Space-time distribution of the Friuli (1976) eartquakes

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RIASSUNTO. - Sono stati esaminati i risultati delle determinazioni ipocentrali delle scosse del periodo sismico iniziato il 6 maggio nel Friuli.

Una particolare considerazione è stata rivolta all'evento principale i cui parametri focali determinati per via analitica, sono stati confrontati con quelli determinati con metodi macrosismici.

L'evoluzione del fenomeno sismico è stata seguita con una rete di stazioni locali che ha permesso l'individuazione degli ipocentri di circa 700 repliche; il metodo utilizzato è stato quello basato sulle differenze $T_{S_g} - T_{P_g}$ assumendo per il fattore K il valore di 7.5 km/sec.

Una valutazione degli errori sperimentali effettuata con un nuovo programma di calcolo ha fornito risultati compresi in $\pm$ 2 km.

Lo studio della migrazione degli ipocentri ha messo in evidenza la comparsa di attività sismica sia come premonitoria ad un evento di maggiore magnitudo sia come ad esso conseguente.

L'evoluzione cronologica del fenomeno è stata rappresentata con piante e sezioni limitate per opportuni intervalli di tempo.

I risultati ottenuti hanno evidenziato interessanti aspetti del periodo sismico che si ritiene possano incoraggiare il proseguimento di studi in questa direzione.

SUMMARY. - Results obtained by hypocentral determination of 700 shocks of the Friuli earthquake have been examined.

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Special care has been devoted to the main shock. A comparison between focal parameters determined by analytical and macroseismic methods has been carried out.

The time and space evolution of the phenomenon has been followed by means of a network of local stations which allowed the determination of the hypocenters of about 700 aftershocks.

The analytical method based on S_g - P_g time interval has been employed, assuming a K-value of 7.5 km/sec.

An evaluation of experimental errors, performed by means of an original code, yielded an accuracy of $\pm$ 2 km.

The study of hypocenters migration shows seismic activity both to precede and to follow an event of greater magnitude.

Epicenter and hypocenter distributions are plotted in order to depict the time-evolution of the phenomenon.

Results show interesting features of the seismic period which, in our opinion, warrant the pursuit of this kind of investigation.

Description of the seismic period.

The seismic period of 1976 in Friuli started, at least in its most remarkable phase, on the evening of May 6 at $19^h\,59^m\,03^s$ (G. M. T.) with a shock having a magnitude $M_L=4.5$ (RMP)* (probably the only foreshock), followed at $20^h\,00^m\,12^s$ by the catastrophic shock of magnitude $M_L=6.3$ (RMP). The very numerous aftershocks which followed showed a distribution in time which is peculiar of the seismic events of high intensity and their distribution law as a function of the magnitude was characterized by a value of parametr b usual for the sites of the Mediterranean area.

Such trend, which appeared to be completely normal at the time, continued until the beginning of the month of September, when a renewal of the seismic activity was observed; this manifested itself on September 11 with the shock of magnitude 5.3 (RMP) at $16^h\,31^m\,12^s$, which was followed after only four minutes by the shock of magnitude 5.9(RMP) at $16^h\,35^m\,00^s$. Also in this case the aftershocks showed a relatively rapid decay.

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* determined at the Central Observatory of the National Institute of Geophysics, Rome.

On September 15, at $03^h\,15^m\,49^s$ a new violent increase of the seismic activiy was observed with the shock of magnitude $M_L=6.1$ (RMP). This new activity reached a new maximum at $09^h\,21^m\,18^s$ with the earthquake of magnitude $M_L=6.0$ (RMP). Since that time and until March 1977, the seismic activity showed, generally, a descending feature; however, renewals both in the frequency of shocks and in their intensity were observed sometimes.

Some considerations on the main shock of may 6.

The hypocentral determination of the main shock, obviously carried out from the data coming from the pre-existing seismographic stations, was difficult because of the overlapping of the first pulse to the pulse of the foreshock.

In any case to carry out this determination a calculation programme based on the times of arrival of the first pulse from the different stations was used; the travel times experimentally derived by prof. Caloi ([1]) in the study of the earthquake of Cansiglio (1936) were used.

The result was the following ([3]):

$H=20^h\,00^m\,11.8^s$	$\pm 0.4^s$
$\varphi=46.266^0\,N$	$\pm 0.027^0$
$\lambda=13.250^0\,E$	$\pm 0.029^0$
$h=20.1$ km	± 3.8 km.

It is necessary to make some considerations on the errors involved in the determination technique.

A first cause of error is related to the error with which the arrival time of the P wave, dependent on the velocity of the recording system and on the frequency response of the instrument, is read. Moreover, it should be taken into consideration that the phase considered as the first one in the seismogram does not always correspond to the actual first pulse coming from the source. This may be more especially true for those stations receiving the wave coming from the nodal plane and for those which are situated at particular distances from the epicenter. Furthermore, one should carefully consider the possibility that the nearer stations, that is to-say more sensitive, could record as

a first pulse a phase which is otherwise mixed up with the noise in the recording of the farther, that is to-say less sensitive, stations.

An evaluation of these errors, even if rather approximate, suggests to consider them within the confidence margins obtained with the least square method, previously discussed.

As far as the hypocentral depth is concerned, the greatest error which can be made in its determination is that of assuming a model of the propagation velocities rather different from reality. This systematic error is very difficult to estimate; several tests carried out using different models resulted in a wide variability for the depth, while, on the contrary, the position of the epicenter remained constant ([3]).

The comparison of the result thus obtained with the results obtained with the method of macroseismic investigation will be shortly discussed.

The epicentral determination is generally made considering the epicenter as the center of the most damaged area. In this case this was found in an area between Gemona, Trasaghis and Osoppo. The discrepancy between the analytical epicenter and the macroseismic epicenter is only apparent: in fact their definition is essentially different. The analytical epicenter is on the vertical line from the spot where the fracture started. The macroseismic epicenter, located according to the damages caused to the buildings, is normally on the vertical line from the spot of the focal volume nearest to the surface and can, furthermore, be affected by particular conditions of the surface geology.

The focal depth, as it is well known, can be calculated from the distance between isoseismals of different degrees. Generally, the well known formula is used ([7]):

$$I_0 - I = \nu \log\left(1 + \frac{R^2}{h^2}\right)^{0.5} \qquad [1]$$

In this case the formula gave the value of $h = 11.8$ km.

Another method to determine the focal depth is based on the Karnik's formula ([5]):

$$M = 0.66\, I_0 + 1.7 \log h - 1.6 \qquad [2]$$

which correlates the magnitude, the epicentral intensity and the focal depth. Assuming $I_0 = IX - X\ MSK$ and $M = 6.3$, h resulted $= 9.1$ km.

This depth is that of the part of the focal volume where the energy release contributed for the greatest amount in causing the damages at the surface.

HYPOCENTRAL DETERMINATION OF THE AFTERSHOCKS.

The scientific interest and the remarkable social aspects of the event of May 6 suggested the immediate intervention of three mobile stations of I. N. G. and three stations of C. N. E. N. These stations operated in the area, in cooperation with the stations already existing at dams of E. N. EL. ([2]).

The development in time of the seismic phenomenon was followed continuously by the local seismic stations, which sometimes were displaced to improve their operation ([6]).

As known, the determination of the hypocenters can be made, using the data of local stations, through two calculation techniques substantially different. These techniques can be reduced to the use of the only first arrivals, or to the intervals between the arrivals of the longitudinal and transversal waves. Without going details concerning the two methods, it should be observed that the first method requires an accurate determination of the absolute first-arrival times or the availability of a telemetric seismic network. The second one, on the contrary, can leave out of consideration the absolute measurement of the time, but requires an accurate interpretation of the seismogram.

The difficulty involved in the synchronization of the clocks used in the network (due to the bad reception of the time-signals, and to the displacements of the stations) suggested the use of the classic method based on the differences $T_{Sg}-T_{Pg}$. Such time is proportional to the hypocentral distance for the recording station, trhough the factor

$$K=\frac{V_{Pg}\cdot V_{Sg}}{V_{Pg}-V_{Sg}} \qquad [3]$$

An evaluation of the parameter K can be made experimentally when a sufficient number of stations recording the same events (at least 4) is available. The tests carried out in this sense resulted in a mean valued of $K=7.5$ km/sec. This value was successively used for all the hypocentral determinations.

Taking into consideration the possibility that the parameter K could be not perfectly known in the area under examination, various tests were carried out to evaluate how these variations could affect the results obtained. It was thus confirmed that, for a variability range of the K factor between the values of 7 and 8 km/sec, the scattering of the hypocentral coordinates was included in the variations related to the errors in the readings of times.

Errors in the $S-P$ hypocentral determination method.

The error in the results of the calculations giving hypocentral coordinates derives from the uncertainty with which the experimental data are read and depend on the number of stations and on their localization with regard to the hypocenter.

The most important difficulty in the reading of the time differences $S-P$ can be attributed to the detection by the operator of the exact arrival of the S phase in the seismogram.

Consequently to minimize this cause of error, all the readings of seismograms for which interpretation doubts existed, were rejected. Moreover, in the successive phases of the elaboration, all the data with large anomalous residues were eliminated; also the analytically impossible solutions were not taken into consideration.

On readings without interpretation doubts, in the case of recording speeds of 60 mm/min, the possible error was evaluated at a value of about ± 0.2 sec. Such value which we considered as the maximum value, is undoubtedly higher than that obtained with magnetic tape reproductions, as it is the case for some stations.

The consequences deriving in the detection of the hypocenter from such reading error, have been carefully analysed through a calculation programme on purpose prepared. The results, rather interesting, evidenced the dependence of the error on the relative position of the stations with regard to the hypocenter of the shock.

When the stations are located all around the hypocenter, constituting a network the size of which is of the same order of magnitude of the hypocentral depth, the error on the hypocentral coordinates is less than 2 km, and the error on the depth is lower. On the contrary, if the distance among the stations is remarkably lower than the hy-

pocentral depth, the error on the depth is still of the same order of magnitude, while the error on the epicentral localization increases.

In the case of a network composed of stations remarkably more distant than in the previous cases, the epicentral position remains relatively sure in its assessment, while the depts results rather uncertain.

The most unfavourable case is that of a network not surrounding the hypocenter; the stations supply data showing a remarkable scattering both of the epicentral coordinates and of the depth.

Migration of the hypocenters.

Interpreting the seismograms recorded by the local stations, it was observed that the values of the hypocentral distances were constant for short periods of time. This observation suggested us to study the possible duration of the seismic activity in given zones of the interested area. For this purpose a calculation programme was adopted, which supplied the graphs showing the location of the hypocenters of the shocks for particular periods of time.

Often the seismograms of a group of shocks, recorded in the same station, showed important analogies.

First of all the epicentral positions of the shocks included between two events with high magnitude were plotted on maps. However, these graphs, though giving a clear representation of the migratory phenomenon, did not completely describe its complex trend.

Successively, the area interested by the seismic phenomenon was subdivided into circular zones having an adequate radius. In most cases the circular zones were centered for the most part on the epicentral positions of the shocks having higher magnitude. Thus the events occurred within the examined zones were evidenced in chronological order. The results obtained showed the appearance of the seismic activity in zones previously inactive, either as forerunners signs of more important events, or as phenomena following such events (see Table 1).

The periods of time characterizing such phenomena supplied us with a subdivision of the events to be used for further maps of the epicenters. With reference to the same periods of time, $N-S$ sections were also prepared, where the positions of the epicenters are represented.

The maps of the epicenters, obtained from a computer printout on an original scalel of 1: 100,000, are shown in figures 1a-26a.

In these maps each event is represented by a number indicating the depth in discrete classes of two kilometers. For instance, the number 0 indicates a depth between 0 and 2 km, and so on: number 9 indicates a depth higher than 18 km. When the number is accompanied by an asterisk, this indicates an event of magnitude equal or higher than 4.

The sections, also derived from an original scale of 100,000, are shown in figures 1b-26b. In these figures the epicenters are indicated with little crosses when the magnitude is lower than 4, with asterisk when the magnitudes are higher.

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* obtained by maximum amplitudes read on a seismograph previously calibrated with the standard « Wood-Anderson » instruments.

LIST OF THE STUDIED SHOCKS.

Meaning of the symbols.

M	=	month
D	=	day
T	=	origin time in hours, minutes, seconds (*GMT*)
ML	=	local magnitude * (the value 0 corresponds to $M_L < 2.5$)
LAT	=	latitude in degrees and thousandths, of the epicenter
LONG	=	longitude in degrees and thousandths, of the epicenter
H	=	hypocentral depth in km
1	=	zone centered on the point with coordinates 46.380 *N* 13.220 *E*
2	=	zone centered on the point with coordinates 46.380 *N* 13.120 *E*
3	=	zone centered on the point with coordinates 46.340 *N* 13.000 *E*
4	=	zone centered on the point with coordinates 46.310 *N* 12.210 *E*
5	=	zone centered on the point with coordinates 46.290 *N* 13.100 *E*
6	=	zone centered on the point with coordinates 46.250 *N* 12.950 *E*
7	=	zone centered on the point with coordinates 46.240 *N* 13.270 *E*
8	=	zone centered on the point with coordinates 46.220 *N* 13.250 *E*
9	=	zone centered on the point with coordinates 46230 *N* 13.250 *E*

The asterisk means that the event has an epicenter included in the circle with 5 km radius, centered on the point respectively indicated.

TAB. 1

M	D	T	ML	LAT.	LONG.	H	1	2	3	4	5	6	7	8	9
5	6	19 59 3	4.5	46.271	13.126	32.8	I	I	I	I	I *	I	I	I	I
5	6	21 42 24	3.9	46.041	13.199	45.1	I	I	I	I	I	I	I	I	I
5	6	21 48 48	3.2	46.266	13.176	1.0	I	I	I	I	I	I	I	I	I
5	6	22 13 41	3.1	46.185	12.988	28.1	I	I	I	I	I	I	I	I	I
5	6	22 20 39	3.9	46.244	13.211	1.0	I	I	I	I	I	I	I *	I	I
5	6	23 7 39	4.0	46.278	13.243	25.8	I	I	I	I *	I	I	I *	I	I
5	7	12 41 40	3.6	46.258	13.126	19.3	I	I	I	I	I *	I	I	I *	I
5	7	13 42 46	4.3	46.474	13.070	26.4	I	I	I	I	I	I	I	I	I
5	7	13 44 12	4.2	46.295	13.251	14.9	I	I	I	I *	I	I	I	I	I
5	7	15 54 38	3.9	46.348	13.157	8.0	I	I *	I	I	I	I	I	I	I
5	7	16 50 28	2.8	46.181	13.086	4.8	I	I	I	I	I	I	I	I	I
5	7	18 33 48	3.0	46.359	13.122	16.5	I	I *	I	I	I	I	I	I	I
5	7	20 12 49	3.7	46.363	13.068	15.3	I	I *	I	I	I	I	I	I	I
5	7	20 52 34	3.3	46.169	13.128	18.7	I	I	I	I	I	I	I	I	I
5	8	1 32 2	2.3	46.358	13.257	1.0	I *	I	I	I	I	I	I	I	I
5	8	1 39 59	2.3	46.290	13.228	21.5	I	I	I	I *	I	I	I	I	I
5	8	2 17 2	3.0	46.442	13.152	12.8	I	I	I	I	I	I	I	I	I
5	8	2 18 58	3.1	46.555	13.259	8.6	I	I	I	I	I	I	I	I	I
5	8	3 0 27	2.0	46.336	13.126	15.3	I	I *	I	I	I	I	I	I	I
5	8	3 10 2	4.5	46.348	13.185	13.3	I *	I	I	I *	I	I	I	I	I
5	8	3 37 24	2.6	46.274	12.997	14.8	I	I	I	I	I	I *	I	I	I
5	8	4 19 56	2.9	46.144	13.073	1.0	I	I	I	I	I	I	I	I	I
5	8	8 45 57	2.5	46.491	13.212	6.8	I	I	I	I	I	I	I	I	I
5	8	9 56 22	3.5	46.403	13.024	13.1	I	I	I	I	I	I	I	I	I
5	8	18 50 7	2.2	46.286	13.107	9.8	I	I	I	I	I *	I	I	I	I
5	8	20 40 31	3.8	46.371	13.119	17.5	I	I *	I	I	I	I	I	I	I
5	8	22 8 49	2.7	46.288	13.131	8.3	I	I	I	I	I *	I	I	I	I
5	8	22 22 47	2.1	46.266	13.045	7.9	I	I	I	I	I *	I	I	I	I * I
5	8	22 47 32	2.5	46.300	12.960	4.8	I	I	I	I	I	I	I	I	I
5	8	23 9 16	1.8	46.294	13.321	1.0	I	I	I	I	I	I	I	I	I
5	8	23 53 1	2.5	46.326	13.272	3.0	I	I	I	I	I	I	I	I	I
5	9	0 53 48	5.5	46.356	13.264	1.0	I *	I	I	I	I	I	I	I	I
5	9	3 14 33	2.4	46.380	13.224	5.8	I *	I	I	I	I	I	I	I	I
5	9	3 39 26	2.9	46.278	13.015	15.1	I	I	I	I	I	I	I	I	I
5	9	3 53 6	2.4	46.240	13.224	9.3	I	I	I	I	I	I	I *	I	I
5	9	6 15 49	2.5	46.271	13.159	7.5	I	I	I	I	I *	I	I	I	I
5	9	9 18 20	2.2	46.378	13.090	14.3	I	I *	I	I	I	I	I	I	I
5	9	10 0 10	2.2	46.333	13.271	1.0	I	I	I	I	I	I	I	I	I
5	9	10 31 18	2.5	46.361	13.197	8.7	I *	I	I	I	I	I	I	I	I
5	9	11 28 41	2.8	46.311	13.139	16.5	I	I	I	I	I *	I	I	I	I
5	9	12 24 42	2.2	46.352	13.222	6.3	I *	I	I	I *	I	I	I	I	I
5	9	12 33 30	3.1	46.267	13.131	6.7	I	I	I	I	I *	I	I	I	I
5	9	14 4 33	2.6	46.384	13.201	1.0	I *	I	I	I	I	I	I	I	I
5	9	14 31 27	2.5	46.281	13.173	11.7	I	I	I	I *	I	I	I	I	I
5	9	18 27 58	2.6	46.367	13.202	1.0	I *	I	I	I	I	I	I	I	I
5	9	22 49 45	1.9	46.353	13.227	1.0	I *	I	I	I *	I	I	I	I	I
5	9	23 26 13	2.3	46.361	13.227	5.1	I *	I	I	I	I	I	I	I	I
5	10	2 26 12	2.8	46.324	13.135	9.6	I	I	I	I	I *	I	I	I	I
5	10	3 28 21	1.9	46.231	13.002	9.1	I	I	I	I	I	I *	I	I	I * I
5	10	4 35 53	4.7	46.303	13.247	1.0	I	I	I	I *	I	I	I	I	I

M	D	T	ML	LAT.	LONG.	H	1	2	3	4	5	6	7	8	9
5	10	4 53 17	2.7	46.293	13.019	15.8	I	I	I	I	I	I	I	I	I
5	10	5 8 51	3.9	46.258	13.119	10.9	I	I	I	I	I *	I	I	I *	I
5	10	7 20 40	2.5	46.332	13.164	13.0	I	I	I	I *	I	I	I	I	I
5	10	10 32 19	2.2	46.320	13.098	13.8	I	I	I	I	I *	I	I	I	I
5	10	11 23 4	2.5	46.265	13.110	11.3	I	I	I	I	I *	I	I	I	I
5	10	11 58 54	2.1	46.384	13.225	1.0	I *	I	I	I	I	I	I	I	I
5	10	13 38 18	2.3	46.332	13.205	8.5	I	I	I	I *	I	I	I	I	I
5	10	14 25 43	2.6	46.337	13.006	18.2	I	I	I *	I	I	I	I	I	I
5	10	15 15 2	2.7	46.275	12.999	14.4	I	I	I	I	I	I *	I	I	I
5	10	15 49 34	2.0	46.277	13.048	20.5	I	I	I	I	I *	I	I	I	I
5	10	16 1 49	2.8	46.297	13.204	6.2	I	I	I	I *	I	I	I	I	I
5	10	16 8 31	2.5	46.307	13.209	7.3	I	I	I	I *	I	I	I	I	I
5	10	16 44 20	2.1	46.282	13.106	13.2	I	I	I	I	I *	I	I	I	I
5	10	20 49 19	2.0	46.333	13.282	1.0	I	I	I	I	I	I	I	I	I
5	10	22 59 43	1.6	46.280	13.133	7.4	I	I	I	I	I *	I	I	I	I
5	11	2 0 52	2.1	46.340	13.125	16.7	I	I *	I	I	I	I	I	I	I
5	11	2 25 45	2.3	46.271	13.328	1.0	I	I	I	I	I	I	I	I	I
5	11	2 40 3	1.8	46.165	13.166	3.5	I	I	I	I	I	I	I	I *	I
5	11	3 57 55	2.0	46.331	13.219	7.0	I	I	I	I *	I	I	I	I	I
5	11	4 25 10	2.6	46.280	13.101	23.7	I	I	I	I	I *	I	I	I	I
5	11	5 32 0	4.2	46.286	13.143	11.2	I	I	I	I	I *	I	I	I	I
5	11	7 34 23	2.1	46.374	13.155	8.1	I	I *	I	I	I	I	I	I	I
5	11	10 5 47	3.2	46.319	13.266	13.5	I	I	I	I *	I	I	I	I	I
5	11	10 6 23	3.3	46.233	13.158	6.6	I	I	I	I	I	I	I	I *	I
5	11	11 47 1	1.8	46.309	13.197	5.0	I	I	I	I *	I	I	I	I	I
5	11	14 47 58	1.8	46.295	13.195	4.8	I	I	I	I *	I	I	I	I	I
5	11	19 28 12	1.7	46.382	13.016	19.5	I	I	I *	I	I	I	I	I	I
5	11	20 2 30	2.2	46.326	13.296	1.0	I	I	I	I	I	I	I	I	I
5	11	20 14 26	1.8	46.306	13.280	10.9	I	I	I	I	I	I	I	I	I
5	11	20 16 9	2.1	46.321	13.233	10.1	I	I	I	I *	I	I	I	I	I
5	11	20 33 28	1.8	46.310	13.034	11.6	I	I	I *	I	I	I	I	I	I
5	11	20 37 42	2.5	46.342	13.135	1.6	I	I *	I	I	I	I	I	I	I
5	11	20 46 2	2.4	46.346	13.183	11.1	I *	I	I	I *	I	I	I	I	I
5	11	20 53 43	2.9	46.255	13.464	1.0	I	I	I	I	I	I	I	I	I
5	11	21 11 38	2.6	46.336	13.165	13.0	I	I	I	I *	I	I	I	I	I
5	11	22 18 5	3.4	46.374	13.295	1.0	I	I	I	I	I	I	I	I	I
5	11	22 44 2	5.3	46.286	13.086	19.1	I	I	I	I	I *	I	I	I	I
5	11	22 49 19	2.4	46.309	13.065	17.4	I	I	I	I	I *	I	I	I	I
5	11	22 52 20	1.8	46.353	13.166	4.3	I	I *	I	I	I	I	I	I	I
5	11	22 54 13	2.3	46.307	13.046	17.4	I	I	I	I	I *	I	I	I	I
5	11	22 56 15	2.0	46.331	13.033	14.8	I	I	I *	I	I	I	I	I	I
5	11	22 57 46	3.2	46.206	13.302	16.2	I	I	I	I	I	I	I *	I	I
5	11	23 22 52	3.7	46.319	12.969	12.1	I	I	I *	I	I	I	I	I	I
5	11	23 36 41	3.9	46.258	13.002	15.8	I	I	I	I	I	I *	I	I	I *
5	11	23 37 31	3.9	46.283	12.903	1.0	I	I	I	I	I	I	I	I	I
5	12	0 7 7	1.8	46.300	12.993	19.0	I	I	I *	I	I	I	I	I	I
5	12	0 9 5	1.9	46.297	13.124	16.4	I	I	I	I	I *	I	I	I	I
5	12	0 12 39	2.1	46.325	13.286	1.0	I	I	I	I	I	I	I	I	I
5	12	1 14 14	2.0	46.326	13.296	1.0	I	I	I	I	I	I	I	I	I
5	12	1 24 5	2.5	46.303	13.307	4.5	I	I	I	I	I	I	I	I	I

M	D	T	ML	LAT.	LONG.	H	1	2	3	4	5	6	7	8	9
5	12	1 34 11	1.8	46.275	13.213	12.1	I	I	I	I *	I	I	I	I	I
5	12	2 23 31	2.3	46.382	13.179	1.0	I *	I *	I	I	I	I	I	I	I
5	12	2 24 35	2.2	46.315	13.068	17.2	I	I	I	I	I *	I	I	I	I
5	12	2 38 12	2.4	46.312	13.355	1.0	I	I	I	I	I	I	I	I	I
5	12	3 1 8	3.6	46.408	13.158	3.8	I	I *	I	I	I	I	I	I	I
5	12	3 51 41	2.5	46.294	13.086	15.9	I	I	I	I	I *	I	I	I	I
5	12	7 17 59	2.7	46.248	13.100	4.6	I	I	I	I	I *	I	I	I *	I * I
5	12	8 47 51	2.4	46.345	13.086	17.8	I	I *	I	I	I	I	I	I	I
5	12	8 48 55	2.0	46.329	13.325	8.2	I	I	I	I	I	I	I	I	I
5	12	9 4 9	3.6	46.306	13.058	5.3	I	I	I	I	I *	I	I	I	I
5	12	9 13 56	2.1	46.286	12.941	1.0	I	I	I	I	I	I *	I	I	I
5	12	14 48 12	2.7	46.253	12.980	12.8	I	I	I	I	I	I *	I	I	I
5	12	16 46 50	2.2	46.301	12.937	7.5	I	I	I	I	I	I	I	I	I
5	12	18 6 52	3.5	46.311	13.305	1.0	I	I	I	I	I	I	I	I	I
5	12	20 12 50	2.9	46.318	13.315	1.0	I	I	I	I	I	I	I	I	I
5	12	20 40 53	2.5	46.290	12.959	6.9	I	I	I	I	I	I *	I	I	I
5	12	22 22 26	2.1	46.320	13.230	1.0	I	I	I	I *	I	I	I	I	I
5	12	22 32 56	2.0	46.293	13.223	9.1	I	I	I	I *	I	I	I	I	I
5	12	23 22 42	2.2	46.298	13.189	8.9	I	I	I	I *	I	I	I	I	I
5	13	0 35 9	2.3	46.277	12.931	6.1	I	I	I	I	I	I *	I	I	I
5	13	1 18 44	2.2	46.287	13.156	12.1	I	I	I	I *	I *	I	I	I	I
5	13	3 15 18	2.9	46.276	13.173	9.8	I	I	I	I *	I	I	I	I	I
5	13	3 21 25	2.9	46.221	13.250	6.7	I	I	I	I	I	I	I *	I	I
5	13	3 38 38	2.6	46.282	13.107	7.0	I	I	I	I	I *	I	I	I	I
5	13	4 35 55	2.2	46.296	13.199	10.6	I	I	I	I *	I	I	I	I	I
5	13	10 0 30	2.1	46.171	13.098	1.9	I	I	I	I	I	I	I	I	I
5	13	10 57 10	2.4	46.260	13.083	9.6	I	I	I	I	I *	I	I	I	I * I
5	13	11 18 4	2.4	46.335	13.075	14.8	I	I	I	I	I	I	I	I	I
5	13	12 14 0	2.2	46.198	13.148	6.4	I	I	I	I	I	I	I	I *	I
5	13	12 51 59	2.5	46.243	13.138	7.9	I	I	I	I	I	I	I	I *	I
5	13	13 4 50	4.3	46.247	12.988	6.7	I	I	I	I	I	I *	I	I	I
5	13	13 23 26	1.4	46.354	13.199	1.0	I *	I	I	I *	I	I	I	I	I
5	13	19 1 0	2.7	46.311	13.187	16.4	I	I	I	I *	I	I	I	I	I
5	13	22 4 41	2.7	46.264	13.164	9.0	I	I	I	I	I	I	I	I	I
5	14	0 49 34	2.7	46.271	13.208	9.8	I	I	I	I *	I	I	I	I	I
5	14	1 18 38	2.4	46.261	13.279	6.5	I	I	I	I	I	I	I *	I	I
5	14	3 6 11	2.8	46.264	13.198	8.0	I	I	I	I	I	I	I	I	I
5	14	3 48 7	1.9	46.263	13.168	9.4	I	I	I	I	I	I	I	I *	I
5	14	5 26 18	1.7	46.295	13.061	11.4	I	I	I	I	I *	I	I	I	I
5	14	5 51 2	2.5	46.246	13.197	8.4	I	I	I	I	I	I	I	I *	I
5	14	9 38 17	2.1	46.401	13.300	8.7	I	I	I	I	I	I	I	I	I
5	14	12 34 46	2.7	46.270	12.926	6.1	I	I	I	I	I	I *	I	I	I
5	14	13 24 54	2.1	46.322	13.171	9.3	I	I	I	I *	I	I	I	I	I
5	14	16 49 54	2.7	46.267	13.127	6.9	I	I	I	I	I *	I	I	I	I
5	14	17 51 29	3.2	46.152	13.148	10.8	I	I	I	I	I	I	I	I	I
5	14	17 58 44	2.8	46.225	13.272	7.3	I	I	I	I	I	I	I *	I	I
5	14	18 52 32	2.7	46.258	13.083	8.4	I	I	I	I	I *	I	I	I	I * I
5	14	20 52 9	2.7	46.279	13.020	8.8	I	I	I	I	I	I	I	I	I
5	14	21 15 54	3.0	46.208	13.243	6.4	I	I	I	I	I	I	I *	I	I
5	14	23 24 51	3.7	46.215	13.152	10.6	I	I	I	I	I	I	I	I *	I

M	D	T	ML	LAT.	LONG.	H	1	2	3	4	5	6	7	8	9
5	15	0 39 55	1.9	46.335	13.117	14.7	I	I	I	I	I	I	I	I	I
5	15	1 16 53	2.4	46.265	13.098	7.2	I	I	I	I	I *	I	I	I	I
5	15	1 29 16	2.0	46.248	13.146	9.1	I	I	I	I	I	I	I	I *	I
5	15	2 33 12	2.4	46.347	13.338	1.0	I	I	I	I	I	I	I	I	I
5	15	4 26 16	4.2	46.241	13.270	15.8	I	I	I	I	I	I	I *	I	I
5	15	8 40 17	3.9	46.233	12.986	10.1	I	I	I	I	I	I *	I	I	I *
5	15	8 57 39	3.1	46.209	13.229	12.7	I	I	I	I	I	I	I *	I	I
5	15	9 29 8	3.4	46.263	13.093	15.9	I	I	I	I	I *	I	I	I	I *
5	15	9 40 39	3.4	46.147	13.190	6.9	I	I	I	I	I	I	I	I	I
5	15	9 42 54	2.1	46.338	13.091	13.3	I	I	I	I	I	I	I	I	I
5	15	10 28 5	2.6	46.182	13.200	6.4	I	I	I	I	I	I	I	I	I
5	15	11 19 43	2.5	46.247	13.116	8.3	I	I	I	I	I *	I	I	I *	I
5	15	13 18 57	2.5	46.286	13.307	13.4	I	I	I	I	I	I	I	I	I
5	15	14 21 32	2.9	46.298	13.177	13.1	I	I	I	I *	I	I	I	I	I
5	15	15 17 24	3.0	46.275	12.922	10.1	I	I	I	I	I	I *	I	I	I
5	15	15 25 10	3.3	46.207	13.131	18.8	I	I	I	I	I	I	I	I *	I
5	15	16 5 58	3.4	46.213	12.971	18.5	I	I	I	I	I	I *	I	I	I
5	15	16 50 48	3.1	46.284	13.210	9.7	I	I	I	I *	I	I	I	I	I
5	15	16 58 3	2.4	46.240	13.156	12.4	I	I	I	I	I	I	I	I *	I
5	15	18 37 8	3.3	46.275	13.235	8.9	I	I	I	I *	I	I	I *	I	I
5	15	19 20 16	2.9	46.214	13.142	3.8	I	I	I	I	I	I	I	I *	I
5	15	20 13 56	2.7	46.330	13.202	7.0	I	I	I	I *	I	I	I	I	I
5	15	20 43 4	2.7	46.278	13.221	7.4	I	I	I	I *	I	I	I	I	I
5	15	21 10 26	2.6	46.324	13.228	1.0	I	I	I	I *	I	I	I	I	I
5	15	22 34 20	2.8	46.290	13.183	11.3	I	I	I	I *	I	I	I	I	I
5	16	0 32 15	2.6	46.252	13.136	8.5	I	I	I	I	I	I	I	I *	I
5	16	2 33 55	2.5	46.223	13.327	1.0	I	I	I	I	I	I	I *	I	I
5	16	3 37 18	2.5	46.219	13.268	5.1	I	I	I	I	I	I	I *	I	I
5	16	4 49 50	2.6	46.237	13.115	7.5	I	I	I	I	I	I	I	I *	I
5	16	4 57 5	3.1	46.193	13.216	7.7	I	I	I	I	I	I	I	I	I
5	16	4 58 20	2.8	46.252	13.332	1.0	I	I	I	I	I	I	I *	I	I
5	16	5 58 48	2.6	46.235	13.064	17.8	I	I	I	I	I	I	I	I	I *
5	16	5 59 23	3.1	46.252	13.255	12.3	I	I	I	I	I	I	I *	I	I
5	16	6 28 7	3.0	46.242	13.253	13.8	I	I	I	I	I	I	I *	I	I
5	16	7 44 30	3.0	46.312	13.141	19.8	I	I	I	I	I *	I	I	I	I
5	16	8 0 9	2.4	46.303	13.042	8.4	I	I	I	I	I *	I	I	I	I
5	16	10 50 17	2.6	46.260	13.039	21.7	I	I	I	I	I	I	I	I	I *
5	16	11 56 8	2.5	46.247	13.189	21.0	I	I	I	I	I	I	I	I *	I
5	16	12 56 18	3.0	46.272	13.302	7.4	I	I	I	I	I	I	I *	I	I
5	16	13 48 27	2.8	46.263	13.325	1.0	I	I	I	I	I	I	I *	I	I
5	16	20 3 26	2.6	46.314	13.049	9.8	I	I	I *	I	I *	I	I	I	I
5	16	20 13 42	2.8	46.259	13.172	9.7	I	I	I	I	I	I	I	I *	I
5	16	21 32 0	2.7	46.296	13.093	13.3	I	I	I	I	I *	I	I	I	I
5	17	2 55 40	2.9	46.294	13.016	9.2	I	I	I	I	I	I	I	I	I
5	17	9 11 33	2.7	46.273	13.068	16.4	I	I	I	I	I *	I	I	I	I *
5	17	13 30 5	2.7	46.245	13.286	11.5	I	I	I	I	I	I	I *	I	I
5	17	15 23 51	2.4	46.304	13.203	11.8	I	I	I	I *	I	I	I	I	I
5	17	16 13 16	4.3	46.296	13.069	1.0	I	I	I	I	I *	I	I	I	I
5	17	16 21 1	3.3	46.292	12.987	14.4	I	I	I	I	I	I	I	I	I
5	17	16 23 27	2.3	46.298	12.987	11.7	I	I	I	I	I	I	I	I	I

