

**AERIAL ARCHAEOLOGICAL PROSPECTION AND DOCUMENTATION
THE AERIAL ARCHAEOLOGICAL ARCHIVE OF THE INSTITUTE OF
ARCHAEOLOGICAL SCIENCES OF THE EÖTVÖS LORÁND
UNIVERSITY OF BUDAPEST**

(SUMMARY OF THE ACTIVITY IN 1993-2005)

ZOLTÁN CZAJLIK

Eötvös Loránd University, Budapest

E-mail: zczejlik@freemail.hu

Abstract

The Aerial Archaeological Archive of the Institute for Archaeological Sciences of the Eötvös Loránd University of Budapest has been created in 1993. It's activity is characterised by four important programs:

- *13 years of aerial archaeological research (until 2000 in the cadre of the Hungarian-French archaeological co-operation).*
- *Exploration and mapping of aerial archaeological sites, which has been done parallel to the other activities.*
- *Processing of the data obtained from the 768 aerial archaeological sites discovered until 2006. The processing of the systematised archive has begun in two directions: we make the interpretations for the important sites and we prepare the geographical transformations of the aerial photos (if possible) and – principally in the case of settlements - we conduct intensive field surveys to control them.*
- *Cataloguing of earthwork fortifications, tell settlements and tumuli, which has been greatly supported by photographic surveys. This surveys can reveal new sites as well as new information about already known sites.*

The research activity of 13 years makes it possible to draw some general conclusions concerning the best choice of geographical areas (Northern and Eastern Transdanubia) and periods (the 2nd and 3rd weeks of June) for the most fruitful research.

KULCSSZAVAK: LÉGI RÉGÉSZET, TÉRKÉPEZÉS, ÉRTELMEZÉS, TEREPIJÁRÁS

KEYWORDS: AERIAL ARCHAEOLOGY, MAPPING, INTERPRETATION, FIELD SURVEY

Introduction

It's a historical fact, that the common use of the aeroplane – developed at the turn of the 19th and 20th centuries – and the photography has been initiated in the First World War. The analysis of the archaeological sites observed during war-time reconnaissance flights has led to a new method in the 1920's: to the development of the aerial archaeology (for the history of the international research see: Leidorf 1996, 33-37).

The situation was similar in Hungary, where the initiator of the research, Sándor Neogrády has served in the former Austro-Hungarian army. He took his first aerial photos in 1917 at the Italian front and from 1920 onwards he had a role in the establishing of the topographical aerial photography in Hungary. He has also found archaeological sites during his work and he managed to attract the attention of the Hungarian

researchers. Unfortunately he did not received any support, and the period of the 2nd World War as well as Cold War period were not suitable for any kind of substantive research (for the short summary of the Hungarian research see: Goguey, Szabó 1995, 18-19).

The political changes in 1989/90 brought a definitive turn. It became to be possible to conduct aerial archaeological research – although under the control of the military censorship until 2000. From that time the National Office of Cultural Heritage issues the permissions.

The research has begun at three institutions with the participation of home and foreign researchers: the Archaeological Institute of the Hungarian Academy of Sciences, the University of Pécs and at the Institute of Archaeological Sciences of the Eötvös Loránd University of Budapest from the beginning of the 1990's.

