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Dimitrij MLEKUŽ

AIRBORNE LASER SCANNING AND LANDSCAPE ARCHAEOLOGY

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Airborne lidar (Light Detection And Ranging), ALS or ALSM (Airborne Laser Scanning, Airborne Laser Swath Mapping) is an active remote sensing technique, which records the surface of the earth using laser scanning. ALS allows very precise three-dimensional mapping of the surface of the earth, producing high-resolution topographic data, even where surface is obscured by forest and vegetation. The level of detail on digital surface and terrain models produced from high resolution ALS topographic data helps us enormously in identification of past events, which reworked and modified the surface of the earth. However, interpretation of ALS data poses much more than technical challenges. ALS does not provide only a layer of data, but offers a different view of landscape. What kind of landscapes do we see with ALS?

Key words: Airborne laser scanning, lidar, topography, landscape, texture, time, archaeology,

Introduction

Laser scanning describes any technology which accurately and repeatedly measures distance using laser pulse, by precise measurement of time needed for the laser pulse to travel from the object and back, and transforms these measurements into a series of points, or a point cloud, from which information on the morphology of the object being scanned may be derived. Airborne LiDAR (Light Detection and Ranging), ALS or ALSM (Airborne Laser Scanning, Airborne Laser Swath Mapping) is an active remote sensing technique, which records the surface of the earth using laser scanning (Opitz 2012: 13).

ALS allows very precise three-dimensional mapping of the surface of the earth, producing high-resolution topographic data, even where surface is obscured by forest and vegetation. The level of detail on digital surface and terrain models produced from high resolution ALS topographic data helps us enormously in identification of past events, which reworked and modified the surface of the earth. However, interpretation of ALS data poses much more than technical challenge. ALS does not only produce pictures, but extends our powers to detect record and imagine landscapes.

I want to argue that paying attention to the richness of detail, visible on ALS scans, allows us to approach landscapes in a different way. ALS can help us to tackle landscapes not as a flat, static, featureles, background or stage, upon which life unfolds, but as a dynamic space, shaped by and shaping its interaction with the bodies, things and substances who inhabit it.

ALS, LANDSCAPE ARCHAEOLOGY AND KNOWLEDGE PRODUCTION

In archaeology, as in every other science, knowledge is not discovered, but constructed, produced, crafted through scientific practice. Science, including landscape archaeology, is a semiotic practice, which deals with signs and symbols instead of touching directly the messy "real world". Since it is impossible to deal with the real world every time you want to make a statement about it, the work of the landscape archaeologists involves the creation of maps, sketches, illustrations, photographs, point clouds, papers, books and other "inscriptions" (see Latour 1986; 1987; 1999).

The striking feature if the process of scientific engagement is its sheer materiality. Bruno Latour and other practitioners of science studies show how in order to engage with the material world scientists need to draw on a whole host of other laboratory agents and equipment. No serious scientists face nature with their bare eyes and hands, whether in the laboratory or in the field. Without instruments, tools, they are no different from non-scientists who have basic training about science. Airborne laser scanning systems are complex assemblages of technologies, including a laser scanner, positioning and georeferencing equipment (GPS and inertial measurement unit, IMU), data recording system located on an airborne platform, aircraft or helicopter that produce the trace of the surface of the earth (Opitz 2012).

These instruments are the interface between the real world and the landscape archaeologist, where inscriptions are produced. If you want to find out what landscape archaeologist does, find out first what kind of instrument he or she is using, and then observe what he or she does to the instrument and with the instrument. Engagement with past landscapes thus becomes 'a kind of performative material intervention' in order to make them sensible.

ALS AS TOPOGRAPHY

Topography is one of the oldest approaches in landscape archaeologist's toolbox. Topography is study of places, their shape and features that can hint about the potential existence of structures buried beneath the soil. Many sites are visible on the ground as a series of traces, topographic "humps and bumps". An accurate plan, produced by topographical survey can reveal the outlines of previously unrecognised site.

ALS produces metrically accurate high-resolution topographic data that can be understood as an extension of these technologies.

What is the difference between topographic data produced by topographic survey or by ALS? There are obvious difference in spatial cover, acquisition speed and sheer volume of data, but there is more. What makes ALS different from other topographic techniques is its lack of selectiveness. ALS data is typically gathered across complete landscape blocks, not limited to selected places, and does not record only important "humps and bumps", recognised as such, but the whole landscapes, all the mess of traces, humps and bumps. ALS records landscape in an indiscriminate way, every place, every feature, every trace, and every square meter is in principle treated with the same attention and resolution (Mlekuž 2012: 92).