M	D	T	ML	LAT.	LONG.	H	1	2	3	4	5	6	7	8	9
5	17	17 35 56	3.3	46.278	13.042	8.1	I	I	I	I	I *	I	I	I	I
5	17	19 58 50	3.0	46.271	12.953	11.0	I	I	I	I	I	I *	I	I	I
5	17	21 15 34	2.3	46.312	13.168	4.0	I	I	I	I *	I	I	I	I	I
5	17	21 31 7	2.3	46.215	13.309	1.0	I	I	I	I	I	I	I *	I	I
5	17	21 56 11	2.7	46.274	12.975	9.5	I	I	I	I	I	I *	I	I	I
5	17	23 48 9	2.8	46.236	13.270	11.9	I	I	I	I	I	I	I *	I	I
5	18	1 30 8	4.3	46.262	12.869	4.9	I	I	I	I	I	I	I	I	I
5	18	1 35 9	3.2	46.287	12.987	11.7	I	I	I	I	I	I *	I	I	I
5	18	2 39 39	3.7	46.275	13.002	3.4	I	I	I	I	I	I *	I	I	I
5	18	2 50 33	2.9	46.256	12.873	6.2	I	I	I	I	I	I	I	I	I
5	18	5 33 51	2.2	46.254	13.081	10.2	I	I	I	I	I *	I	I	I	I * I
5	18	7 0 25	2.7	46.156	13.054	15.9	I	I	I	I	I	I	I	I	I
5	18	8 1 44	3.2	46.265	12.999	12.7	I	I	I	I	I	I *	I	I	I
5	18	8 15 37	2.6	46.313	13.214	14.2	I	I	I	I *	I	I	I	I	I
5	18	9 51 10	2.5	46.222	13.145	10.4	I	I	I	I	I	I	I	I *	I
5	18	14 32 22	3.6	46.216	12.976	13.9	I	I	I	I	I	I *	I	I	I
5	18	15 22 15	3.4	46.127	12.916	9.0	I	I	I	I	I	I	I	I	I
5	18	16 48 6	3.0	46.522	12.995	1.0	I	I	I	I	I	I	I	I	I
5	18	20 18 24	3.1	46.306	13.076	11.2	I	I	I	I	I *	I	I	I	I
5	18	23 45 17	2.2	46.078	12.960	1.0	I	I	I	I	I	I	I	I	I
5	19	0 22 28	2.3	46.322	13.175	9.3	I	I	I	I *	I	I	I	I	I
5	19	4 16 19	2.6	46.262	12.950	5.8	I	I	I	I	I	I *	I	I	I
5	19	4 33 49	2.2	46.299	12.856	10.6	I	I	I	I	I	I	I	I	I
5	19	9 1 19	2.3	46.256	13.027	10.2	I	I	I	I	I	I	I	I	I * I
5	19	9 32 18	2.4	46.201	12.991	9.9	I	I	I	I	I	I	I	I	I
5	19	10 31 22	2.1	46.307	13.147	12.1	I	I	I	I *	I *	I	I	I	I
5	19	11 0 24	2.3	46.232	13.107	8.3	I	I	I	I	I	I	I	I *	I * I
5	19	15 14 53	3.0	46.238	12.960	6.1	I	I	I	I	I	I *	I	I	I
5	19	15 17 23	2.9	46.280	12.971	8.8	I	I	I	I	I	I *	I	I	I
5	19	17 32 30	2.3	46.238	13.106	9.6	I	I	I	I	I	I	I	I *	I * I
5	19	18 16 26	2.2	46.491	12.943	4.4	I	I	I	I	I	I	I	I	I
5	19	18 59 25	3.1	46.163	13.173	13.5	I	I	I	I	I	I	I	I	I
5	19	21 8 41	1.5	46.290	13.039	4.7	I	I	I	I	I *	I	I	I	I
5	19	22 55 11	2.5	46.212	13.211	5.8	I	I	I	I	I	I	I	I *	I
5	20	6 43 9	1.9	46.292	13.171	12.2	I	I	I	I *	I	I	I	I	I
5	20	11 15 55	2.4	46.333	13.129	8.7	I	I	I	I	I	I	I	I	I
5	20	14 44 33	3.2	46.202	13.193	19.3	I	I	I	I	I	I	I	I *	I
5	20	17 23 36	2.7	46.226	13.133	7.5	I	I	I	I	I	I	I	I *	I
5	20	22 5 8	2.3	46.191	13.076	5.9	I	I	I	I	I	I	I	I	I * I
5	21	1 48 17	2.7	46.216	13.255	18.1	I	I	I	I	I	I	I *	I	I
5	21	5 3 40	2.6	46.239	13.243	10.2	I	I	I	I	I	I	I *	I	I
5	21	8 8 9	2.4	46.312	13.141	11.5	I	I	I	I	I *	I	I	I	I
5	21	9 13 56	2.6	46.330	13.095	13.7	I	I	I	I	I *	I	I	I	I
5	21	20 35 27	2.4	46.238	13.208	11.8	I	I	I	I	I	I	I *	I *	I
5	21	22 47 38	2.5	46.210	13.286	4.4	I	I	I	I	I	I	I *	I	I
5	22	3 0 14	2.9	46.263	13.164	12.9	I	I	I	I	I	I	I	I *	I
5	22	4 30 23	1.9	46.279	13.280	1.0	I	I	I	I	I	I	I *	I	I
5	22	6 2 24	2.8	46.307	13.172	19.2	I	I	I	I *	I	I	I	I	I
5	22	9 58 38	3.0	46.189	13.109	1.0	I	I	I	I	I	I	I	I *	I
5	22	11 46 22	2.6	46.319	13.281	6.7	I	I	I	I	I	I	I	I	I

M	D	T	ML	LAT.	LONG.	H	1	2	3	4	5	6	7	8	9
5	22	16 26 0	3.0	46.254	13.114	7.8	I	I	I	I	I *	I	I	I *	I I
5	22	22 45 37	2.4	46.223	13.158	10.5	I	I	I	I	I	I	I	I *	I I
5	23	0 30 59	2.3	46.321	13.108	8.7	I	I	I	I	I *	I	I	I	I I
5	23	0 51 10	4.0	46.228	13.212	12.4	I	I	I	I	I	I	I *	I *	I I
5	23	1 25 49	2.8	46.206	13.145	16.6	I	I	I	I	I	I	I	I *	I I
5	23	1 53 9	3.0	46.252	13.238	18.2	I	I	I	I	I	I	I *	I	I I
5	23	3 57 38	2.0	46.364	13.189	10.1	I *	I	I	I	I	I	I	I	I I
5	23	5 16 8	2.2	46.285	13.029	8.9	I	I	I	I	I	I	I	I	I I
5	23	6 1 13	2.7	46.231	13.117	7.9	I	I	I	I	I	I	I	I *	I I
5	23	6 33 38	2.4	46.289	13.071	2.8	I	I	I	I	I *	I	I	I	I I
5	23	11 18 46	2.3	46.324	13.160	1.3	I	I	I	I *	I	I	I	I	I I
5	23	14 1 42	2.0	46.258	13.269	1.5	I	I	I	I	I	I	I *	I	I I
5	23	23 0 15	2.3	46.259	13.168	10.5	I	I	I	I	I	I	I	I *	I I
5	23	23 40 14	2.3	46.266	13.107	10.1	I	I	I	I	I *	I	I	I	I I
5	24	2 38 20	2.3	46.191	12.815	6.8	I	I	I	I	I	I	I	I	I I
5	24	4 52 15	2.0	46.317	13.052	11.3	I	I	I *	I	I *	I	I	I	I I
5	24	4 57 26	2.6	46.212	13.424	5.5	I	I	I	I	I	I	I	I	I I
5	24	7 30 23	2.6	46.241	12.982	9.7	I	I	I	I	I	I *	I	I	I I
5	24	11 16 43	2.4	46.342	13.063	1.0	I	I	I *	I	I	I	I	I	I I
5	24	14 37 58	2.2	46.298	13.091	11.2	I	I	I	I	I *	I	I	I	I I
5	24	20 1 11	1.9	46.294	13.266	1.0	I	I	I	I *	I	I	I	I	I I
5	25	0 43 59	3.2	46.258	13.337	14.0	I	I	I	I	I	I	I	I	I I
5	25	1 24 35	2.0	46.246	12.911	7.6	I	I	I	I	I	I *	I	I	I I
5	25	3 33 47	2.3	46.249	13.168	10.0	I	I	I	I	I	I	I	I *	I I
5	25	4 55 28	1.9	46.236	13.093	5.0	I	I	I	I	I	I	I	I *	I * I
5	25	12 50 9	2.8	46.221	13.110	6.8	I	I	I	I	I	I	I	I *	I * I
5	25	12 58 0	2.6	46.322	13.172	8.7	I	I	I	I *	I	I	I	I	I I
5	25	16 25 24	2.0	46.205	13.205	1.0	I	I	I	I	I	I	I	I *	I I
5	25	19 4 28	2.8	46.260	13.096	11.6	I	I	I	I	I *	I	I	I	I * I
5	25	19 47 59	3.4	46.211	12.989	5.2	I	I	I	I	I	I	I	I	I I
5	25	20 21 40	2.7	46.280	13.037	7.9	I	I	I	I	I *	I	I	I	I I
5	25	22 21 17	3.3	46.188	13.132	7.1	I	I	I	I	I	I	I	I *	I I
5	25	22 52 37	2.2	46.288	13.185	11.9	I	I	I	I *	I	I	I	I	I I
5	26	4 39 9	2.7	46.372	13.231	11.9	I *	I	I	I	I	I	I	I	I I
5	26	7 48 27	3.2	46.412	13.228	4.1	I *	I	I	I	I	I	I	I	I I
5	26	9 46 25	2.6	46.367	13.213	17.4	I *	I	I	I	I	I	I	I	I I
5	26	9 59 17	2.3	46.275	13.194	10.2	I	I	I	I *	I	I	I	I	I I
5	26	11 20 35	3.0	46.366	13.168	13.0	I *	I *	I	I	I	I	I	I	I I
5	26	13 53 11	2.9	46.299	13.252	9.6	I	I	I	I *	I	I	I	I	I I
5	26	14 11 3	2.2	46.312	13.092	14.0	I	I	I	I	I *	I	I	I	I I
5	26	14 39 19	2.8	46.258	13.244	9.5	I	I	I	I	I	I	I *	I	I I
5	26	19 29 0	3.0	46.214	13.138	6.3	I	I	I	I	I	I	I	I *	I I
5	26	22 6 59	2.3	46.224	13.136	9.1	I	I	I	I	I	I	I	I *	I I
5	27	3 49 47	3.4	46.308	13.198	7.1	I	I	I	I *	I	I	I	I	I I
5	27	6 50 20	2.7	46.240	13.294	12.9	I	I	I	I	I	I	I *	I	I I
5	27	16 3 58	2.5	46.262	13.130	8.4	I	I	I	I	I *	I	I	I *	I I
5	28	10 15 15	2.2	46.379	13.173	8.1	I *	I *	I	I	I	I	I	I	I I
5	28	22 11 29	2.3	46.316	13.110	10.7	I	I	I	I	I *	I	I	I	I I
5	28	23 12 36	2.0	46.309	13.056	11.1	I	I	I	I	I *	I	I	I	I I
5	28	23 38 43	2.5	46.211	13.058	1.0	I	I	I	I	I	I	I	I	I * I

M	D	T	ML	LAT.	LONG.	H	1	2	3	4	5	6	7	8	9
5	29	1 34 0	2.1	46.233	13.122	7.6	I	I	I	I	I	I	I	I *	I I
5	29	4 3 8	1.8	46.205	13.104	6.4	I	I	I	I	I	I	I	I *	I * I
5	29	7 3 33	2.2	46.345	13.089	12.9	I	I *	I	I	I	I	I	I	I I
5	29	12 57 45	3.1	46.334	13.001	10.2	I	I	I *	I	I	I	I	I	I I
5	29	14 45 54	3.3	46.260	13.249	1.0	I	I	I	I	I	I	I *	I	I I
5	29	14 57 45	3.0	46.347	13.059	18.1	I	I	I *	I	I	I	I	I	I I
5	30	21 13 13	3.8	46.250	13.105	7.6	I	I	I	I	I *	I	I	I *	I * I
5	31	4 3 42	3.0	46.298	13.148	18.0	I	I	I	I *	I *	I	I	I	I I
5	31	7 24 22	3.2	46.313	13.091	16.2	I	I	I	I	I *	I	I	I	I I
6	1	3 23 45	2.7	46.298	13.232	31.9	I	I	I	I *	I	I	I	I	I I
6	1	4 33 49	3.4	46.272	12.910	4.4	I	I	I	I	I	I *	I	I	I I
6	1	5 42 51	2.5	46.261	13.118	10.2	I	I	I	I	I *	I	I	I	I I
6	1	5 52 50	2.3	46.286	12.957	8.3	I	I	I	I	I	I *	I	I	I I
6	1	7 56 29	2.4	46.383	13.165	16.1	I *	I *	I	I	I	I	I	I	I I
6	1	10 4 6	2.8	46.324	13.122	7.5	I	I	I	I	I *	I	I	I	I I
6	1	15 46 8	3.3	46.292	13.183	12.2	I	I	I	I *	I	I	I	I	I I
6	1	17 21 11	4.2	46.221	12.880	1.0	I	I	I	I	I	I	I	I	I I
6	1	19 16 4	3.5	46.253	13.127	13.4	I	I	I	I	I *	I	I	I *	I I
6	1	21 29 36	2.6	46.312	13.183	1.0	I	I	I	I *	I	I	I	I	I I
6	2	9 27 2	3.6	46.263	12.965	12.7	I	I	I	I	I	I *	I	I	I I
6	2	11 9 37	2.6	46.270	13.116	15.5	I	I	I	I	I *	I	I	I	I I
6	3	3 56 18	3.0	46.230	13.288	14.2	I	I	I	I	I	I	I *	I	I I
6	3	11 44 50	2.4	46.241	13.118	10.8	I	I	I	I	I	I	I	I *	I I
6	3	15 44 45	3.1	46.267	13.016	7.8	I	I	I	I	I	I	I	I	I * I
6	3	19 23 6	2.7	46.170	13.057	13.6	I	I	I	I	I	I	I	I	I I
6	3	19 35 55	3.0	46.282	13.169	7.7	I	I	I	I *	I	I	I	I	I I
6	3	20 22 10	3.2	46.256	13.042	11.1	I	I	I	I	I	I	I	I	I * I
6	3	21 39 26	2.4	46.253	12.932	1.0	I	I	I	I	I	I *	I	I	I I
6	3	23 15 10	2.7	46.272	13.058	13.3	I	I	I	I	I *	I	I	I	I * I
6	4	2 49 37	2.5	46.356	12.939	7.4	I	I	I	I	I	I	I	I	I I
6	4	7 49 15	3.5	46.262	13.017	15.0	I	I	I	I	I	I	I	I	I * I
6	4	11 56 58	3.5	46.266	13.069	5.4	I	I	I	I	I *	I	I	I	I I
6	6	8 12 36	3.3	46.264	12.988	8.0	I	I	I	I	I	I *	I	I	I I
6	6	11 27 28	2.7	46.270	12.977	8.8	I	I	I	I	I	I *	I	I	I I
6	6	12 30 53	2.8	46.270	13.073	5.4	I	I	I	I	I *	I	I	I	I * I
6	7	3 34 19	2.5	46.281	13.137	10.3	I	I	I	I	I *	I	I	I	I I
6	7	3 15 8	2.6	46.338	13.203	1.0	I *	I	I	I *	I	I	I	I	I I
6	7	12 35 21	2.8	46.212	12.952	5.6	I	I	I	I	I	I *	I	I	I I
6	7	18 18 22	2.4	46.272	12.922	13.7	I	I	I	I	I	I *	I	I	I I
6	7	22 31 6	2.8	46.253	13.005	13.2	I	I	I	I	I	I *	I	I	I * I
6	7	23 5 33	2.6	46.248	12.938	10.8	I	I	I	I	I	I *	I	I	I I
6	8	0 43 32	2.6	46.342	13.102	8.2	I	I *	I	I	I	I	I	I	I I
6	8	4 29 29	2.6	46.307	13.122	18.1	I	I	I	I	I *	I	I	I	I I
6	8	6 34 23	2.3	46.298	13.118	1.0	I	I	I	I	I *	I	I	I	I I
6	8	12 5 31	3.0	46.224	12.905	5.9	I	I	I	I	I	I *	I	I	I I
6	8	12 19 27	3.3	46.301	13.162	17.2	I	I	I	I *	I *	I	I	I	I I
6	8	21 40 55	2.8	46.291	13.320	1.0	I	I	I	I	I	I	I	I	I I
6	9	18 48 14	4.2	46.260	13.008	13.0	I	I	I	I	I	I *	I	I	I * I
6	9	19 12 17	3.2	46.240	12.959	9.0	I	I	I	I	I	I *	I	I	I I
6	10	0 15 15	3.2	46.263	12.974	11.0	I	I	I	I	I	I *	I	I	I I

M	D	T	ML	LAT.	LONG.	H	1	2	3	4	5	6	7	8	9
6	10	13 4 25	3.3	46.247	13.015	11.6	I	I	I	I	I	I	I	I	I * I
6	11	17 29 1	3.2	46.295	13.099	11.4	I	I	I	I	I *	I	I	I	I
6	11	17 39 36	3.0	46.256	12.960	5.3	I	I	I	I	I	I *	I	I	I
6	11	17 51 36	3.3	46.331	13.246	8.9	I	I	I	I *	I	I	I	I	I
6	11	20 10 50	2.8	46.321	13.278	12.3	I	I	I	I	I	I	I	I	I
6	11	21 3 58	2.5	46.267	13.017	13.8	I	I	I	I	I	I	I	I	I * I
6	12	0 5 11	2.4	46.318	13.328	7.7	I	I	I	I	I	I	I	I	I
6	12	18 5 34	3.3	46.321	13.299	1.0	I	I	I	I	I	I	I	I	I
6	13	4 48 45	2.4	46.320	13.252	10.2	I	I	I	I *	I	I	I	I	I
6	13	13 8 34	2.4	46.283	13.151	11.1	I	I	I	I	I *	I	I	I	I
6	14	0 18 57	3.2	46.321	13.098	15.2	I	I	I	I	I *	I	I	I	I
6	15	5 46 34	3.8	46.355	13.249	13.7	I *	I	I	I	I	I	I	I	I
6	16	1 50 37	3.3	46.342	13.265	13.3	I	I	I	I	I	I	I	I	I
6	16	3 20 34	3.6	46.298	13.097	17.5	I	I	I	I	I *	I	I	I	I
6	17	13 27 39	3.5	46.255	12.926	7.2	I	I	I	I	I	I *	I	I	I
6	17	14 28 54	4.4	46.229	12.825	1.0	I	I	I	I	I	I	I	I	I
6	19	3 25 35	3.0	46.162	13.287	11.7	I	I	I	I	I	I	I	I	I
6	19	22 0 10	2.5	46.263	12.955	12.0	I	I	I	I	I	I *	I	I	I
6	20	10 4 13	3.3	46.305	13.096	4.4	I	I	I	I	I *	I	I	I	I
6	20	18 0 9	2.7	46.308	13.256	11.4	I	I	I	I *	I	I	I	I	I
6	20	18 29 1	2.5	46.325	13.211	8.1	I	I	I	I *	I	I	I	I	I
6	22	4 57 17	3.1	46.422	13.115	1.0	I	I *	I	I	I	I	I	I	I
6	23	3 43 17	2.5	46.289	13.285	12.9	I	I	I	I	I	I	I	I	I
6	26	11 13 49	4.3	46.305	13.151	7.4	I	I	I	I *	I *	I	I	I	I
6	26	11 35 59	3.4	46.329	13.109	8.2	I	I	I	I	I *	I	I	I	I
6	26	16 47 38	3.6	46.218	13.046	10.7	I	I	I	I	I	I	I	I	I * I
6	27	11 4 46	2.5	46.382	13.132	5.1	I	I *	I	I	I	I	I	I	I
6	29	17 3 30	2.6	46.302	12.985	2.0	I	I	I *	I	I	I	I	I	I
6	30	19 2 41	2.6	46.242	13.268	3.9	I	I	I	I	I	I	I *	I	I
7	1	21 27 14	2.4	46.382	13.155	14.6	I *	I *	I	I	I	I	I	I	I
7	3	4 46 37	2.9	46.320	13.225	4.0	I	I	I	I *	I	I	I	I	I
7	3	15 36 12	3.7	46.301	13.036	5.6	I	I	I	I	I	I	I	I	I
7	3	16 58 43	3.6	46.240	13.145	16.0	I	I	I	I	I	I	I	I *	I
7	5	2 39 12	2.4	46.314	13.268	11.4	I	I	I	I *	I	I	I	I	I
7	5	3 41 36	2.9	46.321	13.205	11.8	I	I	I	I *	I	I	I	I	I
7	5	8 45 30	2.6	46.296	13.149	17.9	I	I	I	I *	I *	I	I	I	I
7	5	9 51 43	3.5	46.324	13.189	6.2	I	I	I	I *	I	I	I	I	I
7	6	6 5 55	2.5	46.324	13.261	11.5	I	I	I	I *	I	I	I	I	I
7	6	23 8 35	2.8	46.351	13.255	1.0	I *	I	I	I	I	I	I	I	I
7	10	4 11 24	4.1	46.280	13.227	1.0	I	I	I	I *	I	I	I	I	I
7	11	12 24 30	2.6	46.339	13.040	15.1	I	I	I *	I	I	I	I	I	I
7	11	13 23 46	3.1	46.368	13.146	1.0	I	I *	I	I	I	I	I	I	I
7	12	8 4 53	3.6	46.321	13.157	10.0	I	I	I	I *	I	I	I	I	I
7	15	12 58 51	3.8	46.321	13.154	1.0	I	I	I	I *	I	I	I	I	I
7	17	6 58 21	3.1	46.351	13.091	1.0	I	I *	I	I	I	I	I	I	I
7	25	3 45 9	2.6	46.342	13.226	3.5	I *	I	I	I *	I	I	I	I	I
7	27	4 52 33	3.2	46.348	13.074	1.0	I	I	I	I	I	I	I	I	I
7	27	8 19 51	3.7	46.328	13.138	1.0	I	I	I	I	I	I	I	I	I
7	30	7 32 46	3.7	46.327	13.012	1.0	I	I	I *	I	I	I	I	I	I
7	31	14 46 56	3.6	46.333	13.236	1.0	I	I	I	I *	I	I	I	I	I

M	D	T	ML	LAT.	LONG.	H	1	2	3	4	5	6	7	8	9
7	31	19 20 26	2.8	46.306	13.251	13.1	I	I	I	I *	I	I	I	I	I
8	1	12 39 5	2.7	46.302	13.260	13.8	I	I	I	I *	I	I	I	I	I
8	1	14 44 7	3.3	46.385	13.139	8.1	I	I *	I	I	I	I	I	I	I
8	7	10 59 27	2.7	46.236	13.325	1.0	I	I	I	I	I	I	I *	I	I
8	8	17 10 31	.0	46.366	13.213	11.3	I *	I	I	I	I	I	I	I	I
8	9	19 40 21	.0	46.316	13.138	11.4	I	I	I	I	I *	I	I	I	I
8	10	8 29 11	.0	46.292	13.180	13.0	I	I	I	I *	I	I	I	I	I
8	11	18 30 29	3.1	46.290	13.177	6.7	I	I	I	I *	I	I	I	I	I
8	11	22 19 42	.0	46.307	13.036	8.3	I	I	I *	I	I	I	I	I	I
8	12	1 22 19	3.0	46.339	13.258	1.0	I	I	I	I *	I	I	I	I	I
8	12	1 38 27	2.5	46.374	13.132	7.4	I	I *	I	I	I	I	I	I	I
8	12	20 43 57	.0	46.120	13.276	1.0	I	I	I	I	I	I	I	I	I
8	14	5 35 4	3.0	46.331	13.177	9.8	I	I	I	I *	I	I	I	I	I
8	15	21 36 41	2.3	46.333	13.066	1.0	I	I	I	I	I	I	I	I	I
8	16	0 9 5	.0	46.313	13.061	7.2	I	I	I	I	I *	I	I	I	I
8	16	5 35 44	.0	46.195	13.129	5.2	I	I	I	I	I	I	I	I *	I
8	16	8 34 18	.0	46.275	13.142	16.1	I	I	I	I	I *	I	I	I	I
8	16	17 24 27	.0	46.236	13.330	8.3	I	I	I	I	I	I	I *	I	I
8	16	19 42 31	2.9	46.273	13.353	1.0	I	I	I	I	I	I	I	I	I
8	16	21 17 40	.0	46.325	13.055	8.6	I	I	I *	I	I	I	I	I	I
8	16	22 18 55	.0	46.277	13.291	14.2	I	I	I	I	I	I	I *	I	I
8	17	17 46 58	.0	46.210	13.313	5.9	I	I	I	I	I	I	I *	I	I
8	18	5 58 53	3.6	46.364	13.169	9.5	I *	I *	I	I	I	I	I	I	I
8	18	23 31 6	.0	46.303	13.205	6.5	I	I	I	I *	I	I	I	I	I
8	21	12 38 44	.0	46.410	13.130	5.0	I	I *	I	I	I	I	I	I	I
8	21	23 46 32	.0	46.268	13.127	16.7	I	I	I	I	I *	I	I	I	I
8	22	9 58 53	.0	46.308	13.113	14.6	I	I	I	I	I *	I	I	I	I
8	22	17 45 56	.0	46.295	13.188	11.3	I	I	I	I *	I	I	I	I	I
8	23	17 58 5	3.1	46.295	13.187	14.5	I	I	I	I *	I	I	I	I	I
8	24	14 47 46	2.9	46.222	13.275	1.0	I	I	I	I	I	I	I *	I	I
8	25	11 21 31	.0	46.225	13.325	1.0	I	I	I	I	I	I	I *	I	I
8	25	12 21 36	3.0	46.344	13.000	1.0	I	I	I *	I	I	I	I	I	I
8	27	14 37 42	.0	46.177	13.236	1.0	I	I	I	I	I	I	I	I	I
9	2	4 7 25	.0	46.335	13.279	10.0	I	I	I	I	I	I	I	I	I
9	5	7 5 41	.0	46.223	13.285	1.0	I	I	I	I	I	I	I *	I	I
9	6	4 32 25	.0	46.268	13.164	7.3	I	I	I	I	I	I	I	I	I
9	6	19 28 17	4.0	46.345	13.061	1.0	I	I	I *	I	I	I	I	I	I
9	7	0 4 41	.0	46.228	13.069	9.6	I	I	I	I	I	I	I	I	I * I
9	7	9 22 4	.0	46.335	13.279	10.0	I	I	I	I	I	I	I	I	I
9	7	5 53 56	.0	46.280	13.153	6.8	I	I	I	I	I *	I	I	I	I
9	7	7 2 11	.0	46.176	13.076	6.9	I	I	I	I	I	I	I	I	I
9	7	11 8 19	3.8	46.312	12.993	4.7	I	I	I *	I	I	I	I	I	I
9	7	12 6 27	.0	46.291	13.086	7.6	I	I	I	I	I *	I	I	I	I
9	7	14 6 3	.0	46.257	13.064	11.8	I	I	I	I	I *	I	I	I	I * I
9	8	3 30 27	.0	46.300	13.078	10.8	I	I	I	I	I *	I	I	I	I
9	8	4 12 39	3.4	46.225	13.102	12.3	I	I	I	I	I	I	I	I *	I * I
9	8	23 10 9	2.7	46.239	13.192	6.8	I	I	I	I	I	I	I	I *	I I
9	9	19 3 55	.0	46.170	13.053	6.3	I	I	I	I	I	I	I	I	I
9	11	4 30 38	.0	46.261	13.112	7.1	I	I	I	I	I *	I	I	I	I
9	11	16 31 13	5.5	46.290	13.176	9.1	I	I	I	I *	I	I	I	I	I

M	D	T	ML	LAT.	LONG.	H	1	2	3	4	5	6	7	8	9
9	11	16 35 3	5.9	46.324	13.143	5.9	I	I	I	I	I	I	I	I	I
9	11	16 40 38	3.0	46.309	13.195	8.1	I	I	I	I *	I	I	I	I	I
9	11	16 46 8	3.1	46.320	13.197	4.4	I	I	I	I *	I	I	I	I	I
9	11	17 26 9	3.0	46.343	13.182	3.8	I	I	I	I *	I	I	I	I	I
9	11	17 34 58	3.4	46.212	13.274	6.6	I	I	I	I	I	I	I *	I	I
9	11	18 23 17	3.0	46.335	13.226	1.0	I	I	I	I *	I	I	I	I	I
9	11	18 27 48	3.6	46.338	13.223	2.8	I *	I	I	I *	I	I	I	I	I
9	11	21 5 47	3.7	46.298	13.171	7.2	I	I	I	I *	I	I	I	I	I
9	12	1 20 9	4.0	46.325	13.227	11.4	I	I	I	I *	I	I	I	I	I
9	12	1 54 54	2.8	46.279	13.253	7.8	I	I	I	I *	I	I	I *	I	I
9	12	2 25 48	2.9	46.317	13.223	7.4	I	I	I	I *	I	I	I	I	I
9	12	4 44 22	2.9	46.332	13.208	6.5	I	I	I	I *	I	I	I	I	I
9	12	5 33 46	2.8	46.302	13.222	5.0	I	I	I	I *	I	I	I	I	I
9	12	10 40 6	2.9	46.245	13.186	10.5	I	I	I	I	I	I	I	I *	I
9	12	10 41 57	3.7	46.261	13.229	7.7	I	I	I	I	I	I	I *	I	I
9	12	14 45 43	2.5	46.303	13.205	6.5	I	I	I	I *	I	I	I	I	I
9	12	19 53 33	4.5	46.361	13.172	5.2	I *	I *	I	I	I	I	I	I	I
9	12	19 57 47	2.6	46.315	13.233	3.9	I	I	I	I *	I	I	I	I	I
9	13	0 48 13	3.3	46.315	13.158	8.1	I	I	I	I *	I	I	I	I	I
9	13	0 58 8	2.7	46.306	13.212	5.0	I	I	I	I *	I	I	I	I	I
9	13	7 3 51	3.8	46.239	12.997	9.4	I	I	I	I	I	I *	I	I *	I
9	13	7 29 57	3.1	46.307	13.046	7.3	I	I	I	I	I *	I	I	I	I
9	13	14 17 20	3.1	46.176	13.052	8.7	I	I	I	I	I	I	I	I	I
9	13	17 24 17	2.8	46.308	13.271	1.0	I	I	I	I *	I	I	I	I	I
9	13	18 54 51	4.4	46.364	13.238	1.0	I *	I	I	I	I	I	I	I	I
9	13	19 42 16	4.1	46.214	13.015	7.9	I	I	I	I	I	I	I	I *	I
9	13	20 45 59	2.7	46.267	13.216	7.8	I	I	I	I *	I	I	I *	I	I
9	13	21 25 14	3.2	46.333	13.136	10.2	I	I	I	I	I	I	I	I	I
9	14	2 30 37	3.1	46.314	13.138	15.2	I	I	I	I	I *	I	I	I	I
9	14	6 24 12	2.7	46.346	13.151	1.0	I	I *	I	I	I	I	I	I	I
9	14	6 26 44	2.8	46.280	13.139	6.4	I	I	I	I	I *	I	I	I	I
9	14	8 25 34	3.8	46.338	13.209	8.4	I *	I	I	I *	I	I	I	I	I
9	14	8 30 5	3.0	46.304	13.233	4.2	I	I	I	I *	I	I	I	I	I
9	14	15 29 10	3.4	46.309	13.136	3.1	I	I	I	I	I *	I	I	I	I
9	14	20 37 39	2.9	46.264	13.204	6.4	I	I	I	I	I	I	I	I	I
9	14	20 38 27	2.3	46.305	13.181	4.5	I	I	I	I *	I	I	I	I	I
9	14	21 35 19	2.3	46.289	13.175	6.7	I	I	I	I *	I	I	I	I	I
9	15	1 30 12	3.2	46.286	13.168	7.6	I	I	I	I *	I	I	I	I	I
9	15	3 10 49	2.3	46.285	13.165	5.1	I	I	I	I *	I	I	I	I	I
9	15	3 15 25	6.1	46.277	13.141	8.9	I	I	I	I	I *	I	I	I	I
9	15	3 52 43	2.7	46.385	13.052	1.0	I	I	I	I	I	I	I	I	I
9	15	3 55 55	3.2	46.270	13.106	13.5	I	I	I	I	I *	I	I	I	I
9	15	4 15 6	2.6	46.282	13.292	5.6	I	I	I	I	I	I	I *	I	I
9	15	5 14 42	.0	46.258	13.234	10.6	I	I	I	I	I	I	I *	I	I
9	15	5 38 27	3.2	46.370	13.166	5.9	I *	I *	I	I	I	I	I	I	I
9	15	9 9 19	2.6	46.403	13.182	1.0	I *	I	I	I	I	I	I	I	I
9	15	9 21 23	6.0	46.345	13.174	11.7	I	I	I	I *	I	I	I	I	I
9	15	9 34 9	3.4	46.361	13.087	11.5	I	I *	I	I	I	I	I	I	I
9	15	9 37 34	3.6	46.361	13.168	8.7	I *	I *	I	I	I	I	I	I	I
9	15	11 10 23	2.8	46.362	13.162	2.3	I *	I *	I	I	I	I	I	I	I