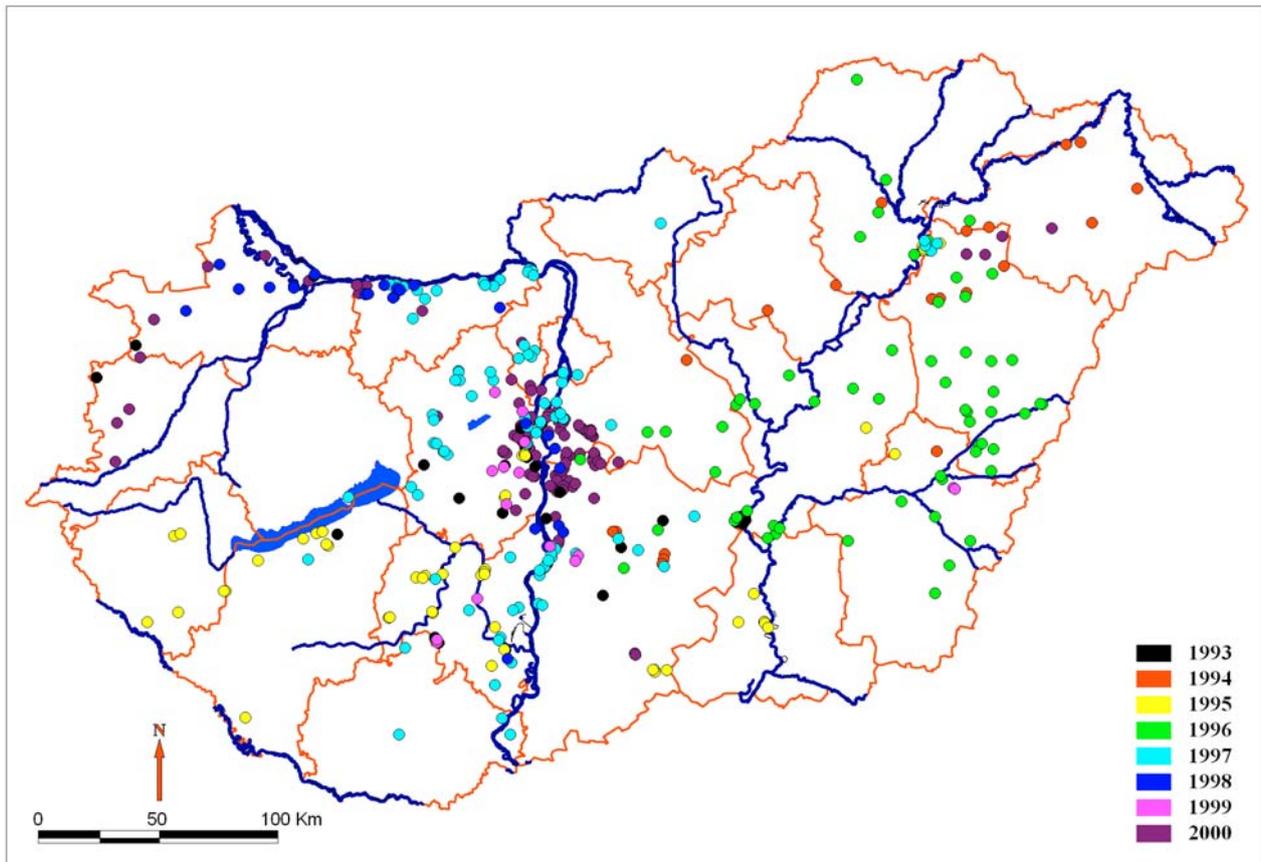


Fig. 1.

Aerial archaeological sites, prospected by R. Goguey (1993-2000), mapping by A. Bődöcs in 2006

The main task of the GIS Laboratory – created in 1993 as a part of the Archaeological Institute of the Eötvös Loránd University – was to process the GIS background of the rescue excavations on the M3 motorway in Hajdú-Bihar county (see: Czajlik & Holl 1996, Czajlik et al. 1997, 1999, Raczky et al. 1998, 2002). The creation of the laboratory has made possible the starting of linked scientific projects. We could manage the background research in the case of the aerial archaeological project between 1993 and 2000 in the cadre of a Hungarian-French co-operation. The initiation of that research comes from Prof. Miklós Szabó (on the Hungarian side) and from René Goguey (on the French side) and the main sponsors were the Ministry for Foreign Affairs of the French Republic, the Regional Council of Burgundy (France), the Institute of Archaeological Sciences of the Eötvös Loránd University of Budapest and the Balaton Program. Anne Violot-Richeton documentarian and Zoltán Czajlik archaeologist have been participating in the project from its very beginning.

Hungarian-French aerial archaeological research (fig. 1)

The main task of the aerial archaeological project starting in 1993, were the support of the Hungarian-French Iron Age research as well as the support of the regional research on the Northern part of the Great Hungarian Plain by the Institute of Archaeological Sciences of the Eötvös Loránd University, Budapest. According to the personal devotion of the French pilot René Goguey, the other main objective was the research of the Roman Danube frontier and Pannonia.

The practical experience – based on the very good weather and soil conditions during the aerial archaeological research - has made it clear, that the most important objective of the aerial research (of 30-40 hours a year) is the preliminary exploration of the whole surface of Hungary. That's why we have decided in the first five years to explore separate regions in order to avoid long aerial trips. This method has been proven very efficient as we have always changed the base airports.

The county museums offered us their aid and we co-operated during the airport use with the Jósa András Museum of Nyíregyháza in 1994, the Rippl-Rónai Museum of Kaposvár in 1995 and the Déri Museum of Debrecen in 1996. We had to get used to the circumstance, that the one-week-long aerial archaeological actions had to be scheduled, because of technical reasons. This means, we have done our research in regions, where the growth of the cereals on the fields has been appropriate.

Between 1993 and 1997, we could use the aeroplane of the Regional Council of Burgundy, a special plane of the type Robin 3000 (registry sign F-GKRB) adapted to the needs of aerial archaeology (board-GPS by Garmin, camera windows built into the door and into the rear fuselage). From 1998, we have used the Cessna 172 aeroplane (registry sign HA-SLG) of the Őcsény Aviation Club, piloted by Péter Cziráki. That plane had a more precise Garmin board-GPS and a camera window in the door. The photos have been taken almost exclusively by René Goguey on conventional films (mainly Kodak Ektachrome) using professional Nikon and Leica cameras. In 1997-1998 and in 2000 Zoltán Czajlik has made photos too, he has taken principally panoramic views to help the identification of the sites.

The processing of the photos has been managed to keep pace with the exploratory research. The basic processing was the preliminary identification (with interpretation sketches in many cases) of the sites, based on the slide copies and digitalised photos handed over by the French partner and on the GPS co-ordinates. The main task of the Hungarian participants was to get the appropriate topographical maps and to identify the sites on the photos. The most of this task has been done in the cadre of the Hungarian Scientific Research Fund Program (nr. T043762) using the benefits of the Balaton program (French-Hungarian bilateral governmental co-operation), too. The identification process has been finished early in 2006.

Year	Time period	Base airport	Number of identified aerial archaeological sites
1993	9-14th June	Sármellék	39
1994	3-7th July	Nyíregyháza	18
1995	26th June - 1st July	Kaposújlak	52
1996	11-18th June	Debrecen	70
1997	17-22nd June	Balatonkiliti	96
1998	5-8th June	Budaörs	38
1999	19-25th June	Budakeszi	38
2000	17-22nd June	Budakeszi	81
1993 - 2000		Total	432
1993 - 2000		Average (yearly)	54

Fig. 2.

