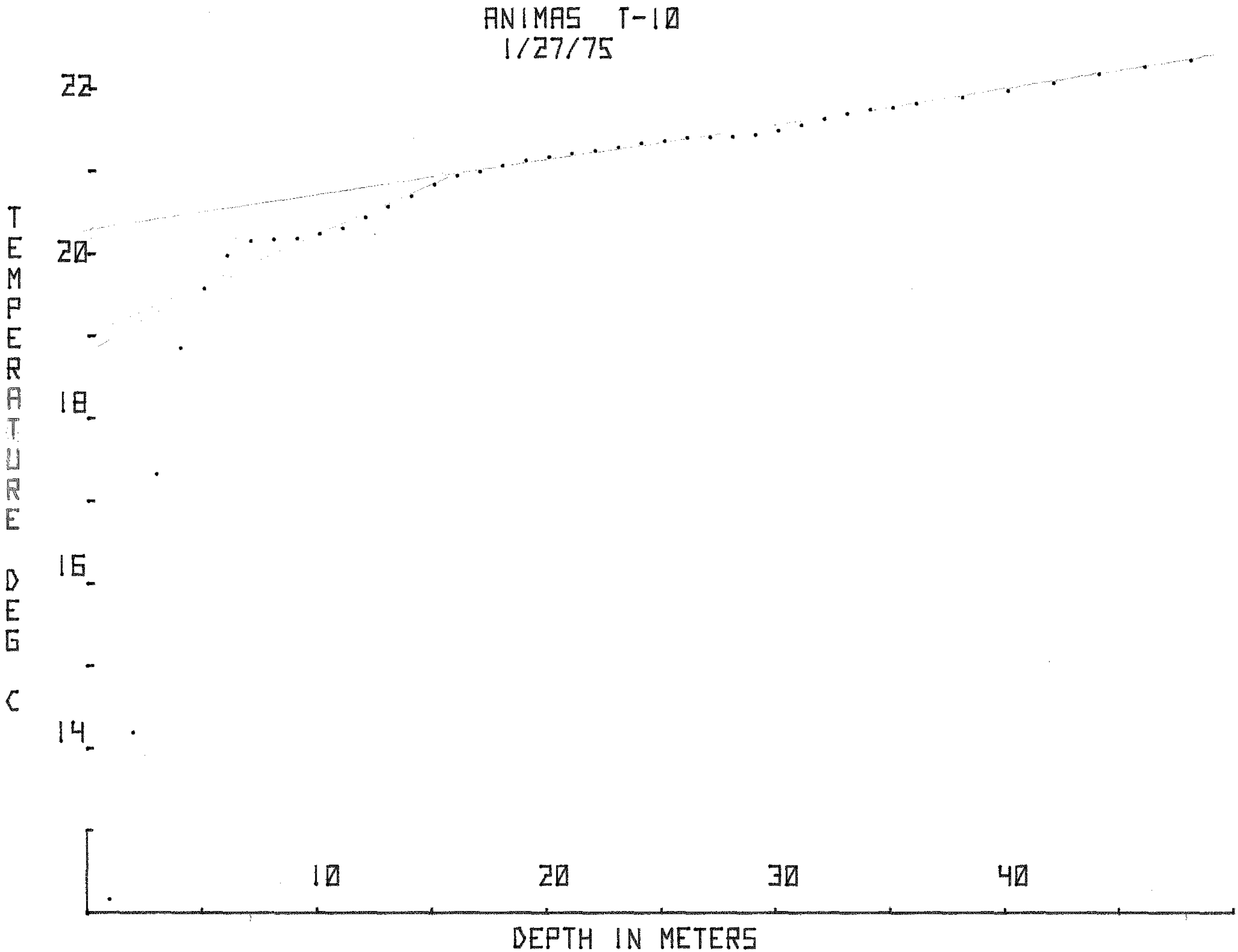

ANIMAS T-5
1/24/75
1/20/75
TEMPERATURE DEG C
20
18
16
14
12
10
10
20
30
40
DEPTH IN METERS


ANIMAS T-6