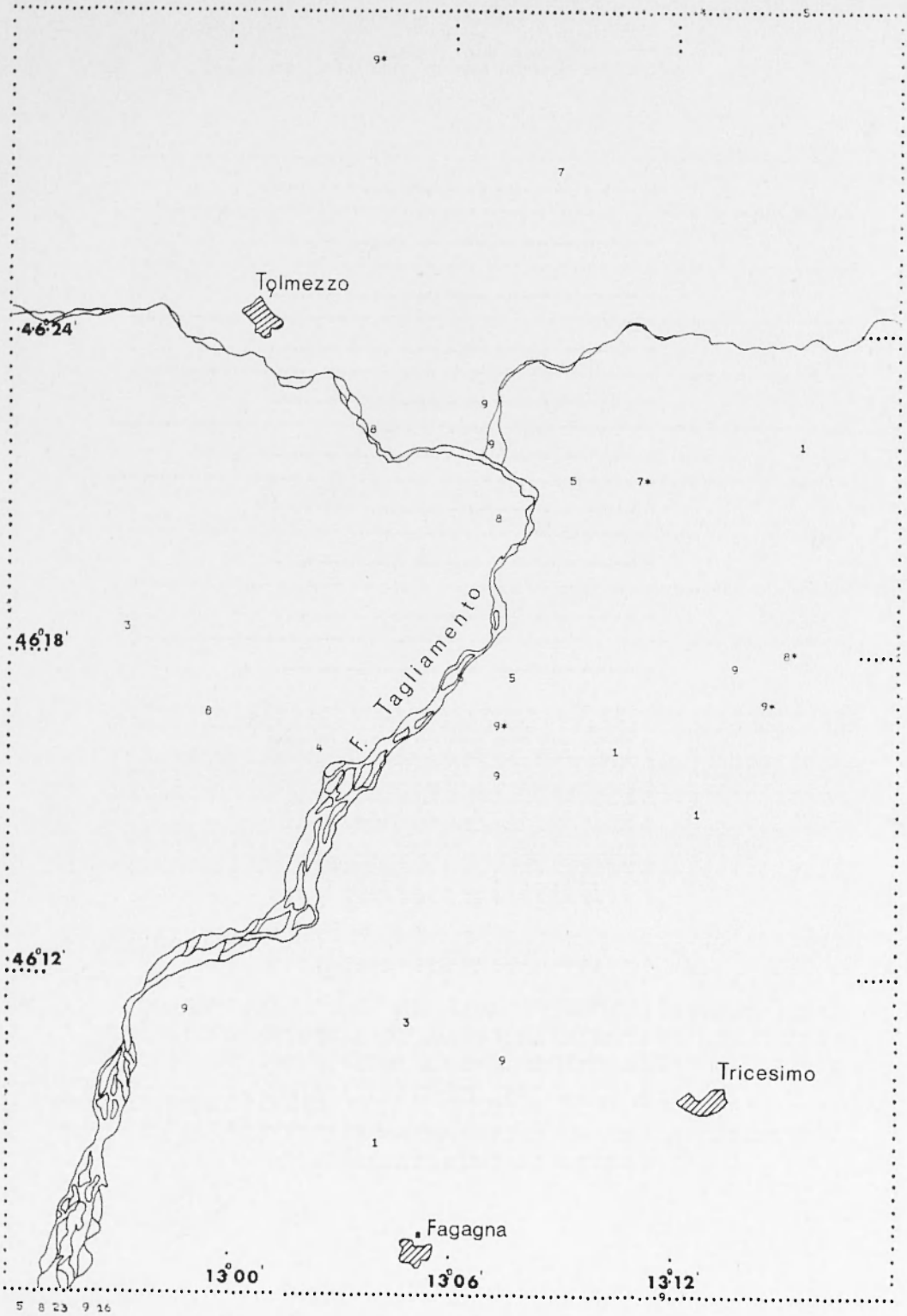
M	D	T	ML	LAT.	LONG.	H	1	2	3	4	5	6	7	8	9
9	15	11 11 11	4.8	46.350	13.188	3.0	I *	I	I	I *	I	I	I	I	I
9	15	11 17 50	3.7	46.357	13.247	5.2	I *	I	I	I	I	I	I	I	I
9	15	11 27 29	3.0	46.384	13.084	1.0	I	I *	I	I	I	I	I	I	I
9	15	11 39 6	3.3	46.341	13.118	1.0	I	I *	I	I	I	I	I	I	I
9	15	12 51 7	3.1	46.360	13.252	10.6	I *	I	I	I	I	I	I	I	I
9	15	12 53 45	3.4	46.288	13.064	10.2	I	I	I	I	I *	I	I	I	I
9	15	13 12 56	.0	46.264	13.263	11.5	I	I	I	I	I	I	I *	I	I
9	15	13 26 3	.0	46.353	13.220	8.4	I *	I	I	I *	I	I	I	I	I
9	15	14 42 41	3.9	46.362	13.065	7.6	I	I *	I	I	I	I	I	I	I
9	15	15 20 0	3.9	46.317	13.085	19.5	I	I	I	I	I *	I	I	I	I
9	15	15 22 49	2.8	46.246	13.264	15.2	I	I	I	I	I	I	I *	I	I
9	15	15 24 30	3.6	46.353	12.977	8.3	I	I	I *	I	I	I	I	I	I
9	15	16 24 30	3.6	46.346	13.152	8.6	I	I *	I	I	I	I	I	I	I
9	15	16 49 53	3.4	46.319	13.086	10.4	I	I	I	I	I *	I	I	I	I
9	15	17 26 10	3.7	46.269	13.232	12.7	I	I	I	I *	I	I	I *	I	I
9	15	17 35 57	3.0	46.257	13.100	21.5	I	I	I	I	I *	I	I	I	I *
9	15	17 42 26	3.0	46.345	13.151	1.0	I	I *	I	I	I	I	I	I	I
9	15	17 44 52	3.6	46.323	12.985	1.0	I	I	I *	I	I	I	I	I	I
9	15	18 17 23	2.8	46.269	13.171	8.3	I	I	I	I *	I	I	I	I	I
9	15	19 31 13	4.3	46.400	13.155	9.0	I	I *	I	I	I	I	I	I	I
9	15	19 57 22	3.2	46.334	13.230	6.0	I	I	I	I *	I	I	I	I	I
9	15	20 11 51	2.9	46.292	13.151	11.2	I	I	I	I *	I *	I	I	I	I
9	15	20 16 42	2.6	46.209	13.158	18.6	I	I	I	I	I	I	I	I *	I
9	15	20 24 11	4.1	46.360	13.170	10.8	I *	I *	I	I	I	I	I	I	I
9	15	20 34 56	3.6	46.379	13.081	1.0	I	I *	I	I	I	I	I	I	I
9	15	20 44 55	3.3	46.279	13.030	14.4	I	I	I	I	I	I	I	I	I
9	15	22 21 3	3.2	46.321	13.103	7.2	I	I	I	I	I *	I	I	I	I
9	15	22 35 48	3.4	46.262	13.165	13.0	I	I	I	I	I	I	I	I *	I
9	15	23 33 37	3.2	46.285	13.076	16.0	I	I	I	I	I *	I	I	I	I
9	16	1 30 44	3.9	46.365	13.151	5.7	I	I *	I	I	I	I	I	I	I
9	16	1 50 3	2.7	46.137	13.221	11.5	I	I	I	I	I	I	I	I	I
9	16	2 8 53	3.0	46.367	13.093	1.0	I	I *	I	I	I	I	I	I	I
9	16	2 42 26	2.8	46.398	13.134	1.0	I	I *	I	I	I	I	I	I	I
9	16	3 30 38	3.0	46.308	13.211	8.6	I	I	I	I *	I	I	I	I	I
9	16	5 40 41	3.6	46.277	13.057	21.7	I	I	I	I	I *	I	I	I	I
9	16	9 8 28	3.2	46.404	13.052	1.0	I	I	I	I	I	I	I	I	I
9	16	9 28 1	2.8	46.373	13.224	1.0	I *	I	I	I	I	I	I	I	I
9	16	14 27 36	3.2	46.284	13.181	9.3	I	I	I	I *	I	I	I	I	I
9	16	14 30 38	2.8	46.454	13.154	1.0	I	I	I	I	I	I	I	I	I
9	16	16 26 39	3.0	46.376	13.189	1.0	I *	I	I	I	I	I	I	I	I
9	16	17 12 30	2.6	46.383	13.143	1.0	I	I *	I	I	I	I	I	I	I
9	16	17 39 29	2.6	46.382	13.096	1.0	I	I *	I	I	I	I	I	I	I
9	16	20 1 38	3.2	46.312	13.090	8.7	I	I	I	I	I *	I	I	I	I
9	16	23 50 40	3.0	46.352	13.167	7.9	I	I *	I	I	I	I	I	I	I
9	16	23 52 3	3.4	46.460	12.941	1.0	I	I	I	I	I	I	I	I	I
9	17	0 38 53	2.8	46.393	13.157	1.0	I	I *	I	I	I	I	I	I	I
9	17	1 56 31	2.8	46.297	13.238	6.8	I	I	I	I *	I	I	I	I	I
9	17	2 47 15	3.1	46.334	13.138	3.5	I	I	I	I	I	I	I	I	I
9	17	4 14 9	3.8	46.393	13.111	1.0	I	I *	I	I	I	I	I	I	I
9	17	6 31 13	2.9	46.332	13.264	11.1	I	I	I	I *	I	I	I	I	I

M	D	T	ML	LAT.	LONG.	M	1	2	3	4	5	6	7	8	9
9	17	8 58 41	2.8	46.382	13.168	1.0	*	*							
9	17	9 17 57	3.4	46.268	13.046	8.7					*				*
9	17	9 36 39	3.1	46.381	13.173	1.0	*	*							
9	17	11 45 6	2.8	46.253	13.232	9.8							*		
9	17	13 15 0	3.3	46.370	13.101	1.0		*							
9	18	0 39 40	3.8	46.362	13.022	1.0			*						
9	18	0 51 16	3.0	46.351	13.032	2.6			*						
9	18	1 8 41	3.1	46.384	13.003	1.0			*						
9	18	5 50 24	3.4	46.386	13.094	4.9		*							
9	18	6 33 27	2.9	46.213	13.116	16.6								*	
9	18	16 22 33	3.2	46.309	13.142	7.4					*				
9	18	21 31 36	2.6	46.394	13.033	1.0									
9	18	21 49 42	3.3	46.383	13.149	1.7		*							
9	19	5 39 46	2.6	46.191	13.290	1.0									
9	19	10 27 55	3.7	46.334	13.173	6.0				*					
9	19	11 13 15	3.2	46.274	13.253	13.9							*		
9	19	22 34 0	2.7	46.233	13.189	11.7								*	
9	20	2 27 6	3.4	46.371	13.379	1.0									
9	20	9 10 1	4.2	46.366	13.281	1.0	*								
9	20	9 51 28	2.6	46.381	13.236	4.0	*								
9	20	15 53 41	2.8	46.363	13.158	9.5		*							
9	20	17 22 55	2.9	46.328	13.194	1.0				*					
9	20	20 7 47	2.5	46.308	13.070	15.7					*				
9	21	6 34 4	2.8	46.422	13.290	1.0									
9	21	16 17 56	3.3	46.358	13.060	1.0									
9	21	21 46 40	2.4	46.191	13.290	1.0									
9	22	3 27 16	3.0	46.364	13.310	1.0									
9	22	12 45 42	.0	46.315	13.261	10.7				*					
9	22	19 29 53	3.0	46.362	13.116	1.0		*							
9	23	15 49 11	3.6	46.317	13.116	10.3					*				
9	23	18 55 8	2.6	46.246	13.136	13.4								*	
9	23	20 36 19	.0	46.234	13.256	9.4							*		
9	24	4 11 11	2.7	46.321	13.167	12.1				*					
9	24	16 12 15	3.4	46.287	13.114	11.0					*				
9	24	18 44 20	.0	46.190	13.251	5.1									
9	25	1 34 50	2.9	46.270	13.094	12.8					*				
9	25	5 56 58	2.2	46.300	13.159	10.1				*	*				
9	25	6 5 33	2.4	46.174	13.270	1.0									
9	25	12 32 37	2.5	46.396	13.286	1.0									
9	25	13 36 52	2.9	46.389	13.028	1.0									
9	25	18 26 41	2.3	46.358	13.176	6.7	*	*							
9	25	20 6 14	3.2	46.234	13.070	9.1									*
9	25	20 6 14	2.9	46.225	13.060	8.8									*
9	25	22 59 17	.0	46.356	13.028	1.0			*						
9	26	1 27 6	2.8	46.403	13.016	1.0									
9	26	1 51 52	3.8	46.310	13.065	8.6					*				
9	26	5 30 53	3.4	46.378	13.035	1.0									
9	26	5 35 16	2.5	46.346	13.180	6.6	*			*					
9	26	7 24 43	3.4	46.412	13.106	1.0		*							
9	26	7 33 43	3.2	46.362	13.063	5.6		*							

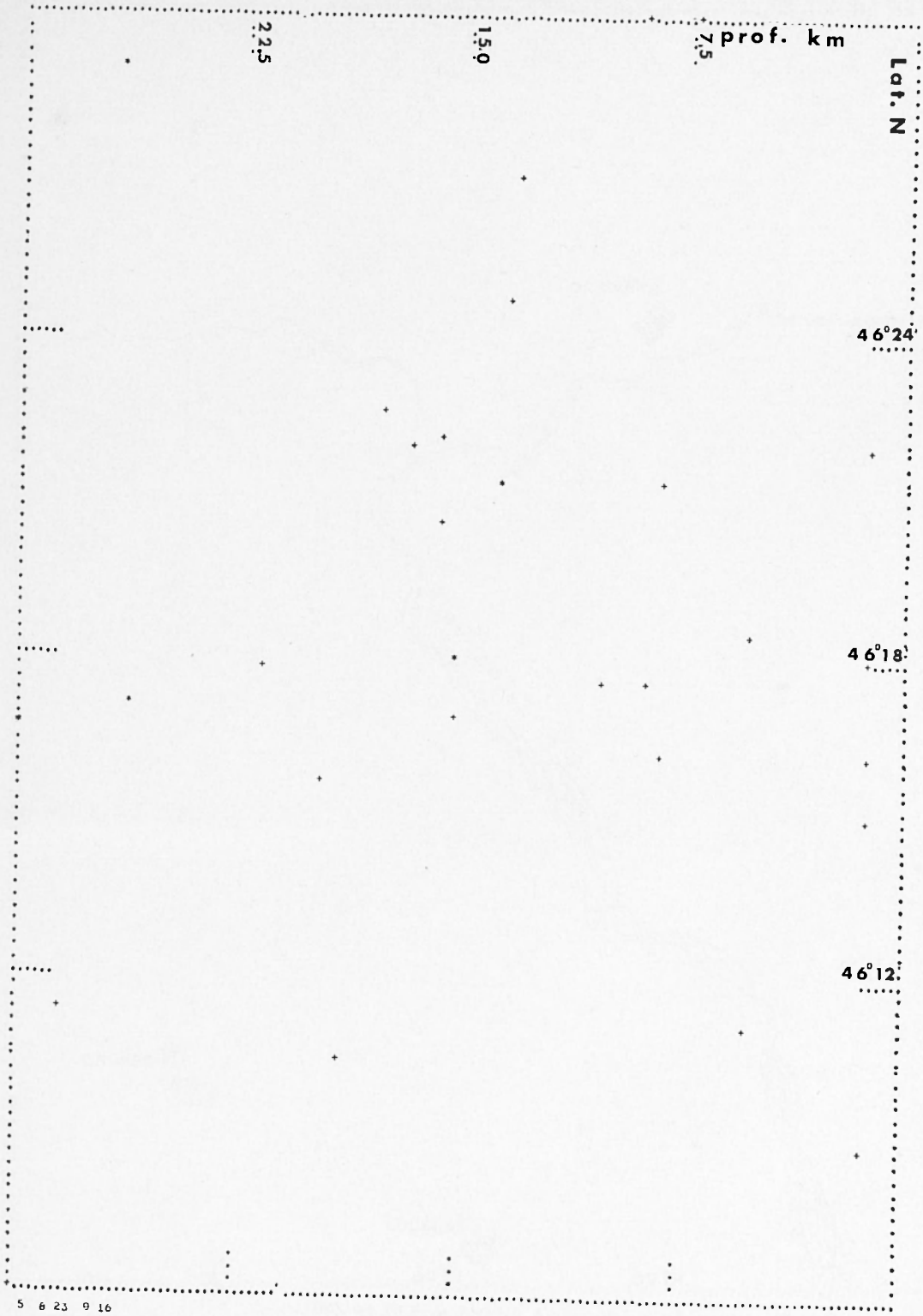
M	D	T	ML	LAT.	LONG.	H	1	2	3	4	5	6	7	8	9
9	26	9 40 8	3.1	46.313	13.187	4.4	I	I	I	I *	I	I	I	I	I
9	26	13 28 3	2.5	46.158	13.235	11.7	I	I	I	I	I	I	I	I	I
9	26	14 52 23	3.7	46.287	13.228	3.6	I	I	I	I *	I	I	I	I	I
9	26	17 50 27	2.6	46.307	13.086	6.5	I	I	I	I	I *	I	I	I	I
9	27	14 37 31	3.5	46.261	13.145	14.0	I	I	I	I	I *	I	I	I *	I
9	27	17 52 23	3.2	46.331	12.993	8.8	I	I	I *	I	I	I	I	I	I
9	28	0 10 14	2.7	46.297	13.227	10.5	I	I	I	I *	I	I	I	I	I
9	29	5 25 47	.0	46.333	13.094	3.6	I	I	I	I	I *	I	I	I	I
9	29	19 15 30	.0	46.400	13.175	1.8	I *	I *	I	I	I	I	I	I	I
9	29	21 53 41	.0	46.433	13.177	1.0	I	I	I	I	I	I	I	I	I
9	29	22 6 12	.0	46.427	13.098	1.0	I	I	I	I	I	I	I	I	I
9	29	22 39 19	.0	46.310	13.135	9.9	I	I	I	I	I *	I	I	I	I
9	29	22 40 3	.0	46.261	13.112	9.8	I	I	I	I	I *	I	I	I	I
9	30	5 47 18	.0	46.351	13.113	1.0	I	I *	I	I	I	I	I	I	I
9	30	9 25 7	.0	46.382	13.080	1.0	I	I *	I	I	I	I	I	I	I
9	30	9 27 46	2.5	46.340	13.042	6.9	I	I	I *	I	I	I	I	I	I
9	30	19 45 43	.0	46.330	13.171	7.9	I	I	I	I *	I	I	I	I	I
9	30	21 31 25	.0	46.261	13.112	9.8	I	I	I	I	I *	I	I	I	I
10	1	4 27 9	.0	46.342	13.092	5.3	I	I *	I	I	I	I	I	I	I
10	1	4 29 26	.0	46.351	13.113	1.0	I	I *	I	I	I	I	I	I	I
10	1	9 8 57	.0	46.242	13.070	6.8	I	I	I	I	I	I	I	I	I *
10	1	11 20 13	.0	46.256	13.262	7.6	I	I	I	I	I	I	I *	I	I
10	1	11 46 35	.0	46.282	13.279	8.2	I	I	I	I	I	I	I *	I	I
10	1	14 46 12	2.8	46.273	13.257	11.3	I	I	I	I	I	I	I *	I	I
10	1	15 28 58	.0	46.300	13.093	8.6	I	I	I	I	I *	I	I	I	I
10	1	15 33 15	.0	46.340	13.042	6.9	I	I	I *	I	I	I	I	I	I
10	1	17 23 53	.0	46.304	13.168	6.5	I	I	I	I *	I	I	I	I	I
10	1	18 8 29	.0	46.356	13.113	10.2	I	I *	I	I	I	I	I	I	I
10	1	18 14 50	3.3	46.365	13.042	8.2	I	I	I *	I	I	I	I	I	I
10	1	18 34 7	.0	46.272	13.102	10.1	I	I	I	I	I *	I	I	I	I
10	1	22 23 5	.0	46.292	13.038	6.6	I	I	I	I	I *	I	I	I	I
10	2	6 51 22	.0	46.272	13.102	9.2	I	I	I	I	I *	I	I	I	I
10	2	10 0 5	.0	46.295	13.189	8.9	I	I	I	I *	I	I	I	I	I
10	2	10 53 12	.0	46.335	13.928	3.4	I	I	I *	I	I	I	I	I	I
10	2	11 43 48	.0	46.346	13.037	2.2	I	I	I *	I	I	I	I	I	I
10	2	17 9 49	.0	46.383	13.127	1.0	I	I *	I	I	I	I	I	I	I
10	2	17 49 43	.0	46.326	13.128	1.0	I	I	I	I	I *	I	I	I	I
10	2	18 59 25	.0	46.358	13.059	1.0	I	I	I *	I	I	I	I	I	I
10	3	5 25 30	3.3	46.325	13.255	5.2	I	I	I	I *	I	I	I	I	I
10	3	8 8 14	.0	46.339	13.085	11.6	I	I	I	I	I	I	I	I	I
10	3	13 53 40	.0	46.400	13.175	1.8	I *	I *	I	I	I	I	I	I	I
10	3	17 23 51	.0	46.285	13.131	8.4	I	I	I	I	I *	I	I	I	I
10	3	17 49 52	3.4	46.391	13.010	1.0	I	I	I	I	I	I	I	I	I
10	3	19 33 2	.0	46.362	13.042	1.0	I	I	I *	I	I	I	I	I	I
10	3	19 39 42	.0	46.352	13.068	4.2	I	I	I	I	I	I	I	I	I
10	3	21 20 33	.0	46.348	13.306	7.9	I	I	I	I	I	I	I	I	I
10	3	22 59 41	.0	46.321	13.245	7.6	I	I	I	I *	I	I	I	I	I
10	4	6 16 25	.0	46.413	13.071	1.0	I	I	I	I	I	I	I	I	I
10	4	11 12 1	2.8	46.369	13.260	1.0	I *	I	I	I	I	I	I	I	I
10	4	28 17 51	.0	46.338	13.404	2.0	I	I *	I	I	I	I	I	I	I

M	D	T	ML	LAT.	LONG.	H	1	2	3	4	5	6	7	8	9
10	4	23 30 9	2.5	46.339	13.190	4.1	I	I	I	I *	I	I	I	I	I
10	5	4 17 1	.0	46.323	13.199	8.7	I	I	I	I *	I	I	I	I	I
10	5	7 33 12	3.3	46.363	13.139	6.1	I	I *	I	I	I	I	I	I	I
10	6	3 53 51	.0	46.302	13.075	7.2	I	I	I	I	I *	I	I	I	I
10	6	10 31 41	3.0	46.384	13.143	1.0	I	I *	I	I	I	I	I	I	I
10	6	18 0 14	.0	46.346	13.053	1.0	I	I	I *	I	I	I	I	I	I
10	7	0 33 1	.0	46.334	13.228	1.0	I	I	I	I *	I	I	I	I	I
10	7	2 45 11	.0	46.315	13.145	8.9	I	I	I	I	I *	I	I	I	I
10	7	10 24 36	.0	46.337	13.076	1.0	I	I	I	I	I	I	I	I	I
10	7	20 4 13	.0	46.342	13.104	2.0	I	I *	I	I	I	I	I	I	I
10	8	3 29 44	.0	46.348	13.142	1.0	I	I *	I	I	I	I	I	I	I
10	8	5 9 25	.0	46.261	13.112	9.8	I	I	I	I	I *	I	I	I	I
10	8	5 10 38	.0	46.322	13.092	8.0	I	I	I	I	I *	I	I	I	I
10	8	8 15 54	2.5	46.280	13.127	5.6	I	I	I	I	I *	I	I	I	I
10	8	9 58 39	.0	46.407	13.040	10.7	I	I	I	I	I	I	I	I	I
10	8	11 23 56	.0	46.344	13.039	11.8	I	I	I *	I	I	I	I	I	I
10	8	18 40 6	.0	46.384	13.167	1.0	I *	I *	I	I	I	I	I	I	I
10	8	19 35 19	.0	46.320	13.070	9.6	I	I	I	I	I *	I	I	I	I
10	9	0 25 44	.0	46.194	13.306	1.0	I	I	I	I	I	I	I	I	I
10	9	0 48 21	.0	46.307	13.102	8.7	I	I	I	I	I *	I	I	I	I
10	9	4 30 31	2.9	46.200	13.210	3.1	I	I	I	I	I	I	I	I	I
10	9	5 0 16	2.5	46.420	13.185	1.0	I	I	I	I	I	I	I	I	I
10	9	18 20 53	.0	46.335	13.279	10.0	I	I	I	I	I	I	I	I	I
10	9	18 34 34	.0	46.342	13.059	5.1	I	I	I *	I	I	I	I	I	I
10	9	21 21 29	.0	46.236	13.238	5.7	I	I	I	I	I	I	I *	I	I
10	9	22 5 6	.0	46.299	13.197	7.8	I	I	I	I *	I	I	I	I	I

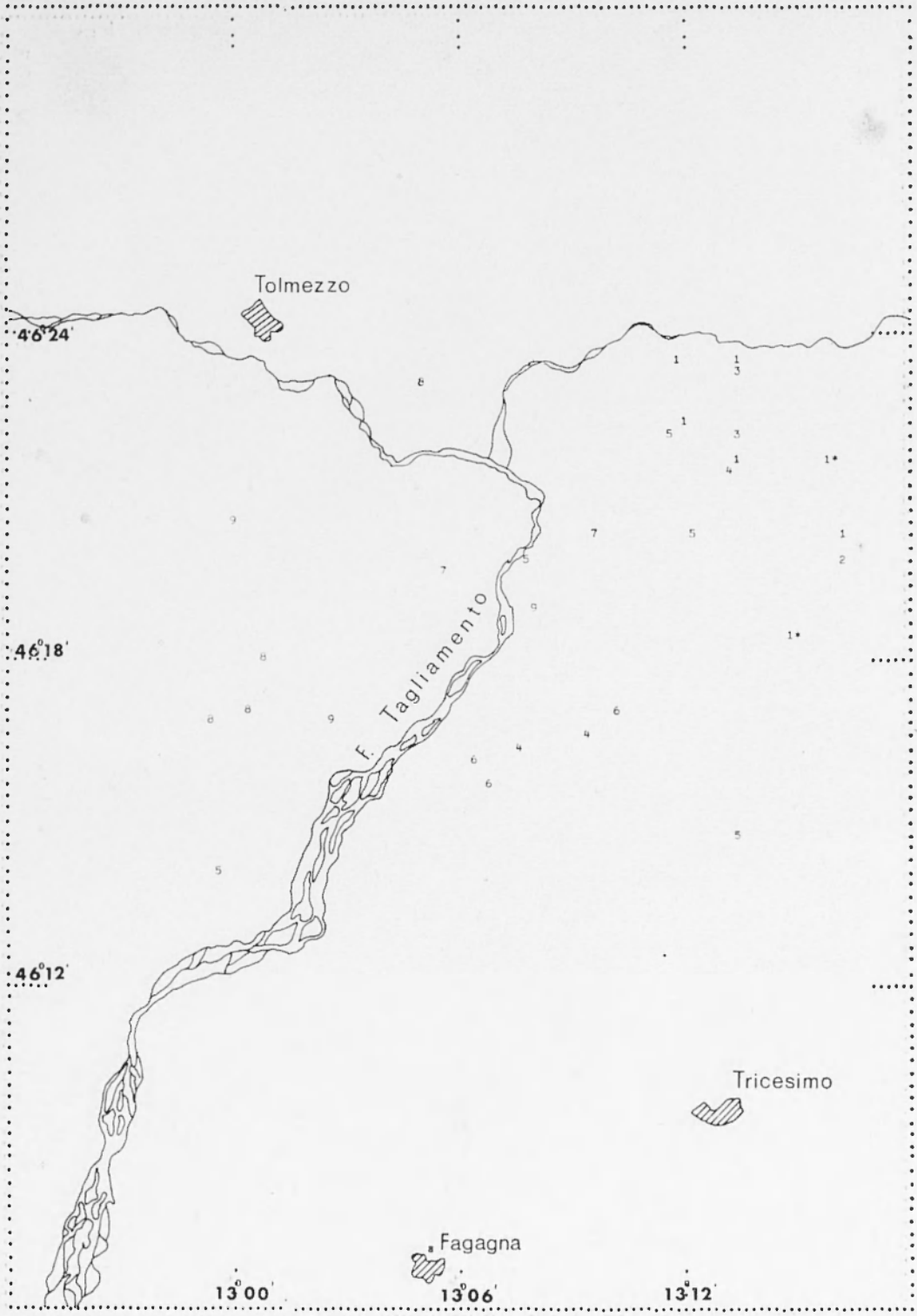
GFL.



Figg. 1a-1b — From 5.6 $19^h 59^m$ to 5.8 $23^h 09^m$.
Seismic activity distributed on a remarkably wide area, showing a high paroxysm of the focal volume, without preferential aligments. It should

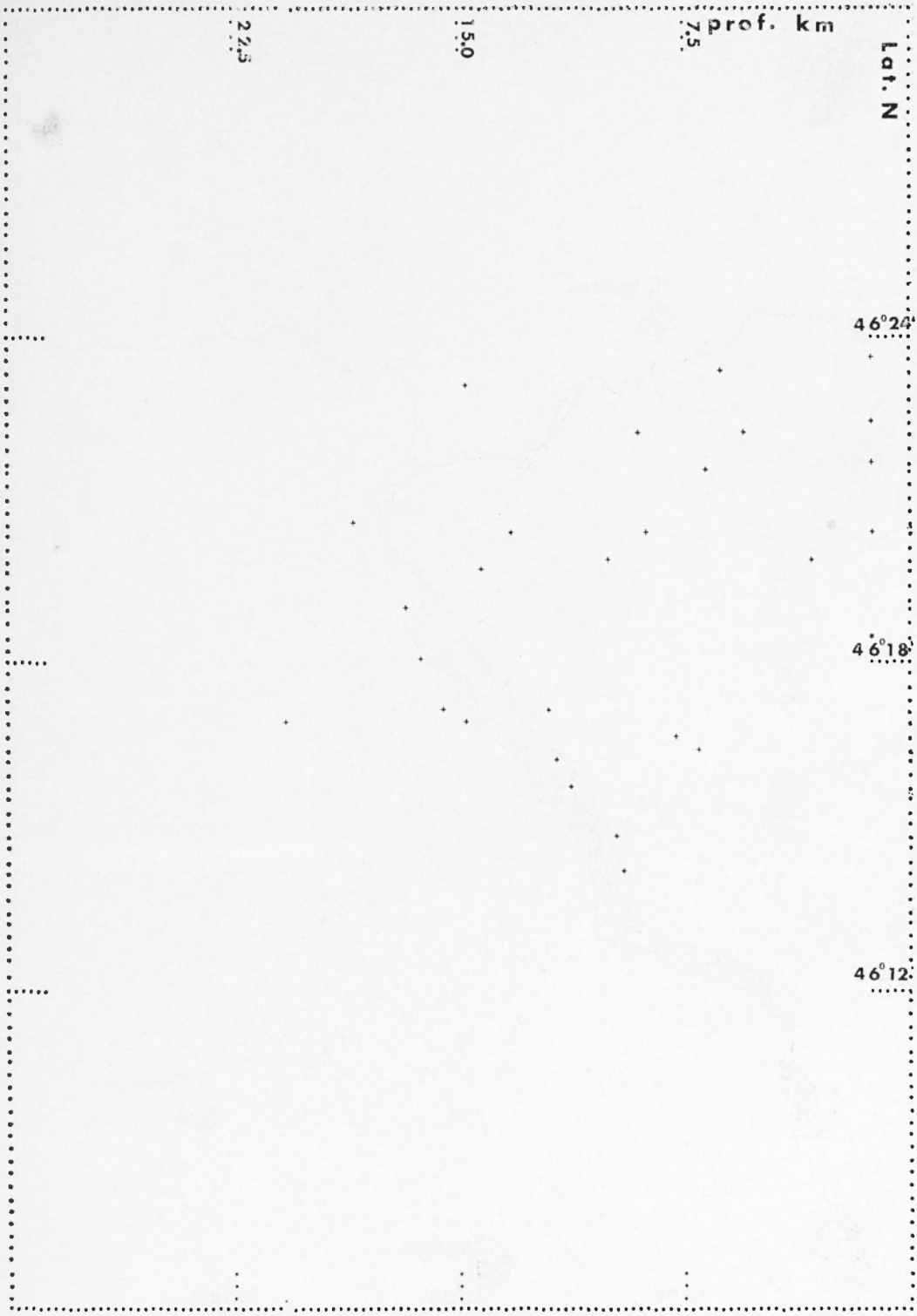


be noted that the number of the events reported is only a small part of the events actually occurred.

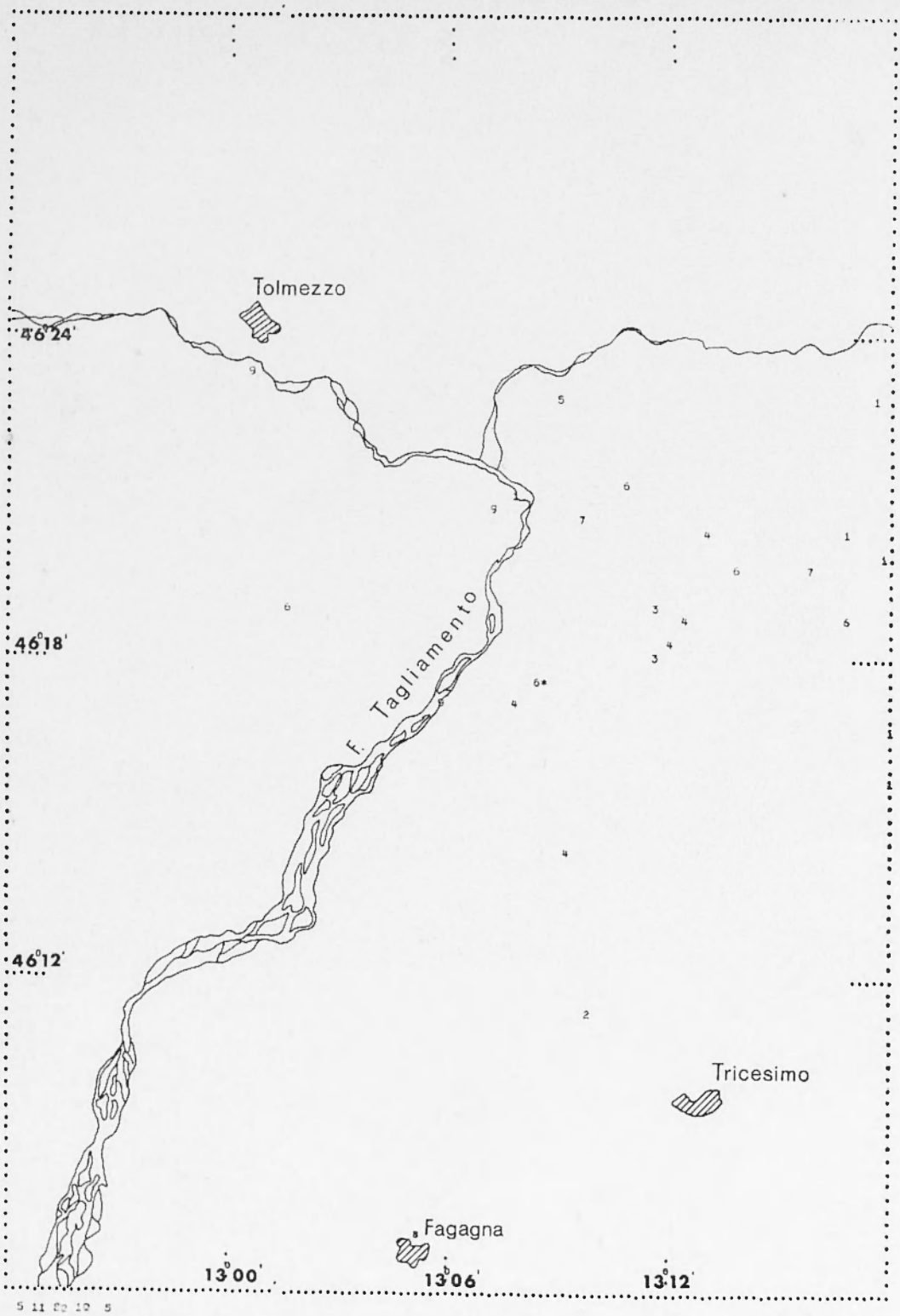


5 10 15 49 34

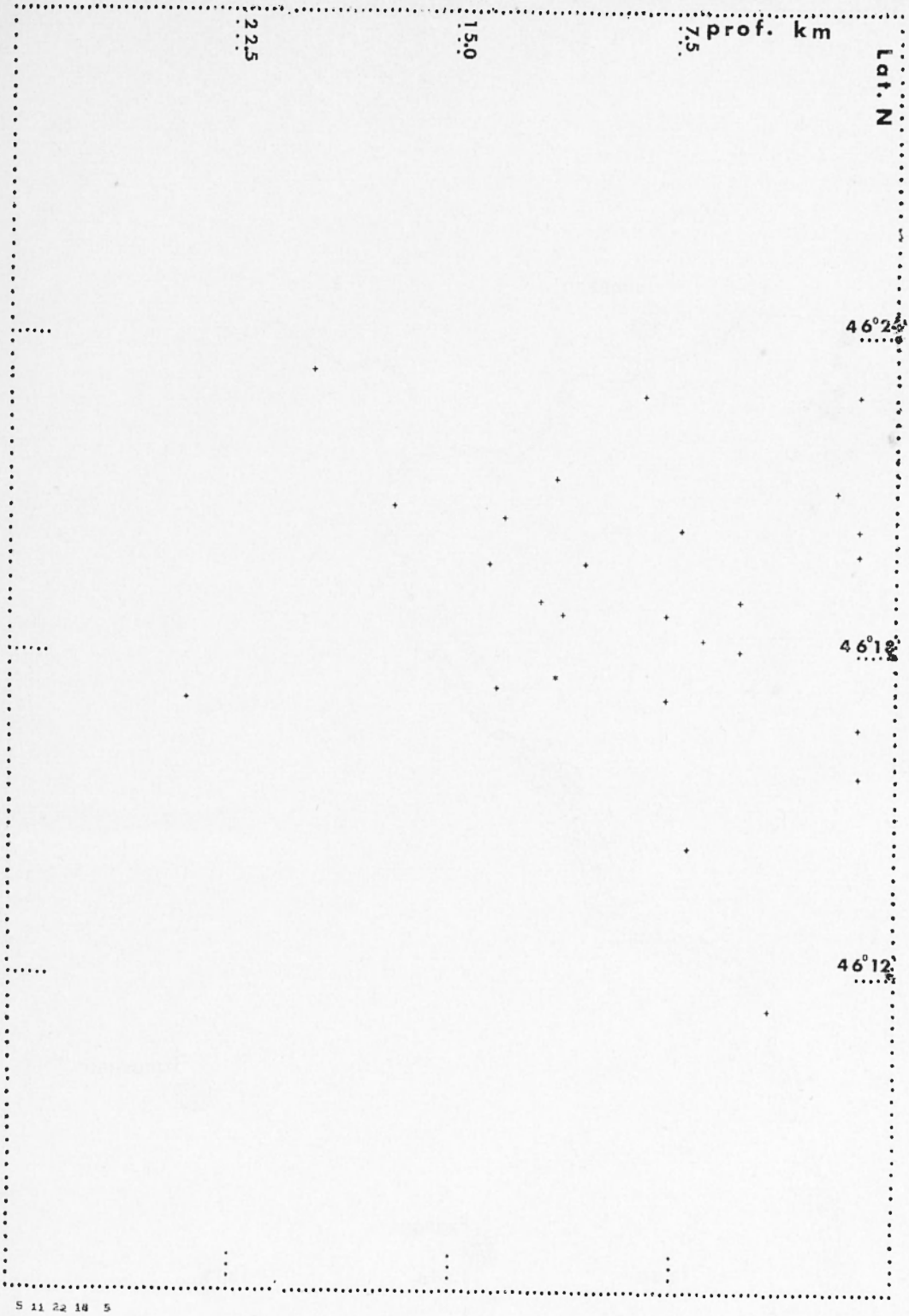
Figg. 2a-2b — From 5.8 $23^h 09^m$ to 5.10 $15^h 49^m$.
The group of shocks with coordinates around the values 46.38 and 13.20 is a forewarning sign of the event with magnitude 4.7 on May 10 at $04^h 35^m$. The zone was previously inactive. The prevailing aligment is *WSW-ENE*.