Aerial archaeological prospections (R. Goguey, 1993-2000)

During the primary identification, we have found 432 aerial archaeological sites (**Fig. 2**). The term „aerial archaeological site” means we have identified 432 places on the 1:10,000 maps altogether using the GPS co-ordinates (rather inaccurate before 2001 because of political and technical reasons) where René Goguey has taken his photos. This number of 432 does not equal with the number of the new sites discovered since the structures seen on the photos could also reveal the following phenomena:

- non-archaeological phenomena (like traces of modern and 19th century farms esp. on the Great Hungarian Plain)
- drains filled in, trenches from the war periods, traces of soil amelioration
- archaeological sites already known (tumuli, earthwork fortifications, etc.)

Despite of the inaccuracies mentioned above the majority of the photos taken show new archaeological sites, thanks to the working method of René Goguey who has filtered the information before he has taken any photos and he has drawn sketches in the aeroplane just over the site after he has completed an action. This method has proven very efficient during the research.

The brief evaluation of the more than 4000 photos taken at 432 aerial archaeological sites during 8 years leads to the following experience:

- the best time interval for aerial archaeological operations in Hungary is linked to the seeding of the cereals planted at autumn, which means usually the 2nd and 3rd week of June. A slight discolouration of the cereals planted in autumn can be observed under circumstances in the 1st week of June and the discolouration is still visible in the 1st week of July – just before harvest. This discolouration is visible even in the spring growth just after plantation.
- Most of the aerial archaeological sites are located in the eastern part of Transdanubia (**Figs. 3-4**) as well as between the Danube and the Tisza and in the Kisalföld (the latest applies for certain years only). Despite of the base airports at Nyíregyháza and Debrecen we have identified only a relative small number of new sites on the Great Hungarian Plain and the same happened when the base airport has been set to Sármellék and Kaposújlak: the number of the sites in Zala and Somogy county is relatively small.
- We believe that the scheduling of the operations has significantly influenced the effectivity of the research, but the results show that the years 1997 and 2000 were very efficient, in contrast to the year 1994 of no avail. In certain years the greenery appeared on the whole surface of Hungary (1993) but sometimes we could observe a mosaic-like pattern (1998, 2000).



Fig. 3 a-b.

Beloianisz – Nagy Vadas: Traces of a medieval farm(?) and the field usage (photo: R. Goguey, 12 June, 1993; interpretation: A. Violot-Richeton in 1995; field survey: Z Czajlik and K. Tankó, 11 April, 2006)



BELOIANISZ (HONGRIE)
Recherches d'Archéologie A. Violot-Richeton - R. Goguey / Plan - A. Richeton

When we would like to have an overview of the results of the Hungarian-French co-operative research activity we can not leave the publications and exhibitions of this 8 years period unmentioned.

The first introduction of the research program was at the RCHMS conference in Oxford in September of 1995 (published only later: Goguey & Czajlik 2003) and, at the end of the same month at the conference of the Brandenburgisches Landesmuseum (Goguey 1995). In October of the same year the results were displayed for the professionals and the public at the international conference organised by the French Institute in Hungary and the Eötvös Loránd University of Budapest as well as at the joint exhibition „L'histoire vue du ciel” - The history from bird's eye view (Goguey & Szabó 1995). The novelty of the exhibition has been confirmed at a series of representations at Debrecen, Székesfehérvár, Dijon, Bibracte and Châtillon-sur-Seine. In December of 1996 he held a presentation at an international aerial archaeological conference in Prague (Goguey 1997) and the results we have displayed at a series of international exhibitions in 1997, participating 6 Central-European nations. The conference in honour of the 10th anniversary of the French-Hungarian co-operation was held just before the flight actions in 1998 with the first comparison of the prehistoric sites in Eastern France and Hungary by René Goguey (Goguey 2000a) and at the same time was published a short report on the technical background of the researches (Goguey 2000b).

