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The Novi Vinodol Astronomic and Trigonometric Point

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Abstract. The paper gives a historical account of how the Novi Vinodol astronomic point was created – a point which has been maintained until the present day as a second class trigonometric point. It is the end point of a chain of triangles set up in the early 20th century to establish the halfway parallel, i.e. the parallel corresponding to 45° latitude. The geometric and astronomic works were conceived and led by General Stevan P. Bošković, Director of the Military-Geographic Institute in Belgrade.

Keywords: Novi Vinodol, astronomic point, trigonometric point, Military-Geographic Institute

1 Introduction

The parallel of latitude which corresponds to latitude 45°N is often called the 45th parallel, although this name is not appropriate, since there are uncountably many parallels, which are impossible to to classify as primary, secondary, and so on. If the Earth were a perfect sphere, then this parallel would divide the meridian arc from the Equator to the North Pole into two equal parts. However, since the Earth has only an approximately spherical shape, the parallel only divides the meridian arc approximately in half. It is sometimes called the halfway parallel (after the French *Le parallèle moyen entre le pole et l'équateur*). At this latitude, the Sun is visible for 15 hours and 37 minutes at the time of the summer solstice, and for 8 hours and 46 minutes at the time of the winter solstice.

This halfway parallel passes through Croatia on the Istrian Peninsula and the Islands of Krk (Fig. 1) and Cres (Figs. 2 and 3) and then continues along the mainland. It is marked in particular in the town of Senj (Fig. 4). Today, pupils learn about the shape of the Earth as early as Class Five in Croatia. It is approximately spherical, somewhat flattened at the poles, and known as the rotational ellipsoid. Of course, at this stage, children cannot understand what is meant by the ellipsoid, and due to a lack of better comparisons, their teachers tell them it is egg-shaped!

In the mid-18th century, the shape of the Earth was a pressing scientific issue. Among others, Ruđer Josip Bošković was occupied with it. It was approached both theoretically (Newton, Huygens) and practically (through geodetic surveys). It was assumed that the Earth's shape was a rotational ellipsoid, so that measuring the length of the meridian arc which corresponded to a latitude length of 1° at least, at different points on the Earth's surface would enable its dimensions to be measured. Geodesists undertook these measurements from the mid-18th century on.

In the early 19th century, the notion arose of ascertaining the lengths of meridian arcs, and the lengths of certain parallel arcs, too. The measurement of the length of the halfway parallel arc, beginning in France, at the Atlantic coast, and further to the Adriatic Sea in Croatia, was of particular interest (Brousseaud and Nicollet, 1826, Brousseaud 1839). It was intended to continue measurements to the Black Sea, however, they ended in Rijeka (*Fiume* at that time).

In 1876, a special institution was established in Belgrade for the task of land surveying and creating military maps (Geographic Department of the General Headquarters – later the Military-Geographic Institute). At that time, geodesy was concerned with defining geodetic data: the position and orientation of the adopted ellipsoid; controlling the orientation of the trigonometric

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Astronomska točka i trigonometar Novi Vinodol

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Saželak. U radu je dan povijesni prikaz nastanka astronomske točke Novi Vinodol koja je sačuvana do danas kao trigonometar 2. reda. Riječ je o krajnjoj točki lanca trokuta koji je bio postavljen početkom 20. stoljeća za određivanje srednje paralele, tj. paralele kojoj odgovara geografska širina 45°. Geodetske i astronomske radove osmislio je i vodio general Stevan P. Bošković (1868–1957), ravnatelj Vojnogeografskog instituta u Beogradu.

Ključne riječi: Novi Vinodol, astronomska točka, trigonometar, Vojnogeografski institut

1. Uvod

Paralela kojoj odgovara 45º sjeverne geografske širine često se naziva i 45. paralelom premda taj naziv nije dobar jer paralela ima neprebrojivo beskonačno mnogo, tako da ih se ne može poredati u niz i reći ova je prva, ova druga itd. Kad bi Zemlja bila savršena sfera, tada bi ta paralela dijelila luk meridijana od ekvatora do sjevernoga pola na dva jednaka dijela. Međutim, budući da Zemlja ima približno sferni oblik, ta paralela dijelit će spomenuti luk meridijana približno na pola. Ponekad se ta paralela naziva i *srednjom paralelom*, npr. na francuskom *Le parallèle moyen entre le pole et l'équateur*. Na toj geografskoj širini Sunce je vidljivo 15 sati i 37 minuta u vrijeme ljetnoga solsticija, a 8 sati i 46 minuta u vrijeme zimskoga solsticija.

Srednja paralela u Hrvatskoj prolazi istarskim poluotokom, otocima Krkom (slika 1) i Cresom (slike 2 i 3), i nastavlja se dalje kopnom. Posebno je označena u gradu Senju (slika 4).

Danas učenici već u 5. razredu osnovne škole uče o Zemljinu obliku. On je sfernog oblika, malo spoljošten na polovima i naziva se elipsoidom. Naravno da učenici u toj dobi ne mogu razumjeti što je to elipsoid pa ga nastavnici u nedostatku boljih usporedbi uspoređuju s jajem!

Sredinom 18. stoljeća Zemljin oblik bio je prvorazredno znanstveno pitanje. Između ostalih, i Ruđer

Fig. 1 Plate marking the halfway parallel on the Island of Krk. Photo by M. Lapaine, 2007

Slika 1. Ploča s oznakom srednje paralele na otoku Krku. Snimio M. Lapaine 2007.

network; processing the levelling network; determining the geoid, and participating in international projects and various investigations into trigonometric networks (Radojčić 2009). The Department undertook the first such tasks in 1882, in order to establish the cause of contradictory coordinate points in Serbia determined by the Austrians in 1875 and the Russians in 1879, on the basis of which a survey of Serbia at the scale of 1:50,000 was launched. The first organised, systematic, contemporary astronomic work began in 1900, when for the first of 30 points throughout Serbia, the time (longitude), latitude and azimuth were measured, with the aim of determining the shape of the geoid.