FROM TRACES TO LANDSCAPES

TRACES

Humans and other creatures and things in landscape are tangled up in constant relations of modification and reciprocity with their environs through various material practices, modifying matter, leaving traces in the fabric of the world.

A trace is a mark of something, a material residue of an occurrence or an existence. One class of traces is thus the imprint of something on a surface, in which nothing of the object that made the imprint remains, merely a negative of its contours. Created by removing, scratching, cutting into the surface, such as footprints, holloways, ditches, cuts. Footprints, cuts, scrapes, scuffs, scratches, scars, are all traces. On the other hand, they can be created by accumulation, bringing things and substances together. Blood stains are example of this kind of traces, same as mounds, walls, cairns, So, too, are piles, heaps, accumulations, mounds, banks.

When comes to leaving traces, people are not privileged. Natural processes leave traces too, same as

animals and humans. Water can accumulate levees, banks and bars and can erode gullies, channels and valleys. Wind can throw trees, creating scars on the forest surface. Animals scrape their traces during their daily routines as well: badger sets, boar rootling, deer digs, and animal trails are traces of animal practices.

As such, traces are also signs of past action, event that made them happen. Traces, being deposited by humans, animals, natural processes such as the weather, need not be purposefully fabricated signs, and in fact most are not. Those features are indices, traces of daily routines, non-discursive practices that left marks on the surface of the earth, material ripples of the practices that occurred on it. However, some traces are intentionally constructed as signs. Buildings, monuments, barrows, roads, parks, gardens signifying the idea of durability, control, aesthetic beauty or monumentality or symbolic power. They were deliberately built to change the way people move, interact, access, see and understand the landscape.

This is what we see on the high-resolution topographic data, multiplicity and richness of past things, traces of past activities and tasks, human and non-human materialised in a landscape. Lime kilns, charcoal burning platforms, fields, holloways, tracks, lynchets, quarry pits, but also animal trails, paleochannels, tree throws, landslides … – landscapes are full of these traces. These features overlap, crisscross, are destroyed, reworked or incorporated into other features (Mlekuž 2012: 92–95). Looking at the ALS scans, anything, literally anything might be of interest, significant as information, as evidence (Mlekuž 2013: 119–122).

This prompts us to shift thinking about past landscape in practical and processual terms, or, in other words, as something that was in a perpetual state of becoming, made and remade by people, animals, natural forces and things.

Reading traces

In order to operate as a sign, the trace must be visible and recognisable (Hauser 2007: 73). As marks of something, as the signs of past events and processes, intelligible only as such, these traces need to be interpreted. Interpreted means correlating trace with the event that produced it, supplementing the trace with a mental image of what is missing from it. The archaeological record is full of absences (Lucas 2012). Thus looking at the trace of holloways, we see something that is not there, people moving along the path (Hauser 2007: 93). There is a gap between trace and the past action or event that produced it, and it has to be crossed by archaeological imagination. This is not always possible; interpretation therefore produces include many uncertain categories. Interpretation is highly subjective process and there can be several "right" interpretations of the same traces, depending on experience of the interpreter and questions asked (Palmer 2012).

Interpretation of these traces is material engagement with the landscape. Dealing with high resolution topographical data involve constant movement, zooming in the traces, and interaction with them through different visualisations, drawing information about them from different inscriptions, circulating along the chain of references, and then again zooming out, panning to other trace, establishing connections with other traces and wider landscape. This is what Rachel Opitz and Laure Nuninger (2010) call "contextual topography" and is way of creating knowledge through practices of mapmaking, transformations and translations of maps, juxtaposing different strands of evidence and between scales. In this way, our own interpretation practices become interwoven with past practices that created material traces in the landscape. Through our encounter with traces, by moving between them, by we reiterate connections between them and create. Interpretation is itself a specific way of dwelling in a landscape. Archaeological engagement with past landscape is always on the move, in mobile temporary articulations of place, person, artefact, events.

And good practice of interpretation includes reflexion on how knowledge is produced through our own practices of contextual topography (see Mlekuž 2012).

Landscape is therefore full of the traces of past practices. These traces should not be understood as isolated discrete "features", but a material residue of a web of interrelated practices. This prompts us to shift thinking about past landscape as something that was in a perpetual state of becoming, made and remade by people, animals, natural forces and things.

