

REPORT ON THE FIRST-ORDER TRIANGULATION OF GREECE

by

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I.—The first-order triangulation net of Greece covers the whole territory of the country (continent and islands). The net has been determined at different periods in conformity with scientific rules and calculated with the Bessel ellipsoid as reference; the geodetic pillar of Athens Observatory was adopted as the origin of the geographical coordinates, which are shown on the annexed tabulation.

One part of the triangulation net, which forms a chain of triangles beginning at the Northern frontier and terminating at the Island of Crete and which is intended for the measurement of an arc of a meridian in accordance with the resolution carried in 1922 by the International Geodetic and Geophysical Union, was determined according to the standards recommended in higher geodesy and calculated with the international ellipsoid (Hayford) as reference, in the year 1946. This chain of triangles is the continuation of a similar chain through Yugoslavia.

On this chain, which should be considered as a fundamental net, the remainder of the net is now being adapted, a few control bases measured with the invar wire apparatus and several Laplace points being introduced in the appropriate calculations with the Hayford ellipsoid as reference in conformity with the indications of the International Geodetic and Geophysical Union.

II.—The first-order triangulation net of Greece is already connected with those of the same order passing through Yugoslavia, Bulgaria, Turkey (in Thrace) and Italy (through Albany) where the Florence Military Geographical Institute established (1941-1942) a first order triangulation net several points of which belong to the Greek triangulation net.

Moreover, the Hellenic net has been connected to the Dodecanese net determined by Italy which will shortly be suitably adapted to the Greek system after the liberation of the Dodecanese.

III.—In 1920-1922, the first-order triangulation net of Greece had been expanded over a fairly large portion of Asia-Minor territory. The annexed tabulation gives the geographical coordinates of the 1st and 2nd order points established there which also have as origin the geodetic pillar of Athens Observatory with the Bessel ellipsoid as reference.

IV.—During the last war, the Greek, Bulgarian, Turkish, Yugoslavia and Austrian triangulation systems were joined up by the British in view of the publication of charts of the Mediterranean area.

V.—Given the more than probable use of the triangulation net of Greece with modern methods of navigation, it is absolutely necessary that, on the one hand, the accuracy of the geographical coordinates of the radio stations be fixed and, on the other hand, to choose whether these coordinates should be determined by geodetic means or by means of astronomical observations.

In the first case, the distance between the stations will be more accurate because in the geodetic calculation of the geographical coordinates of a point starting from the geographical coordinates of another point, the distance between the two points is always taken as an element known with sufficient precision. On the contrary, in the second case, the determination of the geographical points depends on the direction of the vertical of each point only.

However, with reference to the second case, several Laplace points are included in the

TABLE II.

**TABLE OF THE GEOGRAPHICAL COORDINATES
OF 1st AND 2nd ORDER TRIANGULATION STATIONS OF ASIA MINOR.**
Carried out by the Greek Military Geographical Institute during the years 1919-1921.

TABLEAU II

**TABLEAU DES COORDONNEES GEOGRAPHIQUES DES STATIONS DE TRIANGULATION
DE PREMIER ET DEUXIÈME ORDRE DE L'ASIE MINEURE**
Effectuées par l'Institut Géographique militaire hellénique pendant les années 1919 à 1921