Fig. 2 Marker of the halfway parallel on the Island of Cres. Photo by Nikola di Giusto, 2013
Slika 2. Oznaka srednje paralele na otoku Cresu. Snimio Nikola di Giusto 2013.

2 The Halfway Parallel

At the assembly of the International Union of Geodesy and Geophysics (IUGG) held in Stockholm in 1930, a proposal was accepted from the representative of the Kingdom of Yugoslavia, Stevan. P. Bošković, Geodetic General and Director of the Military-Geographic Institute (1868–1957) to determine the length of the halfway parallel. The goals and methods were to be compatible with similar projects undertaken by the IUGG, also proposed by Bošković, and adopted at the assembly in Rome in 1922, to acquire the quality data needed to determine the dimensions and shape of the Earth, and elements for linking the national triangulation networks through whose territory the lines passed, so that each country was to conduct the necessary surveys using its own resources, coordinated by the IUGG, or rather the special Permanent Commission of the IUGG. Bošković was the chair of the 1928 Meridian Commission, and of the 1930 Parallel Commission (Radojčić 2007, 2014.).

The preparatory work for the Yugoslav section of the arc started in 1931, and measurement of the horizontal angles began in 1932. Astronomic measurements at points of the chain were carried out from 1933 on (all points as Laplace points). The extreme points of the Yugoslav section of the chain lying along the halfway parallel were selected by Bošković and were the *Novi Vinodol* point in the west, and *Straža* (Vršac) in the east.

3 Novi Vinodol Astronomic Point

The first astronomic measurements at the *Novi Vinodol* point (Figs. 5 and 6) were performed in 1933. In that year, the Military Geographic Institute (MGI) participated in an international project to determine geodetic longitudes simultaneously (this was again the result of Bošković's initiative in 1927; he elucidated the details of his work and results in *Prva i druga odredba*

Fig. 3 Plate marking the halfway parallel on the Island of Cres. Photo by Nikola di Giusto, 2013
Slika 3. Ploča s oznakom srednje paralele na otoku Cresu. Snimio Nikola di Giusto 2013.

Fig. 4 *Sundial Sculpture* in Senj, located on the halfway parallel. Photo by M. Lapaine, 2015
Slika 4. *Sunčanik* u Senju na srednjoj paraleli. Snimio M. Lapaine 2015.

Bošković bavio se tim problemom. Tom se pitanju pristupalo teorijski (Newton, Huygens) i praktično – geodetskim mjerenjima. Uz pretpostavku da je Zemlja po obliku rotacijski elipsoid, trebalo je izmjeriti duljinu luka meridijana kojem odgovara barem 1° geografske širine na različitim mjestima na Zemljinoj površini i na temelju takvih mjerenja odrediti Zemljine dimenzije. Takva mjerenja izvodili su geodeti od sredine 18. stoljeća.

Početkom 19. stoljeća pojavila se ideja da se uz određivanje duljine luka meridijana odredi i duljina luka nekih paralela. Posebno je zanimljivo bilo mjerenje duljine luka srednje paralele koje je započelo u Francuskoj, na obali Atlantskog oceana i nastavljeno do Jadranskoga mora u Hrvatskoj (Brousseaud i Nicollet 1826, Brousseaud 1839). Bilo je zamišljeno da se mjerenja nastave do Crnoga mora, no završila su u Rijeci (*Fiume*).

Godine 1876. formirana je u Beogradu posebna ustanova sa zadatkom izmjere zemljišta i izrade vojnih karata – Geografsko odeljenje Glavnog generalštaba (kasnije Vojnogeografski institut – VGI). U to doba suvremena geodezija bavila se definiranjem geodetskog datuma (pozicioniranjem i orijentacijom usvojenog elipsoida), kontrolom orijentacije trigonometrijske mreže, obradom nivelmanske mreže, određivanjem