Landscapes as relations

This means that humans, but also other creatures and things are tangled up in constant relations of modification and reciprocity with their environs, modifying matter, leaving traces in the fabric of the world. However, this action, of modification should not be understood not as a one way street running from the actor to the acted upon, from the active to

the passive or mind to matter, from subject to object, from humans to things and landscape, but as a relational phenomena looping back and regulating itself through feedback phenomena such as resistance, balance, rhythm and tone (see Ingold 2000). All things are beings in the world alongside other beings, such as humans, plants and animal s (see Whatmoor 2002).

Material practices relate to the traces of previous activities. Relations are established, forged, through encounters with other things in landscape. In this sense, our first engagement with the landscape happens almost before thought, half second before it, as a shift in sensory perception, which allows us to focus in on one affect, one event, and quieten others to experience a phenomenon. This half-second gap of affect is place where the material body both coincides with and struggles with the materiality of the landscape (Thrift 2007: 12–17).

Landscapes are primarily about relations. Instead of focusing on static things, that landscape is composed of –features, sites, regions –, we might focus on the significance of networks, connections, flows and mobilities in the ongoing making of landscape and bodies that inhabit it (see Urry 2007).

Rather than relations and connections being forged in an already-given space, relations are creative. That is, relations do not occur in space, they make spaces – relational spaces, and the landscape is comprised of these. Relations spawn things, beings and landscapes, not vice versa.

Thus bodies and the landscape are understood to be complimentary concepts that are useful to think through together – each in a constant process of 'becoming' through the other. Human beings are not detached and singular "intentional agents", but rather always already implicated in complex sociotechnical assemblages, networks (see Latour 1999). In this way it is becoming increasing hard to hold human life apart from materiality and to deny agency to all forms of life except humans. What we have are more-than-human landscapes emerging from the relations between many things, bodies, substances, technologies.

The result is that landscape is never entirely realised, never finished, though always on the way to become so. Landscape is not series of discrete states, but ongoing, emerging, never fully realised tendencies.

Busy landscapes

The fundamental characteristic of material world is duration. Traces, by definition material are durable remnants of past events. Traces of different periods can exist simultaneously enduring in a land for different lengths of time because there are variations in change or turnover (Lucas 2005). The landscape is therefore multi-temporal, made up of a series of past durations.

The material world is composed of objects of differential duration. Material objects, things, traces, by definition, have duration that extends their creation created to the current moment of observation. Moments in time that leave no material traces are unknowable, at least from the archaeological past. Past is therefore incorporated and reworked into the present (Oliver 2001: 62).

What makes archaeology different from other disciplines is our concern with time depth of human engagement with the world and landscape. Landscape is continuously produced Thus time is inscribed in its very constitution at multiple levels and scales (Bender 2002). Materially, the past does not exist as a sequence of events; and never did. We never encounter time as date, flow or sequence. Ontologically the past is all around us, mingling, merging, decaying, disappearing in the present (Shanks & Svabo 2013: 100).

The most often used metaphor we use to describe the build up of landscape is palimpsest. Palimpsest is a parchment on which earlier writing has been erased to make way for new text. It refers to the traces of multiple, overlapping activities over variable periods of time and the variable erasing of earlier traces (Crawford 1953). Although the metaphor of palimpsest implies possibility for separating discrete layers, palimpsest usually refers to a process of superimposition of successive activities which partially destroyed or reworked earlier traces (see Lucas 2005: 37). Thus a palimpsest involves both the total removal of all information except the most recent as well as accumulation and transformation of successive and partially preserved activities. Most palimpsests were made both by mixing of material of different ages and destruction of material resulting from successive episodes of clearance and removal or progressive decay of material. The key trait they share in common is that both result from the repetition of activities and the deposition of material in the same location, or in similar locations with considerable overlap.

But past is messy, much messier than simple palimpsests. Due to the processes of reworking, mixing and erasure, dating of individual episodes of palimpsest is difficult if not impossible. However, palimpsest still have considerable information potential because of their precise location in space and their duration.

Thus instead on treating palimpsest as "flattened time" we should focus on the activities and events of erasure, and inscription that produced them. Palimpsests are not anomalies that need to be untangled and separated into layers before they can be interpreted and understood but an inherent feature of the material world (Lucas 2012: 115–123).

