

Field fortifications from the Second World War: possibilities of archaeological research on post-military landscapes in South Moravia (Czech Republic)

Jiří Zubalík*

Institute for Archaeological Heritage Brno, Czech Republic

* Corresponding author: zubalik.jiri@gmail.com

ABSTRACT

Field fortifications from the end of World War 2 which were located in South Moravia are almost forgotten nowadays. This paper presents first results of archaeological research of their remains.

Recently, relics of field fortifications have been registered during rescue excavations on 13 construction sites. In the vicinity of the town of Brno, parts of Wehrmacht trench systems, which defended whole town, have been excavated and documented on several sites. Several dozen small infantry entrenchments have been recorded near Pasohlávky and Mušov, where serious fights lasted for two weeks.

Also, the use of aerial archaeology will be outlined. On five sites, field fortifications have been identified with the help of digital aerial orthophotos (especially historical) and digital elevation model (derived from airborne laser scanning). Results of both excavations and aerial archaeology suggests that archaeology can enhance our knowledge of this kind of relics.

Received: 9 January 2019

Accepted: 22 May 2019

Published online: 15 August 2019

Zubalík, J. (2019): Field fortifications from the Second World War: Possibilities of archaeological research on post-military landscapes in South Moravia (Czech Republic). *AUC Geographica* 55(1), 77–92

<https://doi.org/10.14712/23361980.2019.11>

© 2019 The Author. This is an open-access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>).

1. Introduction

There is already a history of archaeological research of modern battlefields of 20th century, especially in Western Europe. Many scientists could be mentioned here such as Nicholas Saunders and his work concerning World War 1 (Saunders 2004; 2005; 2010), Alfred Gonzales-Ruibal and his excavations of Spanish Civil War battlefields (2011; 2012), or the work of David G. Passmore and his colleagues on the Western front of World War 2 (Passmore, Harrison 2008; Passmore et al. 2013; 2014), to name but a few. On the other hand, the battlefield archaeology is still rather neglected in the Czech Republic. The situation is better in Bohemia; here archaeologists seriously started to survey the World War 2 sites after 2010. Michal Rak concerned with field fortifications of Czechoslovak army from 1938, shot down aircrafts and victims of war (Rak 2011; 2013; 2014). Petr Čech leads an extensive excavation of positions of German anti-aircraft battery in north-west Bohemia (Čech et al. 2014). In recent years, there was an excavation of the concentration camp in Lety in South Bohemia (Vařeka 2018). Also, The Association of Recent Archaeology survey an anti-aircraft defence of Pilsen; its map can be

accessed online on the site <http://protivzduشناobrana.plzne.cz>.

In South Moravia (Fig. 1), there is almost no interest in research of World War 2 among archaeologists. The only exception occurs during excavations on construction sites; if a wartime relic is unearthed, it is properly documented and often excavated. Thanks to this fact, we know graves of fallen soldiers (e. g. Bartík, Chrástek 2018; Kala 2015; 2016; 2018), air-raid shelters (e. g. Holub et al. 2009) and trenches (e. g. Geislerová, Parma 2013). Besides, only amateurs are interested in World War 2 relics. Especially sites of crashed aircrafts are documented (for example <http://www.leteckabadatelna.cz>) and to a lesser extent field fortifications too (<http://www.polni-opevneni.websnadno.cz>).

The topic of the Second World War field fortifications in South Moravia, despite serious fights that took place there, is almost forgotten nowadays. However, there are several examples from Western Europe, which show us, that archaeology can well document trenches and foxholes of a modern conflict. Large areas fortified with trenches are known in the Netherlands and Germany; these trench systems have been identified by LiDAR surveys (Hesse 2014;

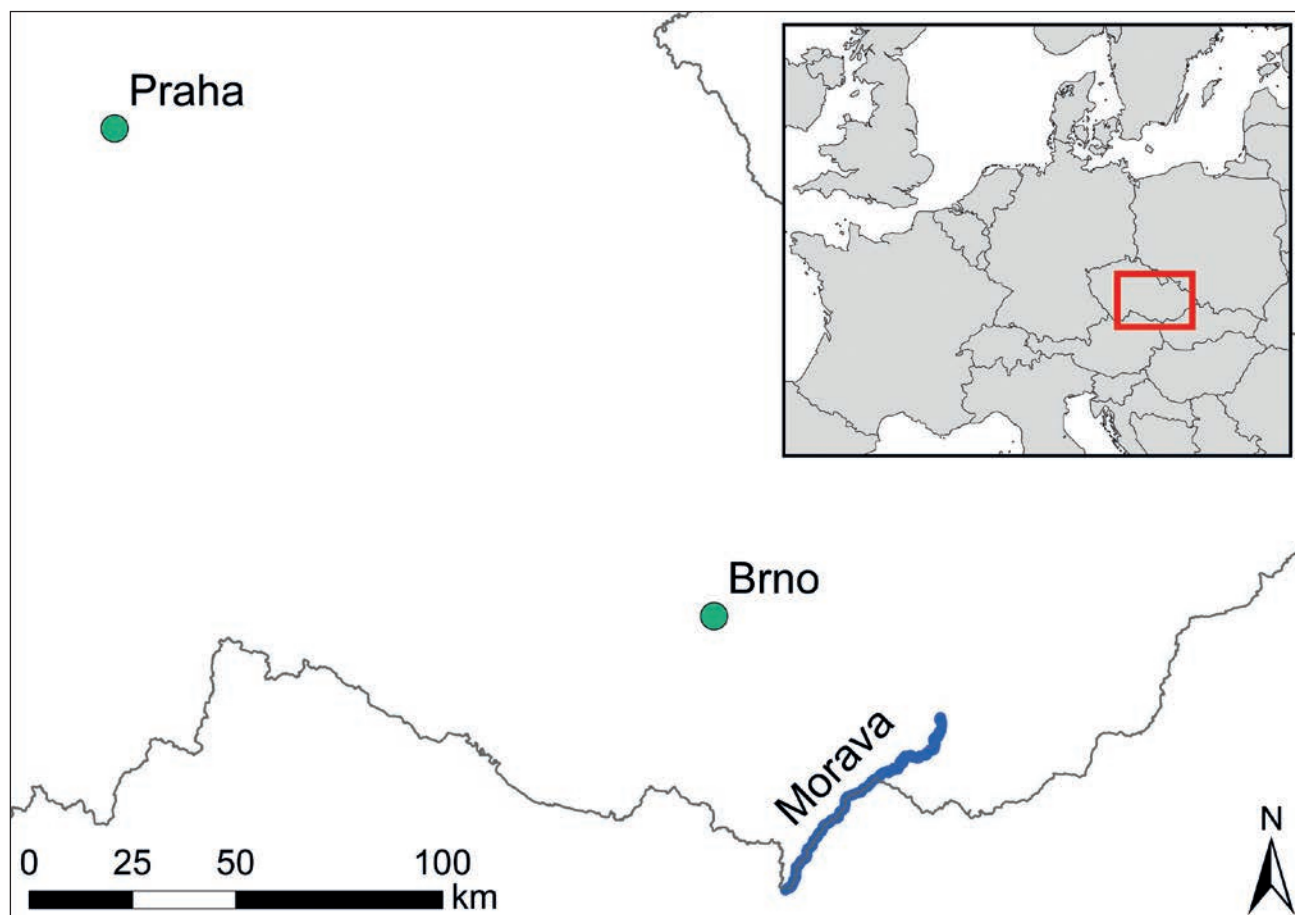


Fig. 1 Map of South Moravia.

Source: <http://geoportal.cuzk.cz>; <https://ec.europa.eu/eurostat/web/gisco>.

van den Schriek, Beex 2018; Wegener 2014a; 2014b). Small-scale fortifications (like foxholes) have been documented during field walking surveys in Germany and Belgium (Müller-Kissing 2015; Passmore, Harrison 2008; Wegener 2014c). The aim of this paper is to illustrate the potential of the archaeological research of WW2 field fortifications in South Moravia. It will be also briefly compared with sites known from the Western front. First, it will mention relics of field fortifications registered during rescue excavations, then it will present the first results of survey of aerial images and LiDAR data.

2. Military operations in South Moravia

Combat operations that took place in South Moravia are connected to the very end of the Second World War. The Wehrmacht prepared one of last points of defence here. It consisted mostly of fortifications on the western bank of the Morava River and a fortified edge of the town of Brno, supposed to become the unconquerable "*Festung Brünn*" (the Brno Fortress). Both defence zones were fortified by field fortifications, therefore trench systems and emplacements for various heavy weapons. These positions were held by "*Heeresgruppe Mitte*" (the Army Group Centre), led by Field Marshal Ferdinand Schörner.

The operation that was planned to drive the German troops back to west was called the Bratislava-Brno Offensive. It was carried out by the 2nd Ukrainian Front commanded by Marshal Rodion Malinovskij. According to the plan of this operation, Brno should be conquered on 8 April 1945; however the Soviet army reached the Morava River as late as 7 April. The Soviet soldiers managed to cross the river and capture the first town (Lanžhot) after serious fights on 11 April. By 15 April, the Soviets seized a large part of the bank of the Morava River, and then they launched an attack towards Brno. The assault was successful at first, but the Germans managed to stop it on 18 and 19 April. There were heavy fights on several places during next several days, especially around the village of Ořechov. The Soviet troops launched the final attack on 23 April; Brno was conquered three days later. Then the Red Army moved in a northeast direction towards the town of Vyškov, which was seized on 30 April 1945 (Břečka 2015; Žampach 2006).

The western part of South Moravia was liberated in a connection with the Prague Offensive. The Soviets reached the Dyje River on 23 April. Serious fights with no results took place around the villages of Pasohlávky and Mušov until 30 April. The final attack was launched here on 7 May; the Red Army managed to conquer Pasohlávky and rest of Moravia quickly; Prague was reached on 9 May (Holečková 2014; Žampach 2006).