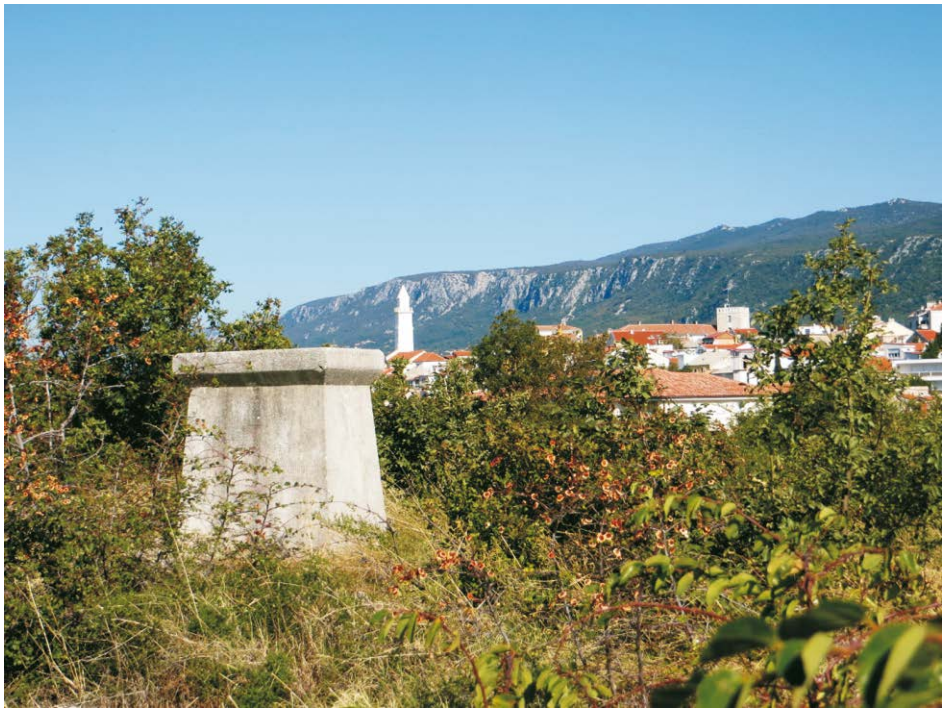

Fig. 5 Post of the *Novi Vinodol* astronomic point, today a 2nd-order trigonometric point. In the background is the tower of Sts. Philip and James' (sv. Filip i Jakov) Church in Novi Vinodolski. Photo by M. Lapaine, 2016
Slika 5. Stup astronomske točke *Novi Vinodol* – danas trigonometar 2. reda. U pozadini toranj župne crkve sv. Filipa i Jakova u Novom Vinodolskom. Snimio M. Lapaine, 2016.

Fig. 6 *Novi Vinodol* astronomic point. The superscription on the post reads: Astronomic point, Military Geographic Institute, 1933. Photo by M. Lapaine, 2016
Slika 6. Astronomska točka *Novi Vinodol*. Na stupu je natpis: Astronomska tačka, Vojni geografski institut, 1933. Snimio M. Lapaine, 2016.

geografske dužine Beograda 1926. i 1933. (First and Second Determinations of the longitude of Belgrade, 1926 and 1933), published by the Serbian Academy of Science, Belgrade in 1946). Bošković wanted the determination of geodetic longitudes at the MGI observatory in Belgrade to be performed simultaneously with the determination of geodetic longitudes at the extreme points of the arc of the halfway parallel, and then, at these points, to continue by determining the geodetic latitudes and azimuths, so that both points would be Laplace points (Radojčić 2016).

Work on the *Novi Vinodol* point was entrusted to Ivan I. Mesić, first-class geodetic captain (and on *Straža*, to Dobrosav Z. Šobić, second-class geodetic captain). However, due to the unusually bad weather (frequent, heavy rain) measurements were interrupted in the Novi Vinodolski area. It is not known whether Mesić or another person carried out the stabilisation of the point, nor when.

Measurement continued, or rather began again, in 1935. The determination of the geodetic latitude, longitude and azimuth (toward *Veli Vrh*, Fig. 7) was performed by Dimitrije M. Zubac, geodetic lieutenant. He used the Kern one-second universal theodolite in his observations:

- to determine geodetic latitude: 15 pairs of stars according to the Pevtsov method

[1] Mikhail Vasil'evich Pevtsov (1843–1902), military geographer, geodesist, traveler, researcher if Central Asia, major general.

Fig. 7 Post at *Veli Vrh* point on the Island of Krk. The azimuth from the *Novi Vinodol* point was determined (1933–1936) toward this point. Photo by M. Lapaine, 2017
Slika 7. Stup na točki *Veli vrh* na otoku Krku. Na tu je točku određivan azimut s točke *Novi Vinodol* (1933–1936). Snimio M. Lapaine 2017.