Name of Station (Nom des points)	Latitude	Longitude Athens Meridian (Longitude Méridien d'Athènes)	Name of Station (Nom des points)	Latitude	Longitude Athens Meridian (Longitude Méridien d'Athènes)	Name of Station (Nom des points)	Latitude	Longitude Athens Meridian (Longitude Méridien d'Athènes)
Ala-Oua	39° 29' 36" 8083	+3° 54' 7" 0614	Kydia	40° 15' 59" 7333	+4° 50' 15" 4998	Pindaros _I	39° 23' 18" 3119	+3° 39' 19 9843
Alaman-Dag	38 2 40 8364	+3 40 34 2688	Karatja-Ali	40 28 36 6048	+5 20 32 5461	Panormos	40 19 50 9661	+4 6 54 1895
Aoura ou Bic-Dag	38 6 59 7826	+4 47 37 9846	Kouyouk-Tepé	38 30 43 8546	+4 49 5 5586	Proussa	40 11 8 5158	+5 18 39 1588
Terme Est(Base de Proussa)	40 13 57 1901	+5 19 9 0616	Kisla-Dag	38 29 24 5503	+8 27 5 6987	Pelladarion	40 20 17 1207	+5 17 57 2574
Asman-Dag	39 12 21 8872	+3 9 1 0968	Kiritjali-Dag	38 14 45 9080	+5 8 20 7052	Palkaboli-Dag	38 1 32 7374	+4 28 58 6510
Ak-Dag	39 2 47 8167	+5 33 20 0715	Kinjil-Dag	38 46 57 7995	+5 40 58 6700	Platianos	40 15 43 3970	+5 17 24 3417
Vigla	40 42 4 6105	+5 2 48 6683	Képès-Dag	39 3 47 4040	+4 34 3 6514	Panisa	38 37 4 3437	+3 12 26 7745
Glo	38 52 32 8214	+4 16 8 9007	Kastro	38 24 48 9234	+3 25 46 1335	Pindaros	39 21 44 8534	+3 30 8 2930
Joud-dag	38 55 52 8556	+3 32 46 0379	Kastraki	38 25 00 3936	+3 17 59 8724	Paraga	38 31 27 1527	+3 18 44 0260
Yaïlatjik	39 18 54 5158	+3 19 15 4556	Kalerga	39 2 56 2342	+3 20 22 5974	Prion	37 55 10 5598	+3 42 16 6050
Yethre	39 8 56 0601	+3 21 12 2313	Kouyoutjak	38 43 46 6190	+4 16 46 6676	Samos	37 43 40 1069	+2 54 16 2075
Guioh-Tepé	39 38 55 8567	+3 37 14 8479	Karlik	38 22 16 1639	+3 58 58 2886	Sipylon _I	38 33 58 8147	+3 44 14 5542
Yeni-kloï	39 48 14 9481	+4 15 57 2008	Kagal-Dag	38 20 22 8534	+4 29 34 4582	Sipylon _{II}	38 31 55 8838	+3 45 2 6870
Guios-Dedé	40 9 31 6524	+5 32 42 8524	Kentik	38 27 57 5112	+3 58 38 8403	Sedan-Dag	39 7 40 5090	+4 24 2 7772
Guioubek	38 23 30 4456	+5 31 3 9854	Kaplatji-Dag	38 6 44 1808	+3 35 28 8391	Sivri-Dag	39 15 37 6296	+4 00 9 7834
Gourgour-Dag	38 11 49 9378	+3 41 3 3482	Kartal-Dag	37 59 53 2607	+3 49 5 2932	Sobeï	39 29 21 6396	+3 29 51 5818
Yanapâ	38 59 17 3623	+4 29 31 6404	Kavakli	37 54 5 6839	+4 9 47 8245	Somakli-Dag	38 55 14 3950	+4 41 17 6990
Yatji-Dag	38 51 14 3634	+5 8 3 9885	Myconos	37 29 8 3394	+1 36 55 4497	Simau-Dag	39 4 48 3268	+5 4 52 4087
Yordan	40 11 47 5635	+3 59 58 2622	Mimas	38 32 47 8800	+2 47 11 2378	Sokioun	39 9 5 1788	+4 11 16 9590
Varine-Dag	39 28 6 2126	+3 23 28 4579	Macronissos	38 30 59 0997	+2 59 55 8972	Sari-Kailla	38 46 22 5849	+4 11 59 2208
Yaïla-Dag	38 55 58 1827	+3 42 13 2905	Meurovouni	38 51 44 8477	+3 50 59 9994	Soucrana	38 29 14 3863	+5 42 47 5660
Yidokastro	38 1 25 1932	+4 42 15 5040	Moshonisso	39 20 32 1070	+2 55 27 9455	Sinerli	38 35 58 8686	+3 57 30 7171
Gour-Tas	37 58 24 4976	+3 43 31 6347	Michalitsi	40 15 46 0102	+4 36 51 6177	Solmissos	37 54 2 2948	+3 37 24 9608
Drakon	38 20 44 0115	+3 47 11 1075	Moudania	40 21 14 0032	+5 6 10 3207	Sorkoun	38 53 3 3518	+5 21 23 0459
Didymos	38 55 56 6728	+5 59 32 4568	Memourt-Dag	38 55 35 1981	+3 42 12 8644	Tsinar-Oua	38 38 00 4750	+4 2 24 4378
Terme Ouest(Base de Proussa).	40 13 28 9862	+5 16 51 8497	Boz-Tepé	38 36 10 0955	+5 46 19 9396	Tmolos _I ou Boz-Dag _I	38 19 22 7423	+4 23 2 5306
Terme Ouest(Base de Menemeni)	38 29 35 8336	+3 15 44 8946	Mal-Tepé	38 13 4 8146	+4 3 33 8655	Tourkman	39 26 20 7597	+4 14 44 2478
Doga	40 10 14 8591	+4 24 1 4340	Boz-Dag _I	38 19 22 7423	+4 23 2 5306	Tsatal-Dag	39 51 49 8736	+4 36 27 3373
Enas-Dag	39 3 52 4440	+3 51 20 1008	Messogis	37 57 6 7862	+4 10 51 3774	Tmolos _{II}	38 15 29 7062	+4 45 16 5700
Elma-Dag	38 46 80 3222	+5 46 19 6791	Monastirion	38 35 23 9309	+3 36 50 7521	Tsatal-Dag	38 38 29 7048	+5 15 56 7640
Ecmensise	38 29 40 3638	+3 46 33 9445	Mimas _{II}	38 33 19 4663	+2 46 49 1898	Tsal-Dag	38 22 19 5746	+5 46 19 7440
Ikarla	37 32 22 9873	+2 20 7 1898	Mehmetli-Dag	38 10 32 3973	+5 00 50 0850	Tsomna	40 13 33 7700	+4 23 20 4913
Idi	39 41 25 5941	+3 9 23 6632	Dédé-Dag	38 33 6 8476	+3 26 21 1452	Tarhanla-Dag	39 8 12 2962	+3 51 48 1449
Irkout-Tepé	39 47 41 2290	+4 00 18 4972	Doumanli-Dag	38 42 38 0832	+3 23 11 0492	Tserkez	38 44 49 5038	+3 44 9 6433
Intetjik	38 35 42 0405	+5 33 31 2029	Nymphéon	38 23 14 1995	+3 38 19 4948	Tsaous-Dag	38 15 55 3724	+4 41 56 4689
Korycos	38 11 54 2589	+2 52 5 6323	Dobek-Dag	38 39 41 0258	+4 29 45 3442	Ypsili-Koryphi	37 50 43 4156	+3 00 14 5726
Kijil-Dag	38 19 52 3736	+3 16 41 8480	Diskarya	40 16 17 3456	+5 30 17 4574	Phokea	38 43 17 3264	+3 8 10 0358
Karatja-Dag	38 3 47 8393	+3 22 24 4630	Dergen-Didi	38 37 55 7964	+4 54 11 8663	Hatji-Pagona	40 5 00 1612	+4 10 51 3682
Kijil-Tepé	38 47 37 4701	+3 40 46 3393	Darouassi	38 24 45 8663	+4 11 24 8593	Larissa [Meandros]	38 7 24 1230	+3 57 52 2436
Kol-Déré	38 40 10 0955	+3 58 1 4643	Ouatjik	38 20 41 9302	+3 55 18 1166	Lophos Giannopoulos	38 34 23 3747	+4 14 2 9775
Kara-Dag (Dikeli)	38 58 5 5780	+3 8 28 6964	Omer-Baba	38 25 39 0315	+5 5 33 9060	Tourkmen	39 5 40 4975	+4 49 6 4310
Mel-Dag	39 57 38 5793	+4 19 41 5495	Ouyouk-Tepé	37 53 42 0006	+3 55 21 8830	Terme Est(Base de Menemeni)	38 29 29 9523	+3 19 54 3783
Kalaitjilar	39 42 00 5061	+4 5 20 5236	Pelineon	38 33 20 7270	+2 17 12 5203			
Kermasti	40 3 31 7291	+4 34 47 3480	Pergamos	39 7 55 4252	+3 27 59 4262			