3. Field fortifications of Wehrmacht

Because of defending its positions, almost all trenches in South Moravia belong to the German army. Thus, German field fortifications will be presented in this part of paper in the same manner as they were described in historical sources, namely manuals. The best source for recognizing trenches is the manual "*Bildheft Neuzeitlicher Stellungsbau*" (The Picture Manual of Fortifications) which is available in two releases. The older one was first printed in September 1942 and appended in March 1943. This edition is known from a version that was re-printed in December 1969 by Bellona Publications Limited in the United Kingdom. The other version is dated June 1944 (Oberkommando des Heeres 1944). There are small differences between both versions, especially in the representation of various types of small infantry fortifications. Other source used in this paper is "German Tactical Manual" by Harry Töpfer (undated), which describes a couple of smallest infantry fortifications. Harry Töpfer has used several historical sources in his work; the "*Heeres-Dienstvorschrift 130/2a*" (The Military Regulations), which was issued in 1942, was his primary source. This manual describes everything a German soldier needed to know about his role in a combat. As a reference for English terminology, the American manual "FM 5-15 Field Fortifications", which was published in February 1944, was used (War Department 1944).

We may distinguish three main types of infantry field fortifications according to their scale, time needed for digging and function.

Smallest fortifications are represented by "*Schützenlöcher*" (in the American manual they are referred as "infantry entrenchments for hasty fortifications"). These fortifications were designed for one or two soldiers. They had to be dug very quickly (in several hours), because they were used almost in a contact with an enemy. The easiest variation is a "*Schützenmulde*" ("an individual prone shelter"), which was used by one lying soldier. Its depth was about 0.4–0.5 metres and it provided only a little protection, mostly against small firearms (Fig. 2A). Another small type of fortification is a "*Schützenloch für 1 Gewehrscützen*" ("a one-man foxhole"), which had two sub-variants: for a kneeling and for a standing soldier. They were square-shaped and their depth ranged from 60 to 160 centimetres (Fig. 2B). A "*Schützenloch für 2 Gewehrscützen*" ("a two-man foxhole") is a similar type for two standing soldiers (Harry Töpfer mentions even a variation for three soldiers). It had a rectangular shape and a depth either 160 or 200 centimetres (Fig. 2C). A foxhole with a depth 160 cm was intended for a direct fire from it, the latter one accentuated a protection and had to have fire steps on both sides. Positions for heavy machineguns, so called "*Schützenlöcher für s. M. G. mit Gewehrführer u. 2 Schützen*",

belongs also to the group of smallest fortifications (Fig. 2D). They had similar shape like a horseshoe and a depth ranging from 140 to 200 cm (Bellona Publications Limited 1969; Töpfer undated; Oberkommando des Heeres 1944; War Department 1944).

Standard trenches are the second main type of field fortifications. In the German manuals, these are referred as "*Verbindungs- (Kampf-) und Annäherungsgräben*" (communications- (fire-) and approach trenches). They covered large areas (compared to foxholes); in some cases, their length reached many hundred meters. A typical trench should have a zig-zagged shape (Fig. 2E). Its depth varied from 60 centimetres (a "*Kriechgraben*" – a crawl trench) to 180 or 200 centimetres for standing soldiers. Small fire positions with fire steps for one soldier ("*Schützennische*") were dug into a frontal trench wall (Fig. 2F). These fire positions were approximately square-shaped, with a length of an each side about 60 centimetres, their depth was 140 centimetres. Also, positions for heavy machineguns and two-man foxholes could be connected to a trench as well. This type of field fortification took the longest time to prepare; four men were supposed to dig 10 metres of standard trench during a whole day. Due to this reason, these trenches were dug a long time before a front got closer, mainly by civilians. In a case of Moravia, 40 000 civilians (men from Bohemia) were ordered to prepare trenches at the end of December 1944 (Bellona Publications

Limited 1969; Oberkommando des Heeres 1944; War Department 1944; Žampach 2006).

A last type of field fortifications consists of emplacements for various types of heavy weapons like mortars, anti-tank or infantry guns and anti-aircraft artillery. For a purpose of this paper, only emplacements for 81 mm mortars (a "*Feuerstellung für mittleren (8 cm) Granatwerfer*") will be mentioned. A shape of these structures is very characteristic – they were circular with a diameter of 160 centimetres and with the same depth; a mortar was placed here. Additionally, two narrow and short hallways with a depth and width of a regular trench were attached to the circular position; here, crewmen of weapon were hiding in a case of enemy artillery fire (Fig. 2G). Five men should prepare an emplacement in 3 hours, 3 more hours were appointed for digging attached covers (Oberkommando des Heeres 1944; War Department 1944).

4. Methodology

South Moravia is mostly a rural land, so many sites lie on a chernozem. Due to this reason, a large number of field fortifications started to disappear soon after the war, hence especially excavations on construction sites could discover them. In a case of favourable conditions, some of these trenches could be seen from above thanks to crop marks. Crop marks appears

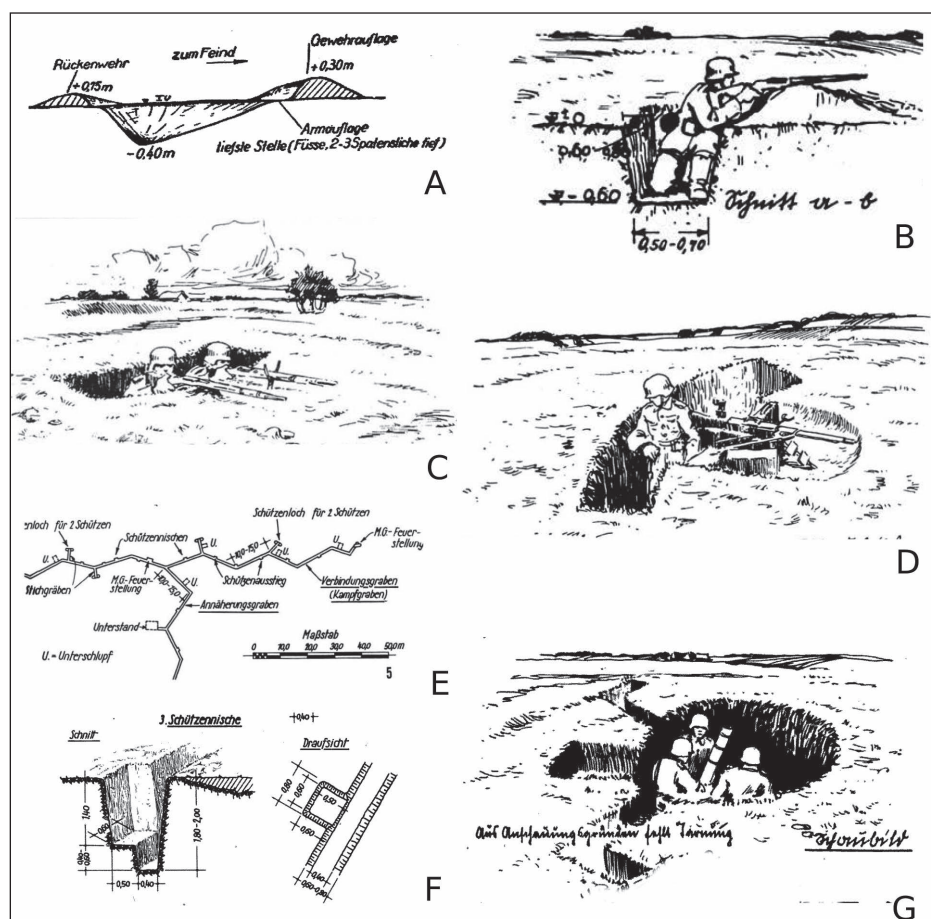


Fig. 2 Field fortifications according to the manuals of the Wehrmacht. Sources: Töpfer (undated): 2A; Bellona Publications Limited (1969): B, C, D; Oberkommando des Heeres (1944): E, F, G.

above buried ditches, stake-holes, pit-houses etc. because fill of these features consists of a more fertile soil than a surrounding ground. Because of this reason, crop grows better there and has a different colour and height than a surrounding crop. This colour changes are best recognizable from air, therefore they can be identified on aerial images (Gojda 2004).

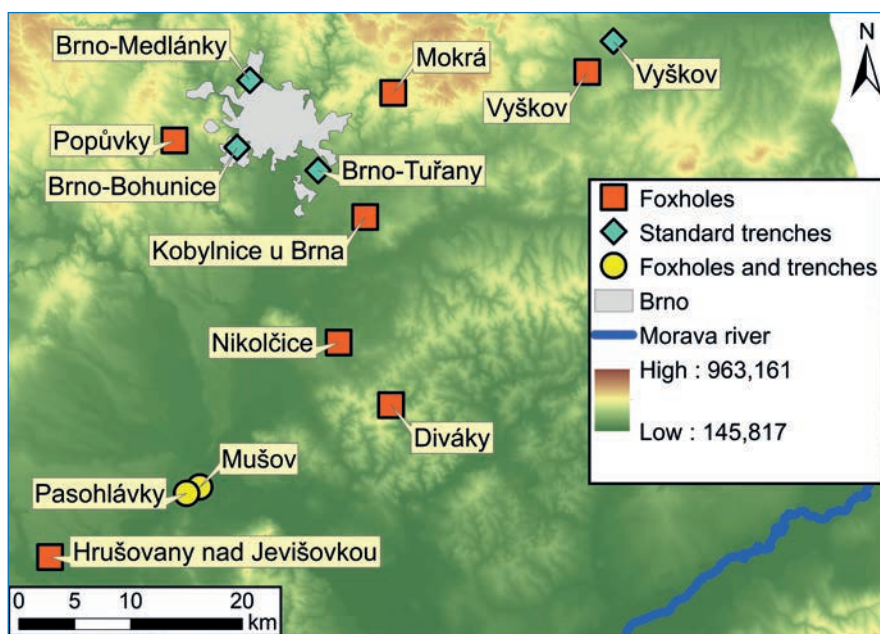
In this work, aerial images, that were photogrammetrically processed, have been used. They can be divided into two groups – contemporary and historical. Although contemporary orthophotos could be useful, historical ones are more important, despite their lower resolution. The highest number of visible trenches can be found on photographs taken two years after the war, in the year 1947. Unfortunately, the region of South Moravia was not photographed complete, so for example a large area of Brno is missing in this set of images. Orthophotographs from the year 1947 are located in an internet application on the site https://lms.cuzk.cz/lms/lms_prehl_05.html (thanks to Survey and Cadastral Inspectorates of Czech Office for Surveying, Mapping and Cadastre). Another source of historical orthoimages is accessible on the site <https://kontaminace.cenia.cz>. Photographs of South Moravia from the year 1953 can be found here. Even though these images were taken eight years after the war, several trenches and dug-outs are still visible in some places. Contemporary aerial orthophotographs are useful especially if we observe a development on sites; however, already mentioned crop marks of trenches or even their relics can be identified on these images occasionally. They can be found on the well-known map portals <https://mapy.cz> and <https://www.google.cz/maps>. The first one offers orthophotomaps from the years 2001–2003, 2004–2006, 2010–2012 and 2014–2015, which is especially suitable for monitoring changes of

a built-up area. Google has actual aerial and satellite images only; on the other hand, it provides a plastic 3D model of Brno and its surrounding, which can well visualize preserved trenches.