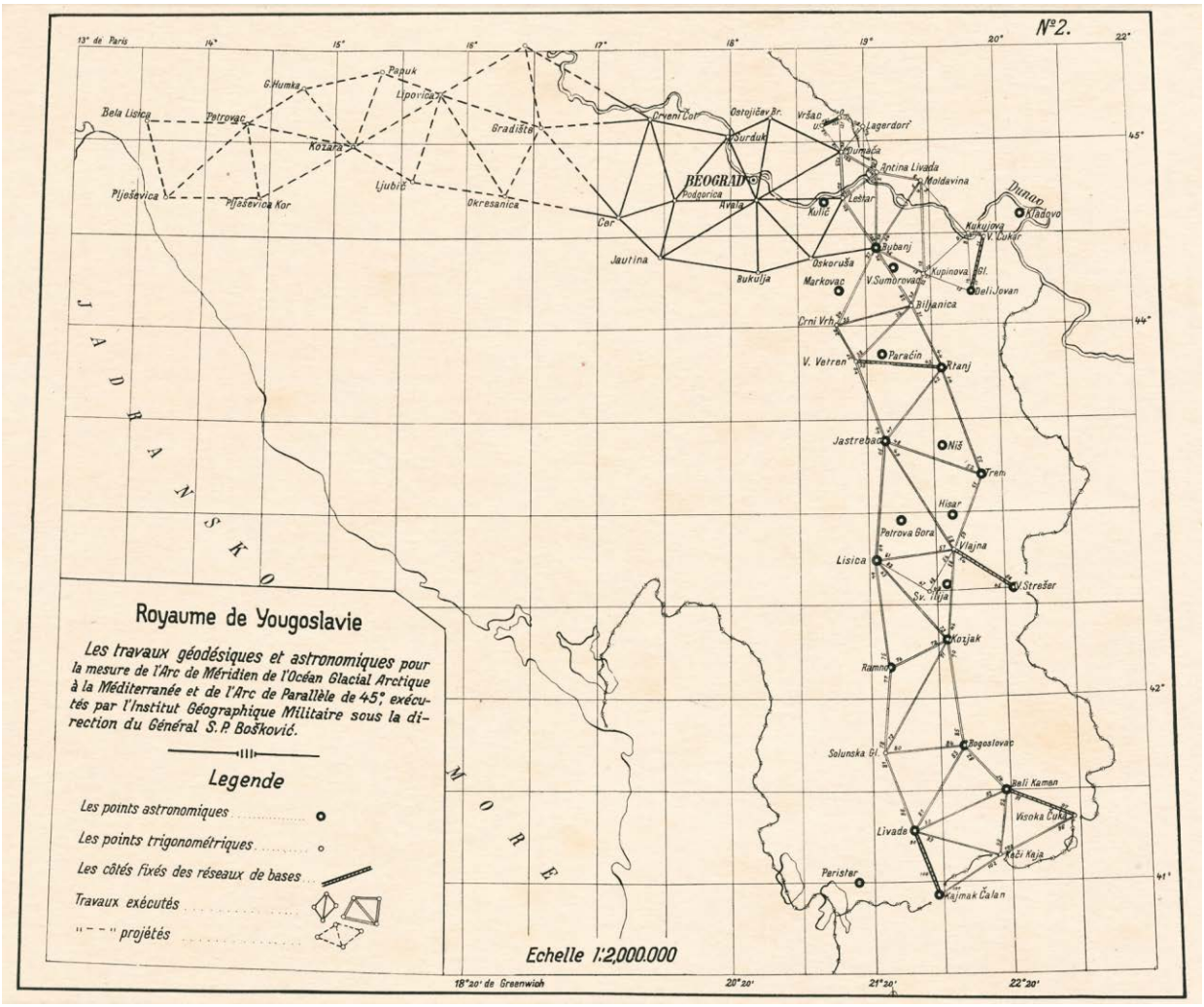

Fig. 8 Map showing geodetic and astronomic work related to surveying the length of the meridian arc from the Arctic Ocean to the Mediterranean Sea, and the arc of the halfway parallel, performed by the Military Geographic Institute between 1930 and 1933, under the direction of General S. P. Bošković (Bošković 1933).

Slika 8. Karta koja prikazuje geodetske i astronomske radove u vezi s mjerenjima duljine luka meridijana od Arktičkog oceana do Sredozemnog mora i luka srednje paralele koje je izvodio Vojnogeografski institut u razdoblju 1930–1933 pod ravnateljstvom generala S. P. Boškovića (Bošković 1933)

geoida, sudjelovanjem u međunarodnim projektima i raznim ispitivanjima trigonometrijskih mreža (Radojčić 2009). Prve takve radove Odeljenje je preuzelo 1882. godine kako bi se utvrdio uzrok neslaganja koordinata točaka koje su na srpskom području odredili Austrijanci 1875. godine i Rusi 1879. godine, a s kojih je 1881. započela izmjera Srbije u mjerilu 1:50 000. Prvi organizirani sustavni suvremeni astronomski radovi počinju 1900. godine kada su na prvoj od ukupno 30 točaka širom Srbije određeni vrijeme, širina i azimut s ciljem određivanja oblika geoida.

2. Srednja paralela

Na Generalnoj skupštini Međunarodne geodetske i geofizičke unije (*International Union of Geodesy and Geophyics* – IUGG) održanoj u Stockholmu 1930. godine, usvojen je prijedlog predstavnika Kraljevine Jugoslavije, geodetskoga generala i načelnika Vojnogeografskog instituta (VGI) Stevana P. Boškovića (1868–1957), da se pristupi određivanju duljine luka srednje paralele. Ciljevi i način rada bili su kompatibilni sa sličnim projektom koji je IUGG, također na Boškovićev prijedlog, usvojio na skupštini u Rimu 1922. godine – doći do kvalitetnih podataka potrebnih za određivanje dimenzija i oblika Zemlje i elemenata za povezivanje nacionalnih triangulacija država preko čijih teritorija prelaze te linije, i to tako što će potrebna mjerenja obaviti svaka država vlastitim snagama, uz koordinaciju IUGG-a, odnosno posebnih stalnih povjerenstava IUGG-a. S. P. Bošković bio je predsjednik povjerenstava za meridijan od 1927, a za paralelu od 1930. godine (Radojčić 2007, 2014).

Pripremni radovi na jugoslavenskom dijelu luka počeli su 1931. godine, a od 1932. mjereni su horizontalni