1/25/75
TEMPERATURE DEG C
20
18
16
14
12
10
10
20
30
40
DEPTH IN METERS

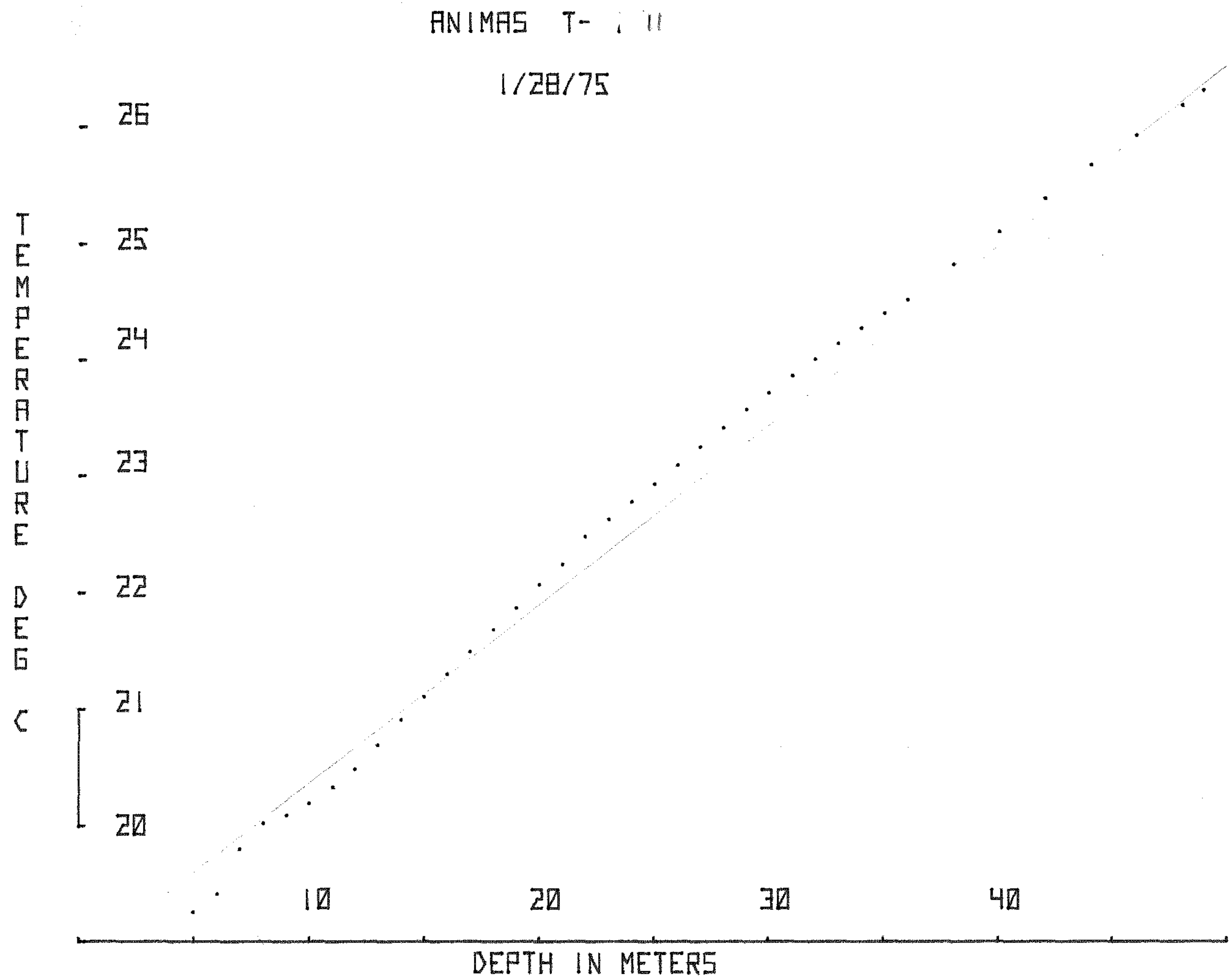

ANIMAS T-7
1/25/75