Several sites lies in hilly and forested regions around the city of Brno (Fig. 3). In this case, an airborne laser scanning, also known as Light Detection and Ranging (LiDAR), can be exploited. LiDAR is a laser scanning device (usually mounted on aircrafts), which is used for creating a virtual 3D model of an earth's surface, so-called Digital Elevation Model (DEM). On this precise model, ancient relics like ramparts or ditches can be identified. A great advantage of LiDAR is a capability of penetrating vegetation, so it can register relics even in a forest (Gojda 2005). LiDAR was already used to detect trenches from World War 2. For example, German trenches of the “Westwall” were recognized by Ralf Hesse near Hügelsheim in Germany (Hesse 2014); Max van der Schriek and Willem Beex have identified field fortifications and other wartime relics on several sites in the Netherlands (van den Schriek, Beex 2018). Also, American artillery positions and German trenches were detected by Wolfgang Wegener near Kranenburg or in Hürtgenwald (Wegener 2014a; 2014b).

For the Czech Republic, there is the Digital Terrain Model of the 5th generation created by Czech Office for Surveying, Mapping and Cadastre. This Digital Terrain Model represents a visualization of an earth's surface in the Czech Republic by using an irregular triangular network ([http://geoportal.cuzk.cz/\(S\(ykyv2ywjnte5tohopcehj0ym\)\)/Default.aspx?lng=CZ&mode=TextMeta&side=vyskopis&metaDataID=CZ-CUZK-DMR5G-V&mapid=8&menu=302](http://geoportal.cuzk.cz/(S(ykyv2ywjnte5tohopcehj0ym))/Default.aspx?lng=CZ&mode=TextMeta&side=vyskopis&metaDataID=CZ-CUZK-DMR5G-V&mapid=8&menu=302)). This model is accessible via a web-based interface on the site <http://geoportal.cuzk.cz/geoprohlizec/?wmcid=22517>; it uses several ways of visualisations

Fig. 3 Map of unearthed field fortifications.
Source: Author;
<http://geoportal.cuzk.cz>.



of data – a colour shaded relief, a shaded relief, a slope and an aspect of slope. Though wartime relics can be detected on each type of these visualisations, it was realized that shaded relief or colour shaded relief visualisations depict trenches best. This method of visualisation is quite useful for searching of ditches (Mlekuž 2013); it has been also successfully tested on several sites in Germany and Netherlands, where remains of trenches dated into the Second World War are still preserved (Hesse 2014; van den Schriek, Beex 2018).

The survey of all mentioned data has focused on the surroundings of sites known thanks for excavations. If relics (or cropmarks) of field fortifications were identified on orthophotographs or DEM, these data were further processed in ArcGIS; here, available data have been uploaded. In addition, a shapefile polyline feature has been created. With this polyline, all visible relics have been digitized.

5. Field fortifications in South Moravia

5.1 Examples of excavated fortifications

In recent years, field fortifications have been documented on 13 sites in South Moravia (Fig. 3). Infantry entrenchments for hasty fortifications have been



Fig. 4 Excavated infantry entrenchments for hasty fortifications in the exercise ground in Hrušovany nad Jevišovkou. Source: Čižmář (2002).

identified in seven cases; standard trenches have been registered four times. On last two sites, there have been discovered both infantry entrenchments for hasty fortifications and trenches. All these examples have been uncovered in excavations on construction sites; no survey was intended to excavate this kind of relic. Only some of the foxholes and trenches have been excavated, others have been at least sectioned. Further, the most representative examples will be mentioned.

All nine sites where foxholes have been found are located in the area between Brno and the Morava River, in closer proximity to Brno (up to 30 kilometres, Fig. 3). It can be assumed that almost all these positions were a part of last defence line of the Wehrmacht ahead of Brno; therefore they were dug around 20 April 1945. The site that lies near the town of Vyškov was related to the situation after the capture of Brno and the following attempt of the 2nd Ukrainian Front to connect with the 4th Ukrainian Front (advancing from Northern Moravia). An interesting area lies close to Hrušovany nad Jevišovkou (Fig. 4). Several infantry entrenchments for hasty fortifications, mostly two-man foxholes, have been unearthed here; they belonged to an exercise ground of the German army (Čižmář 2002). The perfect example of a “*Schützenloch für 2 Gewehrscützen*” has been documented near Nikolčice (Fig. 5). The structure has a length of 160 cm and a depth less than 100 cm. Either agriculture have destroyed an upper parts of the foxhole or it was designed for kneeling soldiers. A layer of fired ammunition cases laid on the ground (Kos 2000). Unusual one-man foxholes with fire steps

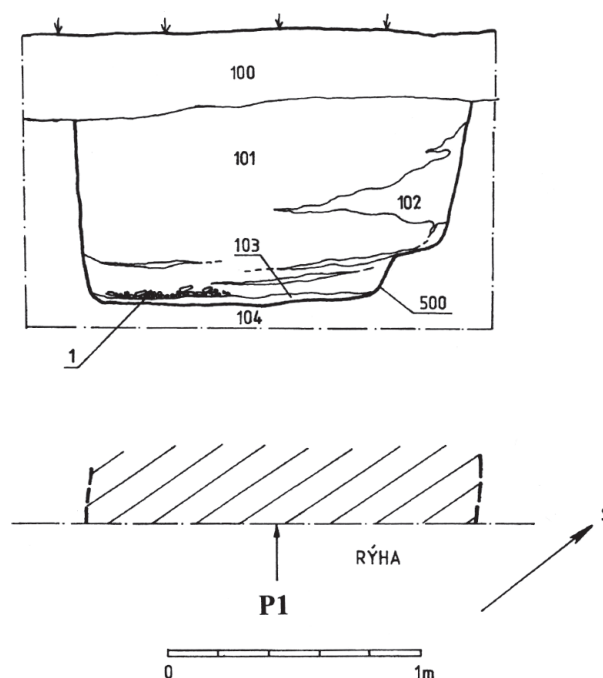


Fig. 5 Cut of two-man foxhole near Nikolčice. The number 1 indicates fired ammunition. Source: Kos (2000).



Fig. 6 One-man foxhole with fire step near Popůvky.
Source: Hájek (2017).

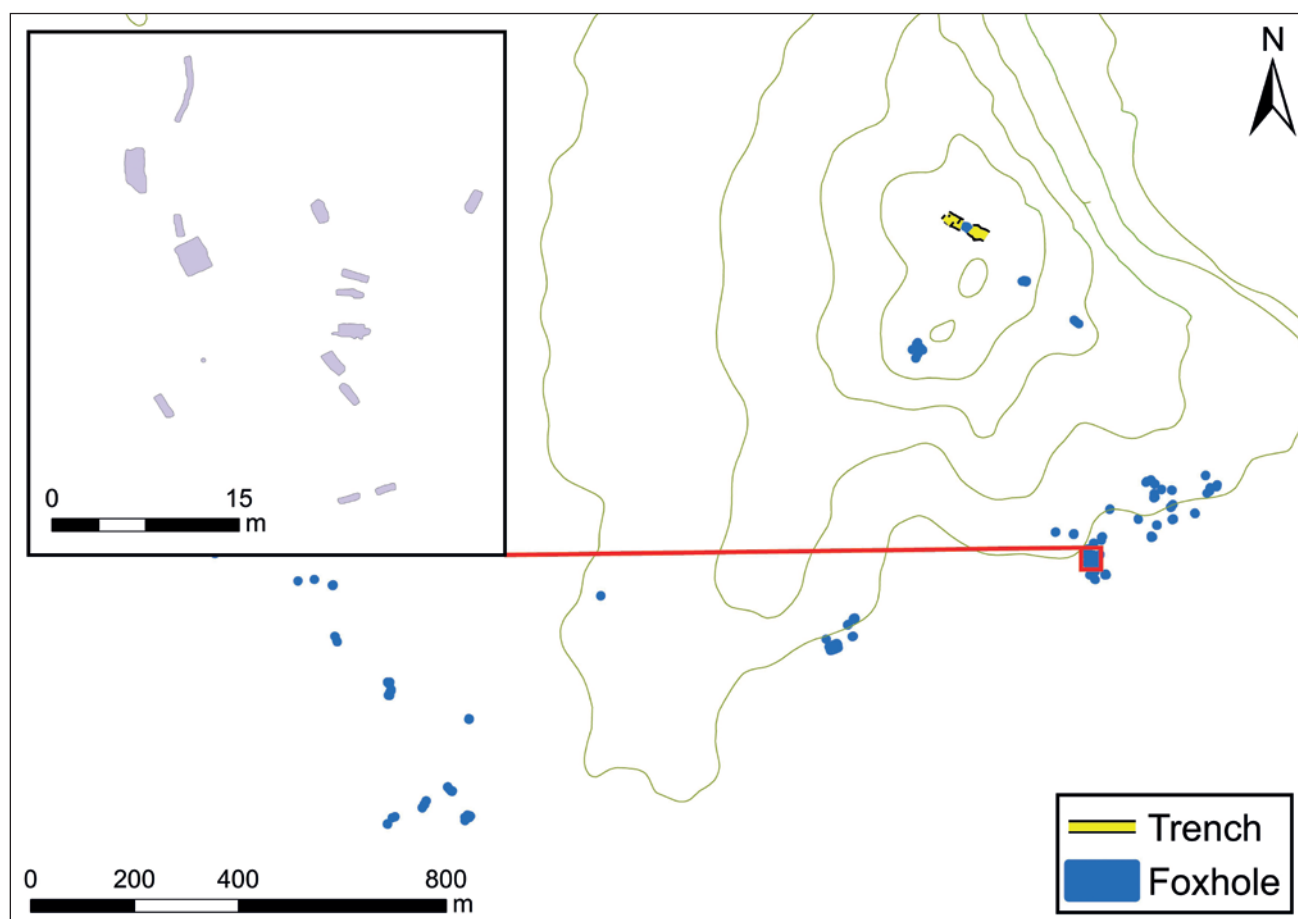


Fig. 7 Layout of excavated infantry entrenchments for hasty fortifications and trenches in Mušov and Pasohlávky. Burgstall Hill is situated in the upper right corner; Pasohlávky lies behind the left edge of image.
Source: Institute of Archaeology of the CAS, Brno; <http://geoportal.cuzk.cz>.