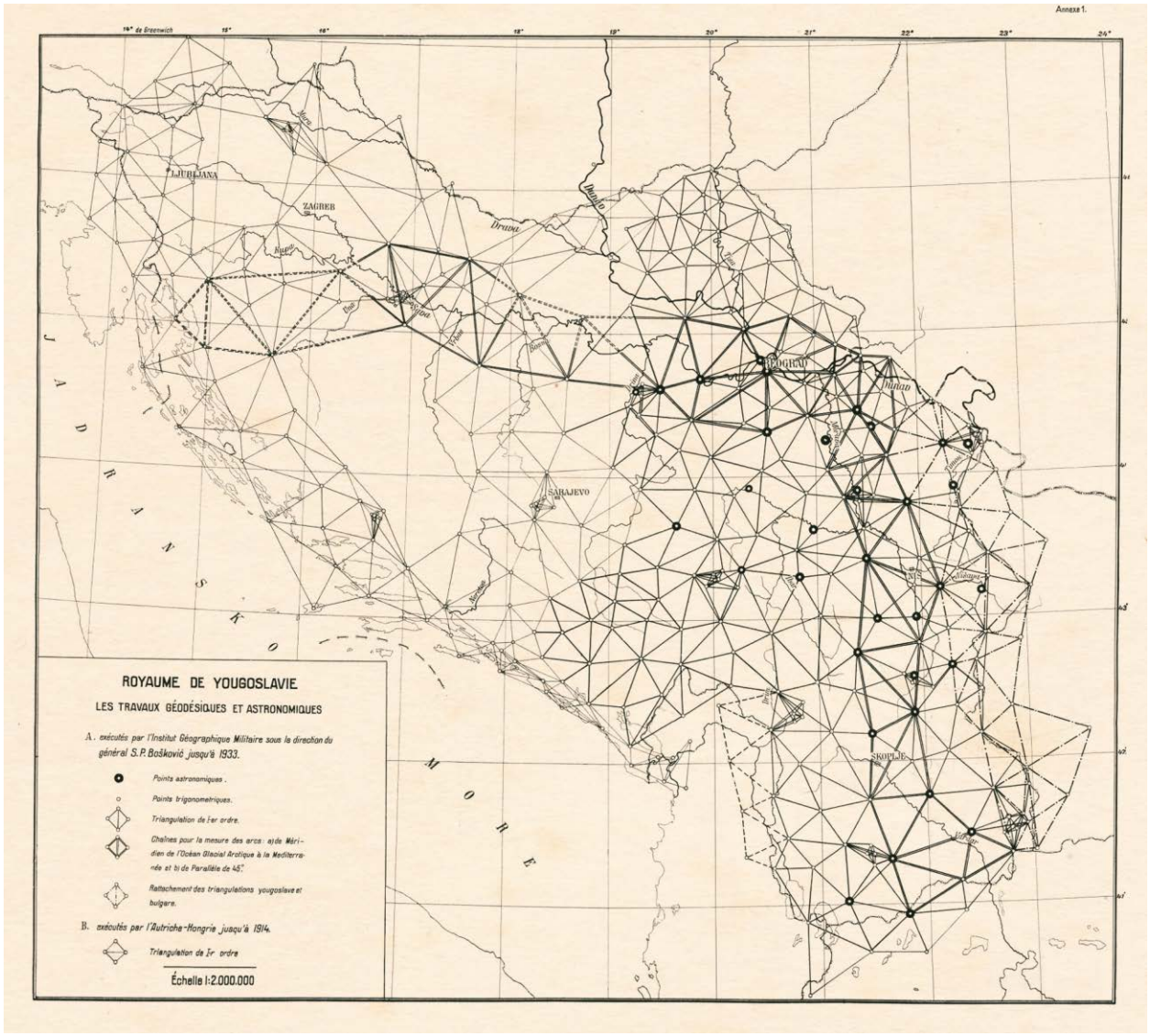

Fig. 9 Map showing a) geodetic and astronomic work carried out by the Military Geographic Institute up to 1933 under the direction of General S. P. Bošković, and b) work carried out by Austro-Hungary up to 1914 (Bošković 1934)
Slika 9. Karta koja prikazuje A. geodetske i astronomske radove koje je izvodio Vojnogeografski institut do 1933. pod ravnateljstvom generala S. P. Boškovića i B. radove Austro-Ugarske do 1914. (Bošković 1934)

- to determine time (adjustment): 10 to 15 pairs of stars each evening (6 evenings altogether), according to Tsinger's[2] method
- to determine the azimuth: 12 measurements in both positions of the telescope, in relation to the Pole Star.

Time signals emitted from four international radio stations were received using Cook's equipment during six evenings.

The measurements at the *Novi Vinodol* point were repeated in 1936 by Dušan Đ. Manzalović, second-order geodetic captain. He used the one-second Kern universal theodolite as follows:

- to determine geodetic latitude: 20 pairs of stars according to the Pevtsov method
- to determine time (adjustment): 73 pairs according to Tsinger's method
- to determine the azimuth: 12 measurements in both positions of the telescope in relation to the Pole Star; Veli Vrh was signalised with a Berlux lamp.

Time signals broadcast from two international radio stations were received over several evenings using a home-made VT apparatus built by Mihailo Maširević, engineer. Contactless Ericsson chronometers were used. Bradley's method was used to register the passage of the stars over the cross-hairs.

Unfortunately, we do not have the reports of these surveys and data processing done by the calculators of the Astronomic Section of the MGI, under the directorship of Vladimir V. Tretjakov, geodetist-hydrologist. They were all lost during the Second World War.

[2] Nikolay Jakovlevich Tsinger (1842–1918), astronomer, geodesist, topographer, professor, lieutenant general.