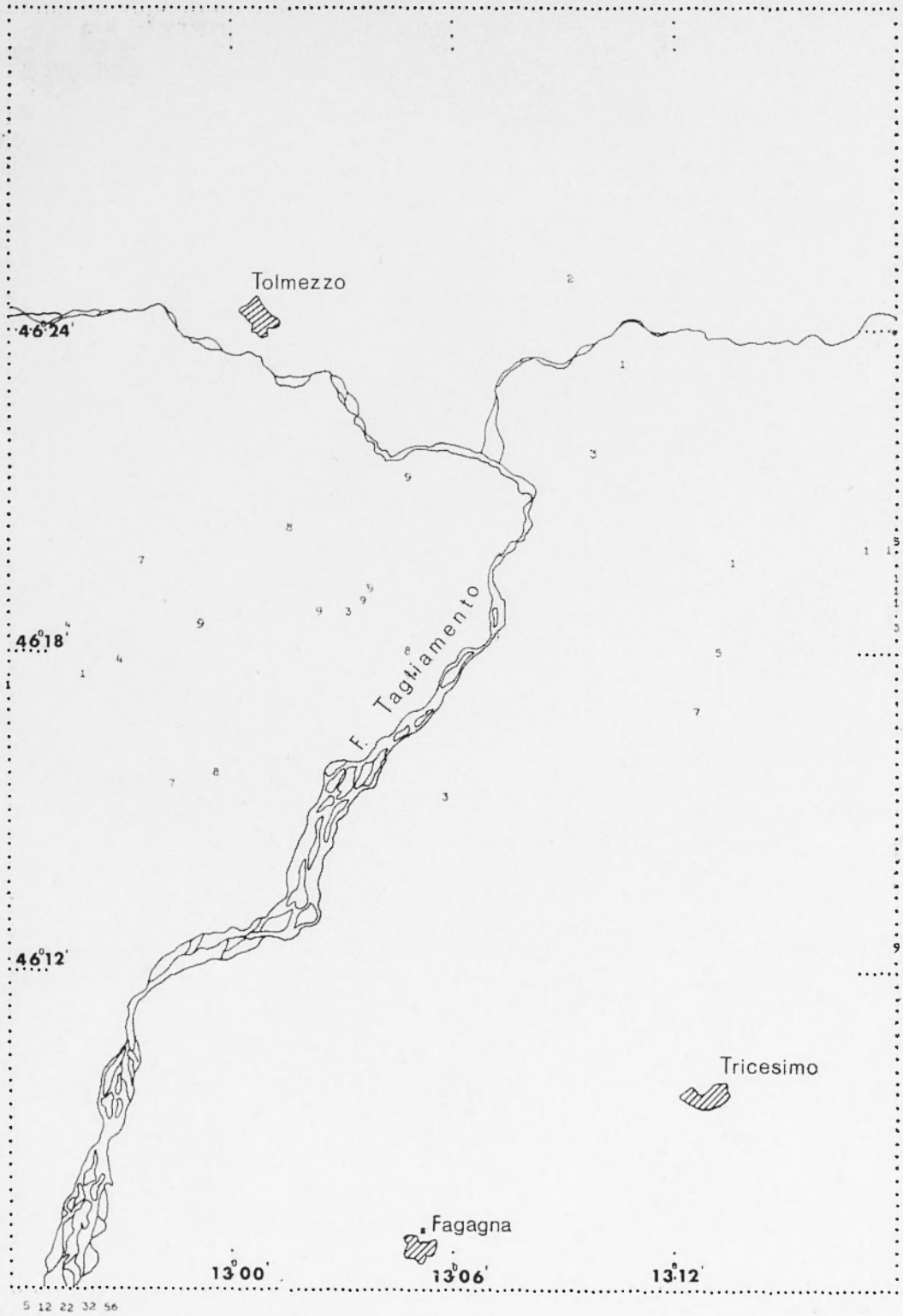
5 10 15 49 34



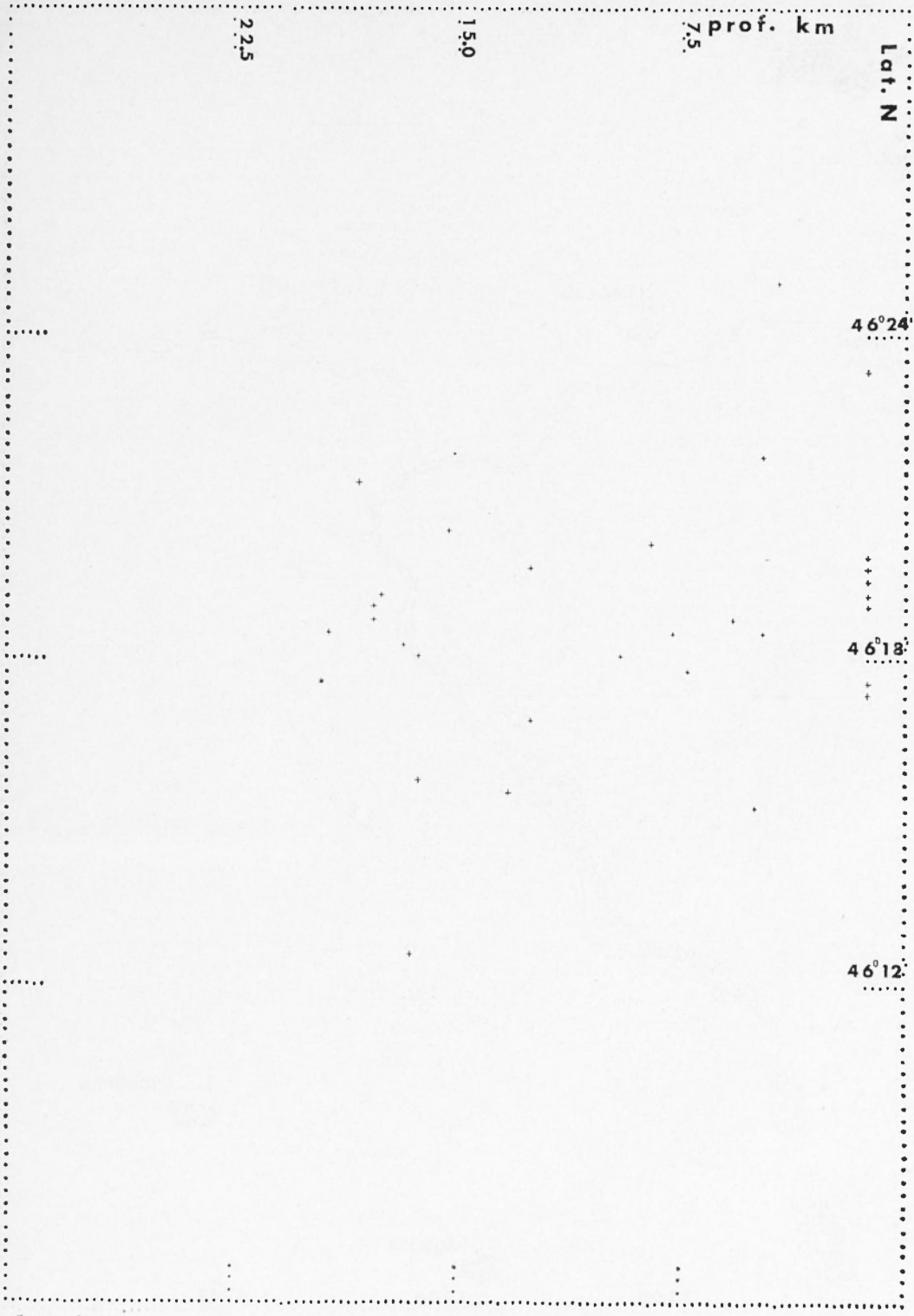
Figg. 3a-3b — From 5.10 $15^h 49^m$ to 5.11 $22^h 18^m$.
The activity is lasting in the eastern part of the map.



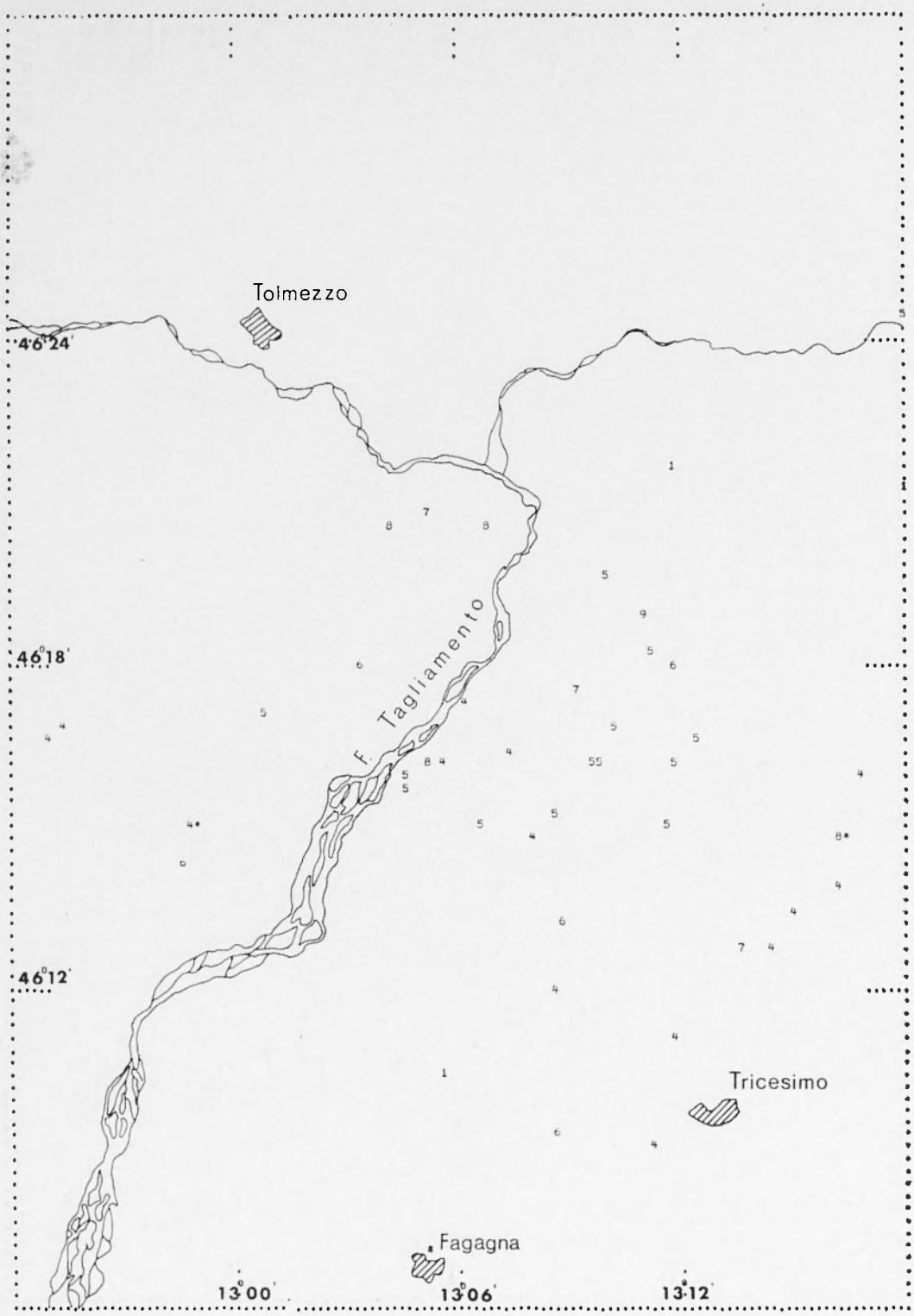
S 11 22 18 5



Figg. 4a-4b — From 5.11 $22^h 18^m$ to 5.12 $22^h 32^m$.
The shock of magnitude 5.3 on May 11 at $22^h 44^m$ is accompanied by a series of shocks which interested the same zone. In the western section of the map, an activity appears.



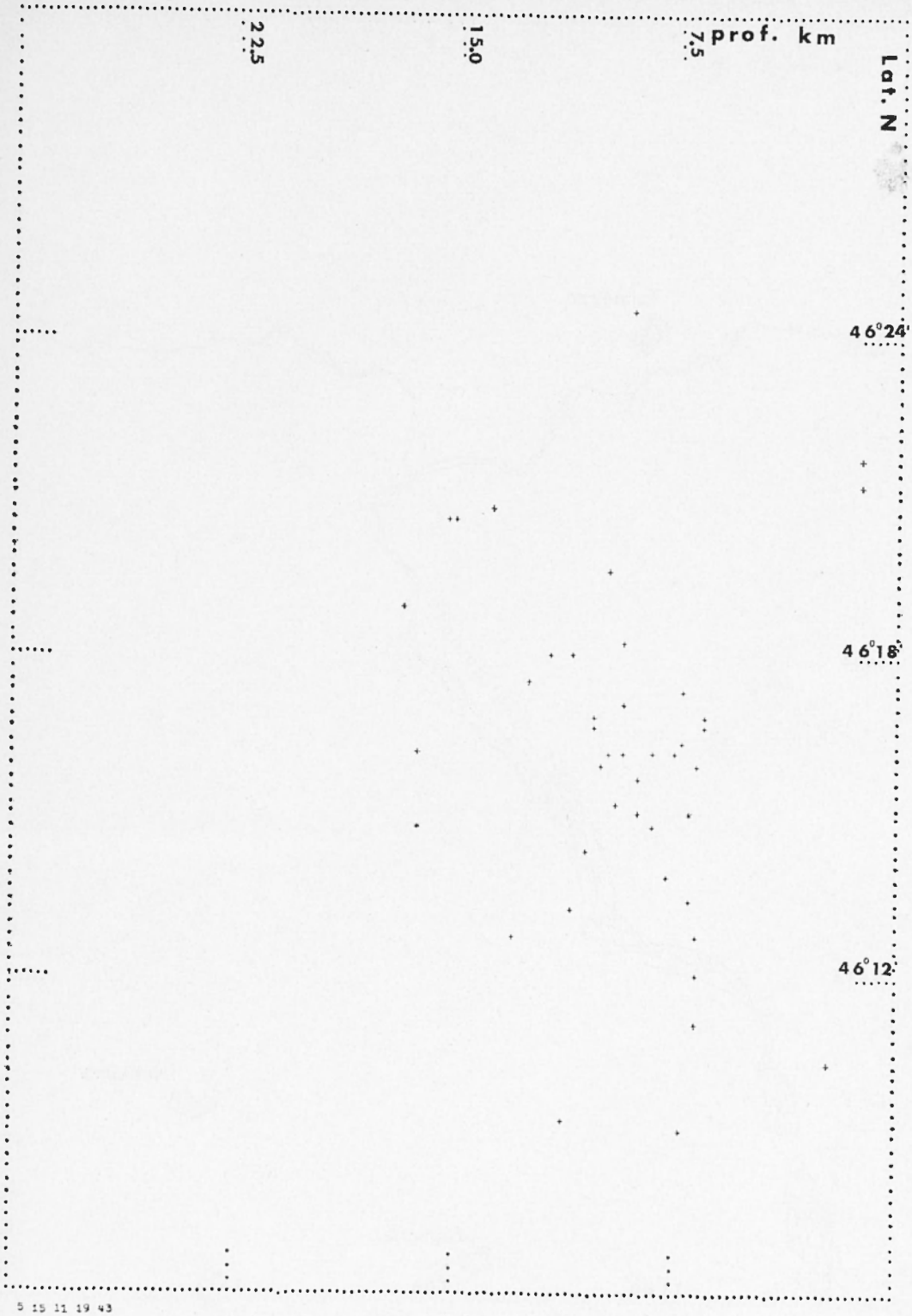
S 12 22 32 56



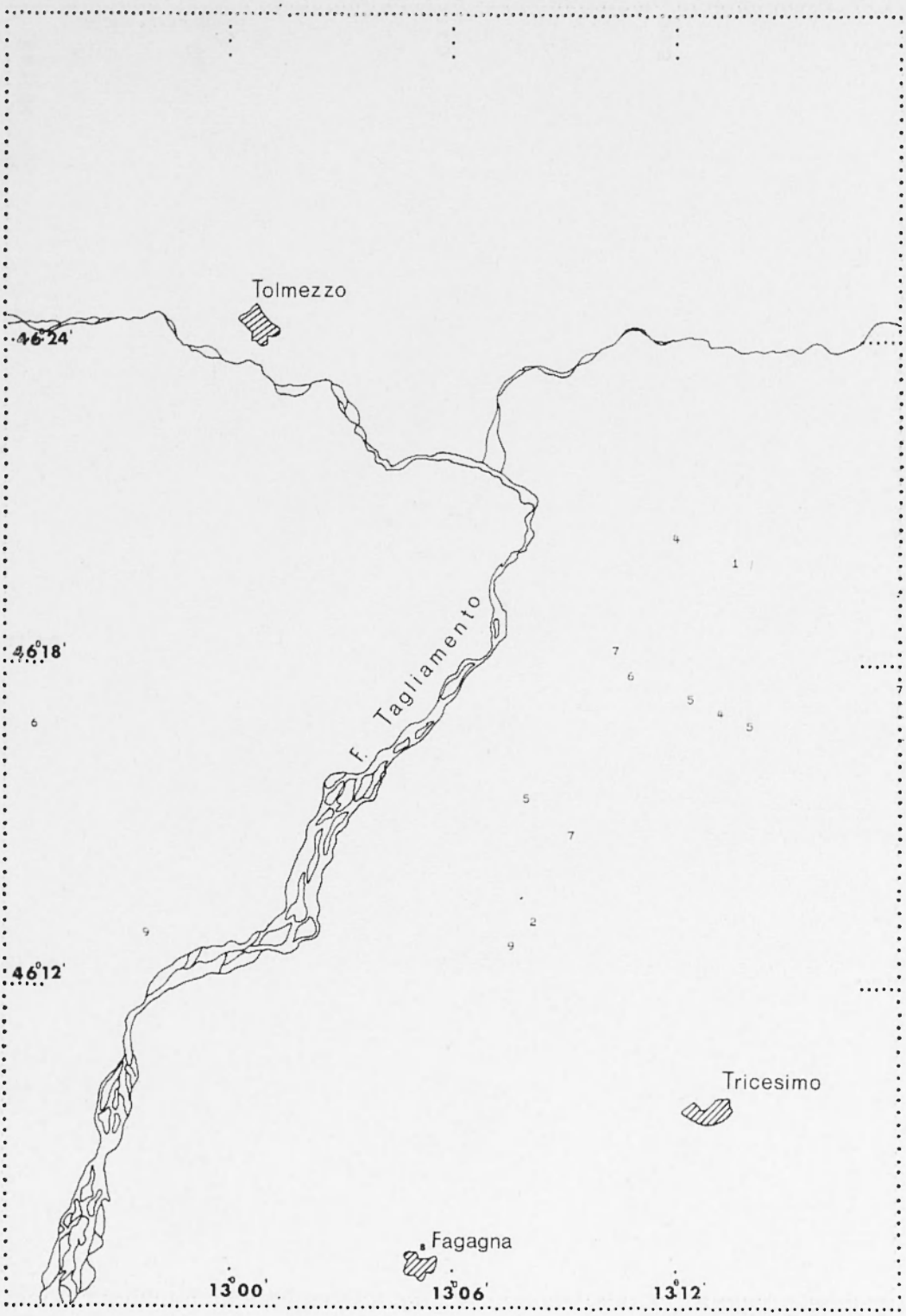
5 15 11 19 43

Figg. 5a-5b — From 5.12 $22^h 32^m$ to 5.15 $11^h 19^m$.

The seismic activity, remaining in the central zone, shows a widening towards a south-eastern zone and its continuation in the western section with a shock of magnitude 4.7.

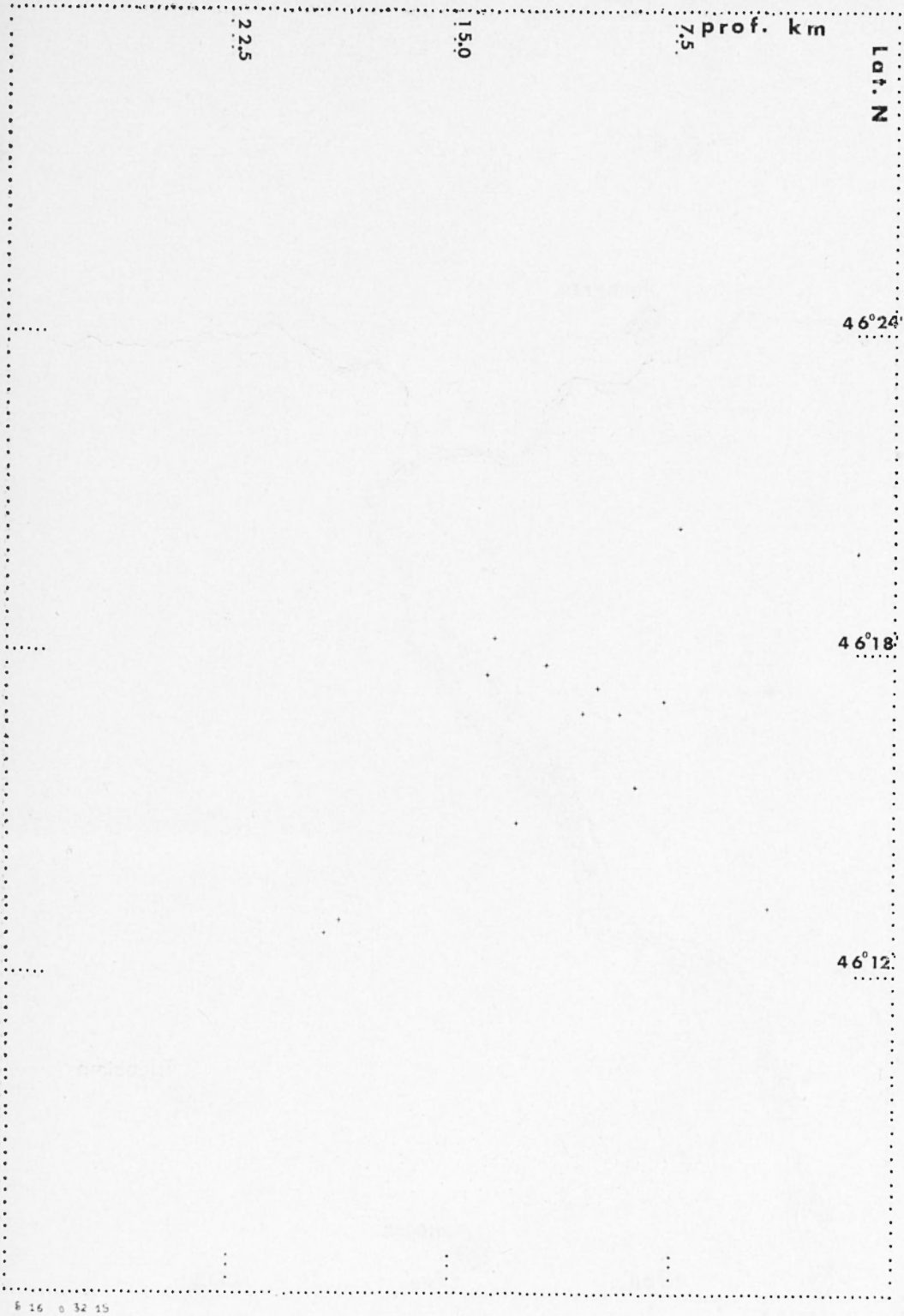


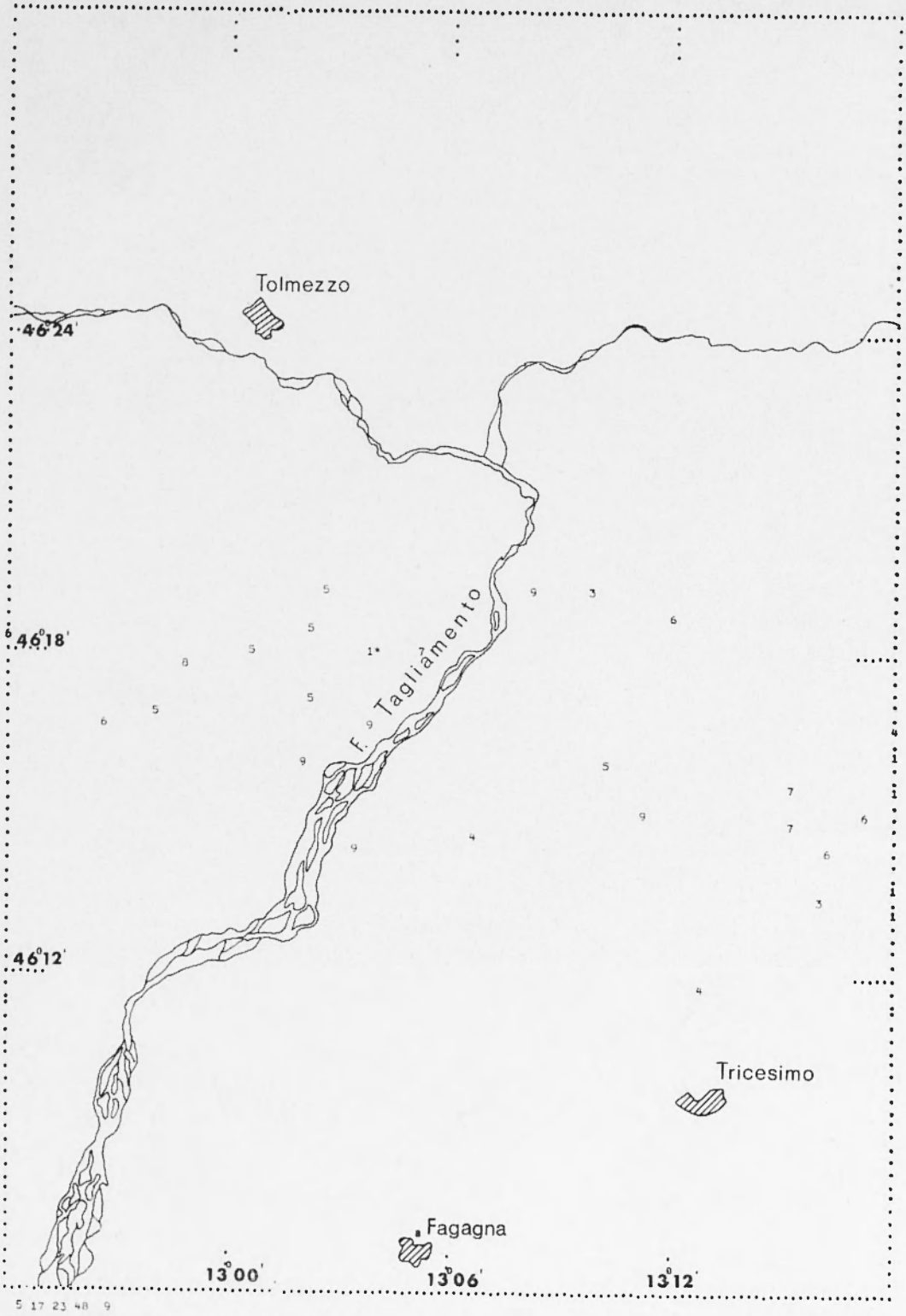
5 15 11 19 43



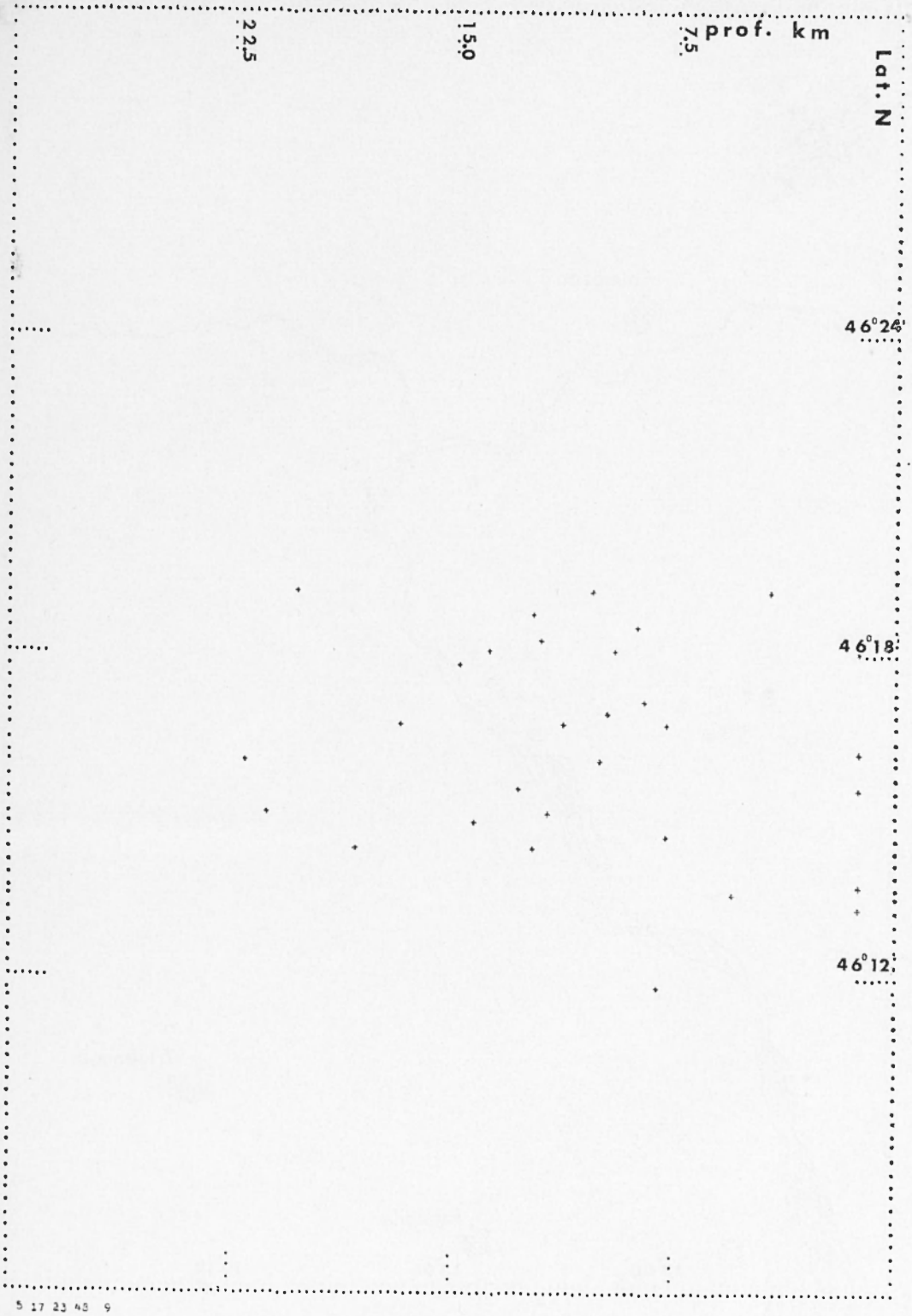
5 16 0 32 15

Figg. 6a-6b — From 5.15 $11^h 19^m$ to 5.16 $00^h 52^m$.
The activity is concentrated in the eastern section with a *SW-NE* alignement of epicenters.