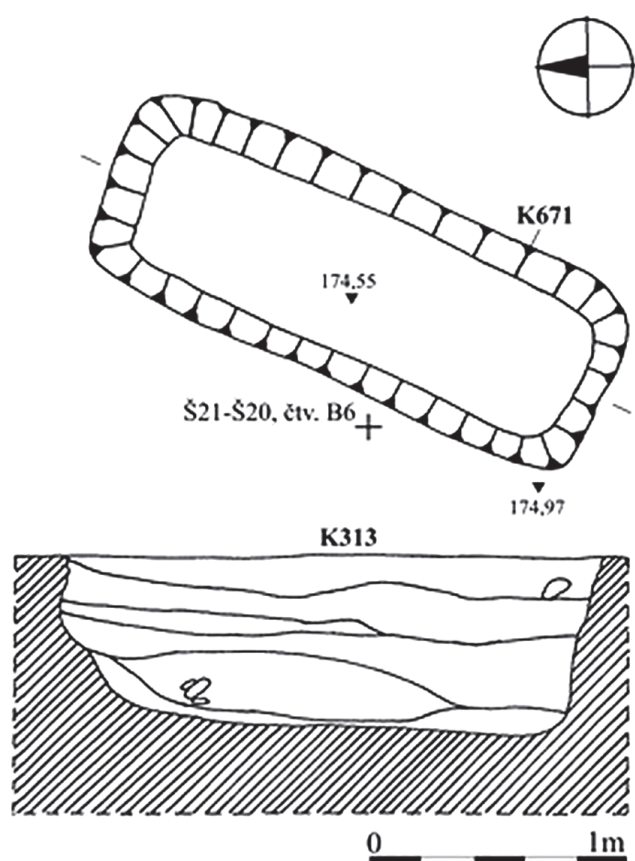


Fig. 8 Two-man foxhole near Pasohlávky.
Source: Institute of Archaeology of the CAS, Brno.

have been registered in Popůvky (Fig. 6). They were around 160 cm long, one half of pit was approximately one meter deep whilst the other half was only 50 cm deep (Hájek 2017).

The biggest number of infantry entrenchments for hasty fortifications has been discovered on two neighbouring sites – Mušov and Pasohlávky. The area

between these villages saw heavy fights from 23 April to 7 May 1945, when the frontline was moving from Burgstall Hill to the village of Pasohlávky (1.5 km far away) and back again several times. Several dozen structures have been documented here (Fig. 7); a two-man foxhole was the most common type (as many as 47 structures, Fig. 8), but individual prone shelters, one-man foxholes, positions for heavy machine-guns or emplacements for mortars (Fig. 9) have been registered as well. Even standard trenches were situated on Burgstall Hill. It can be assumed that a part of these structures belonged to the Red army (Musil 1995; Komoróczy 2000; Zubalík et al. 2017).

Unlike the sites with infantry entrenchments for hasty fortifications, almost all sites where standard trenches were unearthed lie around the city of Brno (Fig. 3). Two of them were prepared as a part of the “*Festung Brünn*” fortification system before the front had reached South Moravia. The third one was dug on the northern outskirts of Brno during the last days of the while; the Soviets had already captured almost whole Brno and continued their attack towards Vyškov. The fourth site was situated in Vyškov and defended a local airfield. The best example of a relatively extensive trench system has been revealed during an excavation on a site in Brno-Bohunice. A recorded length of the standard trenches amounts 322 meters; the trench line was bifurcated on two places (Fig. 10). Also fire positions have been registered on several places; some of them were sectioned during the survey (Fig. 11). This position defended an approach to Brno from the southwest. Another small part of a larger trench system has been unearthed in Brno-Tuřany. The most interesting structure documented here is a position for heavy machine-gun which was connected to the trench system via a communication trench (Fig. 12). This fortification was situated to the southeast of



Fig. 9 Emplacement for 81 mm mortar near Pasohlávky.
Source: Institute of Archaeology of the CAS, Brno.

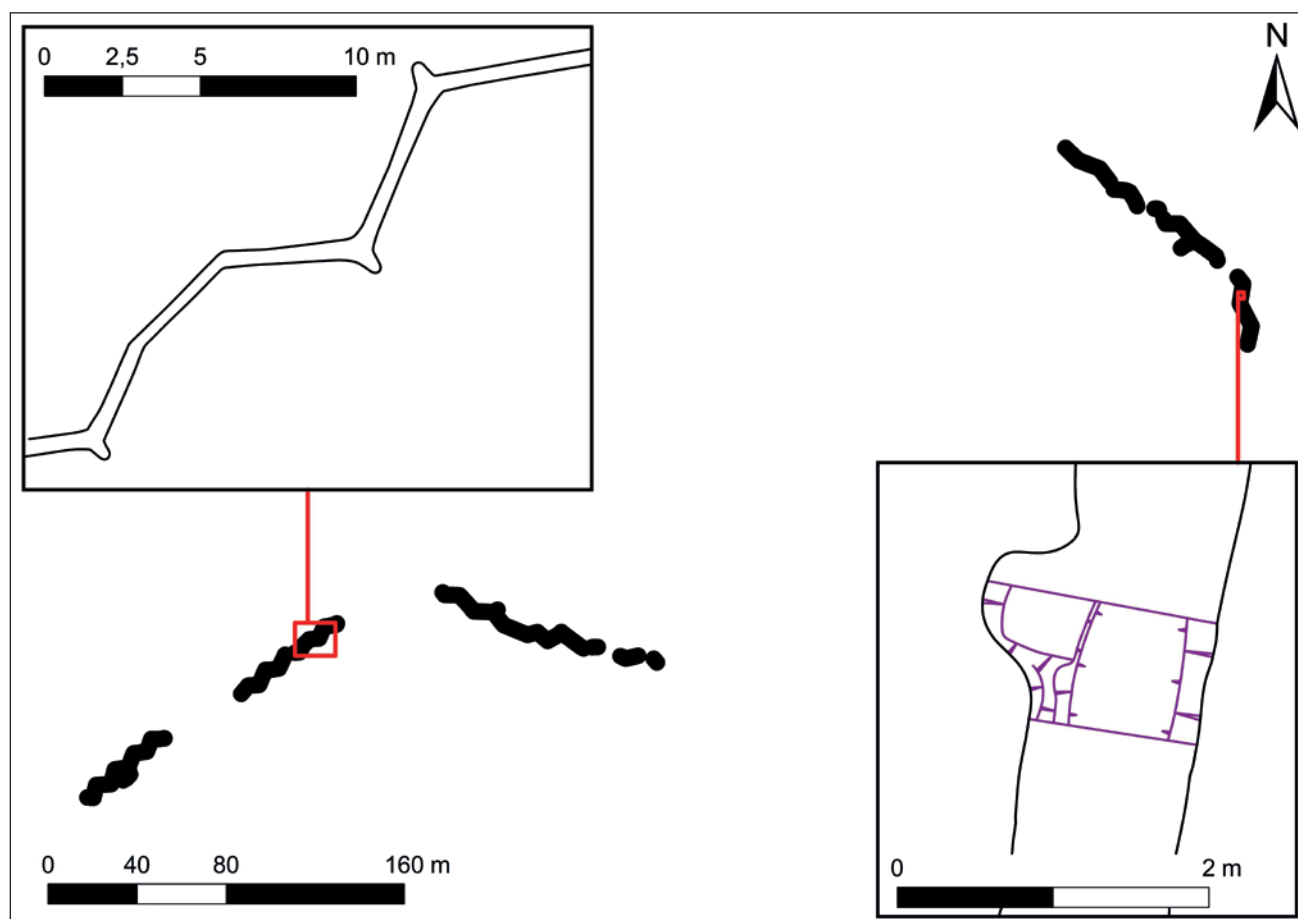


Fig. 10 Layout of documented trench line in Brno-Bohunice. Figure on the bottom right corner displays the section of a fire step.
Source: Institute for Archaeological Heritage, Brno.



Fig. 11 Fire position in trench on site of Brno-Bohunice.
Source: Institute for Archaeological Heritage, Brno.