We can approach palimpsest as textures (see Mlekuž 2014). This can help us to understand the landscape that was busy with people moving around, doing things, being in permanent, direct contact with the landscape using their hands and feet. It is at surface that we are in constant, immediate and close physical contact with the land; textures are not only passive marks that people leave in the landscapes, but also a medium of social reproduction. The world of our experience is continually and endlessly coming into being as textures around, as we weave them into landscape. Like in in weaving, a texture is slowly built up rather than transformed in a single act (Ingold 2011: 210–219).

Textures thus incorporate time; they are result of a slow but constant change of the very texture of surface. Mundane practices which might have a minimum impact on the surface can in a long term combine to form a distinctive texture

This the rhythmic structure of social time emerges not only from the interweaving and mutual responsiveness of human movements, but also from the way these movements resonate to the cycles of the non-human environment, seasons, floods, catastrophes...

Understanding landscapes as weaving and texturing through daily activities give us a richer understanding of the past, indeed it adds texture to the past.

Example: Škocjan landscape

The Škocjan landscape is structured the place where river Reka, the only surface water stream in the region, sinks into the underworld. This is a landscape at the contact zone between limestone and flysch, a dramatic landscape of sheer drops, collapsed caves, shafts, chimneys, sinkholes, abysses walls, caves, canyons… Landscape surface is just a thin membrane over the underworld. Surface and underworld are folded into each other, it is difficult to separate caves from the rest of landscape, and the way ALS indiscriminately records landscape is very suitable for imaging it. The underworld is palpable, visible on the surface (Fig 1).

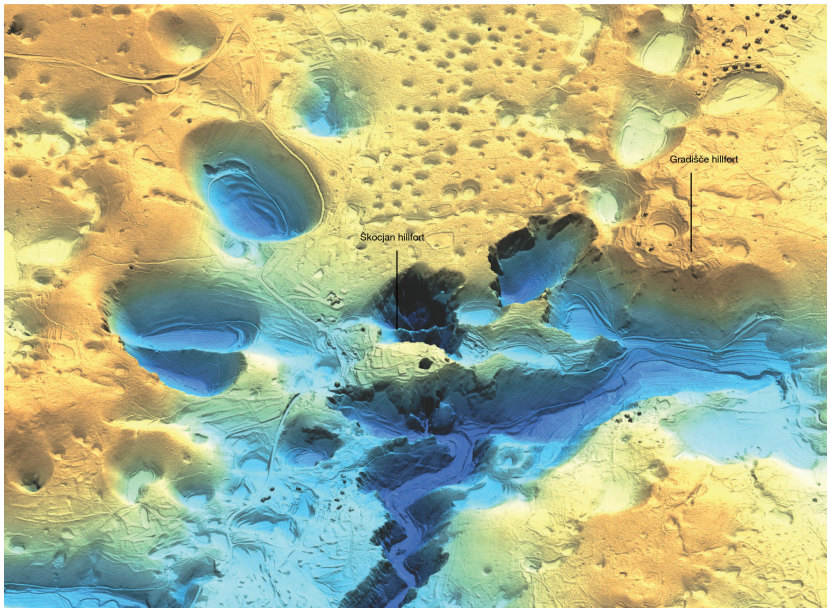

Figure1. Škocjan landscape, viewed using 3D visualisation of ALS data. View from te East. Škocjan hillfort is positioned over the gorge where Reka dramatically enters into the Škocjan cave. It is surrounded by large collapsed caves and texture of small doline. Comparing to the natural landscape, human presence is ephemeral, limited to roads, houses, cairns and dry stone walls (by: D. Mlekuž, 2015).

This dramatic landscape is a result of chaotic creative/destructive force of enormous magnitude that can be seen and felt at the moments, when river Reka floods the caves. However is also a result of millennia of slow change. In limestone, the chemical dissolution of carbonate rocks created a pattern, a large-scale texture of doline, which act as sediment traps, structuring the texture of vegetation and human activities around them.

The textural properties of rocks, stones and landscape have be deliberately explored in creating new landscapes and new features that evoke symbolic and material links between them.

In Late Bronze Age and early Iron Age, we see development of landscape around Škocjan. The landscape became more structured (Turk 2012, Slapšak 1999: 153–156).

Dynamics of territorial sovereignty resulted in the erection of Škocjan hillfort as the centre of territory, surrounded by smaller hillforts, cemeteries, and bounded by barrows and linear earthworks that mark the limits of a territory (Fig. 2a-b).