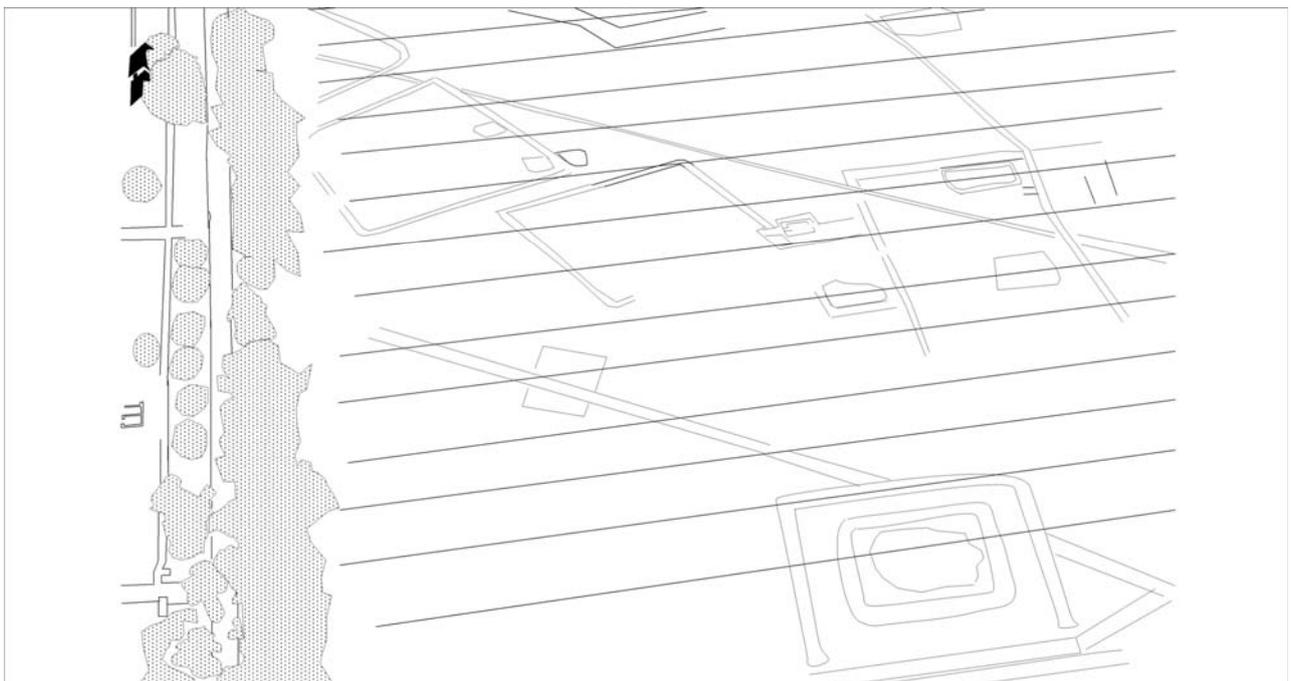
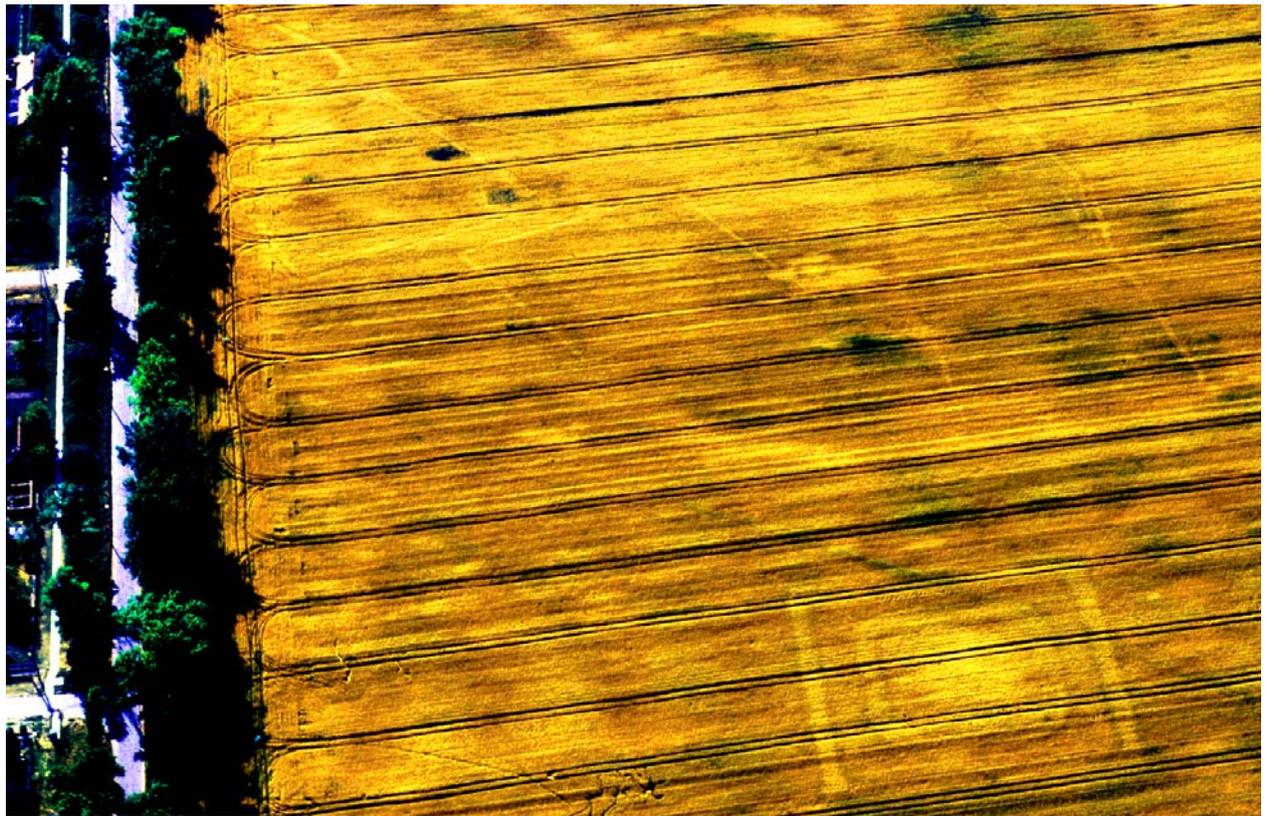


Fig. 4 a-b.

Ercsi – Sinatelep: Traces of a Late Roman military tower, the limes-road and a fortification? (photo: R. Goguey, 28 June, 2000; interpretation and field survey: A. Bődöcs, 2003)

Since we had outstanding results in the year 2000 there has been published a preliminary evaluation incorporating the analysis of the possibilities of the GIS processing, too (Goguey et al. 2003). The exhibition in 2002 displayed in Lyon - Saint-Romain-

en-Gal – Vienne has shown the summarisation of the results of the 8-years-long research period (Goguey 2002a). There has been also released an article for the public (Goguey 2002b).