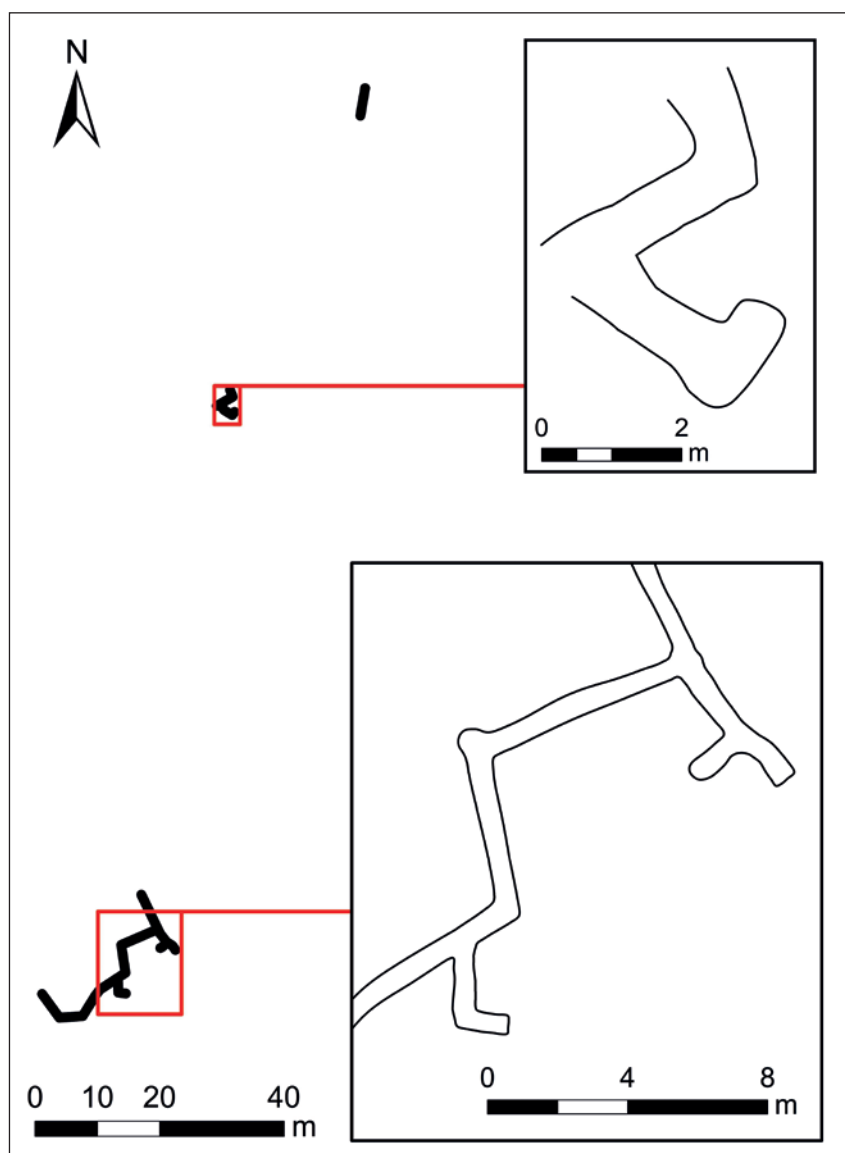


Fig. 12 Layout of documented trench line in Brno-Tuřany. Figure on the upper right corner displays the position for heavy machine-gun. Source: Institute for Archaeological Heritage, Brno.

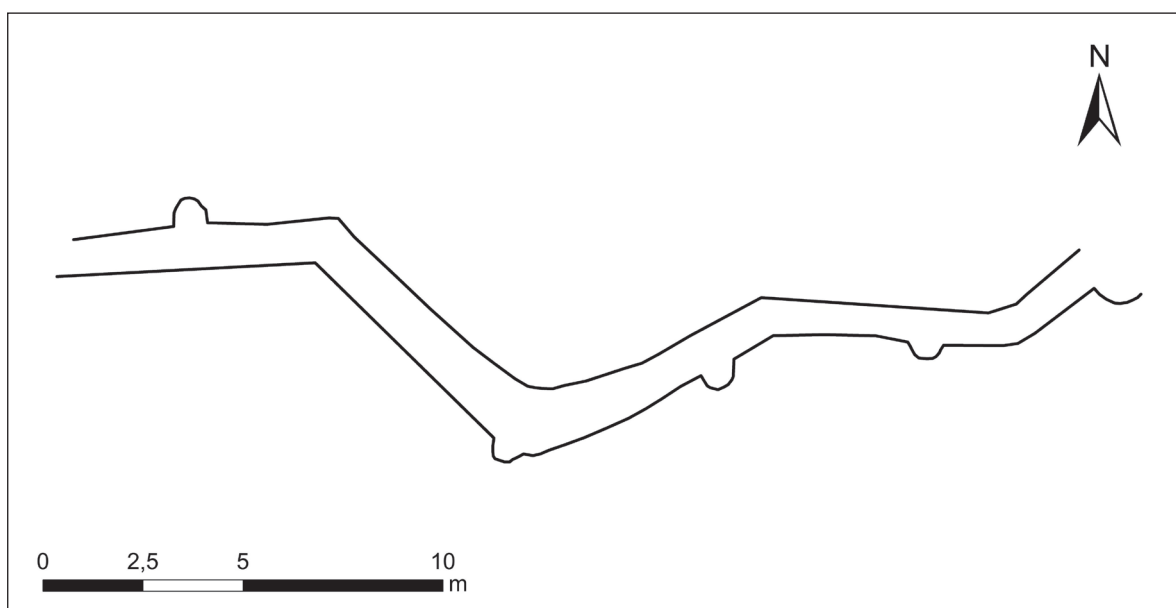


Fig. 13 Layout of documented trench line in Brno-Medlány. Source: Institute for Archaeological Heritage, Brno.

contemporary Brno; it protected a local airfield. The last site where standard trenches have been recorded during an excavation lies in Brno-Medlánky. It is the aforementioned position on the northern outskirts of Brno, which consisted of one trench line; also several fire positions have been documented here (Fig. 13).

5.2 Examples of fortifications detected on aerial photogrammetry and remote sensing data

The validity of the aerial photogrammetry and LiDAR survey will be shown on five sites (Fig. 14). Three of them have been mentioned above; they are known from excavations (Brno-Bohunice, Brno-Medlánky, Mušov). An additional two sites were not excavated; the first one was destroyed after the war, the last one is still preserved today. An important observation resulted from an analysis of the available data of the rest of mentioned sites: a visibility of infantry entrenchments for hasty fortifications is really poor – almost no one is recognizable on both orthophotographs and LiDAR data; however, there is one exception. Quite many infantry entrenchments for hasty fortifications are visible on the aerial images taken above Mušov in 1947 and 1953. Especially the older orthophotos show a large number of these entrenchments and larger weapon emplacements on Burgstall hill and its close proximity (Fig. 15). Only a few of them were unearthed during excavations mentioned above, many others are still waiting for their discovery. These images also show a really large extent of a fieldwork that took place here. On the other hand, the orthoimages from the year 1953 show an extensive destruction of these field fortifications. Only few emplacements and trenches were still preserved at that time, rest of them was destroyed by agriculture. Modern orthophotographs and LiDAR shows no structures, not even crop marks.

An importance of the images from the year 1953 consists in the fact that they were taken above the whole territory of South Moravia. Thus a fortified area in Brno-Maloměřice, which was not photographed before, is visible on these orthophotographs. It is possible to identify several trench lines, which were probably defending positions of a nearby anti-aircraft artillery (Fig. 16). These images are also the only one that captures this fortification, because a construction of a cargo railway station started here in that year; this construction has destroyed the whole fortified area.

Another site recognizable on the orthophotos from 1953 is situated in Brno-Bohunice. One part of this site is known thanks to the aforementioned excavation. The aerial images show us that this trench continues additional 321 meters towards Brno. On top of that, 140 metres of this trench is visible on the DEM; this data partially coincide with the aerial orthophotograph. It's interesting that the unearthed part of fortification is not visible on the historical images (Fig. 17).

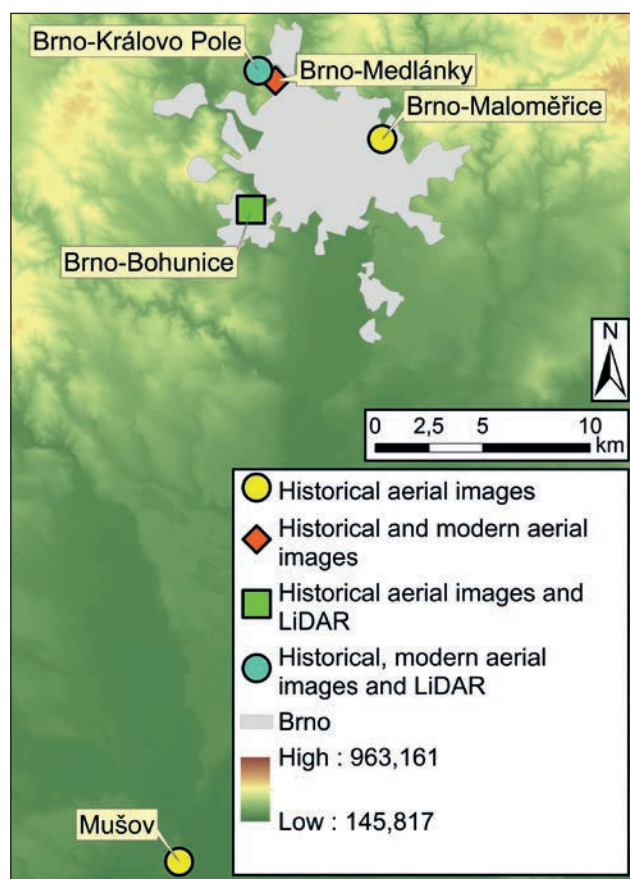


Fig. 14 Map of field fortifications recognizable on orthophotographs. Source: Author; <http://geoportal.cuzk.cz>.

Usage of modern aerial images will be shown on a site located on Střelecký hill in Brno-Královo Pole which lies in close proximity to the site of Brno-Medlánky. It consists of two separate zigzagged trench lines, which are preserved up to this day. They were detected on the plastic 3D model of landscape available in Google Maps or Google Earth. Both trenches are visible on the historical aerial orthophotos too. However, only the northern trench can be found on the DEM (Fig. 18). Perhaps a low vegetation covered up the southern trench when the area was scanned.