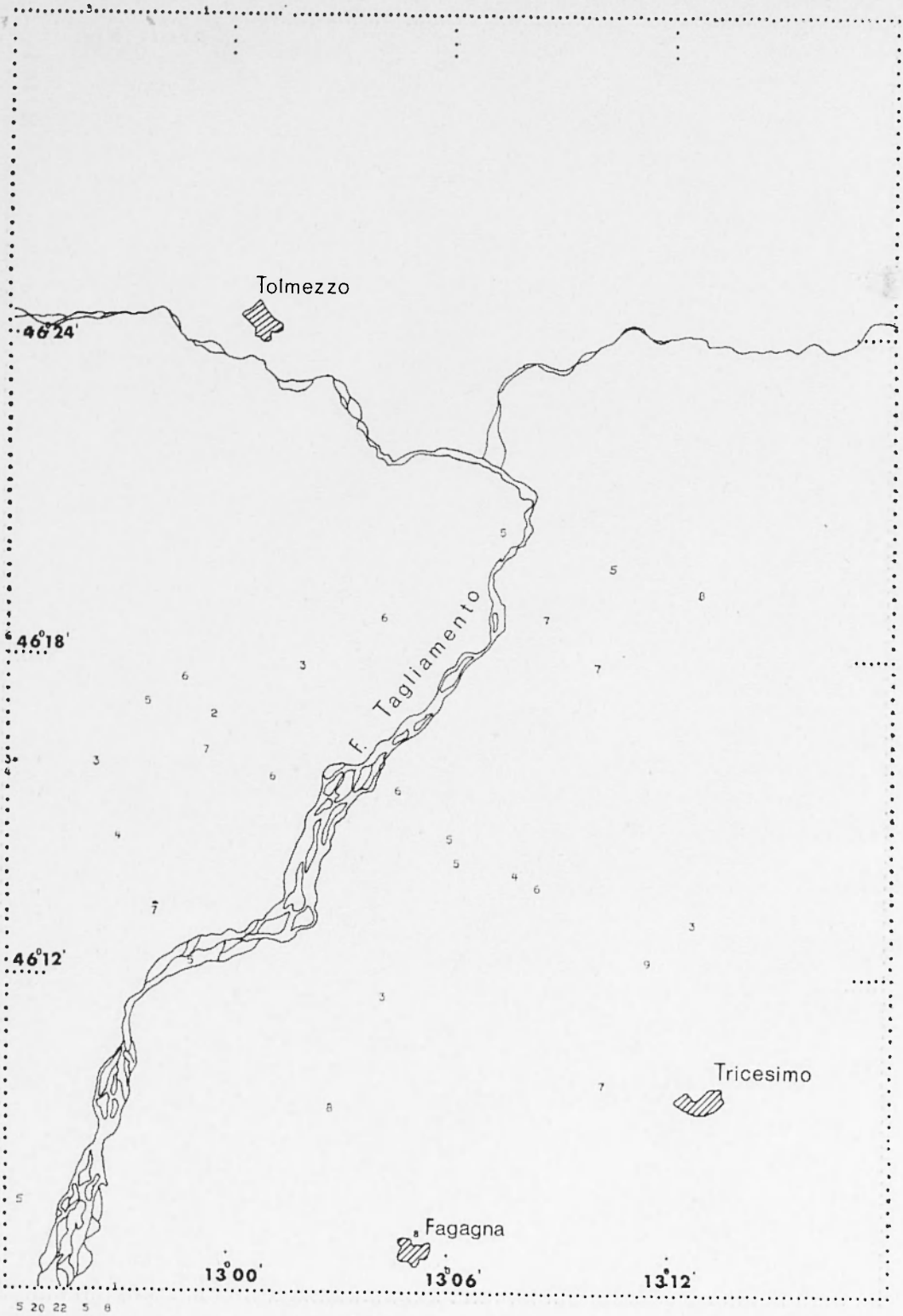

prof. km
7.5
15.0
22.5
Lat. N
46°24'
46°18'
46°12'



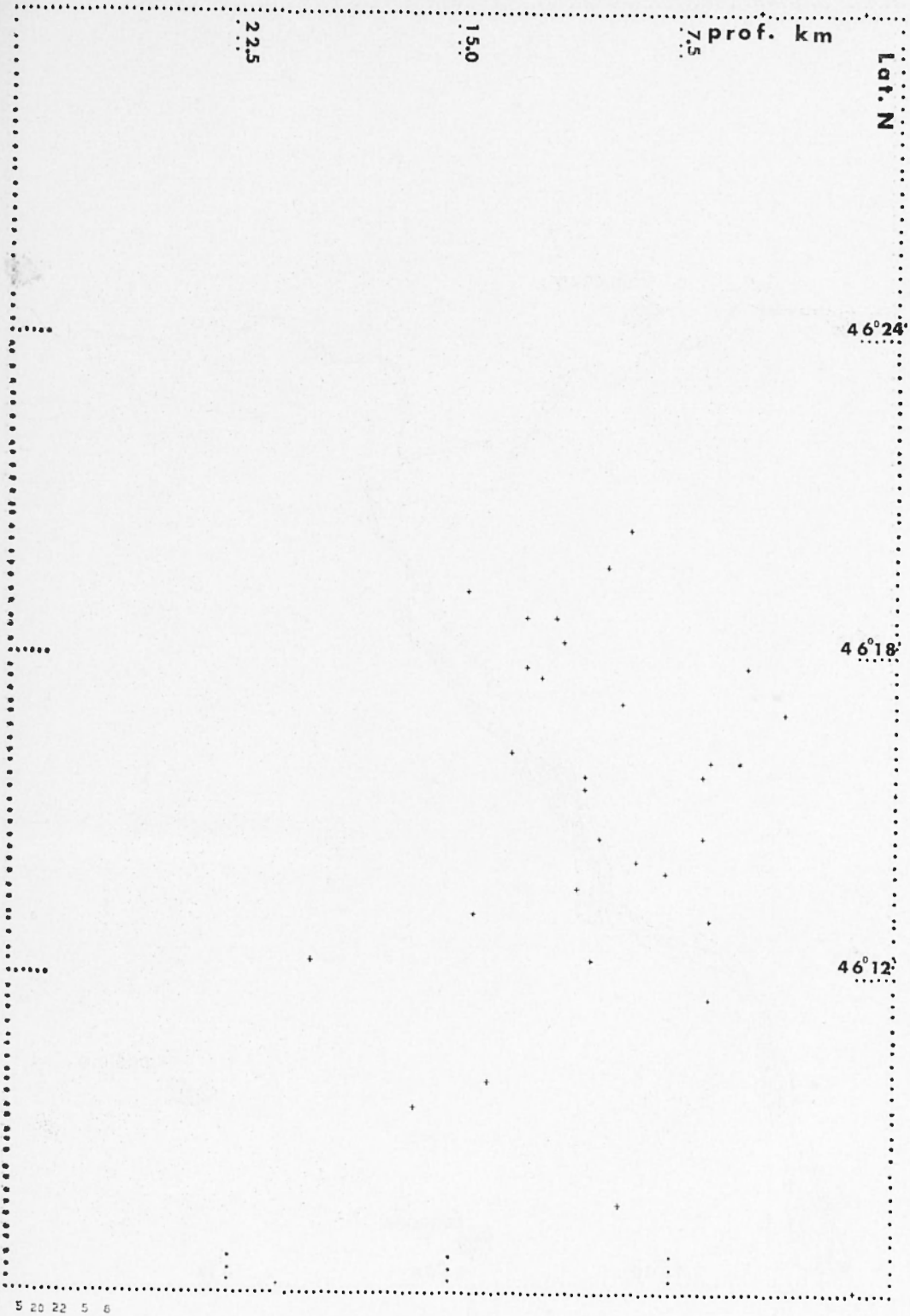
Figg. 7a-7b — From 5.16 $00^h 32^h$ to 5.17 $23^m 48^m$.
The prevailing alignement is approximately *E-W*. The south-eastern section shows a certain activity.



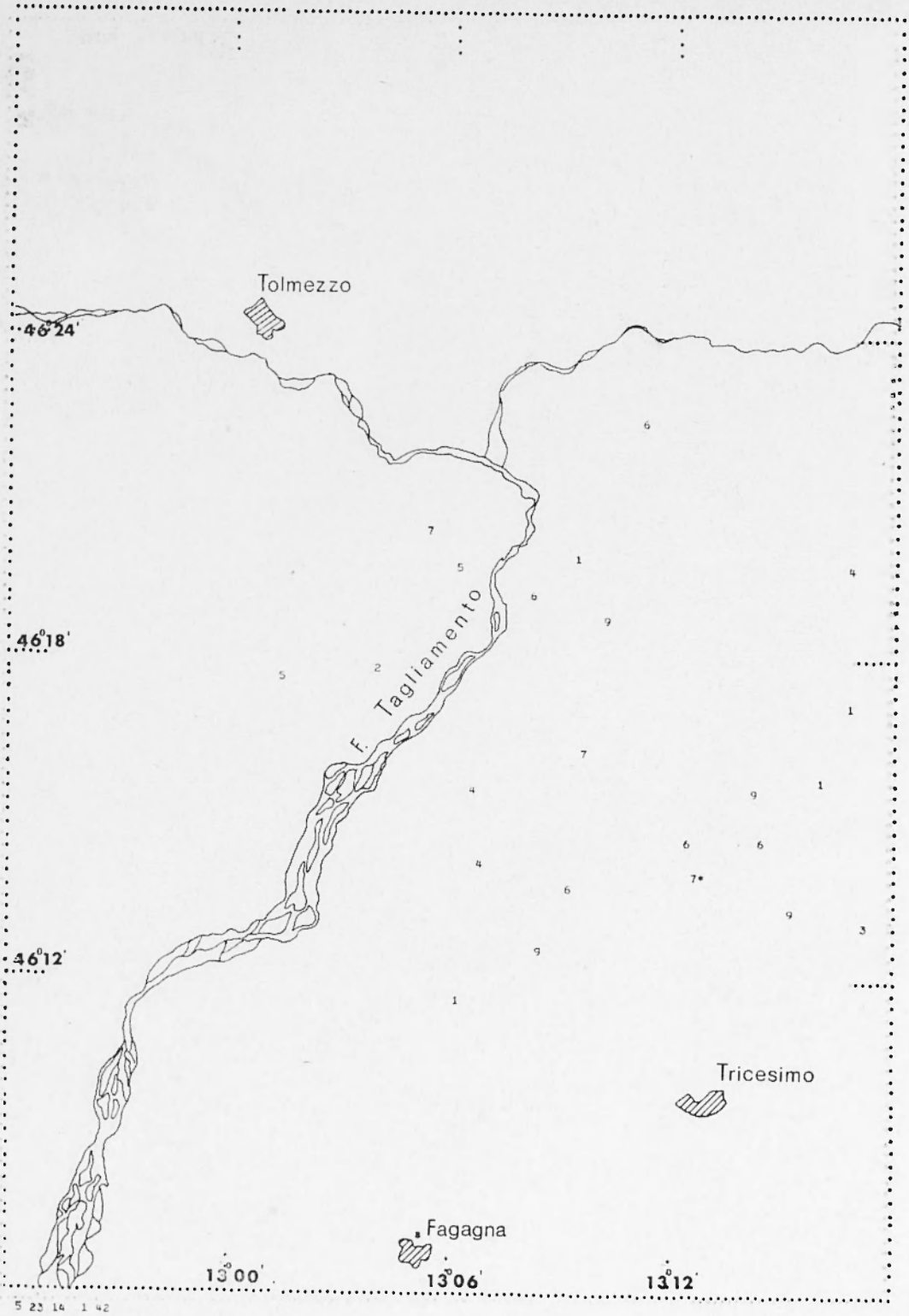
5 17 23 48 9



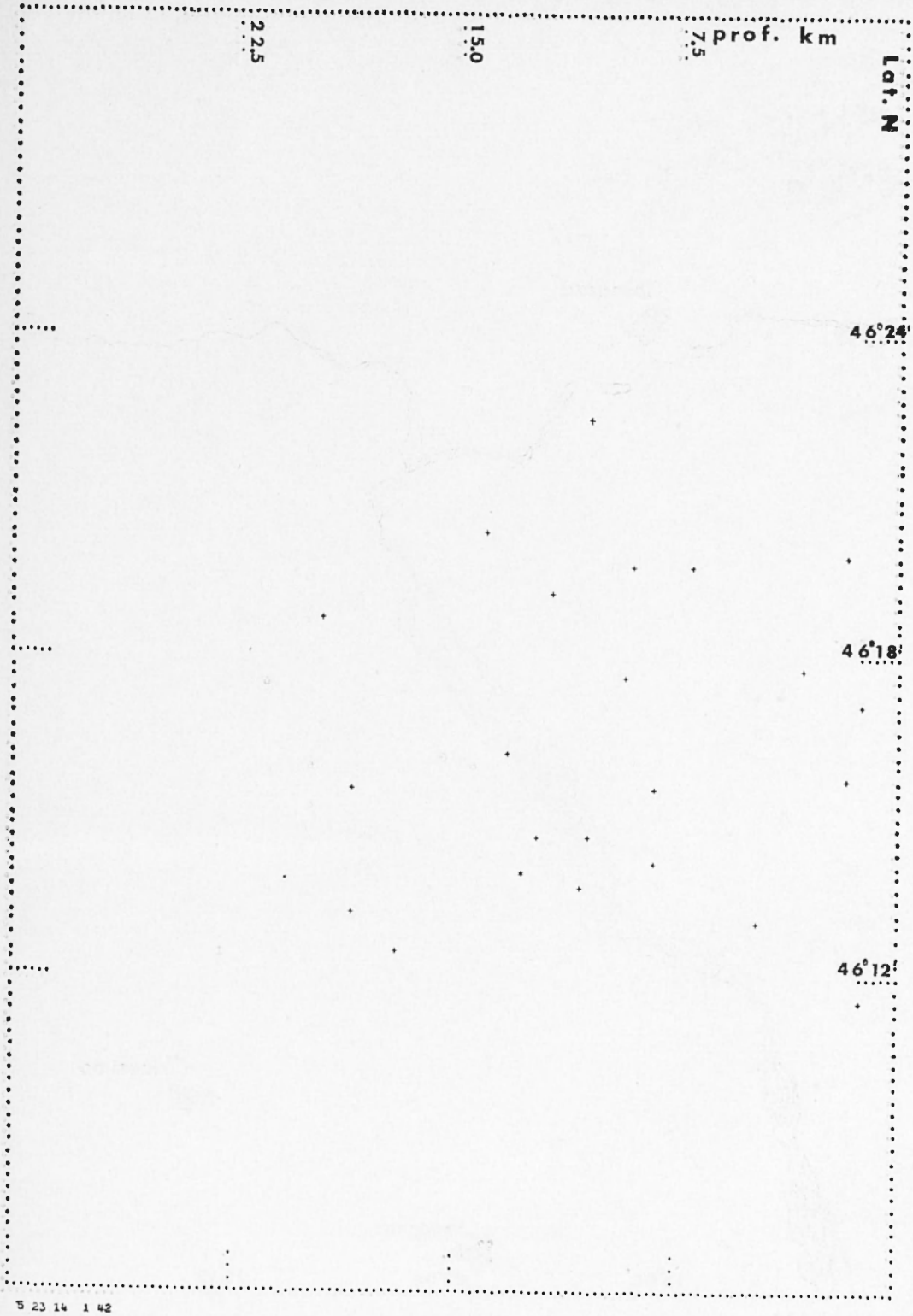
Figg. 8a-8b — From 5.17 $23^h 48^m$ to 5.20 $22^h 05^m$.
The activity is widely diffused and reaches also the southern part of the map.



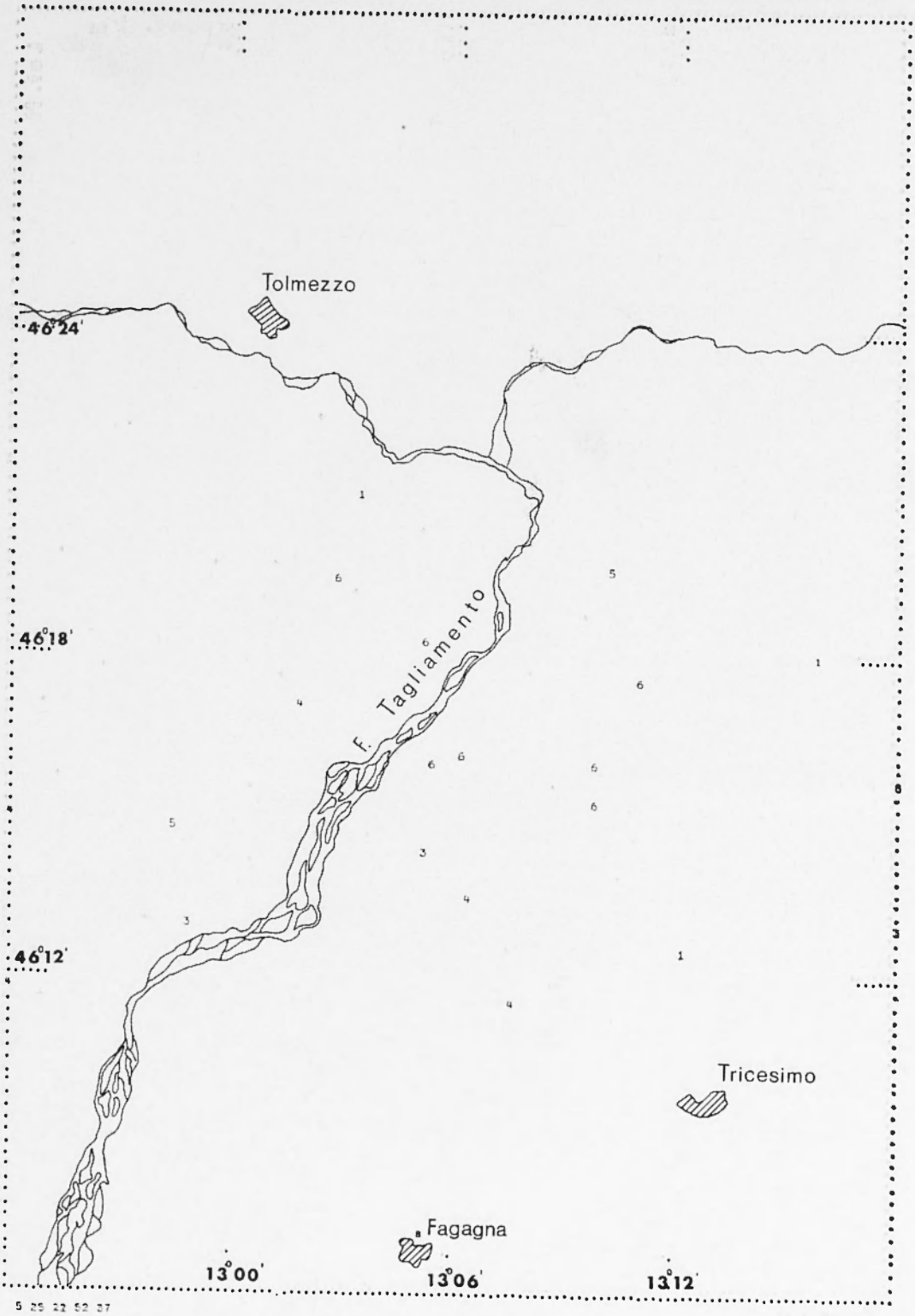
5 20 22 5 8



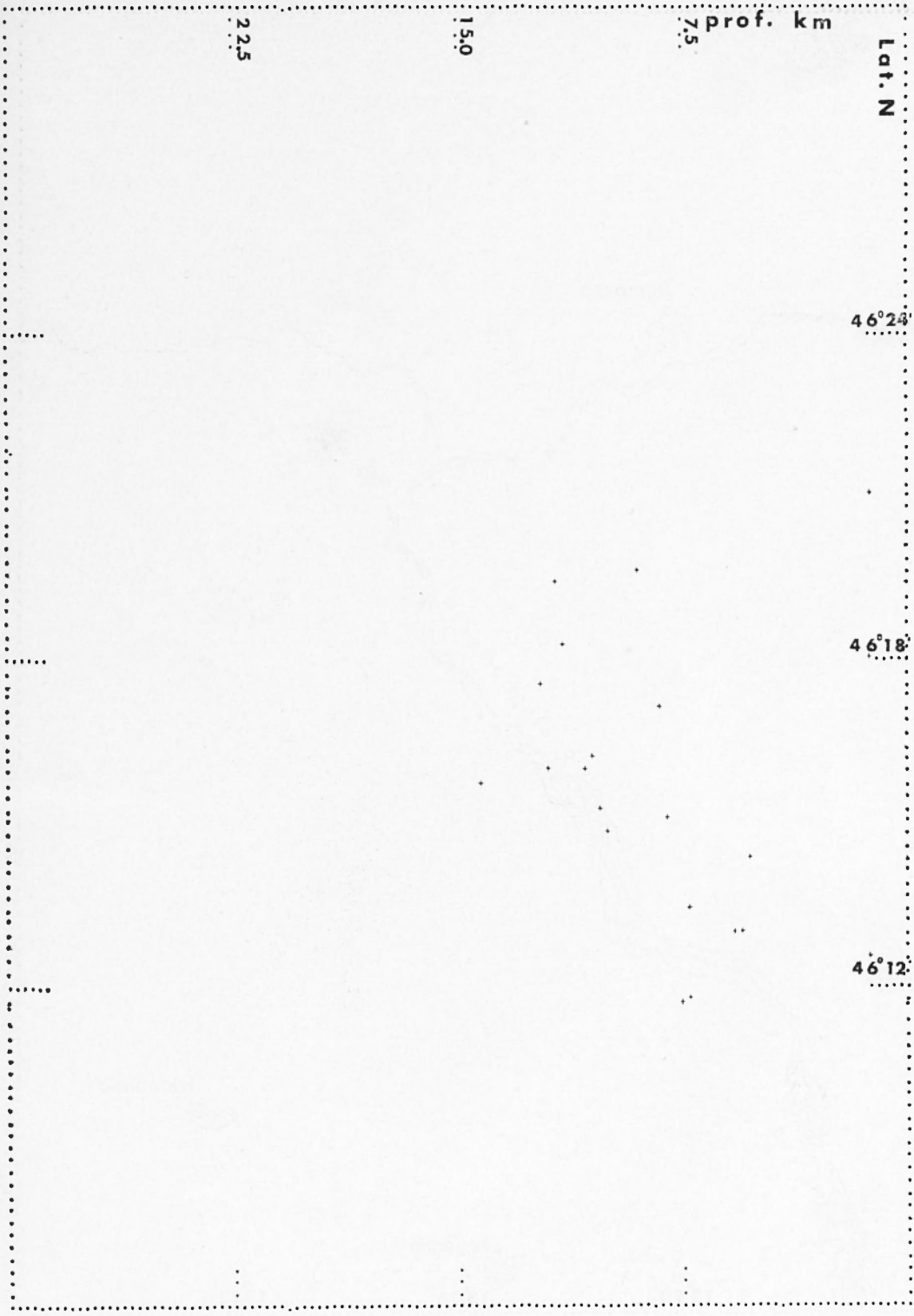
Figg. 9a-9b — From 5.20 $22^h 05^m$ to 5.23 $14^h 01^m$.
In the southern section a shock of magnitude 4.0 appears; it is accompanied by minor events.



5 23 14 1 42

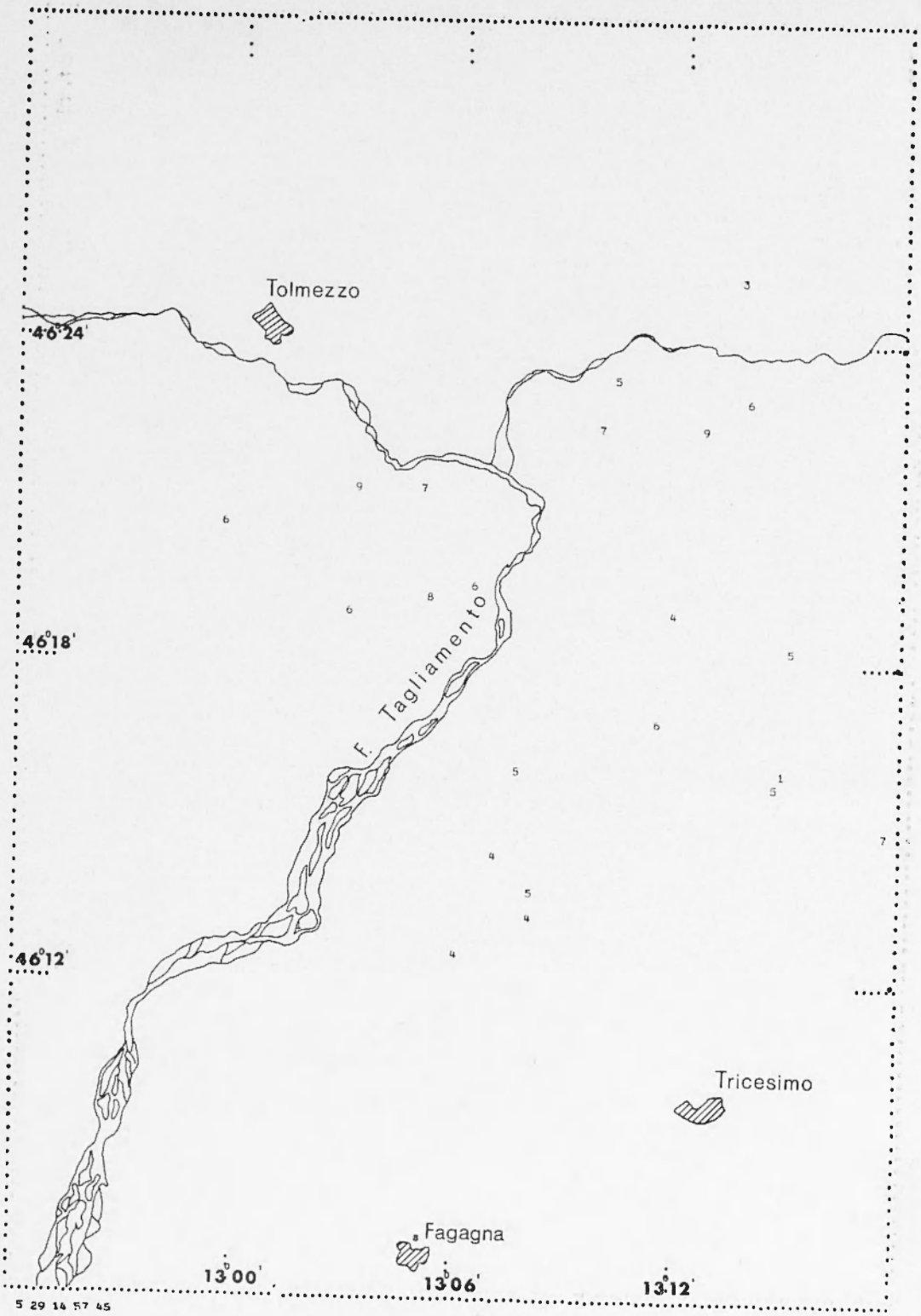


Figg. 10a-10b — From 5.23 $14^h 01^m$ to 5.25 $22^h 52^m$.
The seismic activity, remarkably decreased and not accompanied by high magnitude shocks, covers in an almost uniform manner, all the map. In

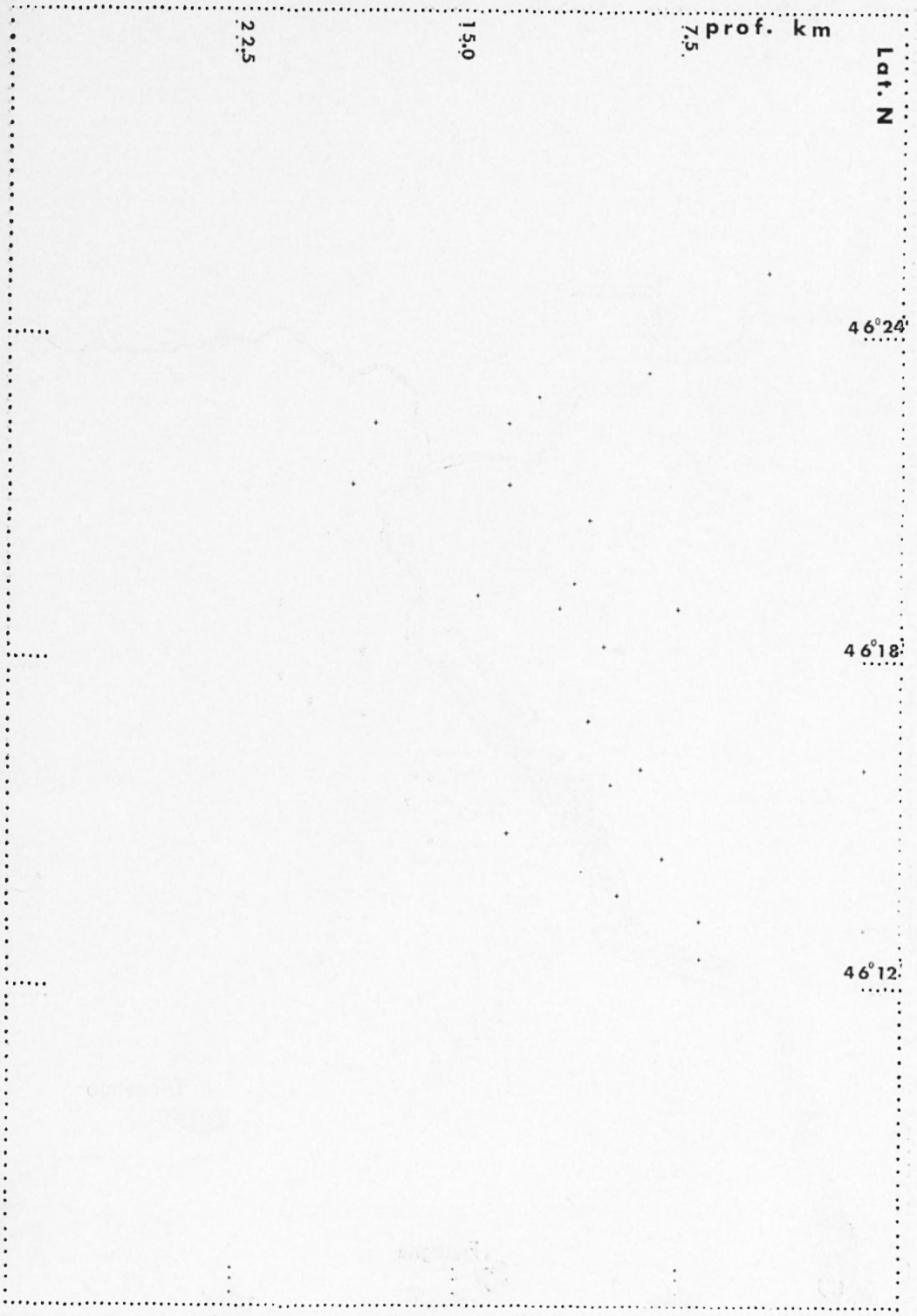


5 25 22 52 37

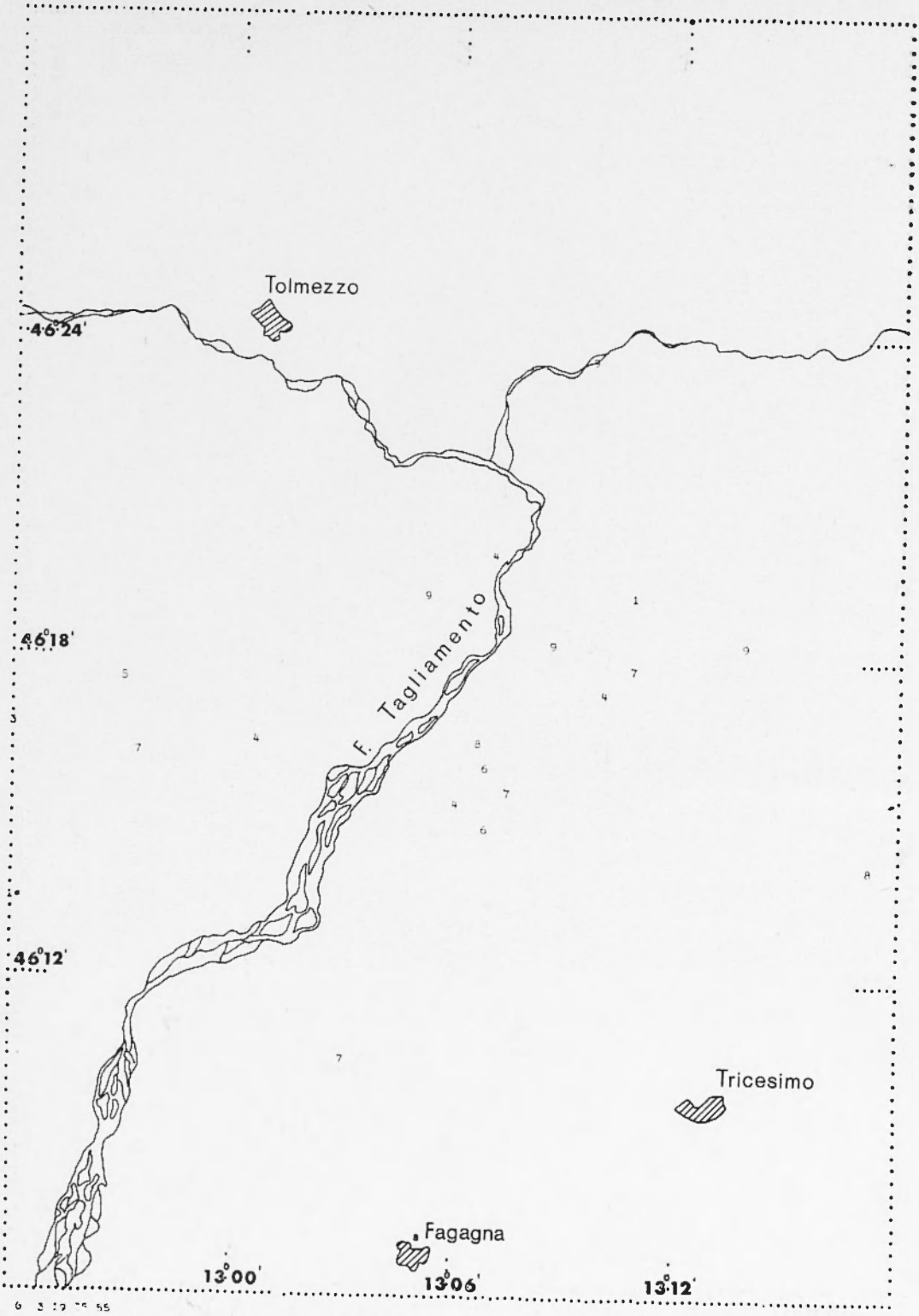
the section an alignement of hypocenters still dipping towards N can be observed.