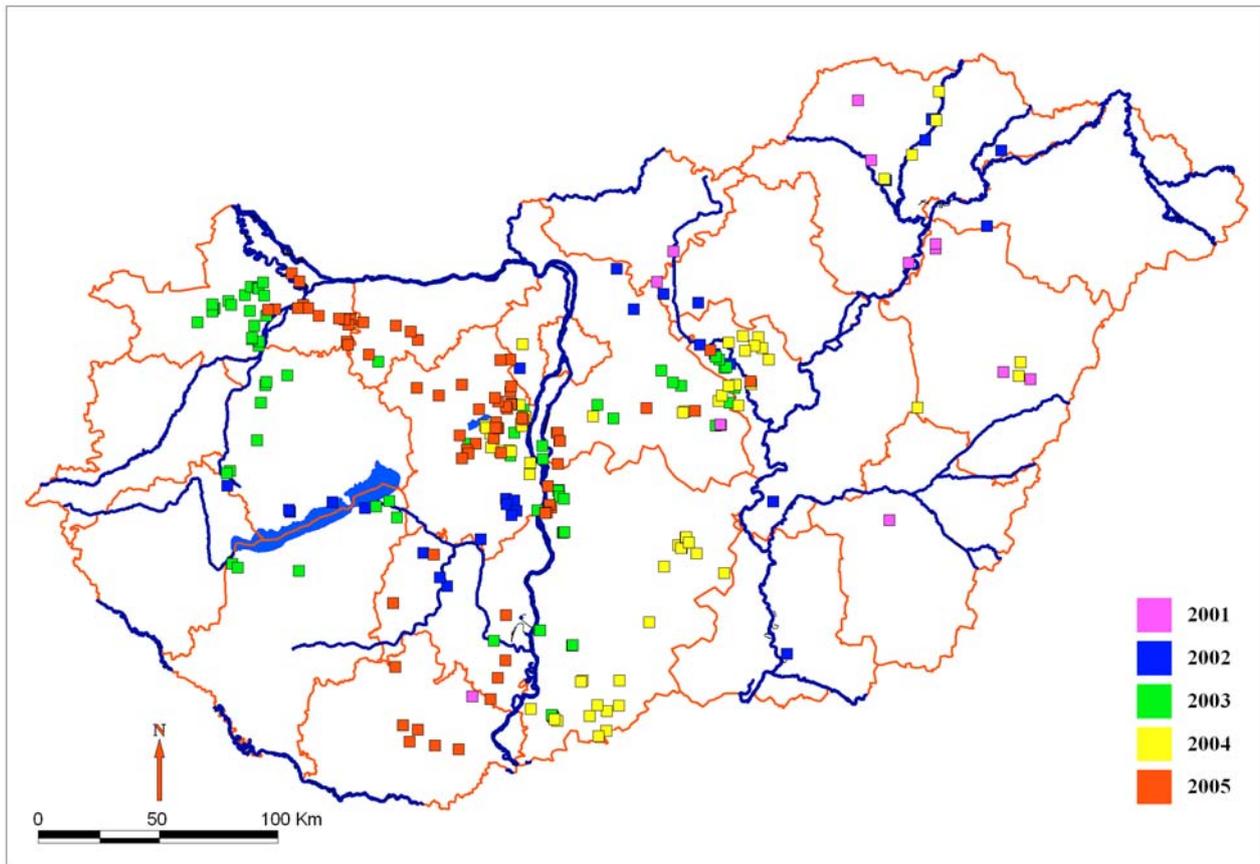


Fig. 5.

Aerial archaeological sites, prospected by Z. Czajlik (2001-2005), mapping by A. Bődöcs in 2006

Aerial archaeological prospection since 2001 (fig. 5)

In 2000 and 2001 the financial background is supported by different projects, from 2003 by the Hungarian Scientific Research Fund Program (as mentioned above) and from 2004 onwards we can benefit the increasing support of the private sector, too. An important support is the assignment from the territorial museum organisations as order as well as a co-operation (Somogy, Bács-Kiskun and Borsod-Abaúj-Zemplén counties).

An important change since the period between 1993 and 2000, that we manage to select the best days for aerial actions considering the weather of the spring/early summer period. It means a significant difference that we have got the flight data from the previous actions (they are processed in an increasing number) which allows us to plan and schedule the aerial photography actions. The technical development – the evolution of the digital photography and the use of video cameras – can be considered as an advantage compared to the past (faster processing), despite of the fact that the digital technology does not allow the same

image quality as the conventional photography technology at the same price level.

Compared to the period between 1993 and 2000 we could explore a bit less number of sites during less or equal time spent with flight between 2001 and 2005 (**Fig. 6**). The region between the Danube and the Tisza rivers as well as the Eastern-Transdanubia proved to be fruitful for the research and in certain years we had outstanding results.