Aerial photogrammetry is also suitable for following a destruction of fortified areas after the war. Several cases were already mentioned – for example a rather slow disappearance of the infantry entrenchments for hasty fortifications and trenches in Mušov and Pásohlávky due to agriculture; even recently, some of them have been destroyed through a building of an aqua park. A special case showing a destruction of a field fortification represents a site in Brno-Medlánky. The trench line which was located there was filled up soon after the war. The aerial orthophotographs from the year 1953 show nothing more than crop marks above it. Almost the same crop marks are still visible on the images from 2006. These orthoimages indicate that the trench was still preserved underground (Fig. 19). The later images from 2012 capture a beginning of

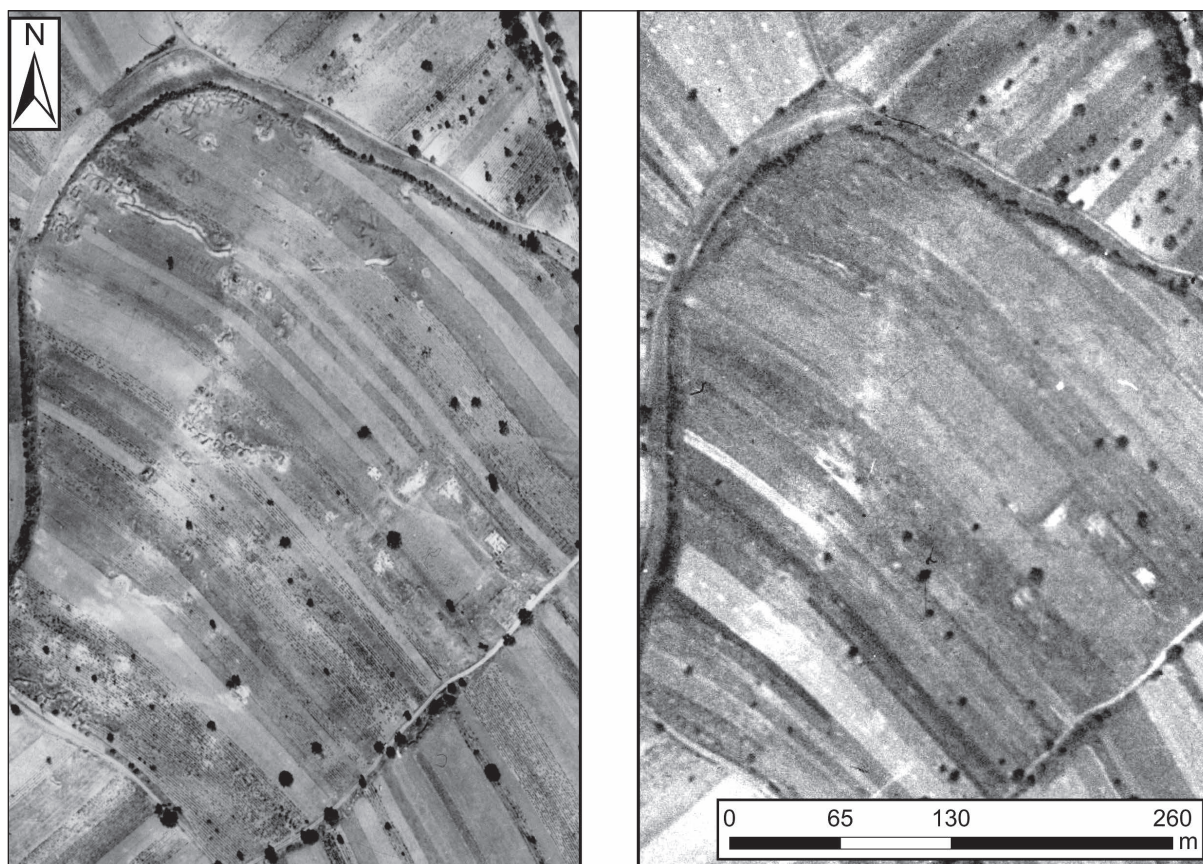


Fig. 15 Orthophotographs from 1947 (on the left) and 1953 (on the right) of Mušov-Burgstall hill. Only part of one trench and relics of a few foxholes and emplacements survived till 1953.

Source: https://lms.cuzk.cz/lms/lms_prehl_05.html; <https://kontaminace.cenia.cz>.



Fig. 16 Orthophotograph from 1953 of Brno-Maloměřice. Anti-aircraft battery is displayed in the upper right corner; one trench is visible at the bottom of the image, another one is on the right side.

Data: <https://kontaminace.cenia.cz/>.

a construction of new buildings in this area. These buildings are finished on the orthophotographs taken in 2015, whereas the trenches were destroyed without a proper documentation (Fig. 20).

6. Discussion and Conclusion

This study gathers all known sites, where were at least partially excavated fortifications; it presents the very first results of analysis of aerial orthophotographs in South Moravia. Overall 15 sites have been mentioned, but we might assume that the quantity of sites related to the World War 2 fieldworks (or even a combat) will grow in the future.

At first sight, it looks like the fortified areas had a lesser extent than those known on Western front. LiDAR surveys have shown really extensive trench systems on sites like Herkenbosch-Rothenbach, Stokum, Hügelsheim or Kranenburg (Hesse 2014: Fig. 3;

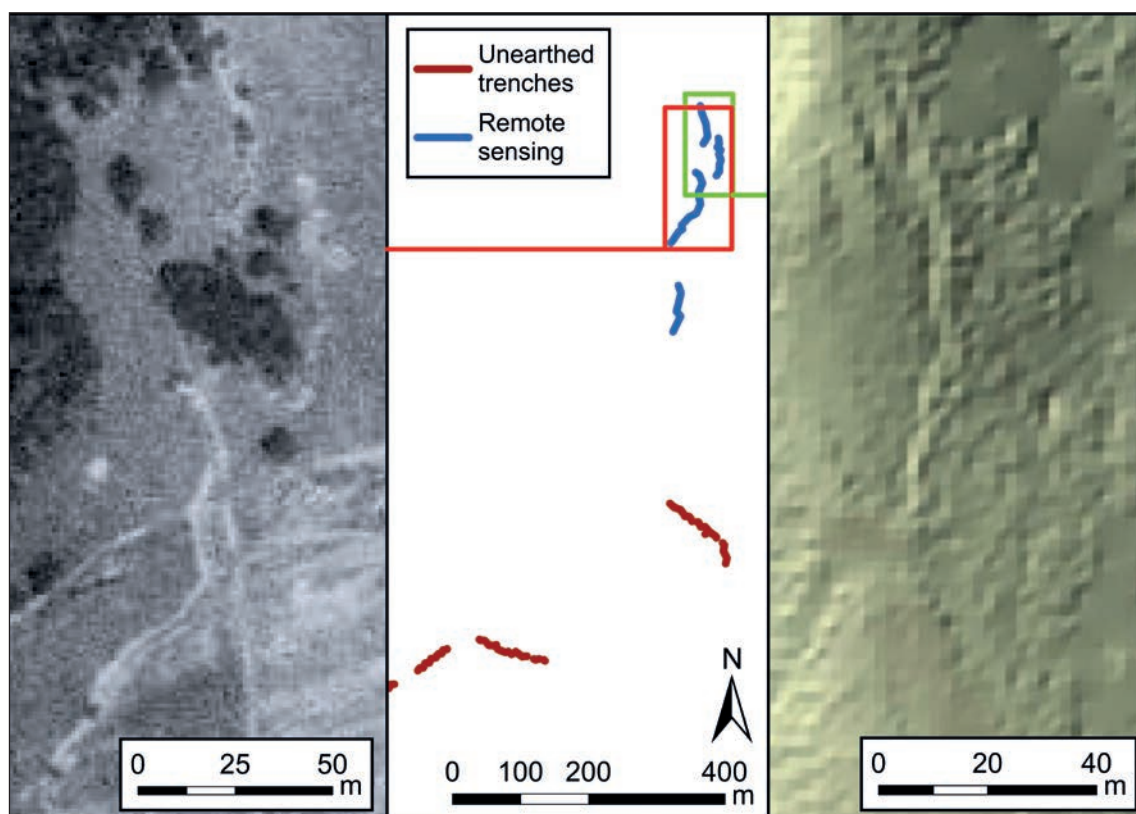


Fig. 17 Orthophotograph from 1953 (on the right) and DEM (on the left) of Brno-Bohunice. The aerial photograph well depicts the trench line. A part of this trench is visible in the middle of LiDAR image.

Data: Author; Institute for Archaeological Heritage, Brno; <https://kontaminace.cenia.cz/>; <http://ags.cuzk.cz/dmr/>.

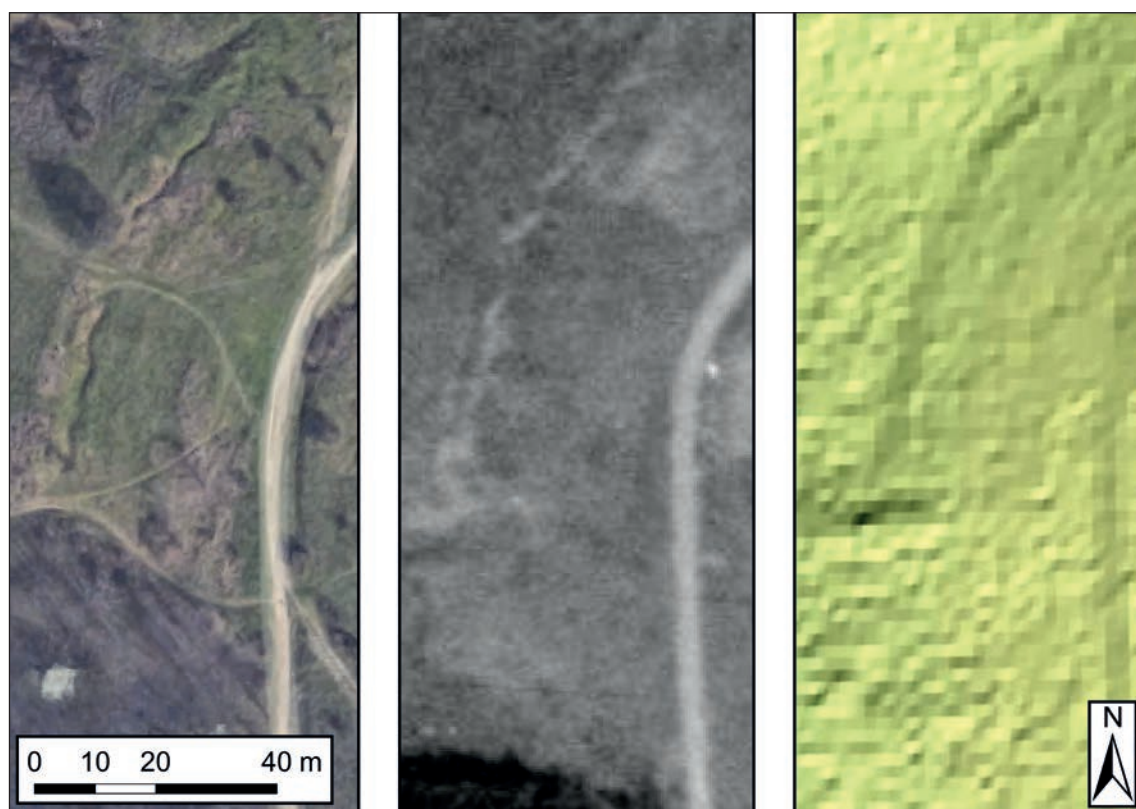


Fig. 18 Contemporary orthophotograph from Google (on the right), orthophotograph from 1953 (in the middle) and DEM (on the left) of Brno-Královo Pole. The trench line is situated in the upper left corner of all images.