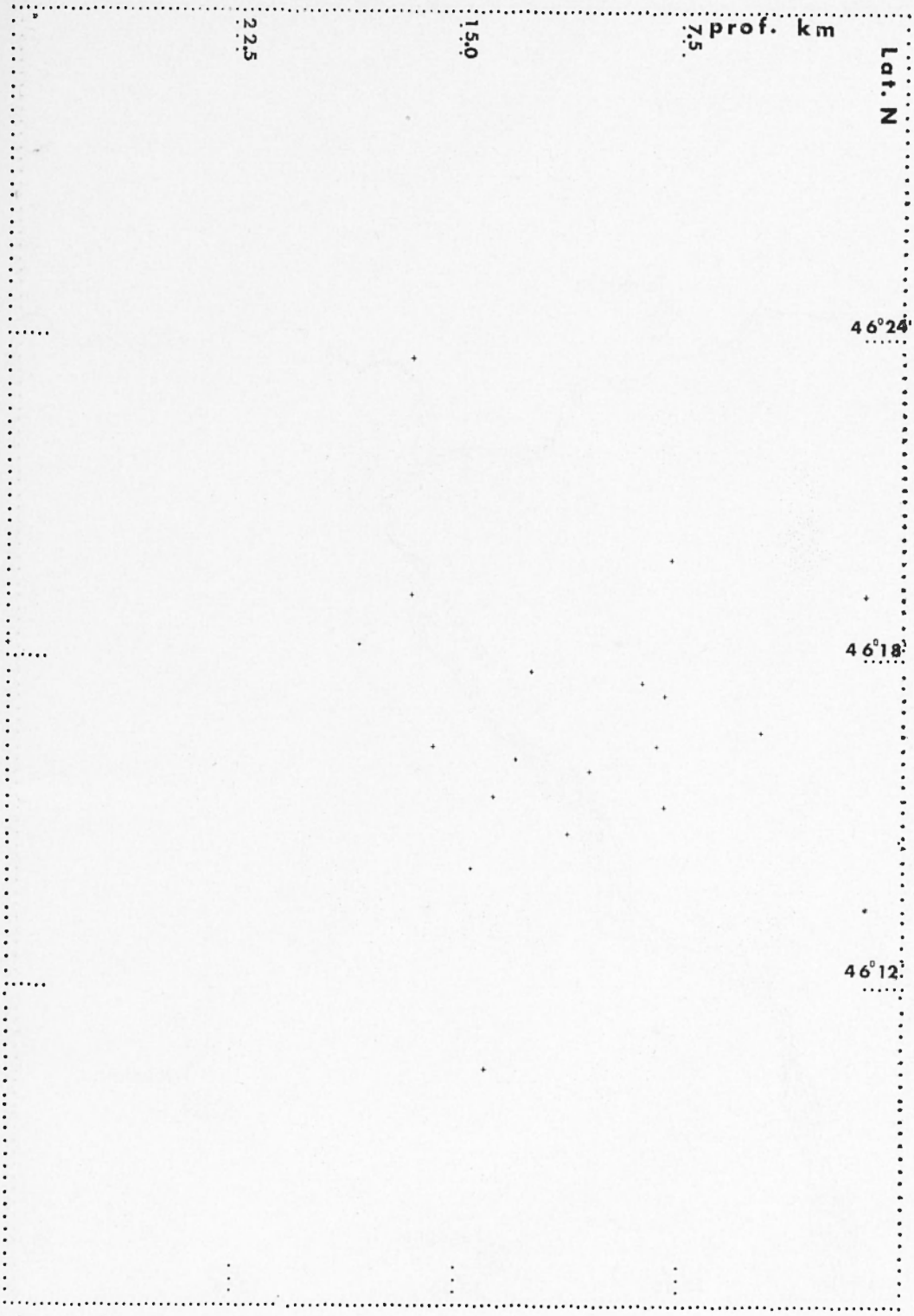
Figg. 11a-11b — From 5.25 $22^h 52^m$ to 5.29 $14^h 57^m$.
The low magnitude activity, diffused in an almost uniform manner, is still visible; the alignement is that of the previous figure in the section N-S,



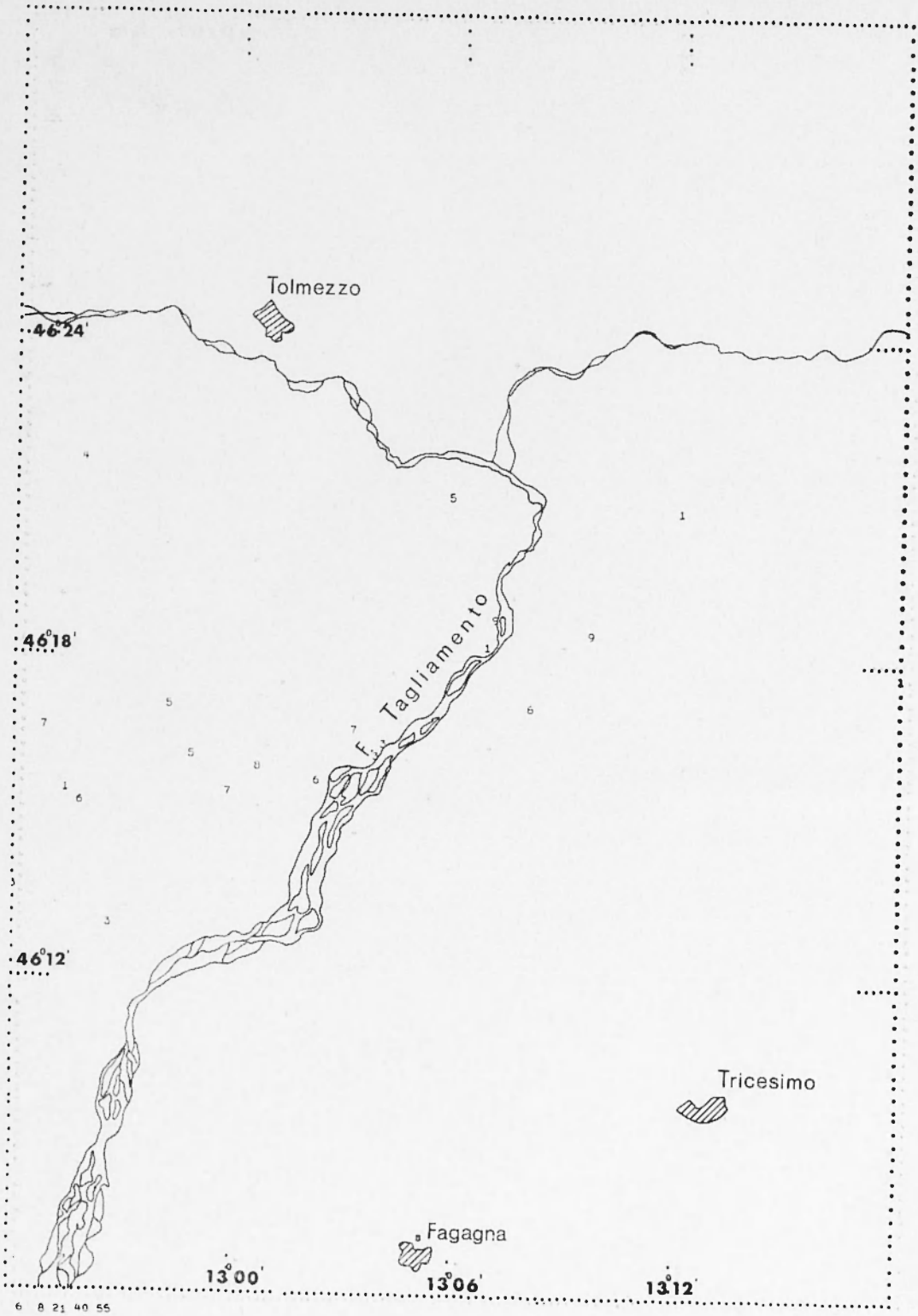
S 29 14 57 45



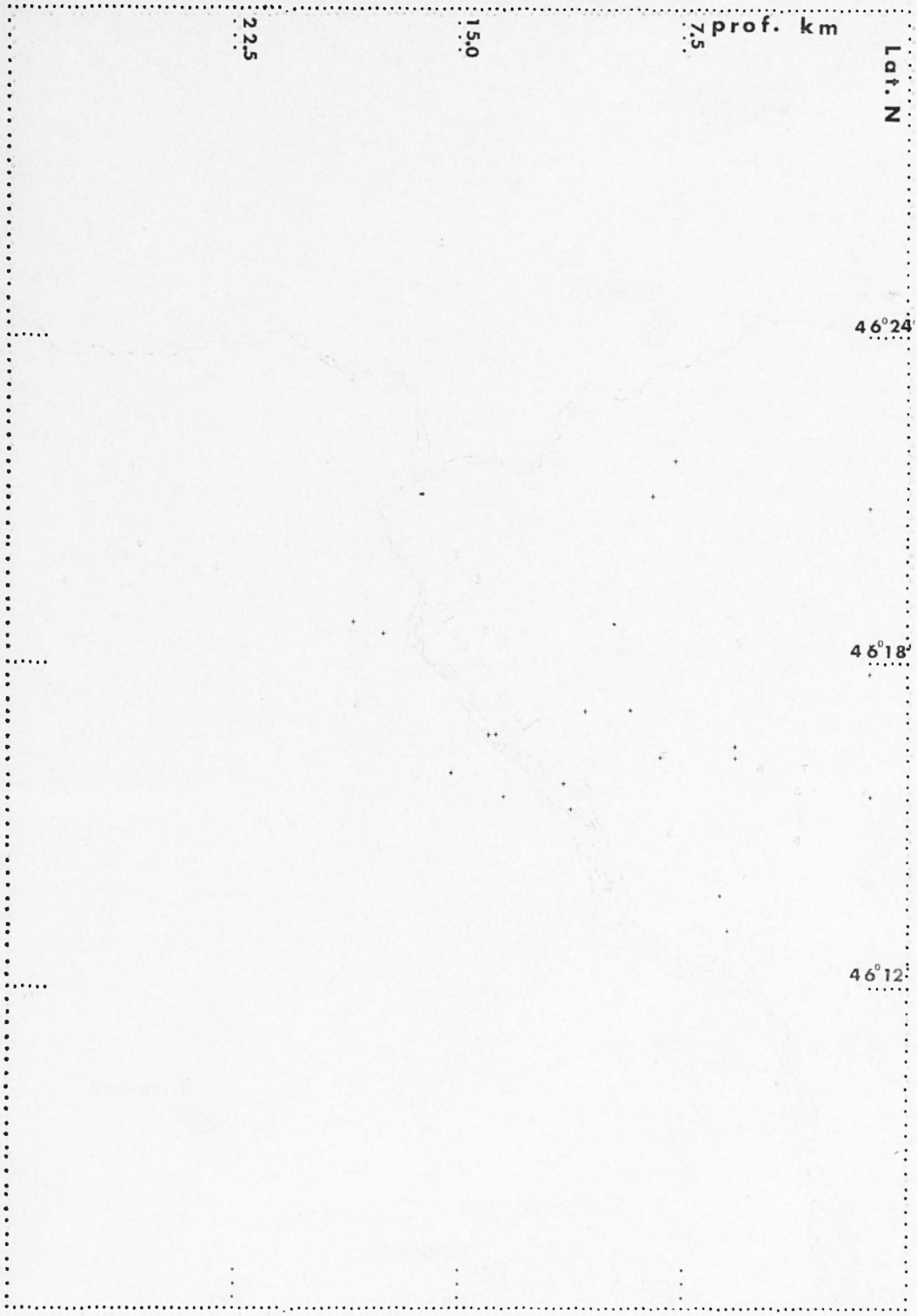
Figg. 12a-12b — From 5.25 $14^h 57^m$ to 6.3 $19^h 35^m$.
The seismic activity is remarkably decreased.



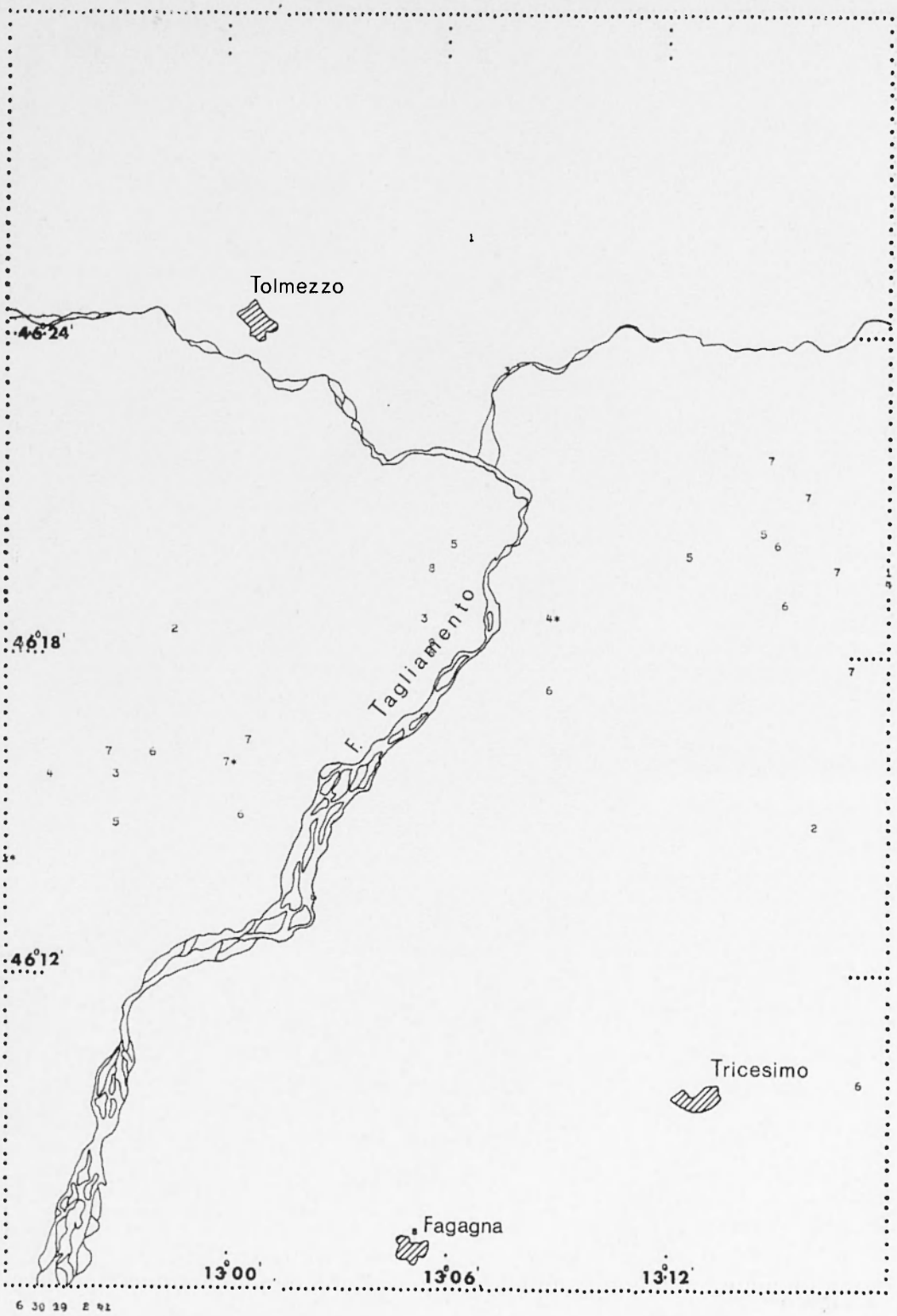
6 3 10 35 55



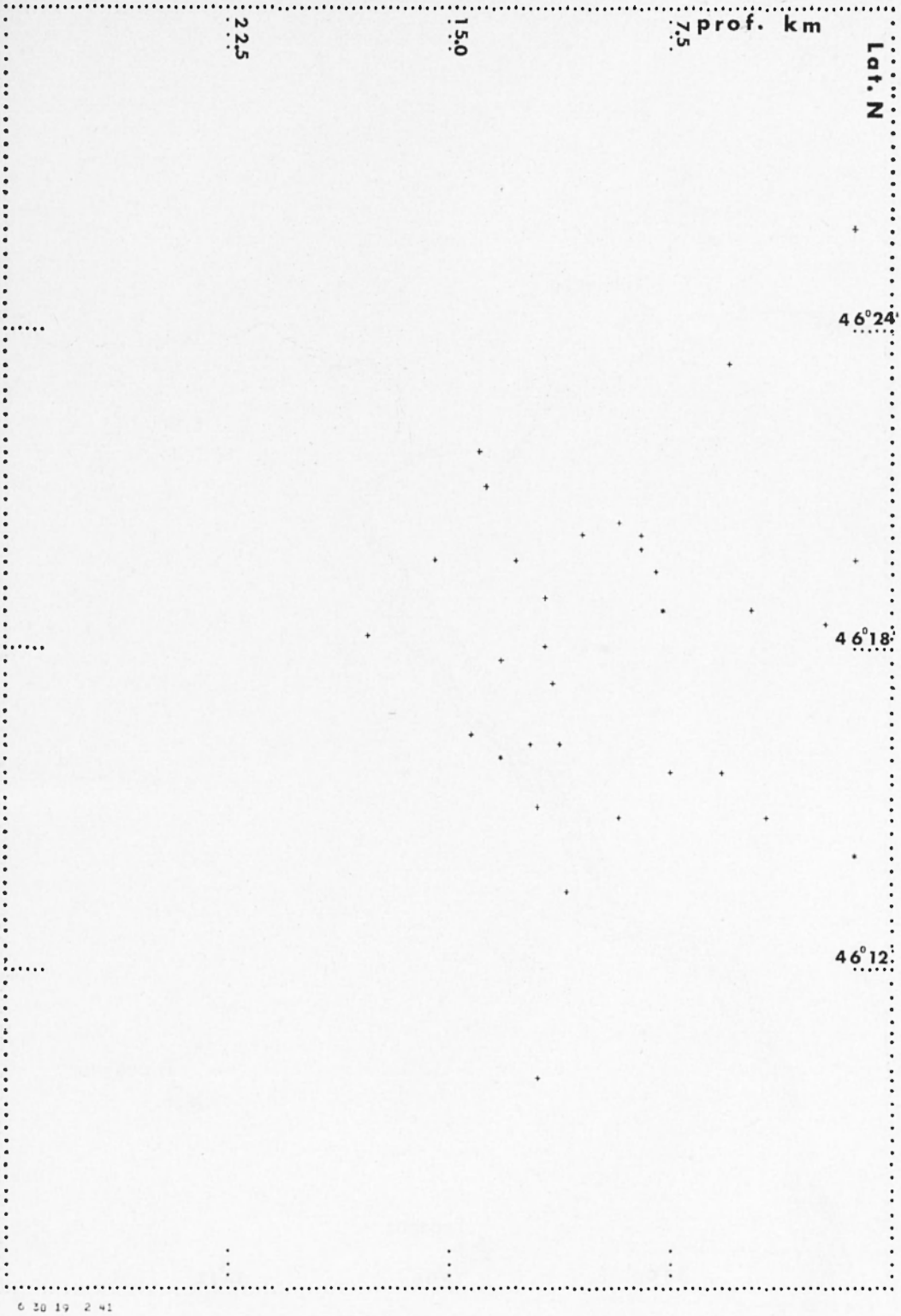
Figg. 13a-13b — From 6.3 $19^h 35^m$ to 6.8 $21^h 40^m$.
The epicenters seem to be aligned in a *WSW-ENE* direction, with a higher concentration to *W*.



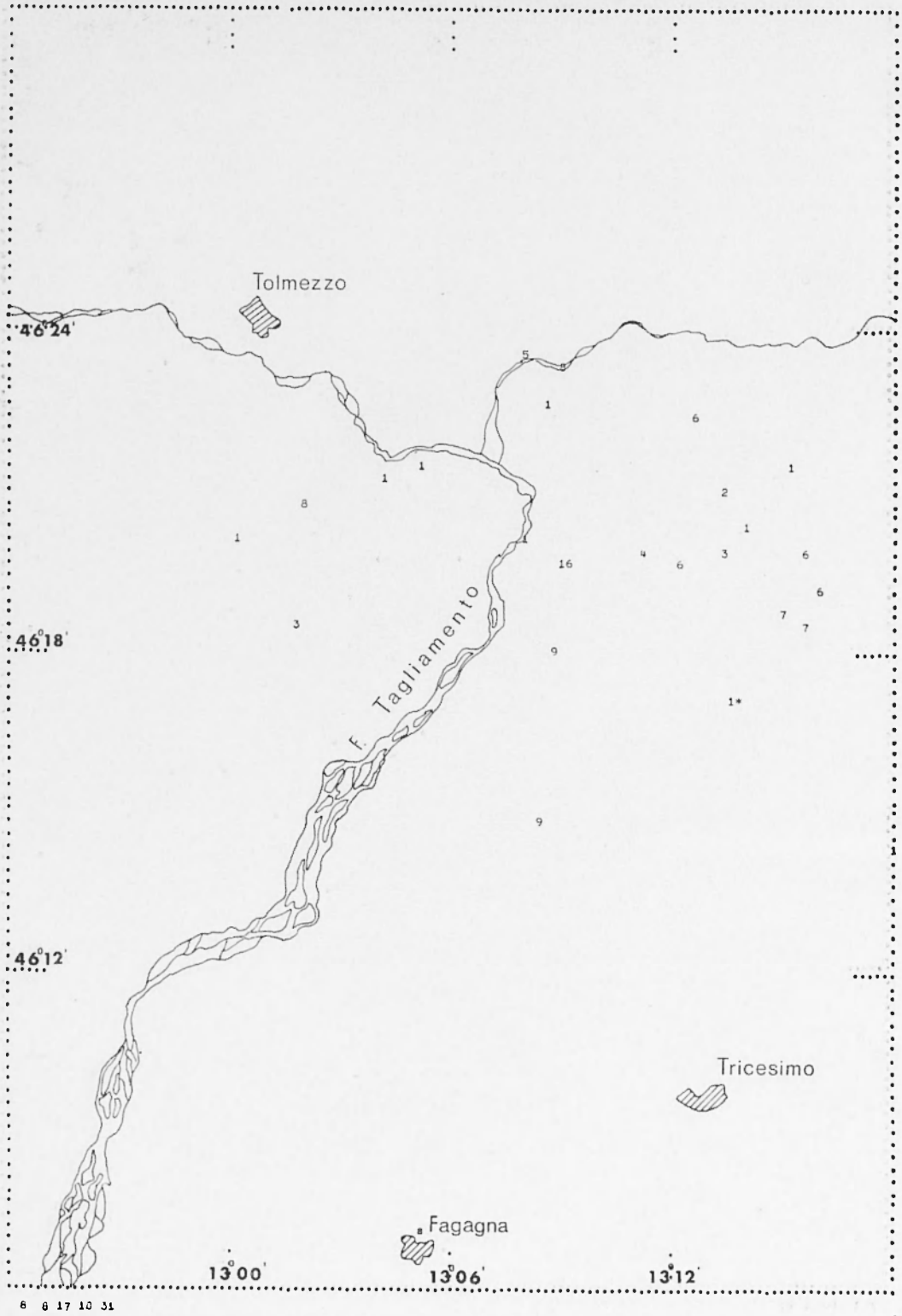
6 8 21 40 55



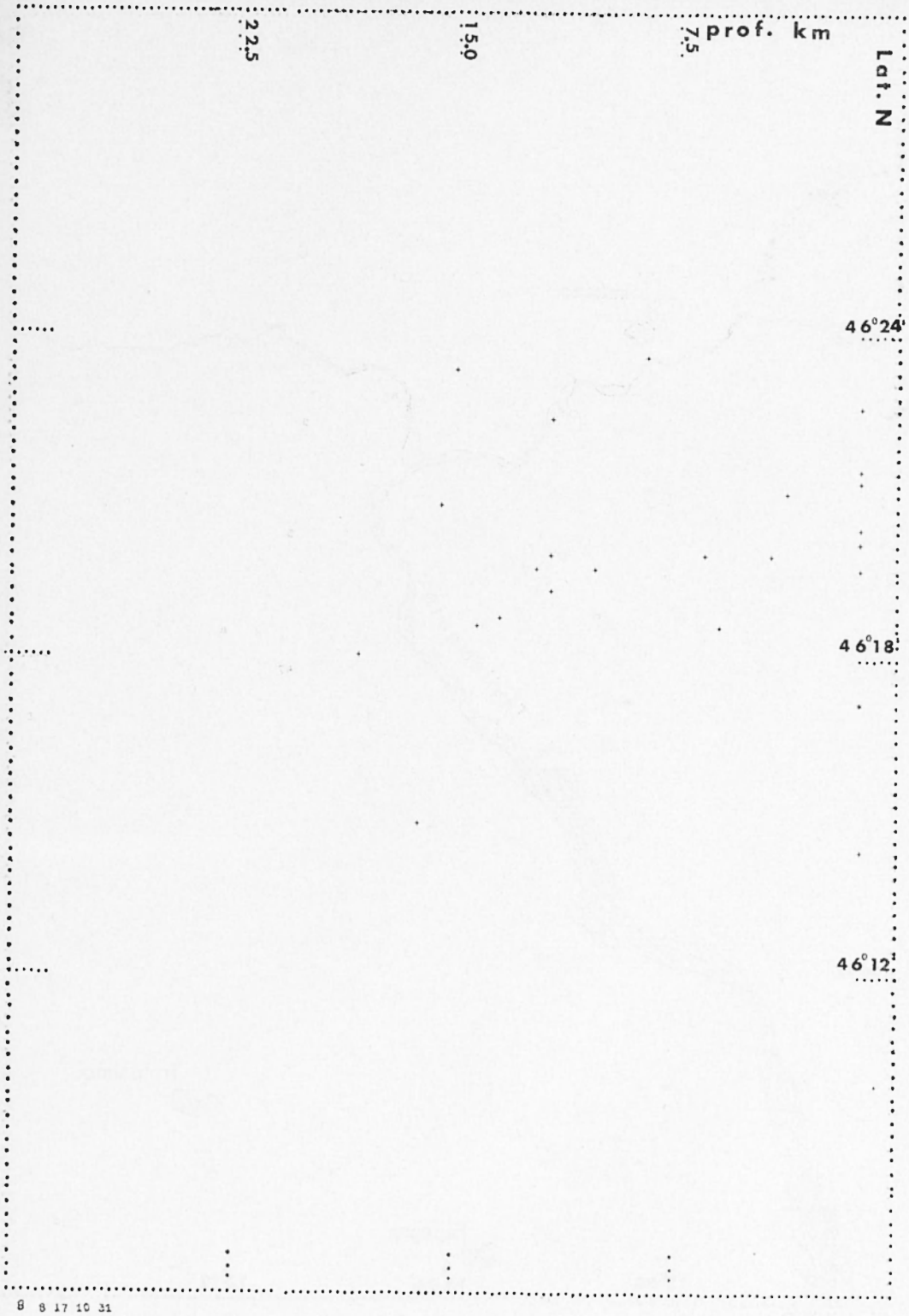
Figg. 14a-14b — From 6.8 $21^h 40^m$ to 6.30 $19^h 02^m$.
The distribution of the epicenters is interesting, mainly, three aligned sectors. The seismic activity in the western zone can be correlated with



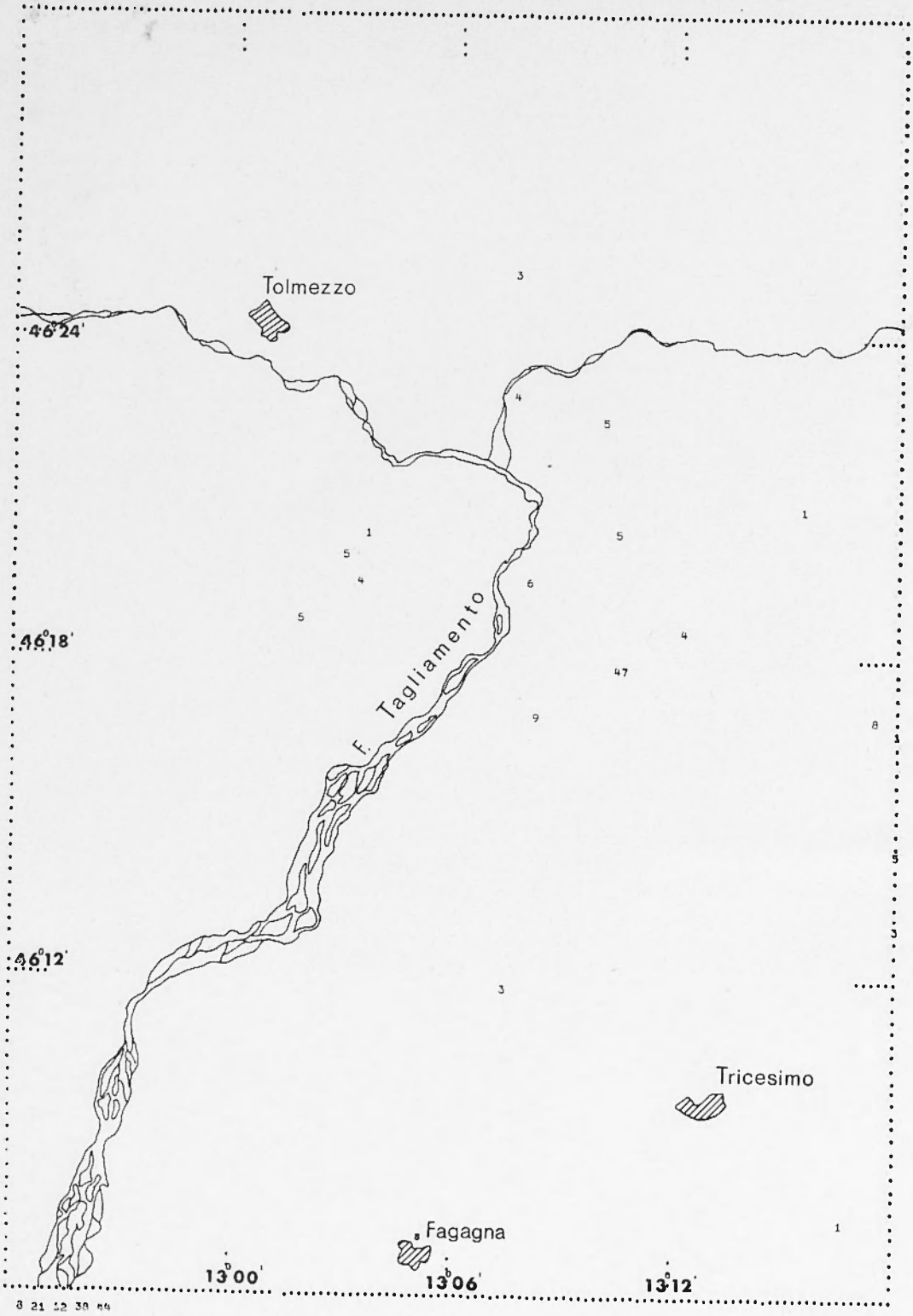
the shock of magnitude 4.2 on June 9, at $18^h\,48^m$. The activity of the central sector ends with the shock on June 26, at $11^h\,13^m$, having a magnitude 4.3. The eastern sector shows the appearance of low magnitude events.



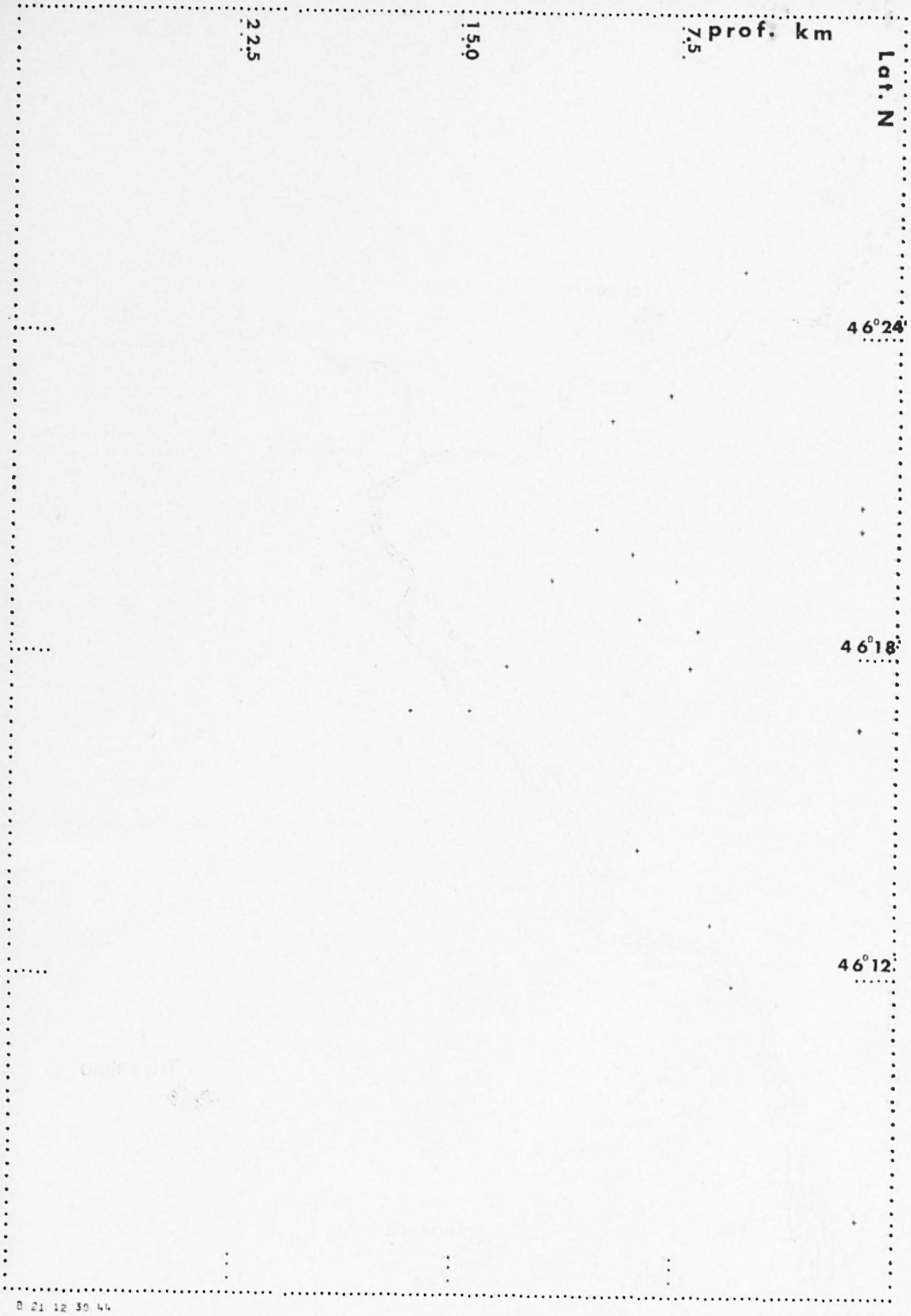
Figg. 15a-15b — From 6.30 $19^h 02^m$ to 8.8 $17^h 10^m$.
In the eastern sector on July 10 at $04^h 11^m$ an event of magnitude 4.1 occurs. Absence of activity in the western sector.

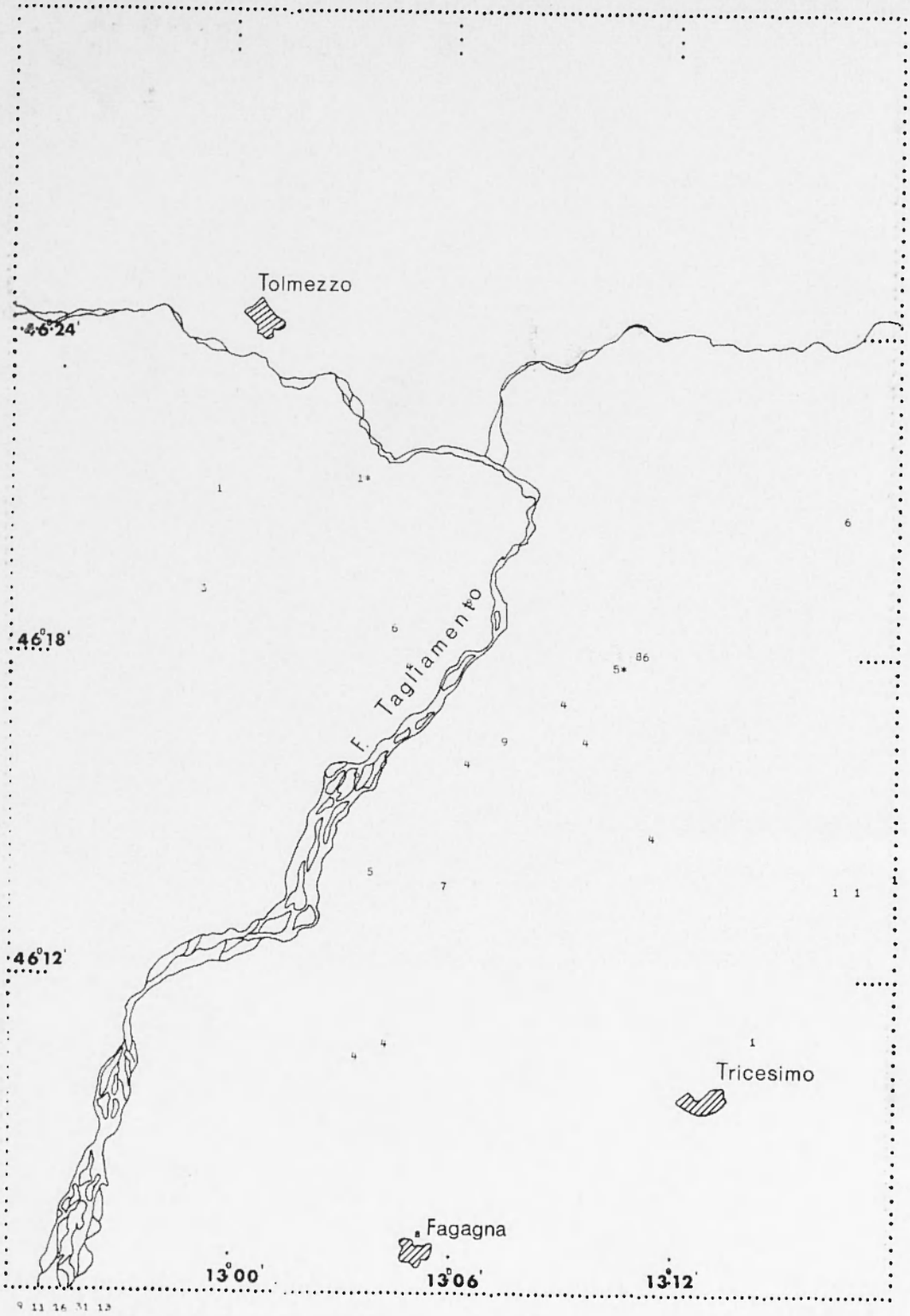


8 8 17 10 31

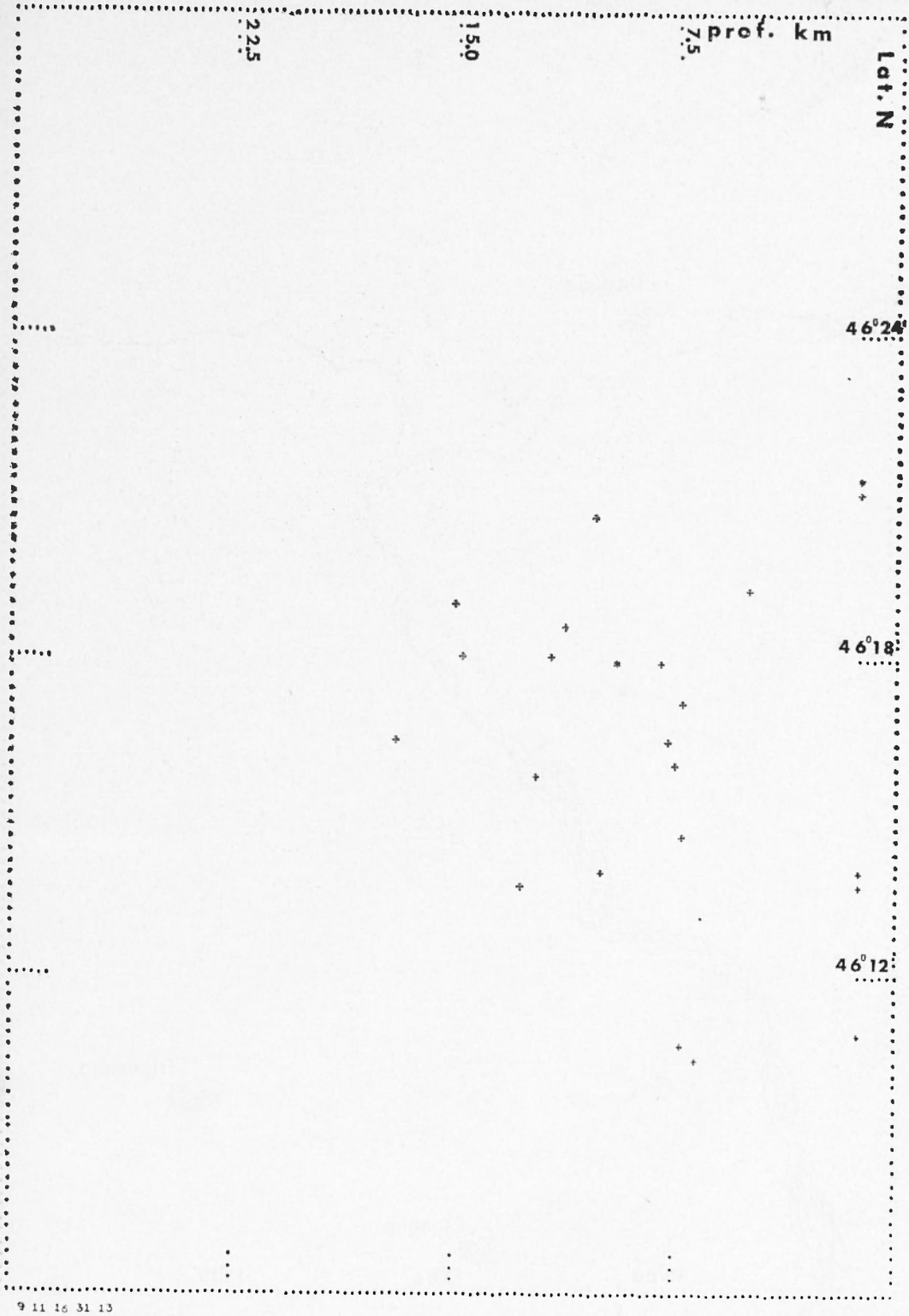


Figg. 16a-16b — From 8.8 $17^h\ 10^m$ to 8.21 $12^h\ 38^m$.
The activity is very weak. Epicenters appear in the northern part of the zone under examination.