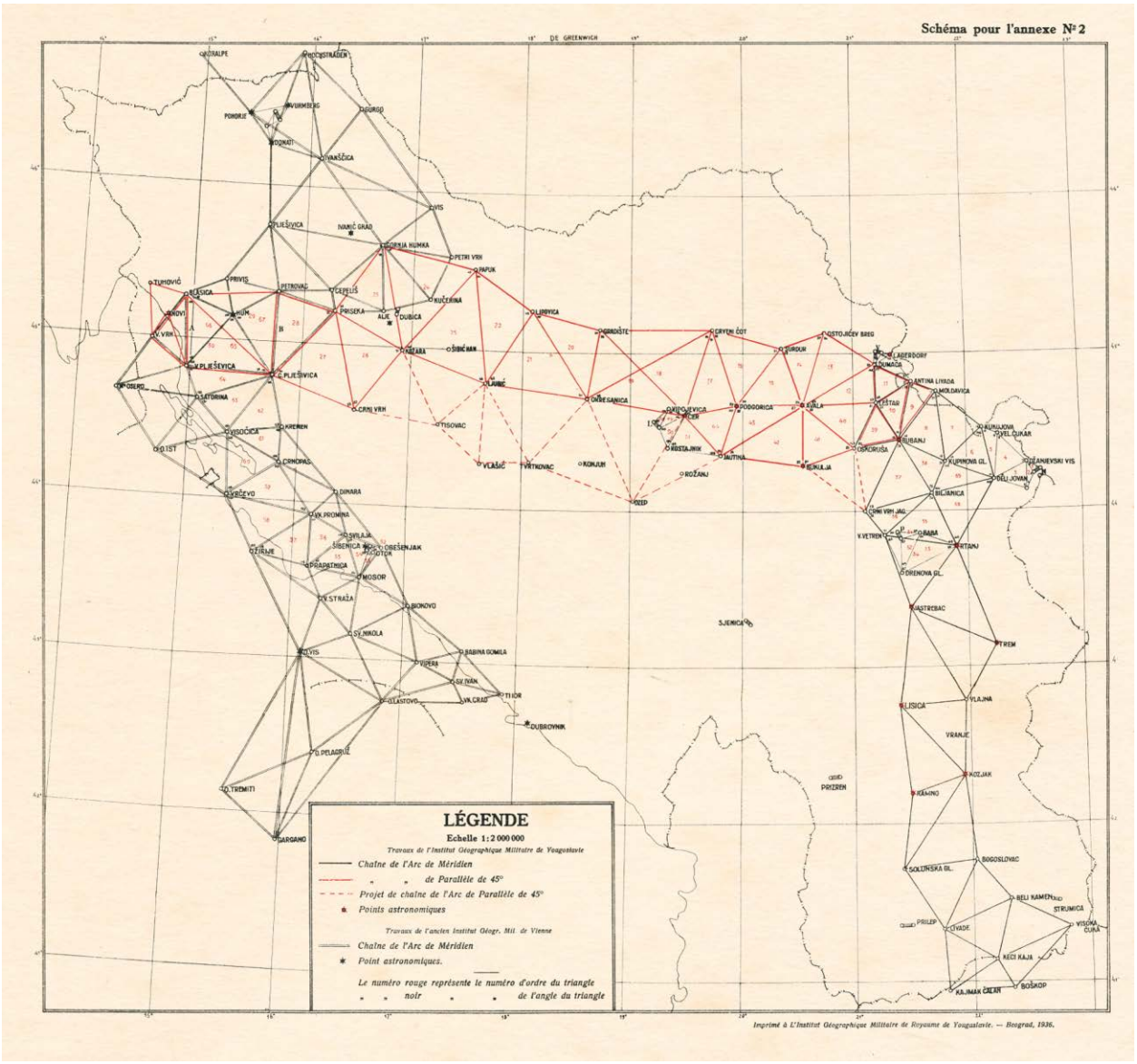

Fig. 10 Map showing chains of triangles derived and projected in relation to surveys of the length of the meridian arc and arc of the halfway parallel, conducted by the Military Geographic Institute in Belgrade, and earlier by the Military Geographic Institute in Vienna (Bošković 1936)

Slika 10. Karta koja prikazuje izvedene i projektirane lance trokuta u vezi s mjerenjima duljine luka meridijana i luka srednje paralele koja su izvodili Vojnogeografski institut u Beogradu i prije njega Vojnogeografski institut u Beču (Bošković 1936)

kutovi. Astronomska mjerenja na točkama lanca izvođena su od 1933. godine (sve točke kao Laplaceove). Za krajnje točke jugoslavenskog dijela lanca položenog uzduž srednje paralele S. P. Bošković je odabrao na zapadu točku kod Novog Vinodolskog (točka *Novi Vinodol*, kako se Novi tada zvao), a na istoku točku kod Vršca (točka *Straža*).

3. Astronomska točka Novi Vinodol

Prva astronomska mjerenja na točki *Novi Vinodol* (slike 5 i 6) obavljena su 1933. godine. Te je godine VGI sudjelovao na međunarodnom projektu simultanog određivanja geodetskih dužina (do kojeg je došlo, opet na Boškovićevu inicijativu iz 1927. godine; rad na tom projektu i rezultate Bošković je detaljno izložio u svojoj knjizi *Prva i druga odredba geografske dužine Beograda 1926. i 1933. g*, izdanje Srpske akademije nauka, Beograd 1946), a Bošković je htio da se istodobno s određivanjem geodetskih dužina na opservatoriju VGI-a u Beogradu izvrše i određivanja geodetskih dužina na krajnjim točkama luka srednje paralele, a da se zatim na tim tačkama nastavi i s određivanjem geodetske širine i azimuta, tj. da obje točke budu Laplaceove točke (Radojčić 2016).

Radovi na točki *Novi Vinodol* povjereni su geodetskom kapetanu I. klase Ivanu I. Mesiću (a na *Straži* geodetskom kapetanu II. klase Dobrosavu Ž. Šobiću). Međutim, zbog neuobičajenih vremenskih neprilika (česte i obilne kiše) na području Novoga Vinodolskog,