Data: <https://www.google.cz/maps>; <https://kontaminace.cenia.cz/>; <http://ags.cuzk.cz/dmr/>.

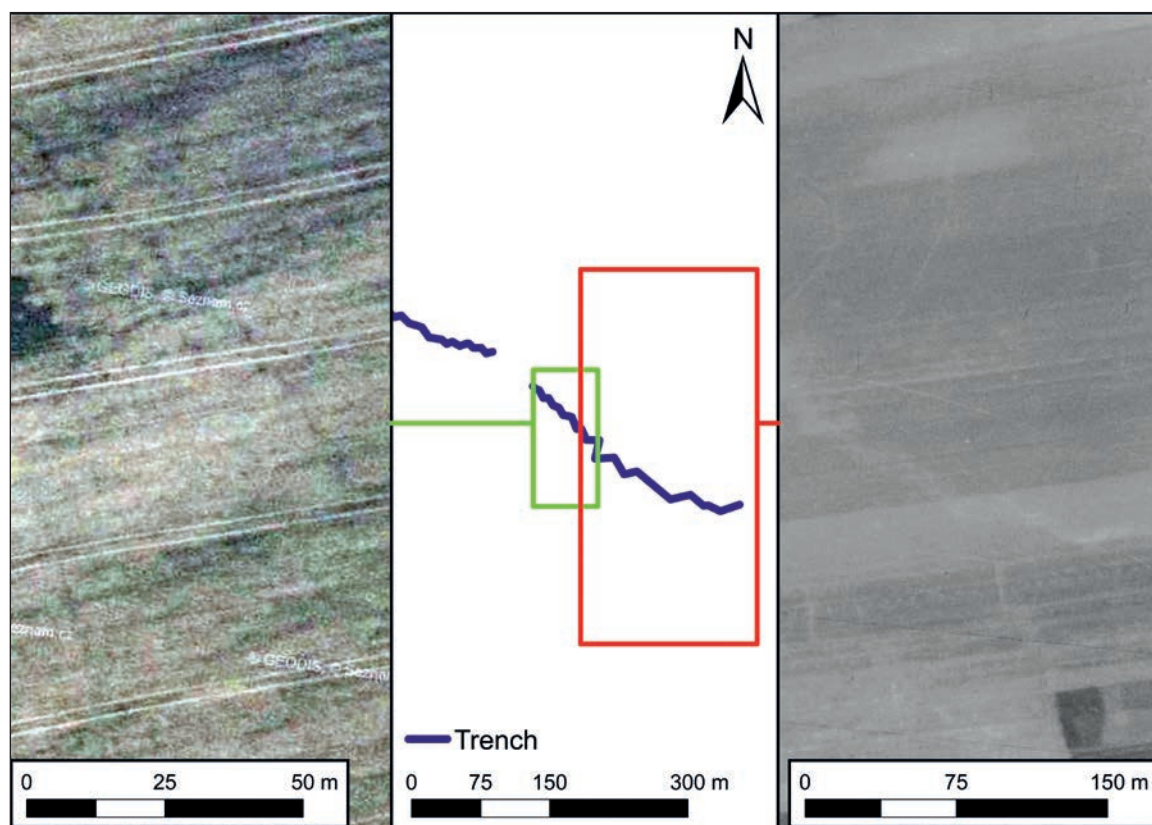


Fig. 19 Orthophotographs from 1953 (on the right) and 2006 (on the left) of Brno-Medlánky depict crop marks of a buried trench line.

Data: Author; <https://kontaminace.cenia.cz/>; <https://mapy.cz>.

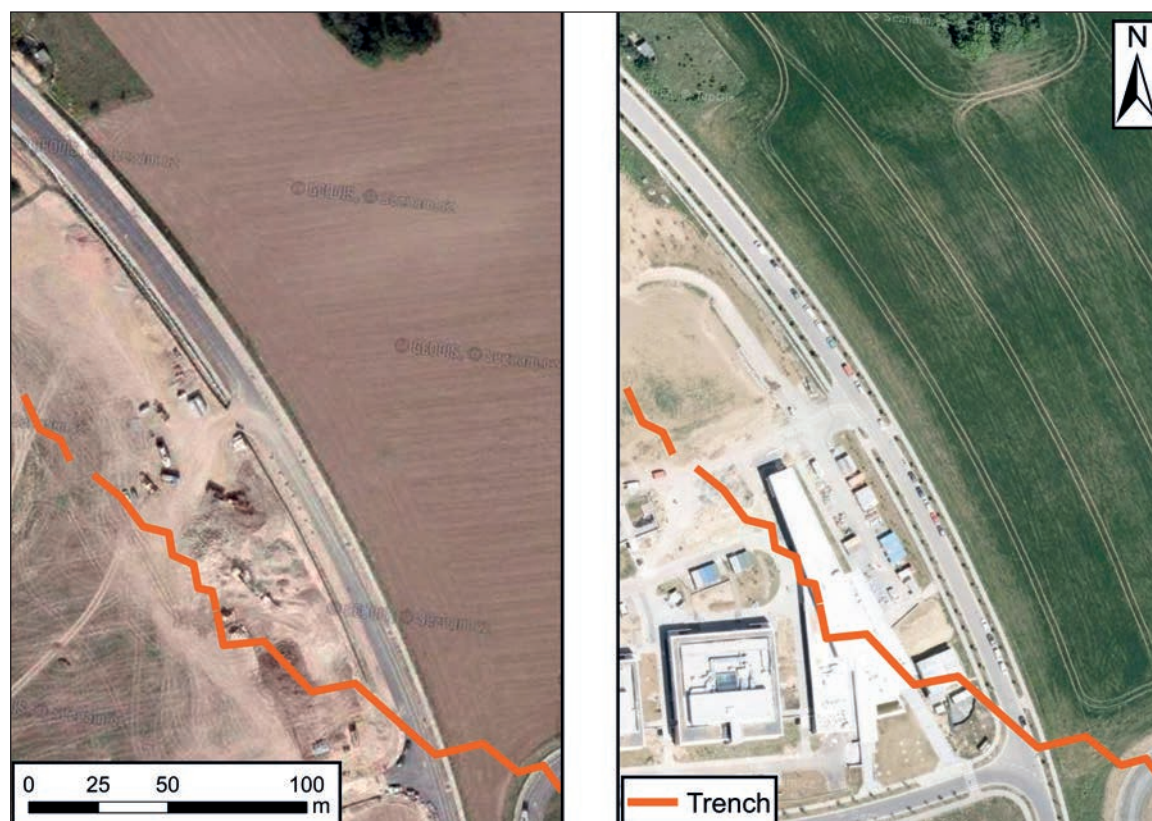


Fig. 20 Orthophotographs from 2012 (on the left) and 2015 (on the right) of Brno-Medlánky capture an area about the same part of trench line as the previous figure.

Data: Author; <https://mapy.cz>.

van den Schriek, Beex 2018: Fig. 7, Fig. 8; Wegener 2014a: Abb. 1). However, we know only small parts of fortified areas in South Moravia. The finest examples represent the trenches in Brno-Bohunice and Brno-Tuřany. On both sites, there are several dozen metres of an empty space between the unearthed relics of trenches. Also historical orthophotos suggests that the actual extent of the field fortification in Brno-Bohunice was probably much bigger; therefore it might be similar to the ones on the Western front.

On the other hand, excavations well document small-scale fortifications, which are almost undetectable on aerial photogrammetry or DEM. The most numerous type of entrenchment in South Moravia is a two-man foxhole; they are known thanks to field walking in Belgium and Germany too. In first case, there is several dozen of these foxholes (and prone shelters) on sites in Prumerberg and Lindscheid; however, they belong to the US Army (Passmore, Harrison 2008). Another American foxholes have been registered by Wolfgang Wegener in Hürtgenwald; they could be clearly distinguished from German standard trenches (Wegener 2014c). German two-man foxholes have been documented at Hohe Warte near Paderborn; on top of that, positions for heavy machine-guns have been recognised here too (Müller-Kissing 2015).

The mentioned sites show that they could have a great potential to study an archaeological impact of the WW2 combat from the Eastern front; thus the region of South Moravia could be an interesting counterpart to the forests of north-west Europe (Passmore et al. 2013). The next step of research will be focused on an exhaustive survey of aerial orthophotographs and LiDAR data, which shall lead to an expansion of the number of sites.

The archaeology of Second World War is at its beginning in the region of South Moravia. However, the first results illustrate that archaeological methods of survey can contribute to the knowledge about the wartime field fortifications in this region. Excavations, aerial photogrammetry and LiDAR survey could find forgotten fortified sites and give us insight into an extent of a German defensive field work. On top of that, a proper combination of orthophotographs shows us a development of studied sites after the war. Despite the fact that South Moravia played only a minor part in the Red Army's operation (the main target was Berlin), archaeology shows us that the Germans put a special effort to fortify large areas of South Moravia. However, this kind of heritage is still rather neglected and endangered by a destruction.