TEMPERATURE DEG C
18
16
14
12
10
10
20
30
40
DEPTH IN METERS

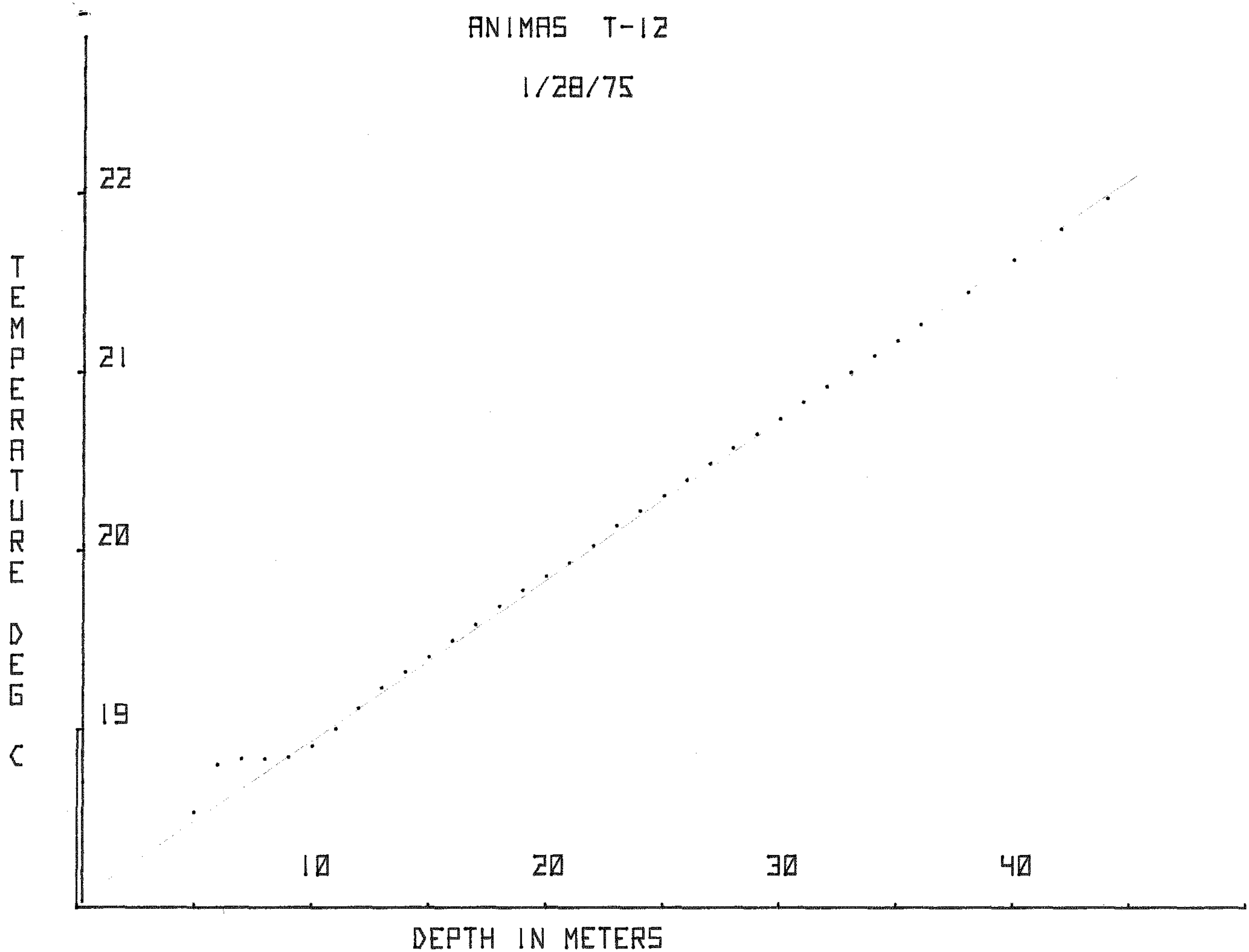

ANIMAS T-8
1/25/75
18
16
14
12
TEMPERATURE DEG C