Shape and structure of hillfort enhances the existing texture of landscape, stone walls may be seen as a deliberate quotation of the material properties of the landscape, associating the materiality, solidity and permanence of limestone bedrock with hillfort and community that lived here.

The landscape of hillforts (or *castellieri*) in Slovenian Karst have been studied almost exclusively from the perspective of hillforts, treating them as isolated points in an empty space. However, airborne laser scanning revealed a host of different traces in a landscape, such as settlements, trackways, burial mounds, enclosures... The landscape around hillforts is full of traces of past human engagement with the landscape. One of the most surprising discoveries are traces of prehistoric land use and division. We can clearly see traces of cultivated landscape, a pattern enclosed farms with fields and clearance cairns ordered and domesticated by means of agricultural diagrams of stone (Mlekuž 2015).

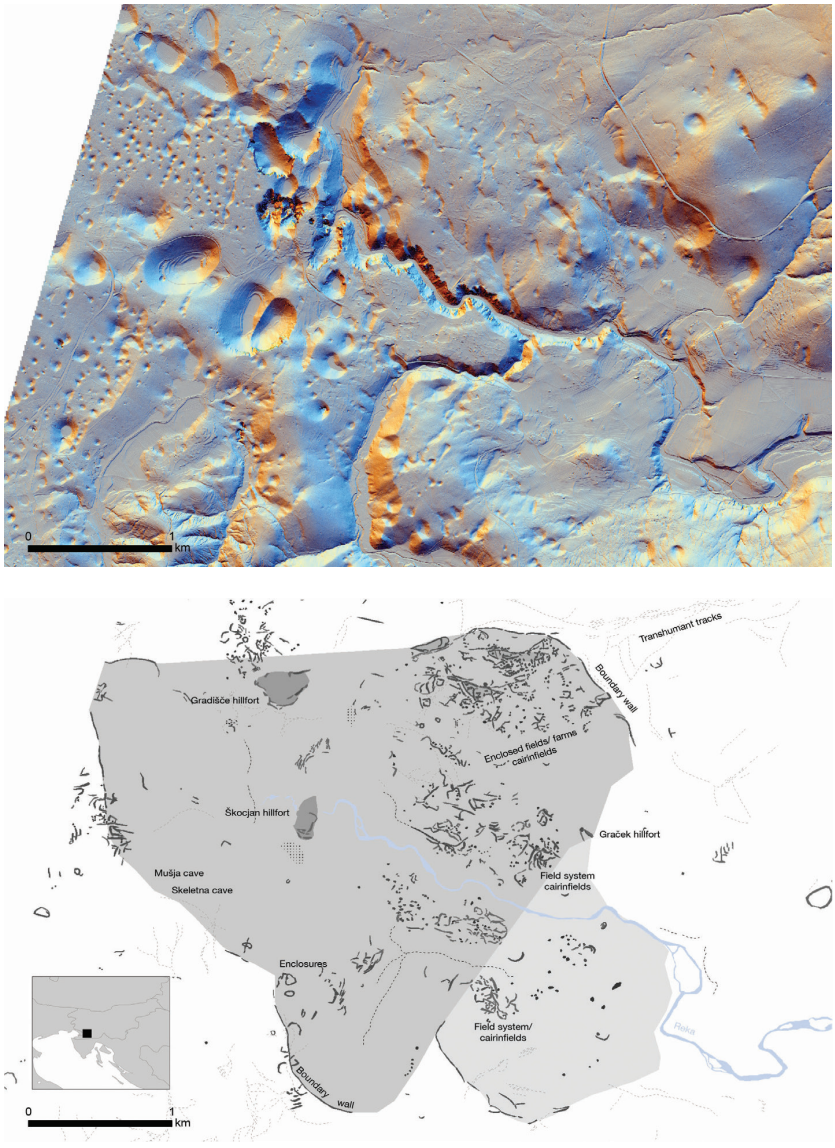

Figure 2a-b. Hillshaded ALS scan of the Škocjan area with the the detected traces. We can recognise the territory of the Škocjan hillfort community (shaded), delimited with the boundary walls. Inside, traces of field systems with cairnfields can be recognised, together with trackways, enclosures and minor hillforts (by: D. Mlekuž, 2015).

Most common traces of land use are cairnfields (see Johnson 2001), scattered heaps of stones, result of surface clearance. Cairnfields are sometimes associated with unenclosed elements, such as low stone walls and short flights of lynchets (cultivation terraces).