Year	Time period	Summer period	Number of identified aerial archaeological sites	Bibliography
2001	6 days, 28th April - 17th November	2 days, 6-12th June	12	Czajlik 2003
	6 days, 9th March - 17th June	4 days, 1-17th June	26	Czajlik 2004a
2003	7 days, 12th January - 25th September	5 days, 24th May - 22nd June	71	Czajlik 2004b
	7 days, 31st March - 21st June	5 days, 8-21th June	59	Czajlik 2005
2005	6 days, 1st April - 28th June	5 days, 13-28th June	68	Czajlik - Bődöcs 2006
	Total		236	
2001-2005		Average (yearly)	47,2	

Fig. 6.

Aerial archaeological prospections (Z. Czajlik, 2001-2005)

We have found a great number of new sites in the Kisalföld region in 2003 and in the Jászság region (where the research has been not very effective before) in 2003 and 2004.

In many cases we could observe very light discolouration in the vegetation, which was seen only once before (in 2000) thanks to the precise schedule of the flight actions and the dry springtime weather in those years. In 2003 and 2004 we could identify even cemeteries of serial type and ditch-framed burials as well as the traces of long houses and houses with foundation trenches.

The results of the archaeological exploration are published in the periodical *'Archaeological Investigations in Hungary'* from 2001 onwards. We are also displaying our results on exhibitions: the most remarkable ones were at the Hungarian University of Fine Arts (January 2005), Denkmalexpo Leipzig (October 2006) and the overview of our research has been displayed at the 'Örökség Galéria' (Heritage Gallery, September, 2007).

Inventory programs

The infrastructural background built up in the GIS Laboratory of the Archaeological Institute of the Eötvös Loránd University of Budapest and the experience in archaeological GIS have made it possible to start the different inventory programs. The inventory program for tumuli, earthwork fortifications and tell settlements has been initiated by the Ministry of Environment in 1996 according to the law 1996/LIII. The database has been finished (with the exception of the Roman Age tumuli and the Medieval earthworks), but in the case of the prehistoric earthwork fortifications and the tell settlement on the Great Hungarian Plain we have also finished the topographical identification. The database of kurgans and the tumuli has been developed by Zoltán Czajlik and Balázs Holl, based mainly on the data collection of István Ecsedy and Dénes Virágh (Ecsedy 1979) and the Archaeological Topography of Hungary (MRT 1966 - 1998). The inventory of the prehistoric earthwork fortifications has been made by Gyula Nováki, Zoltán Czajlik and Balázs Holl using the data collection of József Dénes and Zsuzsa Miklós (presented in Linz, at the ÖGUF-conference in 1999, Nováki et al. 2006) and the inventory of the tell settlements has been created by a workgroup led by Pál Raczky and Nándor Kalicz (participants: Alexandra Anders, Marietta Csányi, Judit Tárnoki, Emese Gyöngyvér Nagy, Zoltán Czajlik). The most important result of the inventory work is not the publishing of the sites – known since the 19th century in many cases - but their precise coordinate definitions. Without that, there would have never been any chance to do the aerial archaeological status control, which is the base of our aerial photo research program.

Aerial archaeological status control of earthwork fortifications (fig. 7)

After the previous work, we have started the aerial archaeological status control of the earthwork fortifications. The program was funded by the Ministry of Education (program Nr. 0198/2000) between 2000 and 2002, from 2003 it is supported by the Hungarian Research Found Program (Nr. T043762).

The inventory finished in 1999 includes the status of 200 earthwork fortifications. During the survey it was a very important factor to take pictures from as many fortifications as possible at one flight action. This resulted in exploration of 5-10 fortifications per flight.

An important factor in the taking of photos, was to make the flight possibly, when the plants were defoliated. In the vegetation period we managed to take photos from the earthworks covered by trees and bushes. It became evident that the spring reveals more opportunity for the flight actions since the trees of the oak genus do not drop their leaves in the late autumn and the early sunset is very unpractical for taking pictures. The snow-covered surface is very good for both types of the fortified settlements: the ones in openings and the ones covered with vegetation.

Regarding our experience detailed above we could finish the documentation of 160 earthwork fortifications, which means 80% of the total. In addition, we have taken photos of 32 Medieval earthwork fortifications and 20 new other ones have been identified (**Fig. 5**). In many cases we could obtain more information about already know fortifications. We have to point out that the photos taken by René Goguey between 1993 and 2000 helped us to identify many fortifications not known before – an addition to the number of earthworks in our database. The results we presented at the international (Czajlik 1999) and national (Czajlik & Holl 2003) conferences, in reports (Czajlik 2004a, 2004b, 2005, Czajlik & Bődöcs 2006, Vicze et al. 2005) and in an overview (Czajlik 2006).

Evaluation of the data

After 13 years of research, we can state that the aerial archaeological research has to be continued in Hungary, because of the very good natural conditions. The best regions for the research are the region between the Danube and the Tisza rivers as well as the Eastern and Northern Transdanubia. Thanks to the good possibilities and the advantage of the airports near to Budapest (Tököl and Budaörs), we could find many new aerial archaeological sites to the South from Budapest along the riversides of the Danube down to Paks in the last 5 years. Going to the East from the Danube we could explore many sites in the zone of Dunaharaszti-Dabas-Dunavecse, even in the years of rainy or disadvantageous weather.

**Fig. 7.**

Etyek – Pince-dűlő: traces of a Bronze age earthen fort (photo: Z. Czajlik, April 1, 2005; field survey: Z. Czajlik, March 12, 2007)

**Fig. 8**

Ráckeresztúr – Malontai út mellett: Traces of a rural settlement from the Celtic period (photo: Z. Czajlik, 11 June, 2003, field survey: Z. Czajlik and A. Bődöcs, March 28, 2006)

This can be caused by the soil structure, since there is a field of gravel from the Late Pleistocene Age under this zone (Goguey et al. 2003, 80.).