10
20
30
40
DEPTH IN METERS

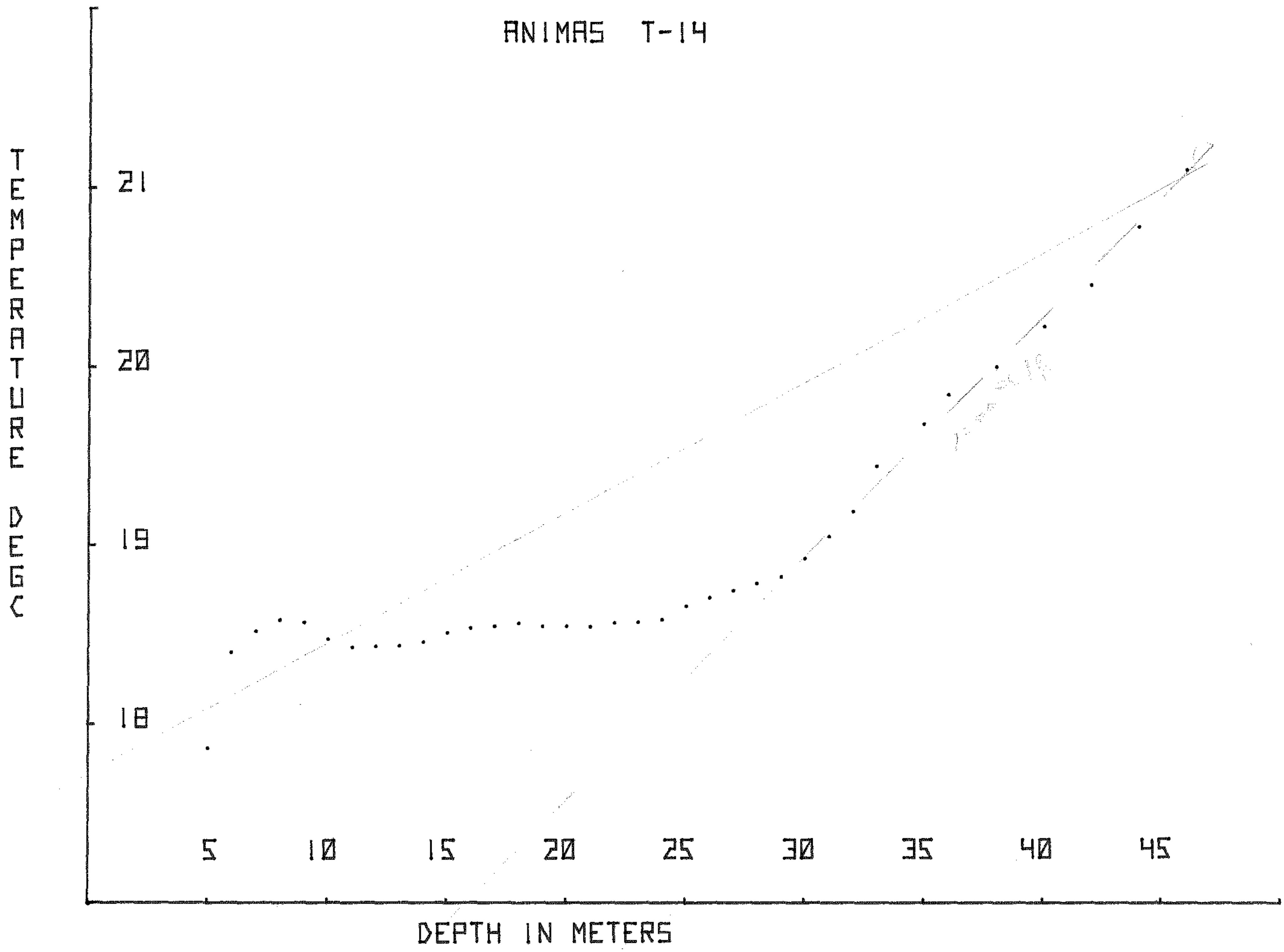

ANIMAS T-9
1/27/75
20
18
16
14
TEMPERATURE DEG C
10
20
30
40