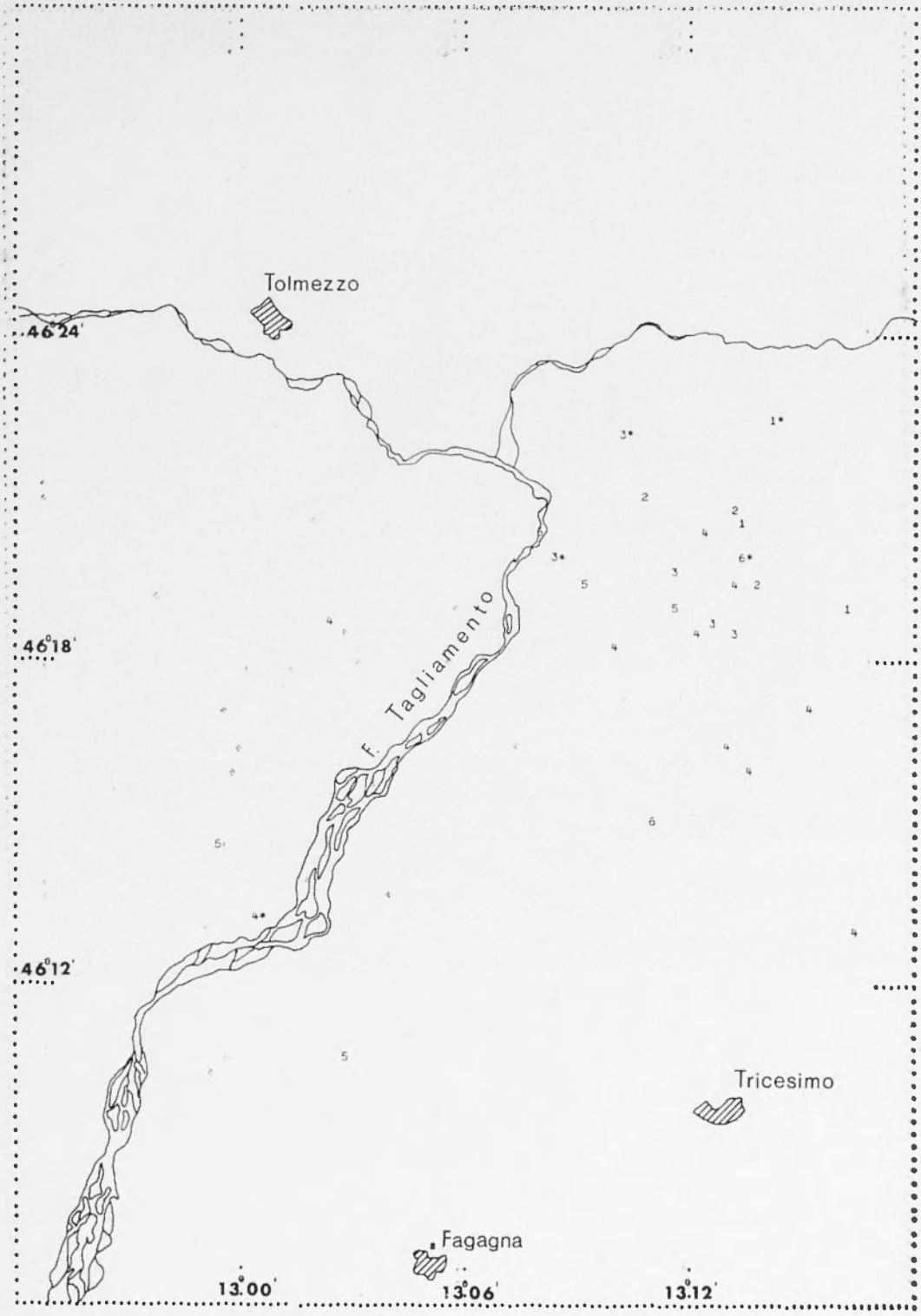

prof. km
7.5
15.0
22.5
Lat. N
46°24'
46°18'
46°12'
B 21 12 30 44



Figg. 17a-17b — From 8.21 $12^h 28^m$ to 9.11 $16^h 31^m$.
The weak activity in the central sector ends with the shock of magnitude 5.5 on September 11, at $16^h 31^m$.

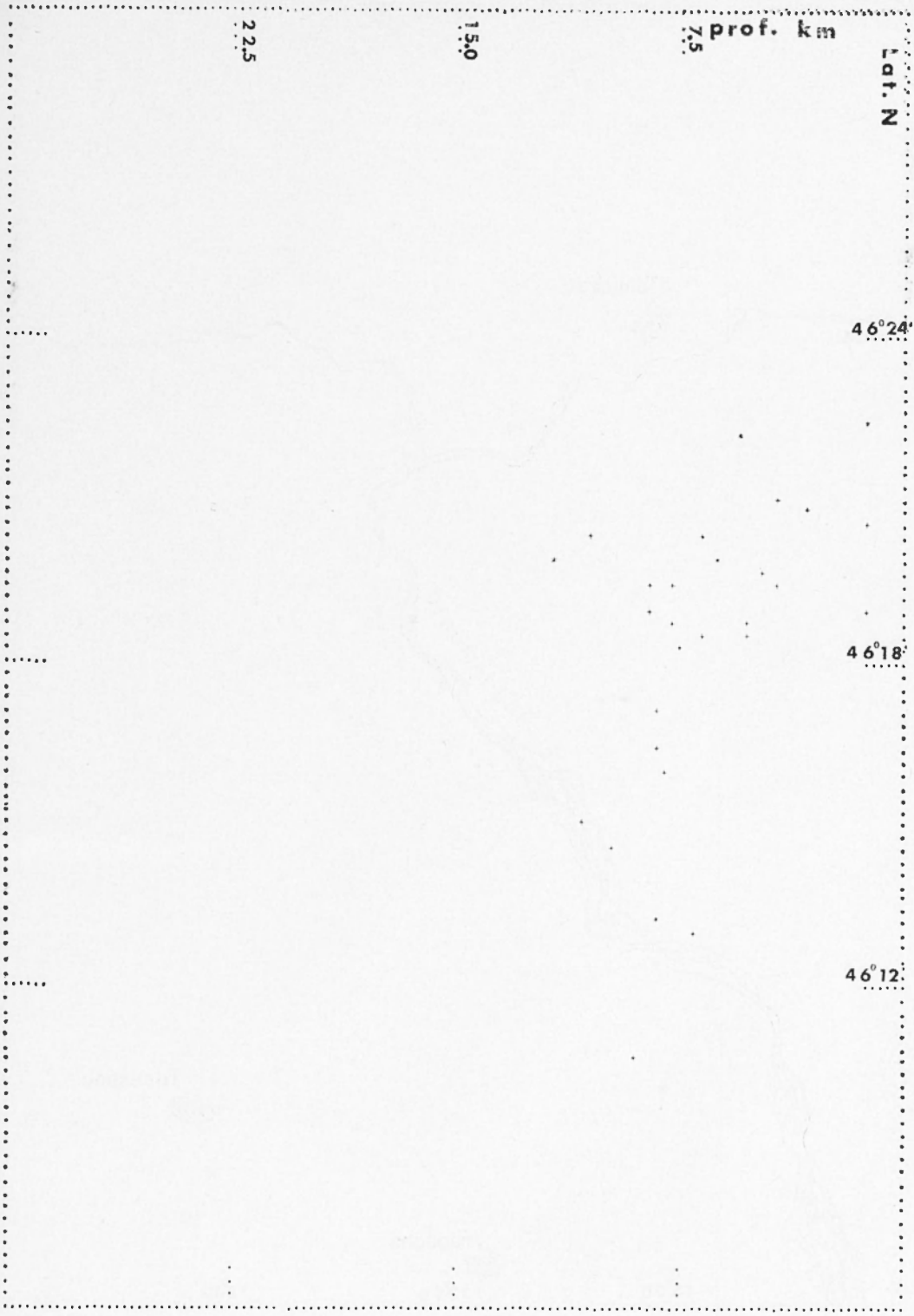


9 11 16 31 13

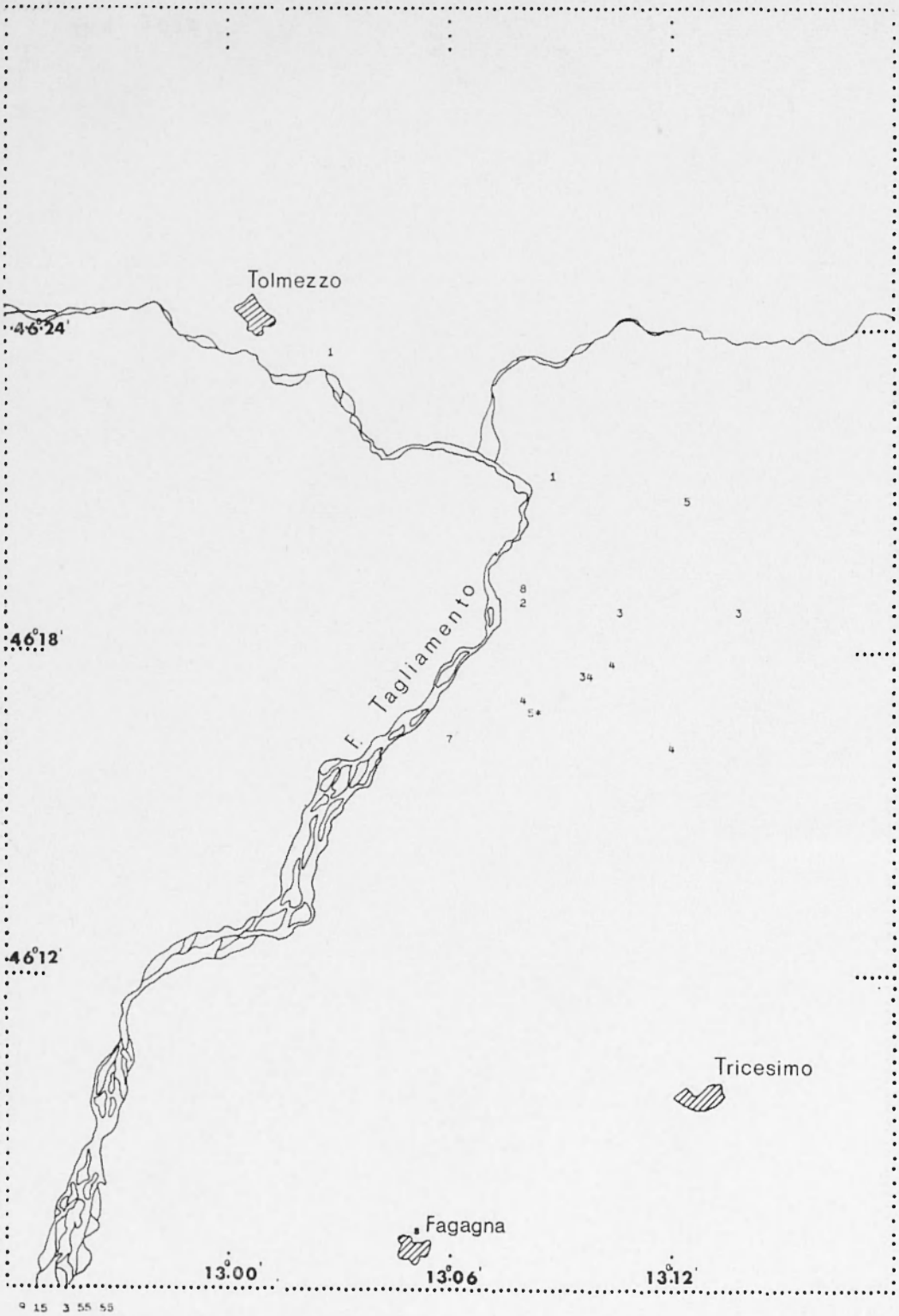


9 13 21 25 14

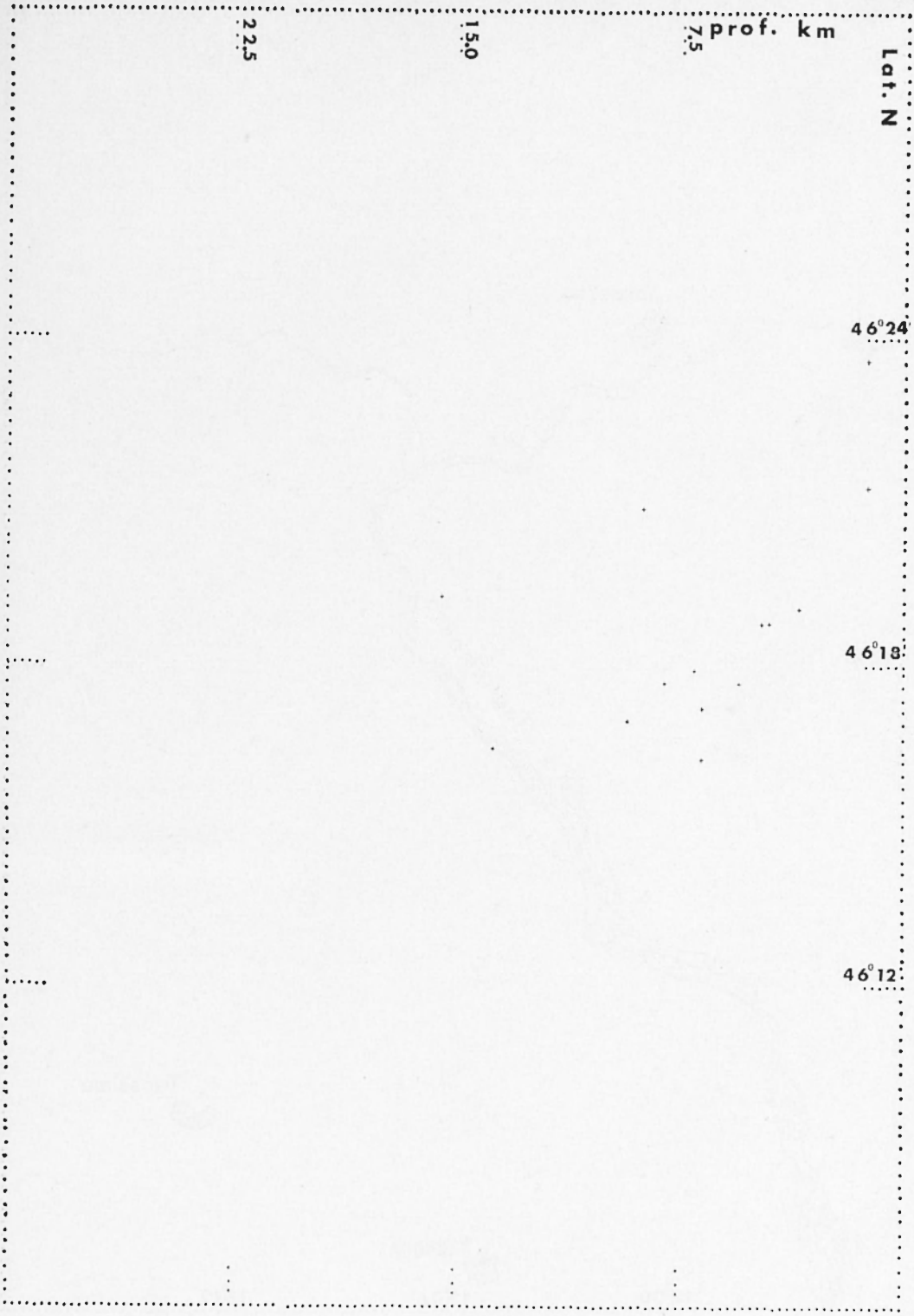
Figg. 18a-18b — From 9.11 $16^h 31^m$ to 9.13 $21^h 25^m$.
The activity begins with a shock of magnitude 5.9 on September 11 at $16^h 35^m$, forming a new seismic period, the concentration of which is evidently situated around the point with coordinates 46.32^0 and 13.20^0.



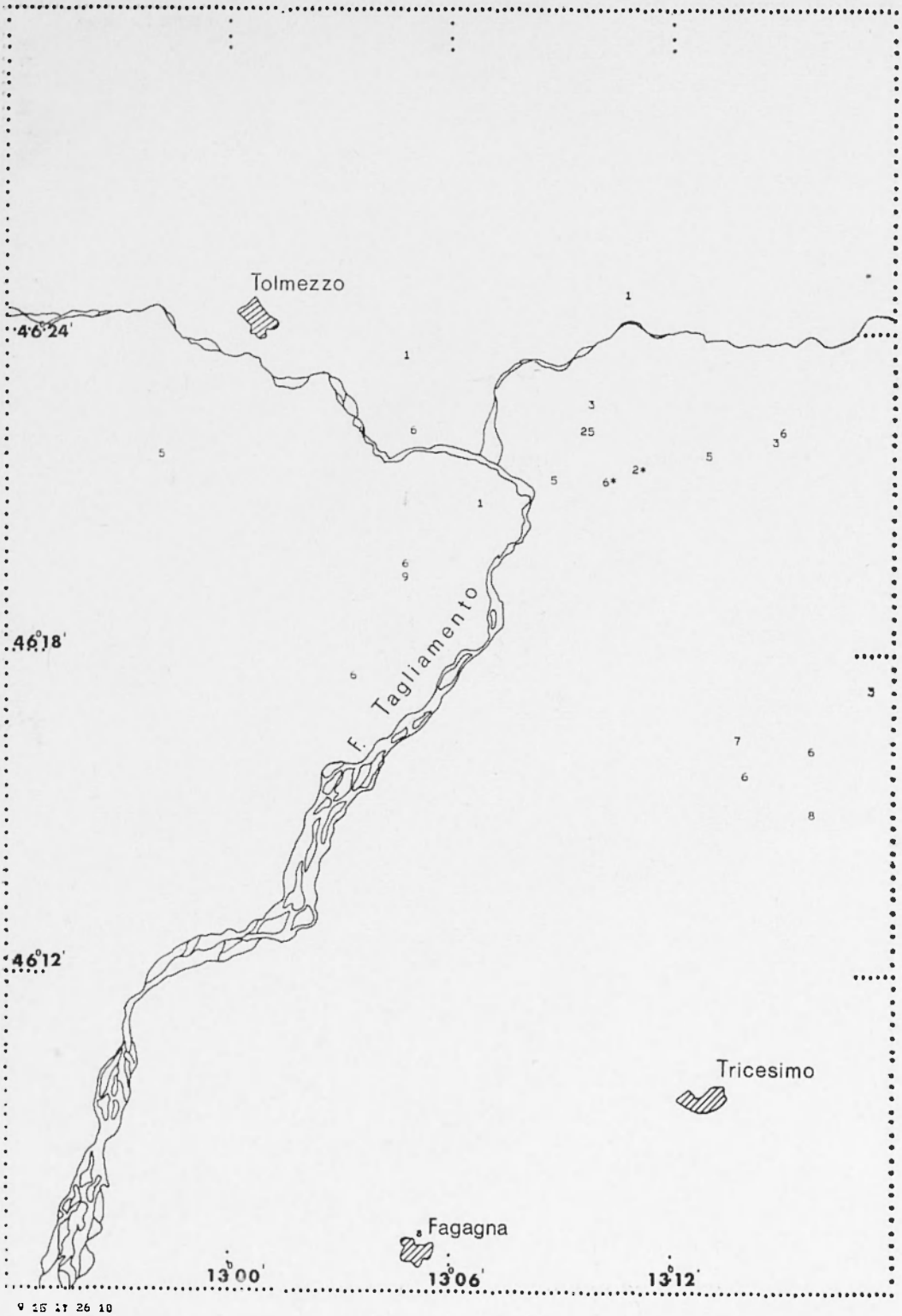
9 13 21 25 14



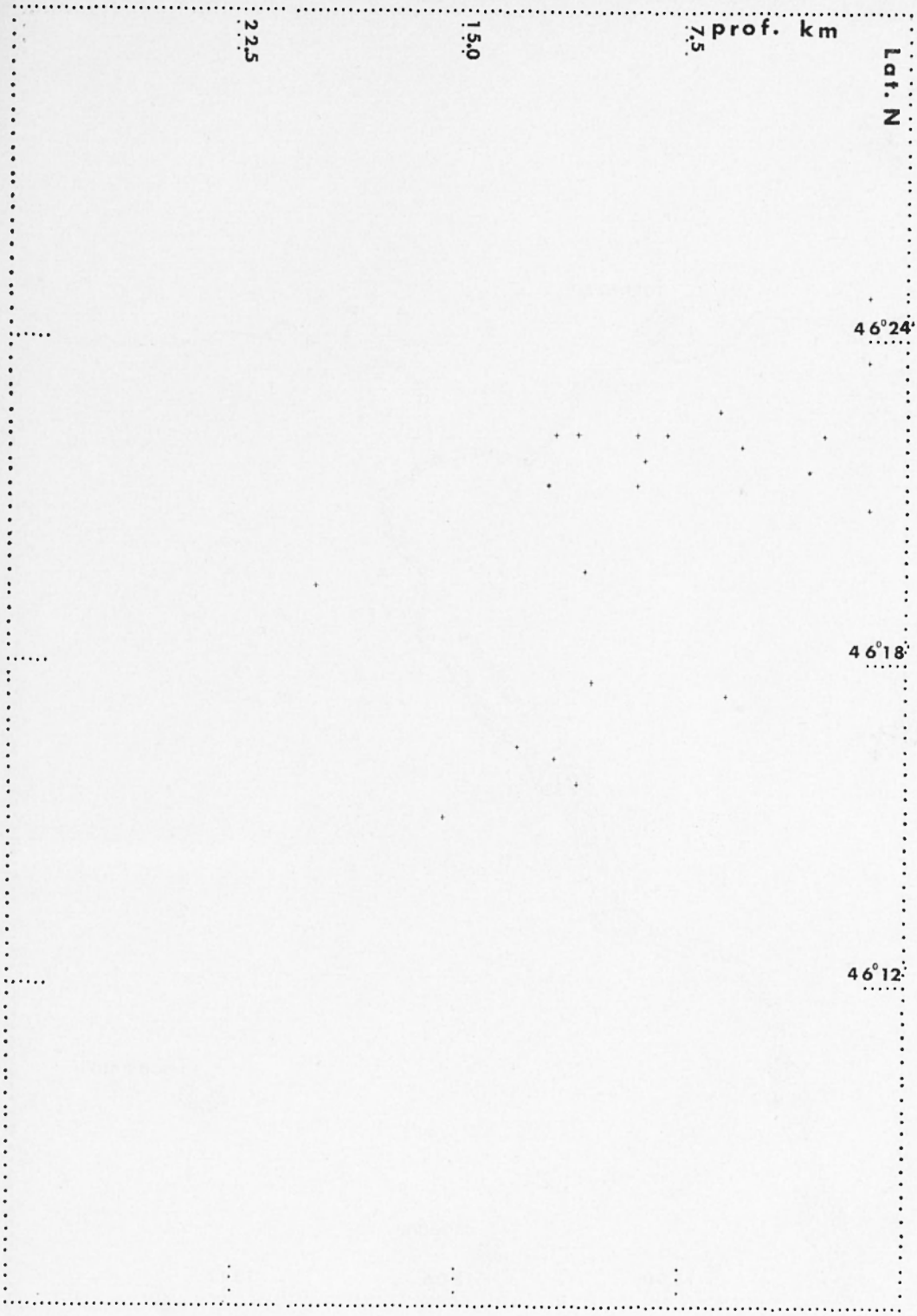
Figg. 19a-19b — From 9.13 $21^h 25^m$ to 9.15 $03^h 55^m$.
The activity concentrates in the central part with low magnitude shocks, followed in the same zone by the event on August 15 at $03^h 15^m$, of magnitude 6.1.



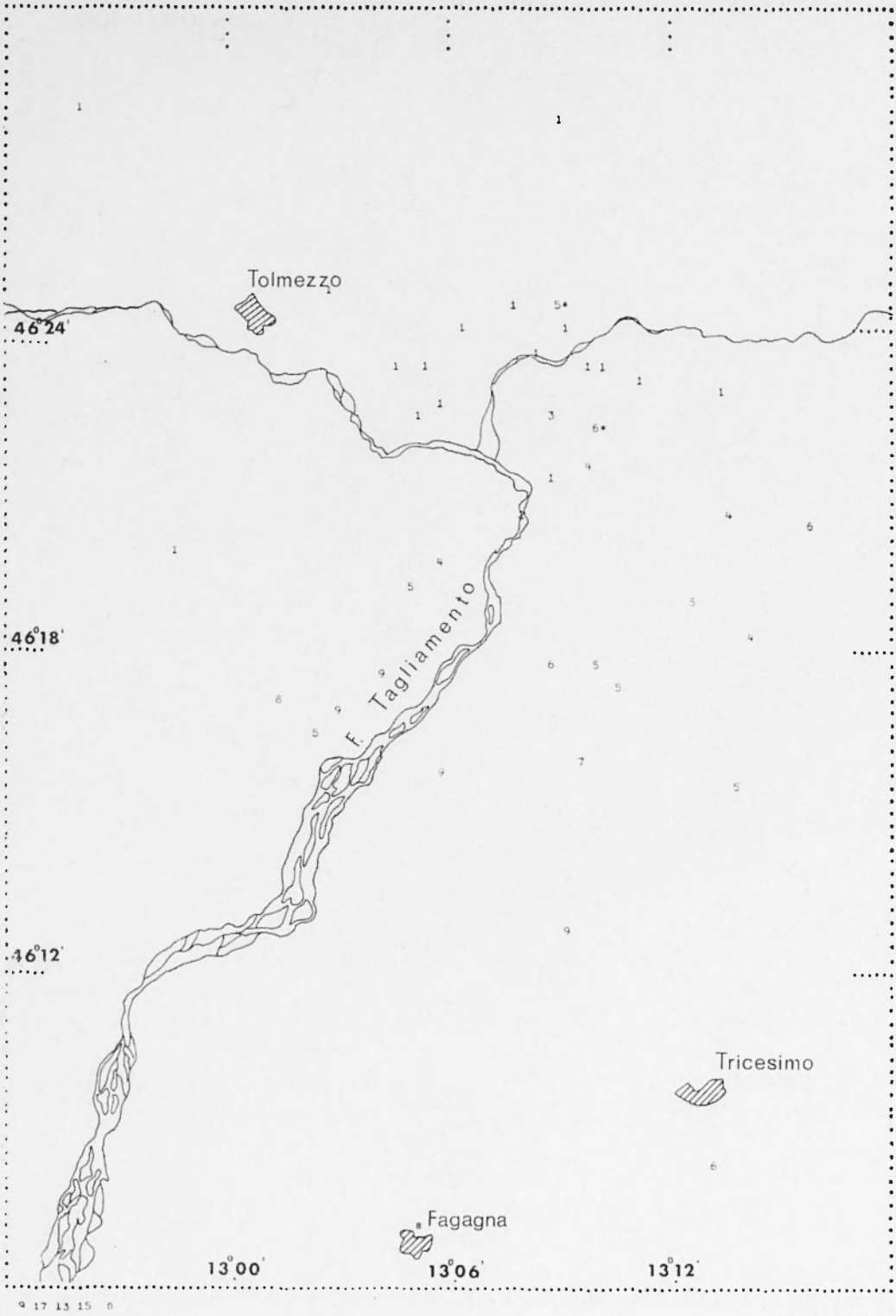
9 15 3 55 55



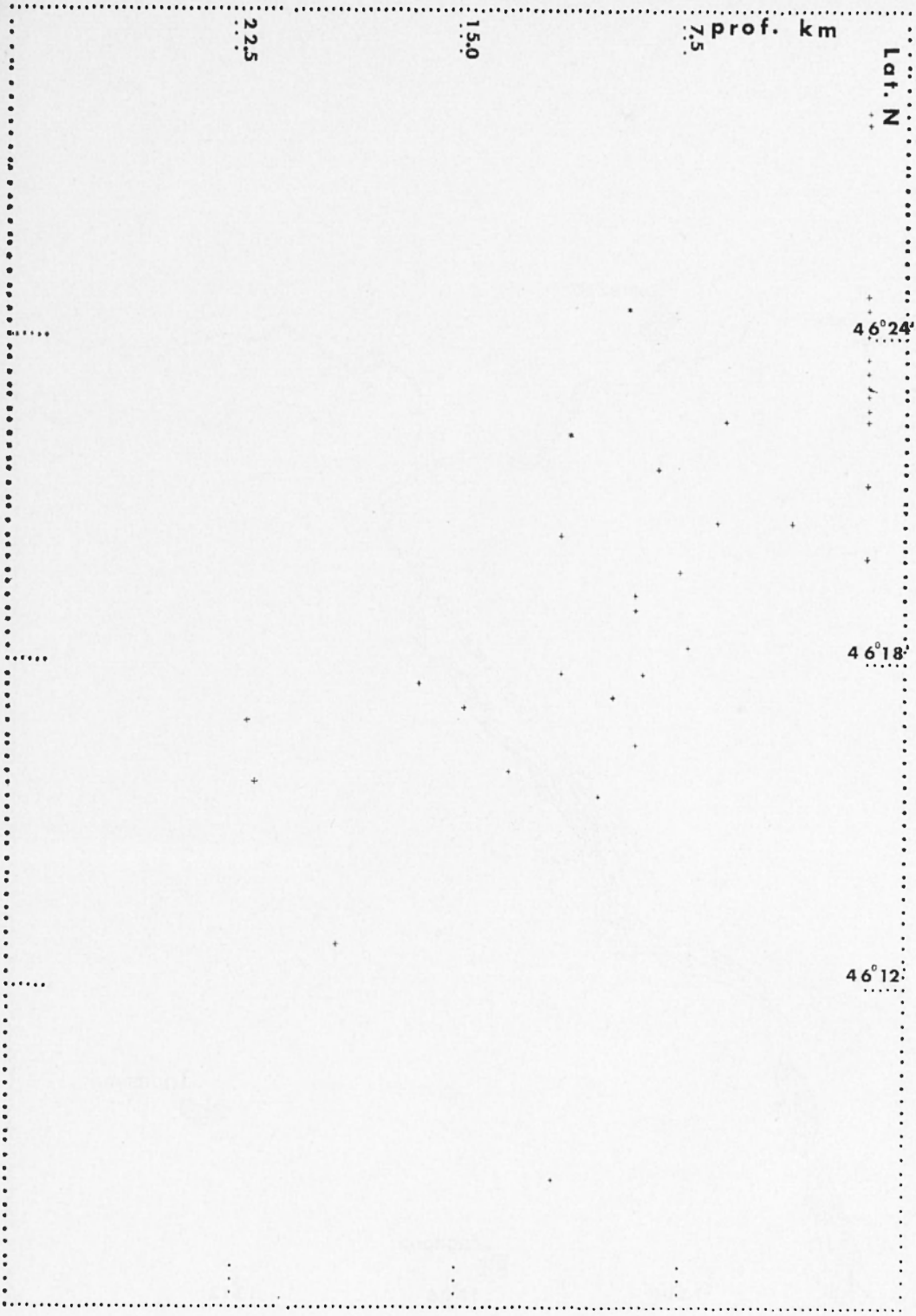
Figg. 20a-20b — From 9.15 $03^h 55^m$ to 9.15 $17^h 26^m$.
The seismic activity, represented by a series of shocks of different magnitude, shows a sharp shifting towards N. A weak activity, concentrated to S-E, is also appearing.