In the temperate European landscapes, the land surface is usually covered with vegetation. In woodland, soil is close, since it easily exposed beneath a litter of dead vegetation and mould. However, there is intactness about these woodland surfaces because of the stability of the crumb structure of the soil (Evans 2003: 62). The stones are hidden beneath the surface. Clearance of woodland and scrub, overgrazing by goats and sheep and create texture of grassy pastures and exposes the soil in places. The underlying geology, which was previously masked by soil and vegetation, is revealed. Stones can be collected from the surface and piled into cairns, low banks or dry stone walls the edges of the cultivated areas in order to make them more distinct and the soil more tillable.

Moving, collecting and sorting stones not only created new agricultural or pastoral land, but created new landscape textures.

We can also identify irregular accreted field systems, defined largely by low, curving earthworks that delineate small irregular conjoined field plots. Where soil is thin, it can be scraped together, and by adding material, like dung, kitchen garbage, a pattern of raised beds or gardens is created. Gardens and fields were worked, manipulated, changed, and curated. They need constant daily maintenance and a flow of substances to replenish the nutrients in the soil. Through middening the discard from houses is incorporated in the matrix of the garden, making the soil more organic, fertile, and darker in colour. One of the consequences of this practice is that there develops an increasing disparity between the high fertility of the soils near the settlements and the low fertility of the soils further away. This can create a fine-grained topographical pattern of cultivated land and marginal land around it. This accumulation of substances and residues also incorporates the identity of people in the soil of the garden plot as traces then encountered during daily work. Tilling, for example, exposes the buried pottery or bones from the midden, making visible the work of the ancestors.

In this way, social relations between people became materialised in the texture of the land. Textures were indices of work of ancestors; they not only changed the surface properties and freed new land for farming and pasture but also changed the way people related to landscape and each other.

Stone walls act as visible markers of land-tenure (Chadwick 2008). They were erected to symbolically demarcate property in a landscape and to act as barriers for livestock, preventing them from entering the fields. We can identify many features such as walled trackways, "funnels", enclosures, and pens that were all likely to have been associated with the husbandry of livestock (Pryor 1996). Seasonal movement of livestock would have been an important part of the practices of these communities. Beyond all this lay the terrain that pastoralists, utilised for communal grazing crossed and re-crossed, along the ancient routes of transhumance in daily and seasonal ebbs and flows (Fig. 3).

And beyond this was liminal, untamed, wild edge of the cultivated world, ambiguous, dangerous, dreadful domain" of sacred. In the Škocjan landscapes, there are two caves, Mušja and Skeletna cave, that emerge during the Late Bronze Age and Early Iron Age as liminal places of the sacred (Turk 2011). These two cave sanctuaries, located at the edge of the territory were set up as focal points of mediation, these "passages between two worlds" indicate the importance of boundaries. Not only political borders between neighbouring communities, but also boundaries between the sacred and profane, mortal and divinity, this world and that beyond (Fig. 4).