DEPTH IN METERS



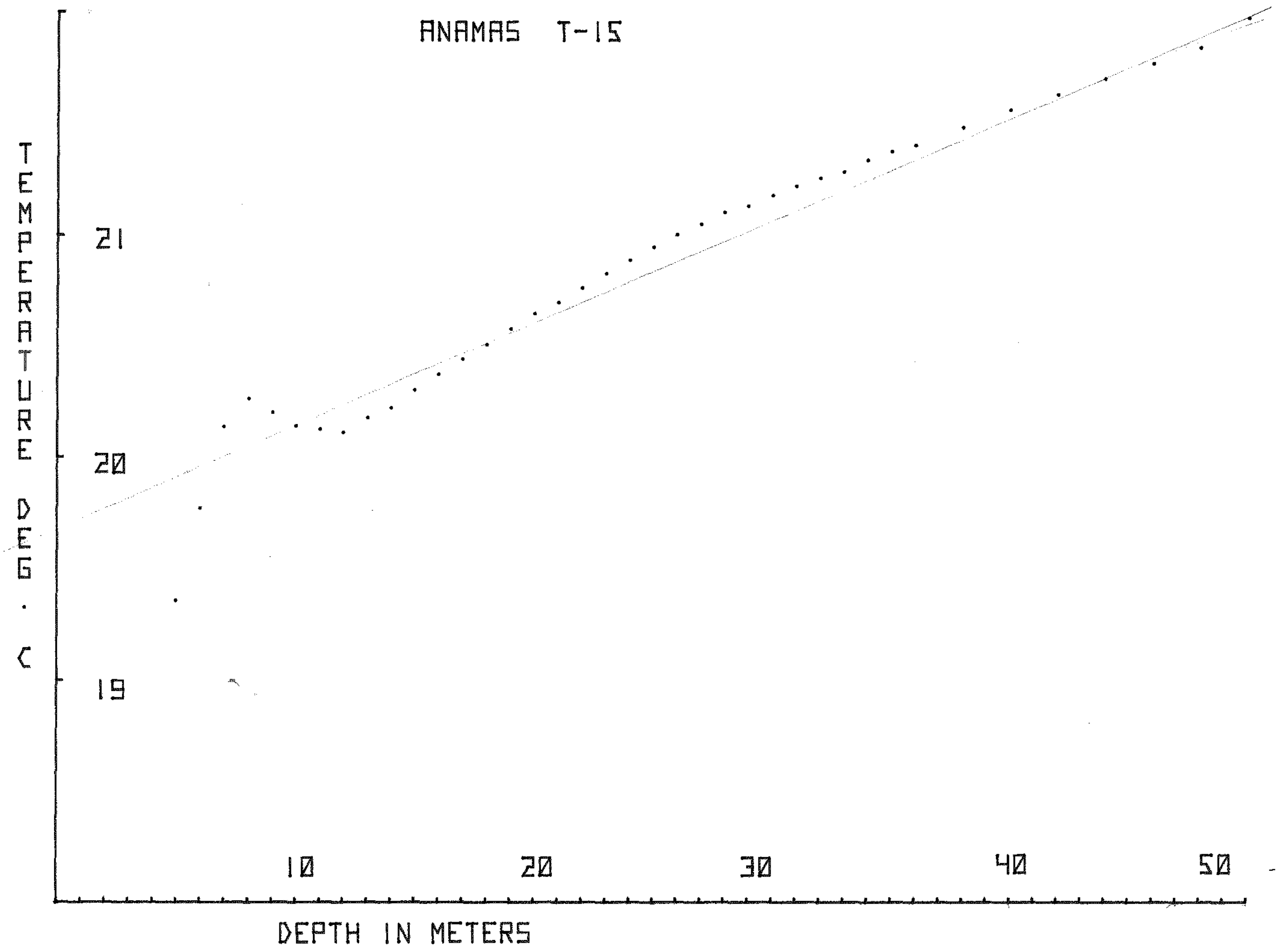
ANIMAS T-10
1/27/75
22
20
18
16
14
TEMPERATURE DEG C
10
20
30
40
DEPTH IN METERS