Greek net the coordinates of which, astronomically determined, are shown in the annexed list. These points may be used for the installation of radio stations if their location is suitable, seeing that the accuracy of their coordinates is quite satisfactory.

VI.—Utilisation of the geodetic nets of Greece and North-East Africa for modern navigation is likely to necessitate the solution of the problem of connecting the Crete and African systems.

For the purposes of this connection there exist a fairly large number of Greek and foreign proposals; one of the Greek proposals has been approved by the International Congress of the International Geodetic and Geophysical Union which met at Stockholm in 1930. However, this proposal requiring considerable working facilities or special instruments and a very large expenditure, it was not applied.

Another proposal, emanating from Yugoslavia and considered very interesting by the General Assembly of the above-mentioned Union held at Lisbon in 1933, has not been carried out for lack of the necessary means.

As the Americans recently solved a similar problem (extension of the triangulation net to the Bahama Islands) in a very satisfactory way, it would be practical to apply the new method then used for obtaining the geodetic connection between Crete and Africa (*).

Greece, having a large interest in the realisation of this project and of the measurement of the arc of the meridian, would be ready to bring her contribution by *every* means within her power.

Having unfortunately been despoiled of her technical and scientific equipment by the Germans, she would nevertheless be ready to make her technical personnel available for any such undertaking.

TABLE III
GREEK MILITARY GEOGRAPHICAL INSTITUTE

List of Geographical coordinates of astronomically determined points of the trigonometrical net

N°	NAME OF STATION	LATITUDE	LONGITUDE
1	Pilier géodésique de l'Observatoire d'Athènes	37°58'18" 6.800	23°42'58" 8.150
2	Terme Sud de la base de Corfou.....	39°37'12" 2.750	19°47'26" 8.500
3	Terme N. W. de la base de Larissa....	39°37'12" 5.245	22°27'30" 8.850
4	Terme Sud de la base de Drama.....	41°03'53" 5.460	24°03'43" 0.920
5	Terme Sud de la base de Crète.....	35°05'11" 1.700	25°40'29" 8.425
6	Kartal Iepé (Adrinople).....	41°35'41" 3.325	26°27'09" 4.500



(*) Commander R. W. Knox (U.S. Coast and Geodetic Survey) has kindly sent us details of another method which is considered more suitable for the solution of the question.