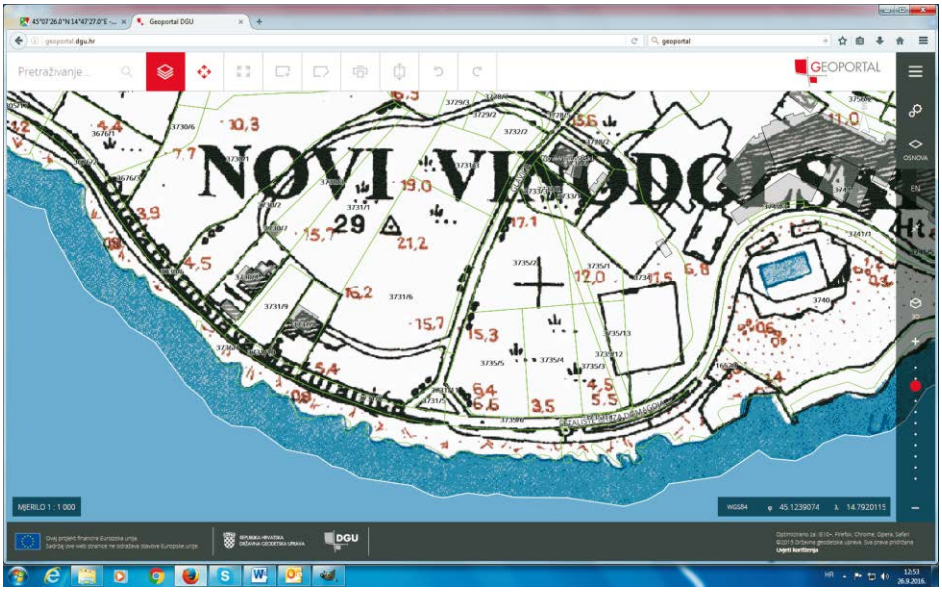

Fig. 11 Position of the *Novi Vinodol* point shown on the basic map of Croatia as trigonometer number 29 (https://geoportal.dgu.hr)
Slika 11. Položaj točke *Novi Vinodol* prikazan na Hrvatskoj osnovnoj karti kao trigonometar broj 29 (https://geoportal.dgu.hr)

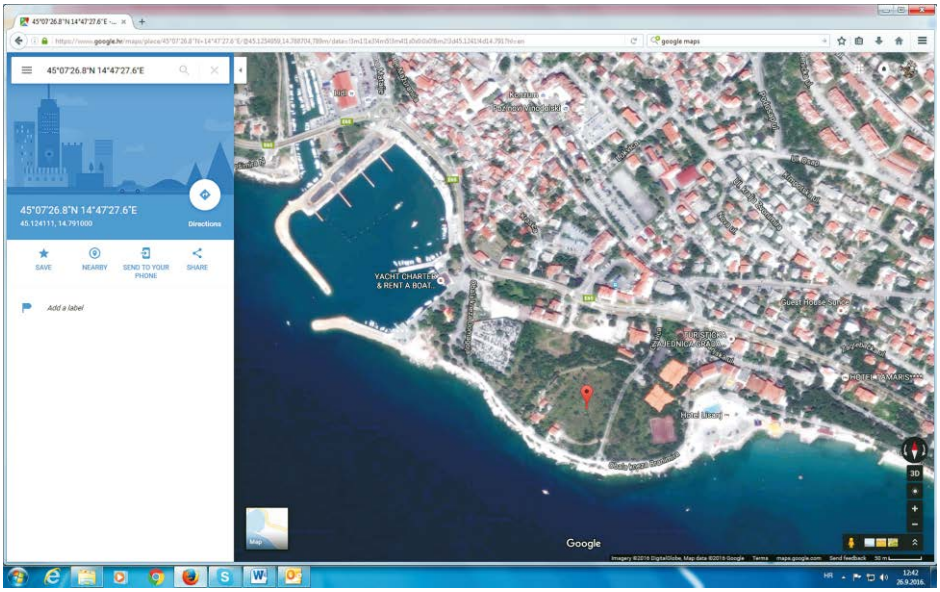

Fig. 12 Position of the *Novi Vinodol* point, trigonometric point number 29, shown on Google Maps (https://www.google.hr/maps)
Slika 12. Položaj točke *Novi Vinodol*, odnosno položaj trigonometra br. 29 prikazan na Google mapsu (https://www.google.hr/maps)

However, thanks to the reports sent by S. P. Bošković to the IUGG on the work of the MGI between general assemblies, many copies of which were printed (Bošković 1925, 1927, 1930, 1933, 1934, and 1936), and in combination with other surviving reports, analyses and recollections by those who participated in the work, kept by the MGI, it is possible to reconstruct the basic data for most of the geodetic and geophysical work undertaken by the MGI (Figs. 9, 10, and 11).

In the last of these reports, dated 1939, signed by Bošković's successor as Director of the MGI, Milorad J. Terzić, geodetic general, the final results of processing Manzalović's survey at the *Novi Vinodol* point in 1936 were published (Radojčić 2009):

Geodetic latitude:	45° 07' 10''.60 ± 0''.09
Geodetic longitude:	0h 59m 08s.589 ± 0s.13
	East of Greenwich
Azimuth (*Veli Vrh*)	31° 52' 46''.69± 0''.27

4 Geodetic Point – Trigonometric Point Number 29

The position of the post which defined the *Novi Vinodol* astronomic point can be seen on the Basic Map of Croatia, where it is marked as trigonometeric point number 29 (Fig. 10), or on Google Maps (Fig. 11). The post is on a private road and is looked after by the State Geodetic Administration of the Republic of Croatia. It is a second-order trigonometric point stabilised with a concrete post above the ground measuring 60 × 60 × 130 cm on a concrete plinth. The approximate coordinates in the WGS84 system are 45° 7' 26.96'' N and 14° 47' 27.37'' E.

5 Conclusion

In Novi Vinodolski, in Croatian Primorje, there is a well-preserved post placed by the Military Geographic

mjerenja su bila prekinuta. Je li stabilizaciju te točke izveo Mesić ili je to napravio netko drugi i kada, nije poznato.