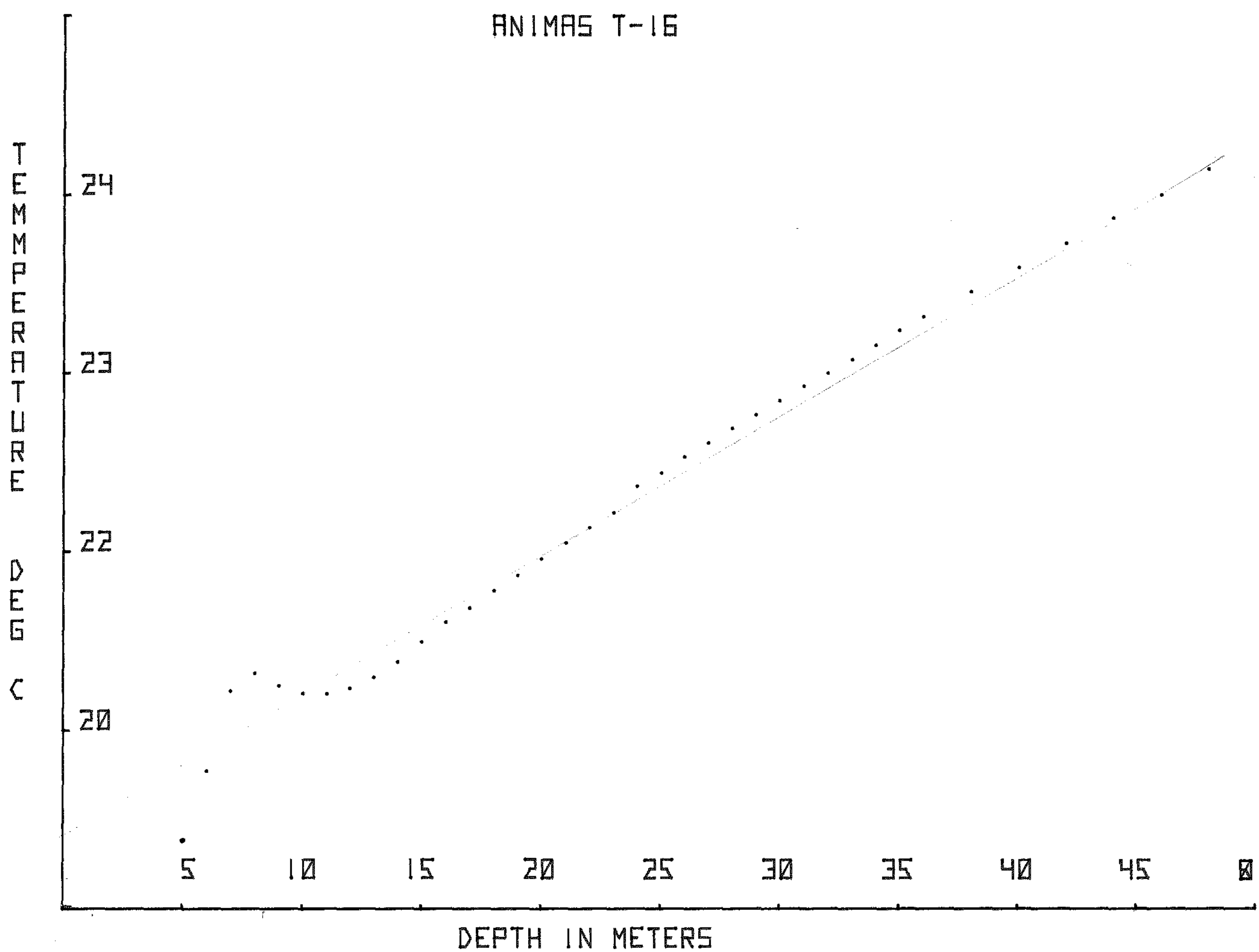

ANIMAS T-
1/28/75
TEMPERATURE DEG C
26
25
24
23
22
21
20
10
20
30
40
DEPTH IN METERS


ANIMAS T-12
1/28/75
22
21
20
19
TEMPERATURE DEG C
10
20
30
40
DEPTH IN METERS



ANIMAS T-14
TEMPERATURE DEGC
21
20
19
18
5
10
15
20
25
30
35
40
45
DEPTH IN METERS


ANAMAS T-15
TEMPERATURE DEG. C
21
20
19
10
20
30
40
50
DEPTH IN METERS


ANIMAS T-16
TEMMPERATURE DEG C
24
23
22
20
5
10
15
20
25
30
35
40
45
0
DEPTH IN METERS

#1 $\frac{21.2 - 19.7}{48 - 10.} = 39.47$

#2 $\frac{19.75 - 19.67}{(41.6)} = 1.92\ °C/hr$

$\frac{19.74 - 19.8}{}$

#3 $\frac{22.5 - 19.5}{48.} = \frac{3^{\circ}}{48} = 62.5$ °/km

#5 $\frac{20.3 - 18.8}{50} = 30.$ °/km

#6 $\frac{21. - 19.2}{48} = 37.5$ $\frac{20.9 - 19.6}{35} = 37.1$

#7 $\frac{19 - 16.6}{42.5} = 56.5$ $\frac{19.735 - 18.355}{25} = 55.2$

#8 $\frac{19.1 - 17.2}{48} = 39.58$ $\frac{19.0 - 17.775}{35} = 35.$

#9 $\frac{20. - 18.8}{48} = 25.$ $\frac{19.94 - 19.09}{35} = 24.29$

#10 $\frac{22.3 - 20.3}{48} = 41.67$

#11 $\frac{26.4 - 18.8}{49.} = 155.1$, $\frac{25.8 - 20.2}{35} = 160.$

$\frac{26.05 - 20}{40} = 151.25$

#12 $\frac{22 - 18.}{44} = 90.9$ $\frac{21.82 - 19.13}{30} = 89.7$

#13 $\frac{20.82 - 18.735}{35} = 59.6$

20 trial

#14 $\frac{21.1 - 17.7}{46} = 73.9$? $\frac{21.9 - 19.5}{35} = 68.6$

#15 $\frac{22. - 19.7}{51} = 45.1$ $\frac{21.7 - 20.2}{35.} = 42.9$

#16 $\frac{24.1 - 19.4}{48} = 97.92$ $\frac{23.9 - 21.2}{35.} = 77.14$

#17 $\frac{20.15 - 19.15}{51.8 - 12.} = 25.12$ $\frac{20.07 - 19.2}{35} = 24.9$