The density and complexity of the aerial archaeological sites in the region to the South from Budapest (Adony-Ivánca, Zichyújfalu-Szabadegyháza, Szalkszentmárton, Bugyi, Dabas) is the reason for a full-scale photo interpretation work. This work results in the merging of the rectified photos with the maps and the processing of photo-maps.

Since the decision between archaeological sites and the other phenomena can be done only after field survey of the aerial archaeological sites, we have begun the field surveying in the spring of 2006 and our first impressions are very positive about the results. The first task of the field survey done on the fields of Ráckeresztúr (**Fig. 8**), Adony, Beloianisz, Ercsi, Perkáta, Szabadegyháza and Gárdony is to determine whether they are settlements or not. As a preliminary evaluation, we can report that the majority of the aerial sites proved to be an archaeological site of the Bronze, Celtic or Roman Ages.

Translated by Lőrinc Timár

Bibliography

CZAJLIK, Z. (1999): Archaeological Aerial Prospection in Hungary: a Landscape Vanishes... in: FASSBINDER, J. & IRLINGER, W. E.: Archaeological Prospection. Third International Conference on Archaeological Prospection, Munich 9.-11. September 1999. *Arbeitshefte des Bayerischen Landesamtes für Denkmalpflege*, **108**, 24-25.

CZAJLIK, Z. (2003): Rövid jelentések - Short reports (Békés – Viharsarok TSZ, Cegléd – Hódula-dűlő, Hajdúszovát – Cenzus-föld, Hunya – Baják L. tanya, Konyár – Nagy Hangás-dűlő, Polgár – Ferenci-hát 2, Szeghalom – Cigányéri-dűlő, Tiszakeszi – Rigós), *Régészeti Kutatások Magyarországon – Archaeological Investigations in Hungary 2001*, KÖH, Budapest, 142., 156., 171., 173., 180., 204., 218., 229.

CZAJLIK, Z. (2004a): Légirégészeti kutatások Magyarországon 2002-ben (Rövid beszámoló az ELTE Régészettudományi Intézetének Térinformatikai Kutatólaboratóriumában végzett munkáról) - Aerial archaeological investigations in Hungary in 2002 (A short report on the work done in the GIS Research Laboratory of the Institute of Archaeological Sciences, Eötvös Loránd University), *Régészeti Kutatások Magyarországon – Archaeological Investigations in Hungary 2002*, KÖH-MNM, Budapest, 161-169.

CZAJLIK, Z. (2004b): Légirégészeti kutatások Magyarországon 2003-ban (Rövid beszámoló az ELTE Régészettudományi Intézetének Térinformatikai Kutatólaboratóriumában végzett munkáról) - Aerial archaeological investigations in Hungary in 2003 (A short report of the activity of the 3D Research Laboratory of the ELTE Archaeological Institute), *Régészeti Kutatások Magyarországon – Archaeological Investigations in Hungary 2003*, KÖH, Budapest, 111-125.

CZAJLIK, Z. (2005): Légirégészeti kutatások Magyarországon 2004-ben (Rövid beszámoló az ELTE Régészettudományi Intézetének Térinformatikai Kutatólaboratóriumában végzett munkáról) - Aerial archaeological investigations in Hungary in 2004 (A short report of the activity of the 3D Research Laboratory of the ELTE Archaeological Institute) *Régészeti Kutatások Magyarországon – Archaeological Investigations in Hungary 2004*, KÖH, Budapest, 121-142.

CZAJLIK, Z. (2006): Óskori erődítések kutatása légi régészeti módszerekkel. In: KOVÁCS, Gy. & MIKLÓS, Zs.: „Gondolják, látják az várnak nagy voltát...” *Tanulmányok a 80 éves Nováki Gyula tiszteletére*, Castrum Bene Egyesület – Históriaantik Könyvesház, Budapest, 71-80.

CZAJLIK, Z. & BÖDŐCS, A. (2006): Légirégészeti kutatások Magyarországon 2005-ben (Rövid beszámoló az ELTE Régészettudományi Intézetének Térinformatikai Kutatólaboratóriumában végzett munkáról) - Aerial archaeological investigations in

Hungary in 2005 (A short report of the activity of the 3D Research Laboratory of the ELTE Archaeological Institute). *Régészeti Kutatások Magyarországon – Archaeological Investigations in Hungary 2005*, KÖH, Budapest, 149-159.

CZAJLIK, Z. & HOLL, B. (1996): The Archaeological Chronology and the Excavation Data Bases. In: MARTON, E. ed.: *The Future of Our Past '93-'95*, MNM, Budapest, 144-150.

CZAJLIK, Z. & HOLL, B. (2003): Die Luftbildprospektion der urzeitlichen Erdburgen Ungarns. In: VISY, Zs., ed.: *Mandulavirágzás tudományos napok, Régészeti műemlékek kutatása és gondozása a 3. évezred küszöbén Pécs-Szekezsárd*, 2002. március 4-8., Pécsi Tudományegyetem Ókortörténeti és Régészeti Tanszék Régészeti Szemináriuma, Pécs, 67-82.