Nastavak mjerenja – zapravo, novo mjerenje – uslijedio je 1935. godine. Određivanje geodetske širine, dužine i azimuta (na točku *Veli vrh*, slika 7) izveo je geodetski poručnik Dimitrije M. Zubac. Upotrijebio je Kernov jednosekundni univerzalni teodolit, kojim je opažao:

- za određivanje geodetske širine: 15 parova zvijezda po Pjevcovljevoj metodi
- za određivanje vremena (popravke sata): 10 do 15 parova zvijezda svaku večer (ukupno 6 večeri), po Cingerovoj metodi
- za određivanje azimuta: 12 girusa u oba položaja durbina, u odnosu na Polaru.

Vremenski signali emitirani sa 4 svjetske radiostanice primani su Coockovim priborom, tijekom 6 večeri.

Mjerenja na točki Novi Vinodol ponovljena su 1936. godine. Izveo ih je geodetski kapetan II. klase Dušan Đ. Manzalović. I on je upotrijebio jednosekundni Kernov univerzal, i to:

- za određivanje geodetske širine: 20 parova zvijezda po Pjevcovljevoj metodi
- za određivanje vremena (popravke sata): ukupno 73 para po Cingerovoj metodi
- za određivanje azimuta: 12 girusa u oba položaja durbina, u odnosu na Polaru; Veli vrh signaliziran je lampom Berluks.

Vremenski signali emitirani sa 2 svjetske radio-stanice primani su, tijekom nekoliko večeri, aparatom domaćeg proizvođača V.T. koji je konstruirao inž. Mihailo Maširević. Upotrijebljeni su beskontaktni kronometri Ericson. Bradlyjevom metodom registriran je prolaz zvijezda preko konaca končanice.

Na žalost, danas ne raspolažemo zapisnicima tih mjerenja i elaboratima obrade koju su obavili kalkulatori Astronomske sekcije VGI-a pod rukovodstvom geodeta-hidrologa Vladimira V. Tretjakova. Sve je to nestalo tijekom II. svjetskoga rata. Ipak, zahvaljujući izvještajima koje je S. P. Bošković dostavljao IUGG-u o radu VGI-a između dviju Generalnih skupština, a koji su tiskani u većem broju primeraka (Bošković 1925, 1927, 1930, 1933, 1934, 1936) i koji u kombinaciji s pojedinim izvještajima, analizama i sjećanjima učesnika tih radova koji su ostali sačuvani u VGI-u, moguća je rekonstrukcija osnovnih podataka za većinu geodetskih i geofizičkih radova VGI-a (slike 9, 10, 11).

U posljednjem od tih izvještaja, onom iz 1939., koji je potpisao Boškovićev nasljednik na mjestu načelnika VGI-a, geodetski general Milorad J. Terzić (1879–1939), objavljeni su i konačni rezultati obrade mjerenja D. Manzalovića na točki *Novi Vinodol* iz 1936. godine (Radojčić 2009):

geodetska širina:	$45^{o}\ 07'\ 10''.60 \pm 0''.09$
geodetska dužina:	$0^{h}\ 59^{m}\ 08^{s}.589 \pm 0^{s}.13$
	istočno od Greenwicha
azimut (*Veli vrh*)	$31^{o}\ 52'\ 46''.69 \pm 0''.27$

4. Geodetska točka – trigonometar br. 29

Položaj stupa koji definira astronomsku točku *Novi Vinodol* može se vidjeti na Hrvatskoj osnovnoj karti, gdje je označen kao trigonometar broj 29 (slika 10) ili npr. na Google Mapsu (slika 11). Stup se nalazi na privatnoj čestici, a o njemu brigu vodi Državna geodetska uprava RH. Riječ je o trigonometru 2. reda, stabiliziranom s pomoću betonskog stupa iznad zemlje dimenzija 60×60×130 cm na betonskom postolju. Približne koordinate u sustavu WGS84 su 45° 7' 26,96'' N i 14° 47' 27,37'' E.

5. Zaključak

U Novom Vinodolskom u Hrvatskom primorju vrlo dobro je sačuvan stup koji je 1933. godine postavio Vojnogeografski institut iz Beograda. Riječ je o betonskom stupu iznad zemlje dimenzija 60×60×130 cm na betonskom postolju kojim je stabilizirana astronomska točka, kao krajnja točka lanca trokuta postavljenog za određivanje srednje paralele, tj. paralele kojoj odgovara geografska širina 45^{o}. U današnje doba to je trigonometar 2. reda o kojem vodi brigu Državna geodetska uprava RH. Astronomske i geodetske radove iz toga doba na području tadašnje Kraljevine Srba, Hrvata i Slovenaca te zatim Kraljevine Jugoslavije moguće je pratiti na temelju izvještaja koje je pisao i objavljivao ravnatelj Vojnogeografskog instituta u Beogradu, general Stevan P. Bošković i jednog izvještaja njegova nasljednika na toj dužnosti, geodetskog generala Milorada J. Terzića (1939).

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[1] Mihail Vasil'evič Pevcov (1843–1902), vojni geograf, geodet, putnik, istraživač srednje Azije, general-major.

[2] Nikolaj Jakovlevič Cinger (1842–1918), astronom, geodet, topograf, profesor, general-pukovnik.

Institute of Belgrade in 1933. It is a concrete post above the ground measuring 60 × 60 × 130 cm, set on a concrete plinth. Thus, the astronomic point was stabilised as the extreme point of a chain of triangles set up to determine the halfway parallel, that is, the parallel corresponding to 45° latitude. Today, it is a second-order trigonometeric point looked after by the State Geodetic Administration of the Republic of Croatia. Astronomic and geodetic work from the period in the area of what was then the Kingdom of the Serbs, Croats and Slovenes, and later the Kingdom of Yugoslavia, can be traced through the reports written and published by the Director of the Military Geographic Institute, General Stevan P. Bošković and one of his successor to that position geodetic general Milorad J. Terzić (1939).

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