39.8

#18 $\frac{19.385 - 17.765}{51. - 12.} = 41.5$ $\frac{19.27 - 17.87}{35}$

(39)

#14 alternate $\frac{21.2 - 18.8}{46. - 25.9}$

20.1

Recommendations and Comments

Geothermal Prospects

Animas, New Mexico

Model - deep circulation along Basin and Range faults bounding ranges or in case of Animas-Antelope area possible heat source related to recent basalt volcanism.

Recommendations - Interpret gravity data by analysing profiles to locate faults.

Measure thermal conductivity on samples of valley gravel and of rhyolite.

Detailed heat flow profile between Animas and at approximately ½ - 1 km spacing. Wells on the order of 35m deep. Compare results with fault zone models.

Beulah, Oregon

Model - deep circulation along faults and fractures in basin of Juntura sediments or deep heat source and subsidiary hydrothermal circulation in thick volcanic pile, the results of drilling in progress (shallow) should furnish important data dealing with possible model.

Recommendations - Age date any young looking volcanic units, particularly "upper Pleiocene" rhyolite intrusives shown on map.

Do thermal conductivity measurements on "typical" rock units cut by wells. Keep in mind possible terrain effects on gradients if results are ragged, as the terrain effect may be substantial in some cases.

Consider attempting a gravity profile over Beulah Res. Basin and thermal anomaly.

May need more air mag. coverage?

M.T. studies of geothermal anomaly might give depths and geographic extent.