CZAJLIK, Z., MARTON, Á. & HOLL, B. (1997): Az M3-as autópálya régészeti leletmentéseinek térinformatikai feldolgozása Hajdú-Bihar megyében - The GIS Processing of the Rescue Excavations Associated with the M3 Motorway in Hajdú-Bihar County. In: KOVÁCS, T., ANDERS, A. & RACZKY, P.: *Utak a Múltba - Paths into the Past - Az M3-as autópálya régészeti leletmentései - Rescue Excavations on the M3 Motorways*, Budapest 1997, 153-155.

CZAJLIK, Z., MARTON, Á. & HOLL, B. (1999): Az M3-as autópálya régészeti leletmentéseinek térinformatikai feldolgozása Hajdú-Bihar megyében. *DÉM 1997-1998* **73** 193-197.

ECSEDY, I. (1979): The people of the pit-grave kurgans in Eastern Hungary, *Fontes Archaeologici Hungariae*, Akadémiai kiadó, Budapest

GOGUEY, R. (1995): Archéologie aérienne de la Seine au Danube : quelques aspects des récentes recherches sur la Bourgogne et la Hongrie. In: „Luftbildarchäologie in Mittel- und Osteuropa”. *Actes du Colloque de Berlin, 26-30 sept. 1994*. Potsdam, Brandenburgisches Landesmuseum für Ur- und Frühgeschichte, 227-235.

GOGUEY, R. (1997): Coopération franco-hongroise en archéologie aérienne: Cinq campagnes de recherches de 1993 à 1997. In: OEXLE, J.: *Aus der Luft – Bilder unserer Geschichte*, Dresden, Landesamt für Archäologie, 82-89.

GOGUEY, R. (2000a): Nécropoles et habitats protohistoriques : aperçu des recherches d'archéologie aérienne menées sur le quart nord-est de la France et sur la Hongrie. In: GUILLAUMET, J.-P.: *Dix ans de coopération franco-hongroise en archéologie 1988-1998*, Collegium Budapest, Budapest, 77-96.

GOGUEY, R. (2000b): Sur la route de Dijon ... au limes romain de Pannonie. *Bulletin de Centre interdisciplinaire de Recherche Aériennes* **23** 30-31.

GOGUEY, R. (2002a): *Traces dans la Grande Plaine... Photographies aériennes de Hongrie*. Exposition du 18 avril au 2 juin 2002. Musée et site archéologiques de Saint-Romain-en-Gal – Vienne.

GOGUEY, R. (2002b): L'histoire vu du ciel, *Archéologia* **395** 32-43.

GOGUEY, R. & CZAJLIK, Z. (2003): Un aspect de la coopération Bourgogne-Hongrie dans la recherche et la protection sites : le GPS, vecteur entre l'archéologue, le chercheur aérien et la carte informatisée. *CommArchHung* **23** 5-14.

GOGUEY, R. & SZABÓ, M. (1995): *L'histoire vue du ciel. Photographie aérienne et archéologie en France et en Hongrie – A történelem madártávlattól. Légi fényképezés és régészet Franciaországban és Magyarországon*. Institut Français en Hongrie – Eötvös Loránd Tudományegyetem Budapest.

GOGUEY, R., CZAJLIK, Z. & BÖDŐCS, A. (2003): Magyar-francia légi régészeti kutatások Magyarországon - Recherches franco-hongroises d'archéologie aérienne en Hongrie en 2000. *Régészeti kutatások Magyarországon - Archaeological Investigations in Hungary, 2000.*, KÖH - Magyar Nemzeti Múzeum, Budapest, 75-86.

LEIDORF, K. (1996): Luftbildarchäologie – Geschichte und Methode. in: BECKER, H. (Zgst.) : Archäologische Prospektion. Luftbildarchäologie und Geophysik. *Arbeitshefte des Bayerischen Landesamtes für Denkmalpflege*, **59** München.

MRT 1966 -1998: *Magyarország Régészeti Topográfija*, volumes 1-10, Akadémiai kiadó, Budapest.

NOVÁKI, Gy., CZAJLIK, Z. & HOLL, B. (2006): Kataster der prähistorischen Erdburgen Ungarns – Versuch einer umfassenden Datenerfassung zum Schutz des kulturellen, archäologischen und naturräumlichen Erbes In: Alexandra Krenn-Lieb (Hrsg.): *Wirtschaft, Macht und Strategie. Höhensiedlungen und ihre Funktionen in der Ur- und Frühgeschichte. Archäologie Österreichs Spezial* **1** 125-139.

RACZKY, P., CZAJLIK, Z., HOLL, B. & MARTON, Á. (1998): GIS and the evaluation of rescue excavations along the M3 Motorway in Hungary, *Poročilo* **24** 157-170.

RACZKY, P., PUSZTA, S., CZAJLIK, Z., HOLL, B. & MARTON, Á. (2002): Investigation of archaeological sites with the integrated application of aerial photography, magnetometer surveys and archaeological excavation. In: JEREM, E., T. BIRÓ, K. & RUDNER, E.: *Archaeometry 98. Proceedings of the 31st Symposium Budapest, April 26 - May 3 1998, Volume I, BAR International Series* **1043** (I), 135-143.

VICZE, M., CZAJLIK, Z. & TÍMÁR, L. (2005): The archaeological topography of the Northern part of the Benta-valley. In *Százhalombatta Archaeological Expedition (SAX)*, **2**, Matrica Museum, 251-254.