Acknowledgements

The author would like to thank Balázs Komoróczy, Zdeněk Hájek, Petr Kos and Michal Přichystal for providing data of their excavations.

References

- Bartík, J., Chrástek, T. (2018): Archeologie bojišť z II. světové války v Bílých Karpatech. Příklad výzkumu hrobu německého vojáka padlého u Horního Němčí v dubnu 1945. *Acta musealia Muzea jihovýchodní Moravy ve Zlíně a Muzea regionu Valašsko, Vsetín*, 2017, 1–2, 116–133.
- Bellona Publications Limited (1969): Merkblatt 57/5 (Anhang 2 zur H. Dv. 1a, Seite 57, lfd. Nr. 5). Bildheft Neuzeitlicher Stellungsbau. Vom 15. 9. 42. Nachdruck einschl. eingearb. Berichtungen nach dem Stande vom 11. 3. 43. German Field Works of World War II. Hawthorn Hill, Bellona Publications Limited.
- Břečka, J. (2015): Před sedmdesáti lety skončila válka...: Průběh osvobozovacích bojů na brněnském směru v dubnu – květnu 1945 = Vor siebzig Jahren ging der Krieg zu Ende...: Verlauf der Befreiungskämpfe in Richtung Brünn im April–Mai 1945. Brno, Moravské zemské museum.
- Čech, P., Křivánek, R., Soukup, M. (2014): Archeologie a druhá světová válka. Výzkum palebného postavení z roku 1944 v předpolí hnědouhelného lomu (k. ú. Libovice u Mostu) a poválečné postdepoziciční procesy. *Zprávy České archeologické společnosti*, Suppl. 93, 42–44.
- Čížmář, Z. (2002): Hrušovany nad Jevišovkou 2001. "Sever" – výstavba komunikace+inž. sítí+RD. Final Report on an Archaeological Excavation deposited in Institute for Archaeological Heritage Brno.
- Geislerová, K., Parma, D. (eds.) 2013: Výzkumy 2005–2010. Ausgrabungen 2005–2010. Brno, Ústav archeologické památkové péče Brno.
- Gojda, M. (2004): Letecká archeologie a dálkový průzkum. In: Kuna, M. (ed.): *Nedestruktivní archeologie. Teorie, metody a cíle = Non-destructive archaeology*, 49–115. Prague, Akademie věd České republiky.
- Gojda, M. (2005): Lidar a jeho možnosti ve výzkumu historické krajiny. *Archeologické Rozhledy* 58(4), 806–810.
- González-Ruibal, A. (2011): Digging Franco's Trenches: An Archaeological Investigation on a Nationalist Position from the Spanish Civil War. *Journal of Conflict Archaeology* 6(2), 97–123, <https://doi.org/10.1179/157407811X13027741134102>.
- González-Ruibal, A. (2012): From the Battlefield to the Labour Camp: Archaeology of Civil War and Dictatorship in Spain. *Antiquity* 86(332), 456–473, <https://doi.org/10.1017/S0003598X00062876>.
- Hájek, Z. (2017): Popůvky – P. Z. východ, odvedení splaškových vod. Final Report on an Archaeological Excavation deposited in Moravian Museum.
- Hesse, R. (2014): Geomorphological traces of conflict in high-resolution elevation models. *Applied Geography* 46, 11–20, <https://doi.org/10.1016/j.apgeog.2013.10.004>.
- Holečková, S. (2014): Ztráty 7. gardové armády v bojích o Brod nad Dyjí, Ivaň, Mušov a Pasohlávky – Verluste der 7. Gardarmee in den Kämpfen um Goldenfurth (Brod nad Dyjí, Eibes (Ivaň), Muschau (Mušov) und Weißstätten (Pasohlávky). *Jižní Morava* 50, 310–341.
- Holub, P., Merta, D., Zúbek, A. (2009): Protiletcké kryty v Brně (Dům umění a areál fakultní nemocnice u sv. Anny). *Archeologia technica* 21, 129–136.

- Kala, J. (2015): Válečné úspěchy ÚAPP Brno. Brno, Zákopy.cz. Available from: <http://www.zakopy.cz/valecne-uspechy-uapp-brno>.
- Kala, J. (2016): Válečné úspěchy ÚAPP Brno, rok 2015. Brno, Zákopy.cz. Available from: <http://www.zakopy.cz/valecne-uspechy-uapp-brno-rok-2015>.
- Kala, J. (2018): Válečné úspěchy ÚAPP Brno, rok 2017. Brno, Zákopy.cz. Available from: <http://www.zakopy.cz/valecne-uspechy-uapp-brno-rok-2017>.
- Komoróczy, B. (2000): Mušov (k. ú. Pasohlávky, okr. Břeclav). Přehled výzkumů 41, 145–147.
- Kos, P. (2000): Nikolčice 1999. Vodovod. Final Report on an Archaeological Excavation deposited in Institute for Archaeological Heritage Brno.
- Mlekuž, D. (2013): Skin deep: LiDAR and the Good Practice of Landscape. In: Corsi, C., Slapšak, B., Vermeulen, F. (eds.): Good Practice in Archaeological Diagnostics: Non-invasive Survey of Complex Archaeological Sites, 113–129. Cham – Heidelberg – New York – Dordrecht – London, Springer International Publishing, <https://www.doi.org/10.1007/978-3-319-01784-6>.
- Musil, J. (1995): Mušov (k. ú. Pasohlávky, okr. Břeclav). Přehled výzkumů 38 (1993–1994), 162–166.
- Müller-Kissing, J. (2015): Durch diese hohle Gasse muss er kommen. Deutsche und amerikanische Feldbefestigungen von 1945 bei Detmold-Berlebeck am Teutoburger Wald. Mitteilungen der Deutschen Gesellschaft für Archäologie des Mittelalters und der Neuzeit 28, 187–194, <https://doi.org/10.11588/dgamn.2015.0.21766>.
- Oberkommando des Heeres (1944): Merkblatt 57/5. Bildheft Neuzeitlicher Stellungsbau. Vom 1. Juni 1944.
- Passmore, D. G., Harrison, S. (2008): Landscapes of the Battle of the Bulge: WW2 Field Fortifications in the Ardennes Forests of Belgium. *Journal of Conflict Archaeology* 4, 87–107, <https://doi.org/10.1163/157407808X382773>.
- Passmore, D. G., Tunwell, D. C., Harrison, S. (2013): Landscapes of Logistics: The Archeology and Geography of WWII German Military Supply Depots in Central Normandy, North-West France. *Journal of Conflict Archaeology* 8(3), 165–192, <https://doi.org/10.1017/S0003598X00115455>.
- Passmore, D. G., Harrison, S., Tunwell, D. C. (2014): Second World War conflict archaeology in the forests of north-west Europe. *Antiquity* 88, 1275–1290, <https://doi.org/10.1017/S0003598X00115455>.
- Rak, M. (2011): Možnosti archeologického poznání novodobých polních fortifikací na příkladu lokality z 30. let 20. století. *Archaeologia historica* 36(1), 279–288.
- Rak, M. (2013): Archeologie konfliktů 20. století. In: Vařeka, P. (ed.): Archeologie 19. a 20. století. Přístupy – metody – témata, 115–136. Plzeň, Západočeská univerzita v Plzni.
- Rak, M. (2014): Archeologie konfliktů 20. století: Aeroarcheologie: historie – témata – metody – příklady. Plzeň, Západočeská univerzita v Plzni.
- Saunders, N. J. (ed.) (2004): *Matters of Conflict. Material culture, memory and the First World War*. Abingdon, Routledge, <https://doi.org/10.4324/9780203502549>.
- Saunders, N. J. (2005): Culture, conflict and materiality: the social lives of Great War objects. In: Finn, B. – Hacker, B. C. (eds.): *Materializing the Military*, 77–94. London, Science Museum.
- Saunders, N. J. (2010): *Killing time. Archaeology and the first world war* (2nd edition). Brimscombe, The History Press.
- Töpfer, H. (undated): German Tactical Manual. Electronic Publication. <http://www.gr916.co.uk/assets/pdfs/GermanTacticalManual.pdf>.
- Van der Schriek, M., Beex, W. (2018): The application of LiDAR-based DEMs on WWII conflict sites in the Netherlands. *Journal of Conflict Archaeology* 12(2), 94–114. <https://doi.org/10.1080/15740773.2017.1440960>.
- Vařeka, P. (2018): Archeologický výzkum tábora v Letech. Archeologie modernity a výzkum táborů z druhé světové války. *Dějiny a současnost* 40(4), 10–14.
- War Department (1944): *War Department Field Manual FM 5-15 Field Fortifications*. Washington, United States Government Printing Office.
- Wegener, W. (2014a): Feldstellungen des Zweiten Weltkrieges im Reichswald, Kreis Kleve. In: Hoppe, W. – Wegener, W. (eds.): *Archäologische Kriegsrelikte im Rheinland*, 89–91. Essen, Klartext Verlag.
- Wegener, W. (2014b): Amerikanische Artilleriestellungen im Hürtgenwald, Kreis Düren. In: Hoppe, W. – Wegener, W. (eds.): *Archäologische Kriegsrelikte im Rheinland*, 212–215. Essen, Klartext Verlag.
- Wegener, W. (2014c): Amerikanische und deutsche Feldstellungen im Hürtgenwald, Kreis Düren. In: Hoppe, W. – Wegener, W. (eds.): *Archäologische Kriegsrelikte im Rheinland*, 216–222. Essen, Klartext Verlag.
- Zubalík, J., Komoróczy, B., Lukáš, M., Vlach, M. (2017): Předběžná interpretace objektů polního opevnění německého Wehrmachtu u Pasohlávek (okr. Brno-venkov). *Archaeologia Historica* 42(1), 319–333, <https://www.doi.org/10.5817/AH2017-1-17>.
- Žampach, V. (2006): *Od Hronu k Vltavě: podíl 2. ukrajinského frontu Rudé armády na osvobození Československa*. Praha, Futura.