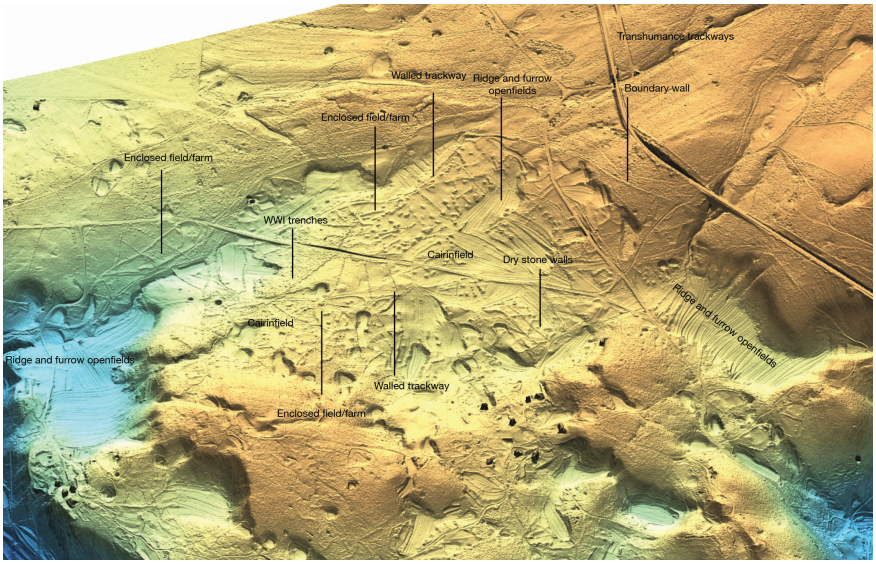

Figure 3. Textured surface of a rue palimpsest of traces near Gorice, north of Škocjan. We can recognise curving banks that enclose fields or farms with walled trackways between them. Outside, we can see several cairinfields and small enclosures. The complex is enclosed by linear boundary earthwork. Traces of prehistoric field divisions are truncated by medieval ridge and furrow fields or overlaid by low stone walls that demarcate modern field division. WW I era zig-zag shaped trench extend on both sides of the road, cutting through older traces (by: D. Mlekuž, 2015).

Both caves, with their unassuming entrances that open in deep shafts traumatically shows that the boundary, membrane between surface and underworld is extremely thin, that otherworld is literary everywhere, it can open up anywhere. The separation between world takes continuous effort, perhaps enacted in the sacred calendar with periodic processions, festivals and sacrifice, as finds of artefacts, human and animal bone in caves testify.

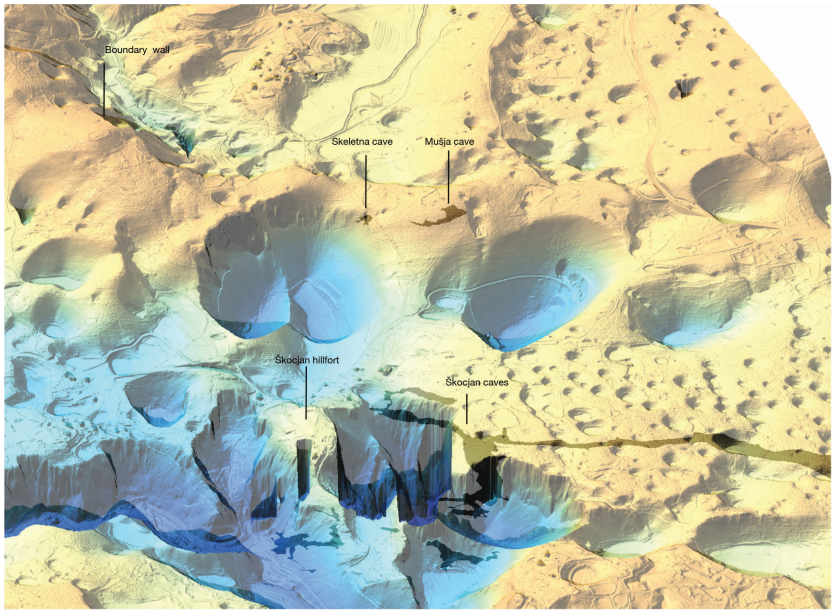

Figure 4. Around Škocjan, landscape is just a surface over the underworld (shaded). Mušja and Skeletna caves are located on the edge of the Škocjan hillfort territory (by: D. Mlekuž, 2015).

It is at the surface that we are in constant, immediate and close physical contact with landscape. People relate to places also through tactile and visual experience of textures under their fingers or beneath their feet. The texture of the ground is experienced directly through the feet, especially if people moved around bare footed as most people in the past probably did. People were born in the landscape built by their ancestors. The landscape continues. The change in the rhythm of time is translated into space. In the ploughing, digging, grazing, pilling, walking, trampling, clearing, cutting wood, adzing, hammering, regularity of form and rhythmic repetition of the same movement are necessarily connected and incorporated in textures. Thus textures are never designed, never finished, but forever in making. While building features such as houses, ramparts, castles, roads, comes to an end with the completion of a work, weaving of textures continues as long as life goes on, punctuated but not terminated.

The development of tools, technologies and machinery such as the plough, the wheel, the yoke, the cart, the steam engine, the internal combustion engine, etc., changes the ways in which people leave traces in the landscape. This development is nested within the slower rhythms of economic rises and falls, social changes and political events. All these rhythms and their intertwining are materialised in the landscape.

Different ways of working the soil can also have changed the traces in a landscape, disturbed older and created new. The development of the yoke and the plough and ploughing techniques changed methods of cultivating fields and even their shape. We can observe these changes in the landscape. Medieval cultivation of the land is preserved by ridge and furrow a texture pattern consisting of strips of parallel ridges separated by furrows (Fig. 3).