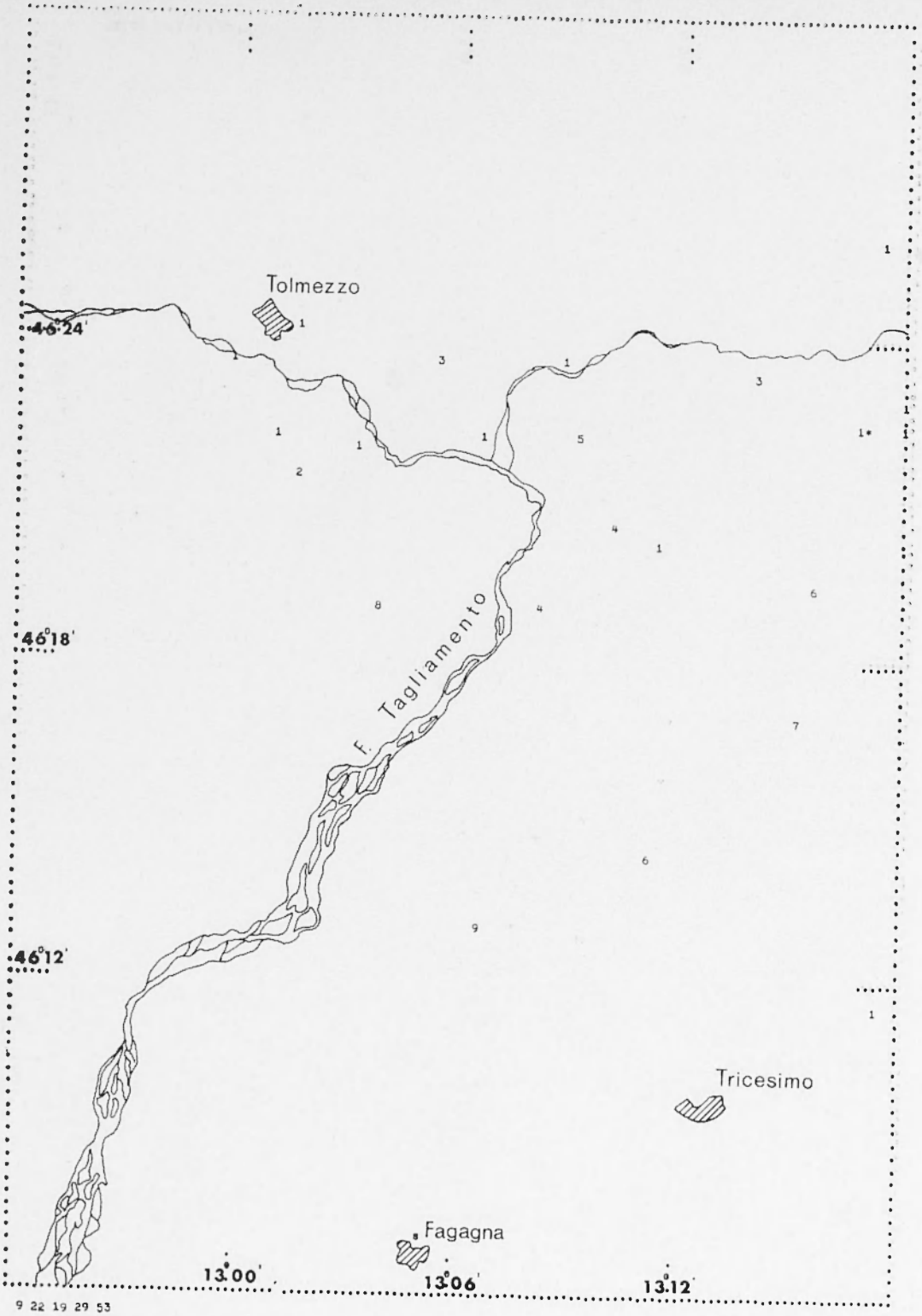
9 15 17 26 10



Figg. 21a-21b — From 9.17 17h 26m to 9.17 13h 15m.
The distribution of the epicenters, though diffused, shows a higher concentration in the N sector. The alignement of the epicenters goes towards S.

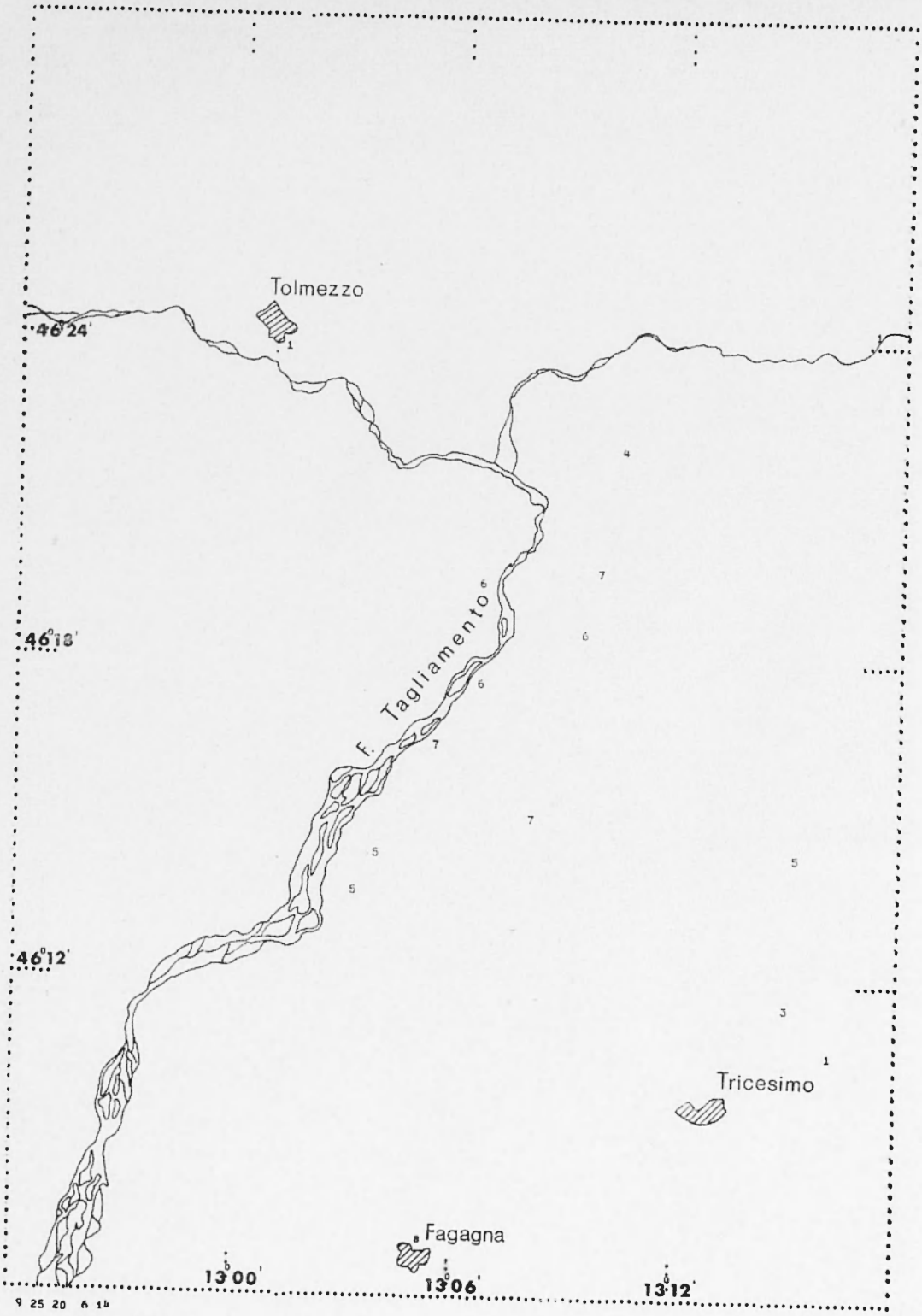


9 17 13 15 0

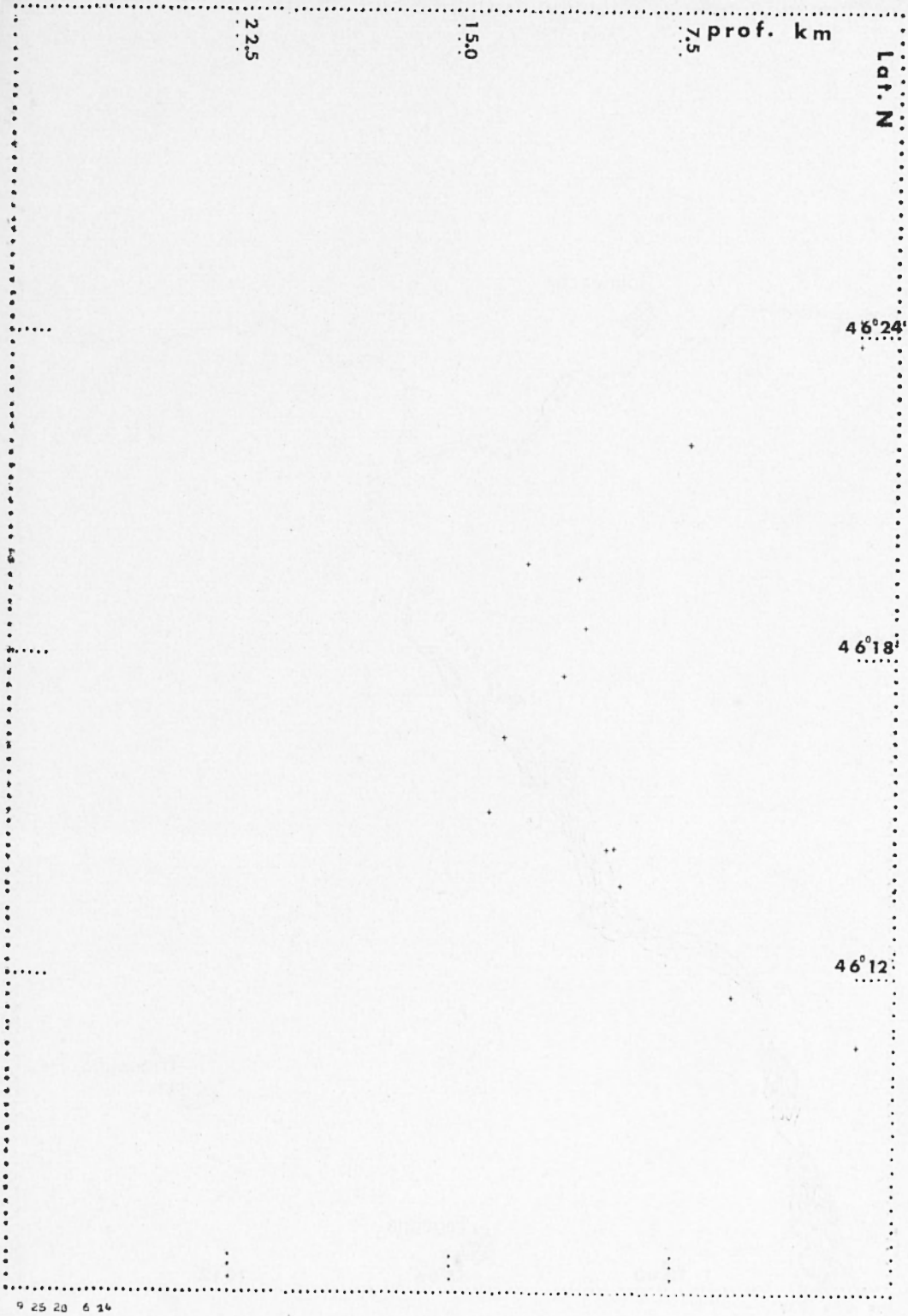


Figg. 22a-22b — From 9.17 $13^h\ 15^m$ to 9.22 $19^h\ 29^m$.
The activity decreases. A dip towards *S* of the alignement of the epicenters can still be observed.

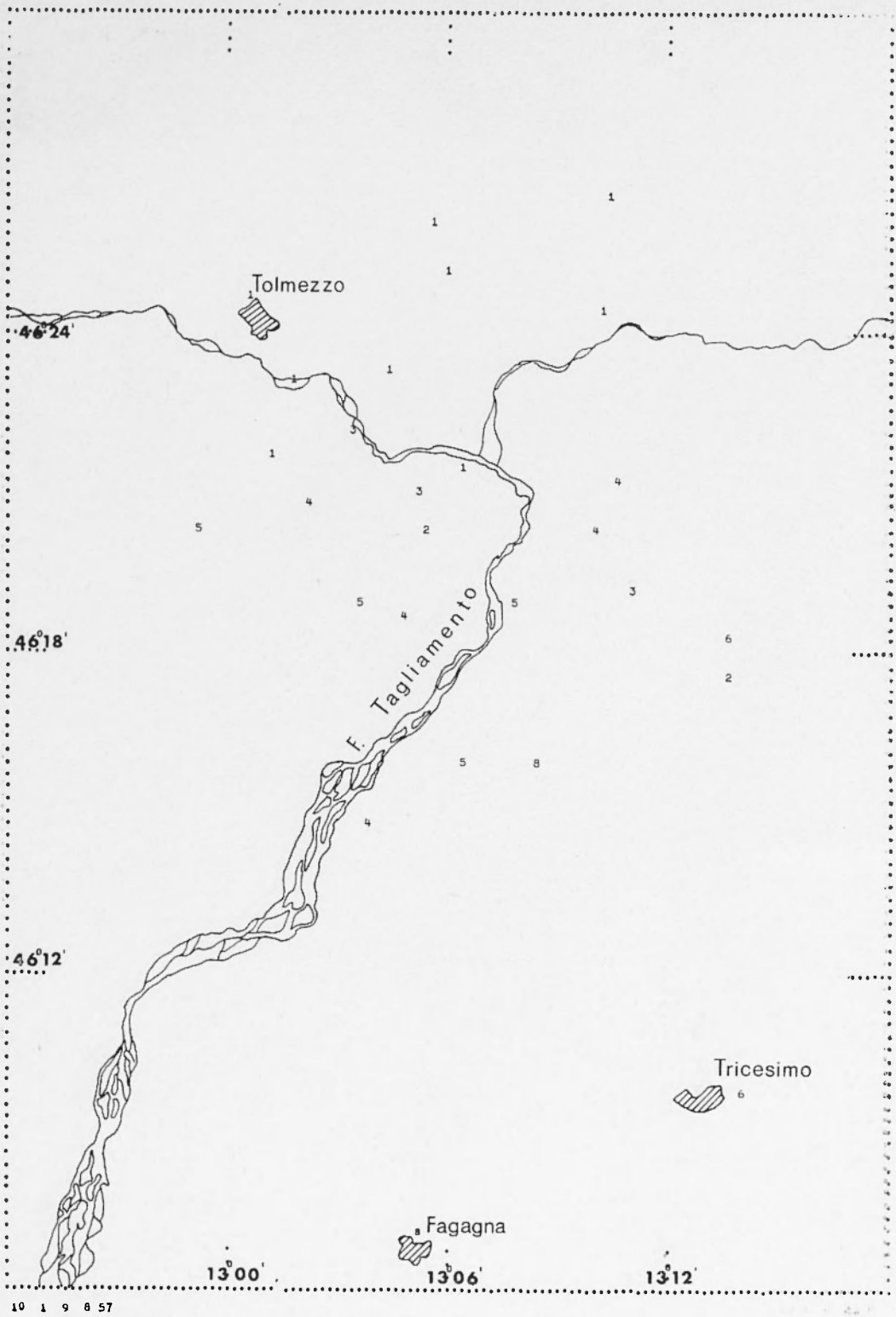
9 22 19 29 53



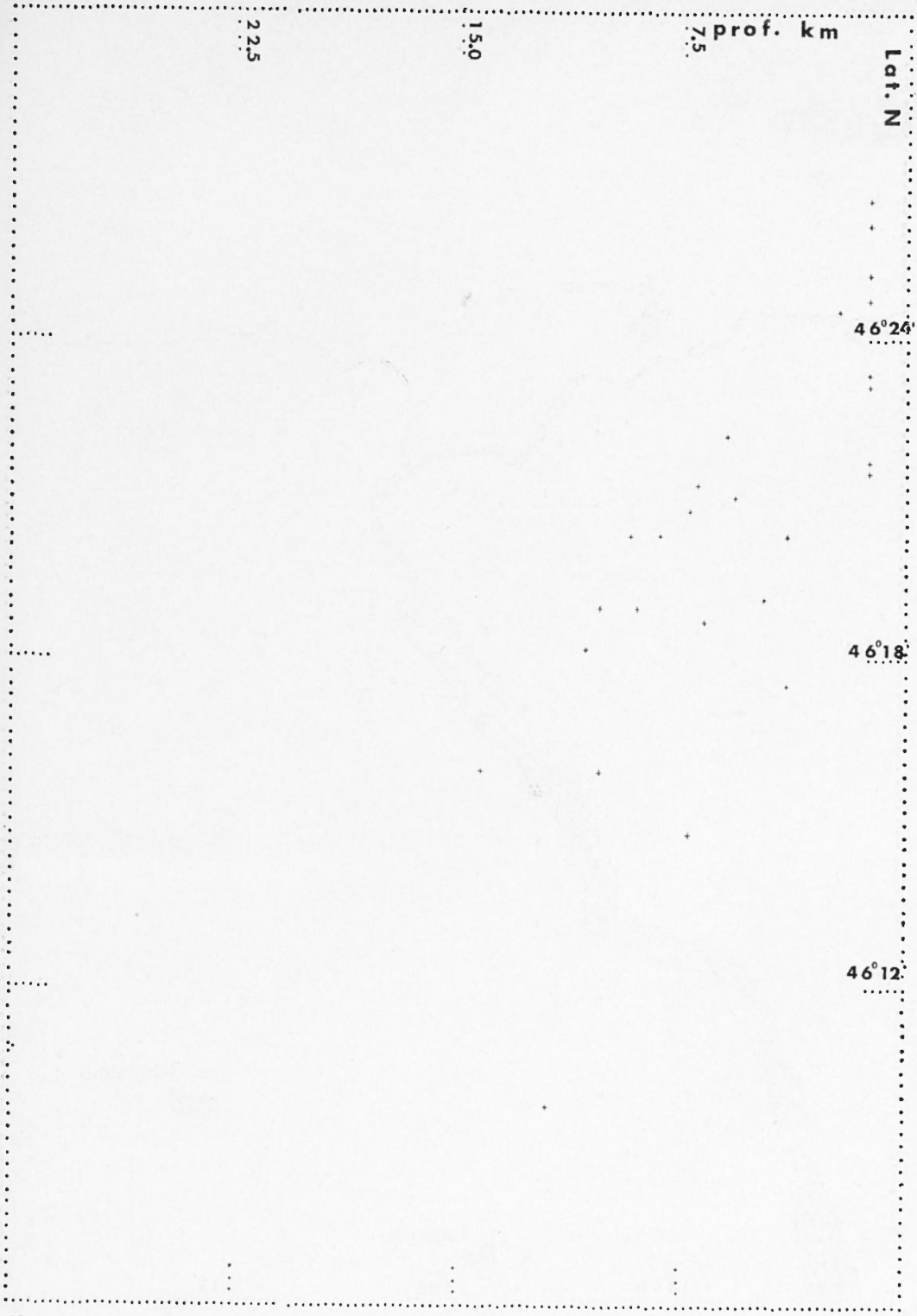
Figg. 23a-23b — From 9.22 $19^h 29^m$ to 9.25 $20^h 06^m$.
No high magnitude shocks can be seen. A modest activity is re-appearing to *S-E*.



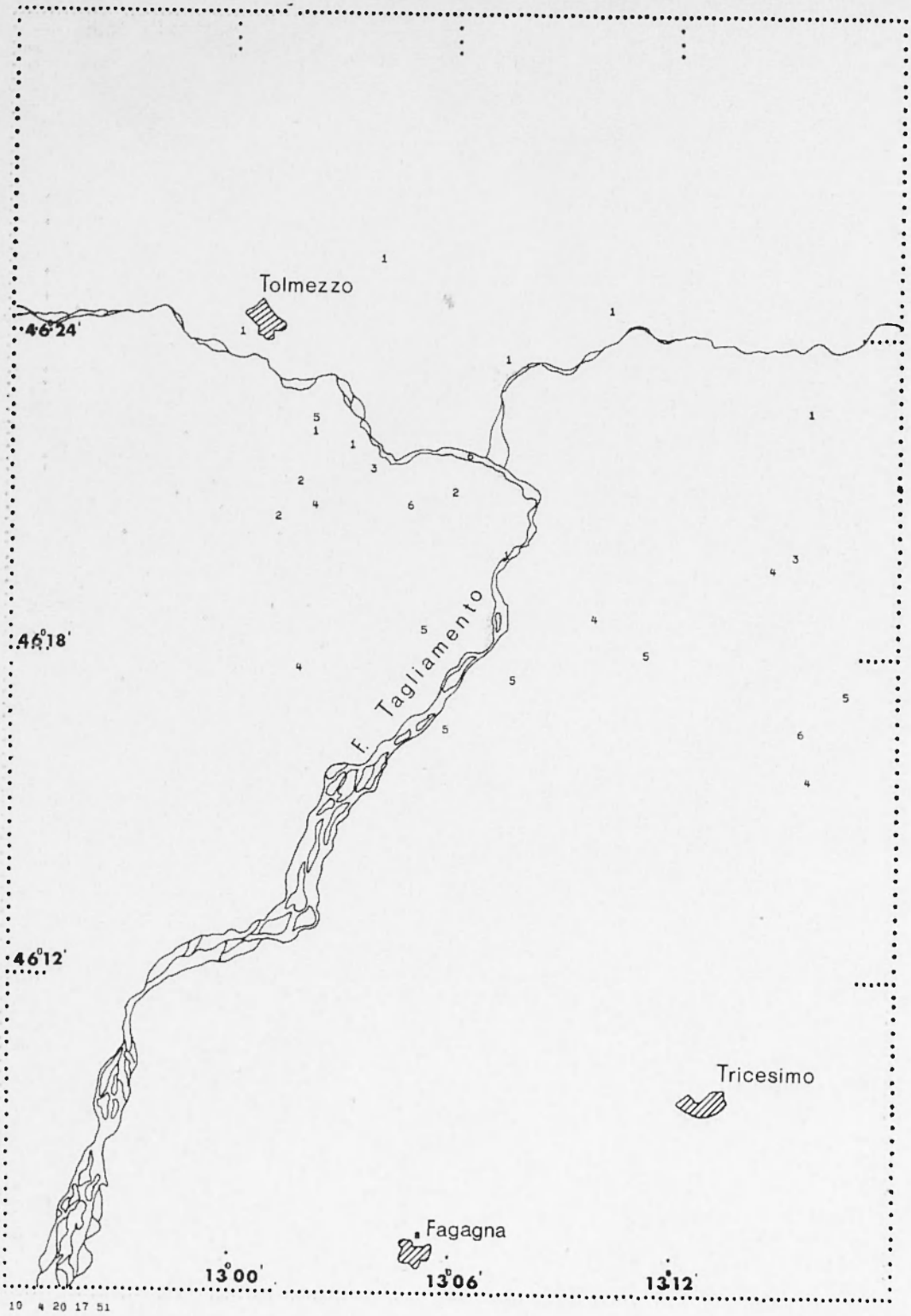
9 25 20 6 14



Figg. 24a-24b — From 9.25 $20^h 06^m$ to 10.1 $09^h 08^m$.
The activity is scanty. The most important observation can be made for the alignement of the hypocenters still towards *S*.

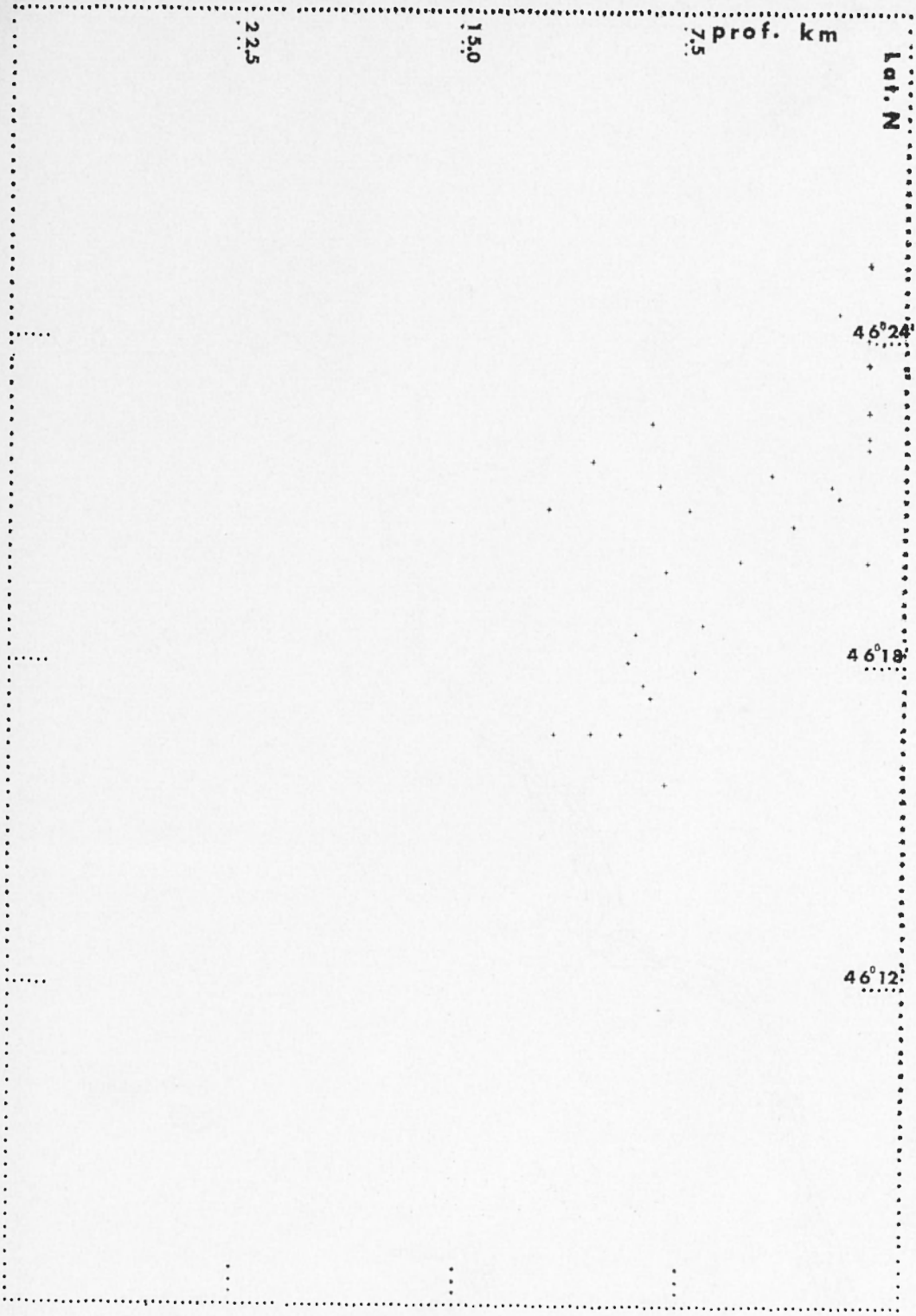


10 1 9 8 57

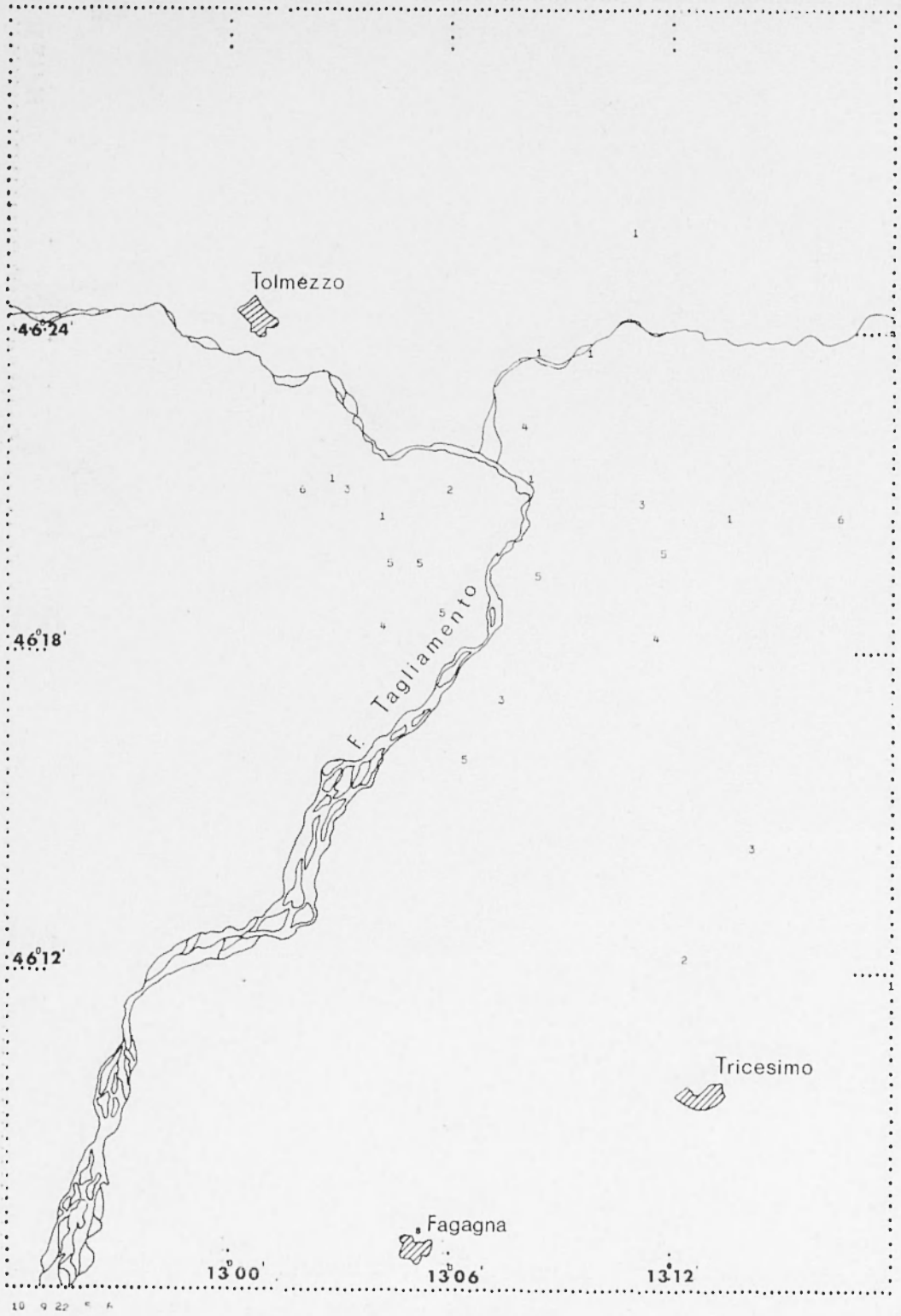


Figg. 25a-25b — From 10.1 $09^h 08^m$ to 10.4 $20^h 17^m$.

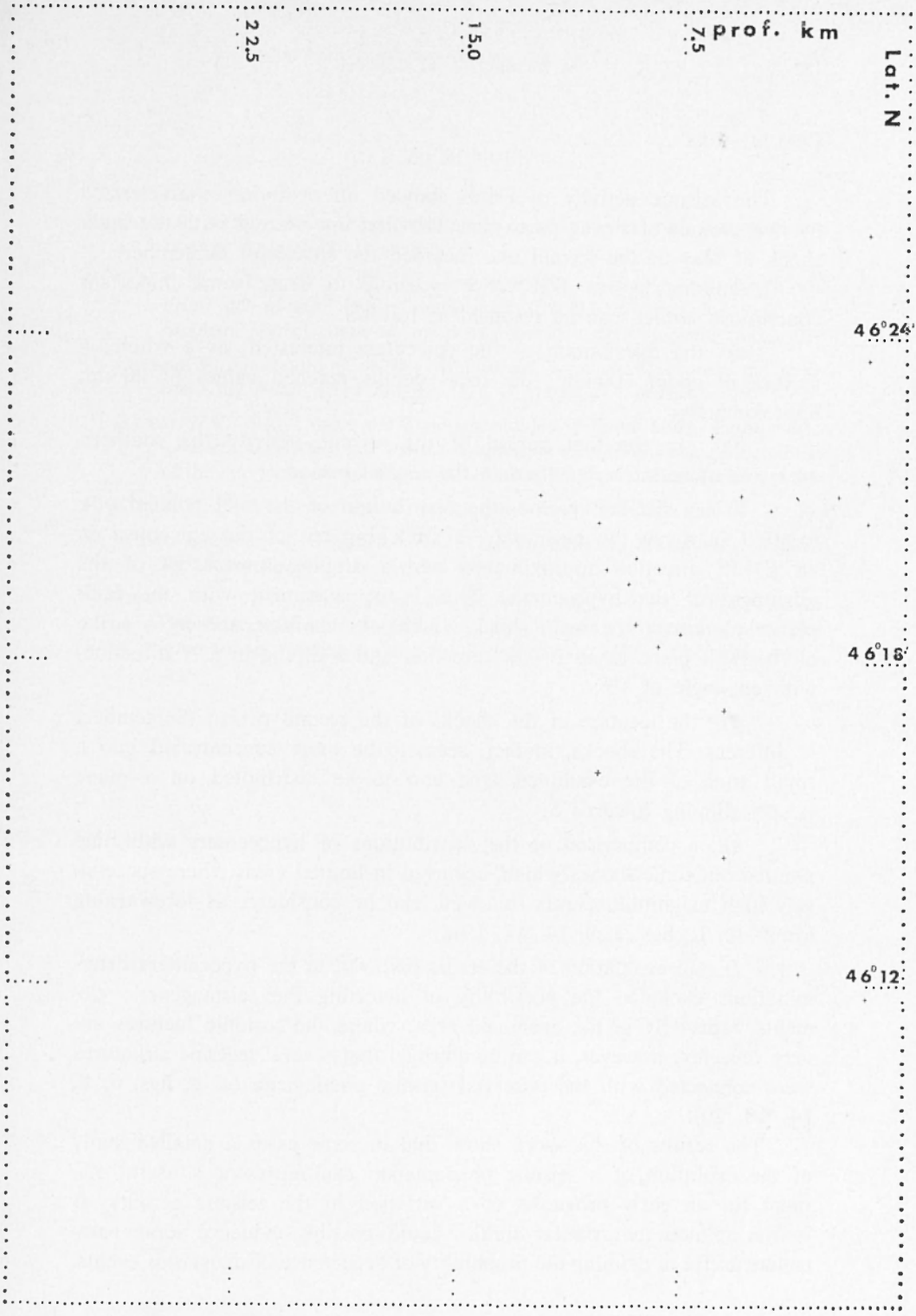
In the northern sector the activity is continuing. Also the alignement of the hypocenters is still dipping towards *S*.



10 4 20 17 51



Figg. 26a-26b — From 10.4 $20^h 17^m$ to 10.9 $22^h 05^m$.
The seismic activity has a low intensity, prevailingly concentrated in the northern sector.



10 9 22 5 6

CONCLUSIONS.

The seismic activity in Friuli showed an evolution characterized by two periods of strong paroxysm. The first one started with the main shock of May 6; the second one included the shocks of September.

Examining figures 1-26, it is possible to draw some important conclusions, which can be resumed as follows:

a) the distribution of the epicenters interested, as a whole, a surface of about 700 km^2; the focal depths reached values of 20 km, approximately;

b) in the first period of the seismic activity the southern area was more interested than in the second period;

c) in the first period, the distribution of the foci pointed out, event if in a not too clear way, a stretching out of the epicenters in an $E-W$ direction approximately and a dipping towards N of the alignment of the hypocenters. This is in agreement with the fault plane solution of the main shock which was characterized by a strike of the fault plane in an $E-W$ direction and a diping in a N direction, with an angle of 15^0;

d) the location of the shocks of the second period (September) is different. The shocks, in fact, seem to be more concentrated into a small zone of the examined area and to be distributed on a plane steeply dipping towards S;

e) a comparison of the distributions of hypocenters with time pointed out some shocks which, occurred in limited areas where successively high magnitude events followed, can be considerer as forewarning events (e. g., figs. 2, 9, 14, 17, 19);

f) an evaluation of the errors involved in the hypocenters determinations excluded the possibility of detecting the seismogenetic elements, especially in the examined area, where the tectonic features are very complex; however, it can be affirmed that several tectonic structures were connected with the observed seismic phenomena (e. g. figs. 6, 8, 14, 18, 20).

The results of this work show that in some cases a detailed study of the evolution of a seismic phenomenon can represent a useful element for an early prognosis of a variation in the seismic activity. It is our opinion that similar studies could possibly evidence some parameters useful in defining the probability of occurrence of dangerous events.

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