The ridges came about with the development of the plough at the end of the first millennium AD. The ridge and furrow is the long-term result of ploughing in a pattern where an asymmetric plough turns the furrow towards the centre of the field, the so-called back furrow (Beresford 1948). A heavy plough mounted on a plough-carriage needs several pairs of oxen to pull it and it is difficult to turn round, so fields are usually long and narrow strips. This was the origin of the characteristic ridge and furrow shape, which also helped with the drainage of heavy clay soil. The plough was usually drawn by several pairs of oxen, and when the first pair reached the edge of the field the plough was still quite a way from the end of the furrow. When the pairs of oxen reached the end of the field, they turned in the opposite direction. The result of this was that the furrows curved towards the end of the field (usually towards the left with regard to the direction of ploughing). Viewed from above, fields therefore gain a soft S shape, which remains despite the fact that the ridge pattern no longer exists. Even the length of the field, corresponding to an old unit of measurement called a furlong (around 220 yards), is the result of interactions between the bodies of the oxen, ploughing technology and the material nature of the land; it is the length of the furrow that a pair of oxen can plough.

Ridge and furrow open fields are situated in a doline, where solid is deep enough for ploughing. Elsewhere, meadows and pastures were developed, bounded by low stone walls. Dry stonewalls are physical signs of land allotment. They are result of landscape clearance, result of depositing stones on the plot boundaries. Their form, location, shape, materiality and scale differ widely. They are means by which individuals or communities define, de-

marcate and divide landscape for specific uses and activities and uses. Dry stonewalls are expressions of territoriality that may be imbued with conflict, discord and dispute, with histories based on memory and traditions, or may be the tangible material results of co-operation. They may relate to specific land uses, or express mental imagery and ideas of landscape, such as liminality (Chadwick 2008).

Once these contrasts in landscape texture were in place, they were used in further engagements, for example, open fields were arena of communal decision making and cooperation, but also used by young men for ploughing matches, while the stony pastures used by herders or as meadows.

And then, we have punctuated events, war, catastrophes which can suddenly destroy, scar, the old textures, creating new ones, associated with violence, destruction and death. WWI trenches were dug besides the road, cut across older landscape, ignoring old traces focusing only on the immediate challenge to control approach (Fig. 3). It takes work and time to clean those scars, work in the landscape and work in the society to heal those wounds. Some are never healed.

Conclusions

ALS is related to a topographic survey, one of the oldest field techniques in the landscape archaeology's toolbox. Topographic survey means that location of surface traces, anomalies, "humps and bumps" are recorded. But the sheer quantity of data that can be quickly and relatively cheaply collected with ALS has transformed into new quality, new way of observing landscape. ALS does not separate between sites and its environment, landscape, but treat them as the same.

ALS does not limit itself merely to "significant", isolated features of the landscape and does not separate them from the landscape as separate "sites". All locations are fully incorporated into the surrounding area; their form, dimension, context and structure are the result of complex and lasting interactions with a changing landscape.

And it turns out that nowhere is the landscape empty; everywhere it is full of traces of practices and activities that have been materialised in the landscape. These scars and traces range from "ordinary" archaeological sites such as castles, settlements, burial mounds, etc. to traces of human activities such as sunken lanes, lynchets, clearance cairns, field boundaries, lime kilns, charcoal-burning platforms, quarries, ridge and furrow, but also boar digs, animal trails, paleochannels, tree throws, landslides …

ALS allows us to understand landscape, not as assemblage of sites, but as an assemblage of traces, produced by people, animals, machines and their various mixes and hybrids.

The role of landscape archaeology is to understand how people, landscape, animals, things, nature society are entangled and dependent, and how have these complex entanglement emerged and changed over time.

Understanding the landscape as never finished weaving, texturing, through daily activities of people, animals and other agents give us a richer understanding of the past, indeed it adds texture to the past. It help us to understand the landscape that was busy with people moving around, doing things, being in permanent, direct contact with the landscape using their hands and feet.

Thus landscapes as textures are never designed, never finished, but forever in making. While building features such as houses, ramparts, castles, roads, comes to an end with the completion of a work, weaving of textures continues as long as life goes on, punctuated but not terminated. This is close to the original of *texere* meaning to weave, fabricate, to thatch, which has a deeper Indo-European root, **taks* to be busy, to be active (Ingold 2011: 209–219).

Studying landscapes means that we become part of them, that we establish relationships with them, that we involve ourselves in them, that we visit their places, either on foot or with the help of remote sensing. We are led through the landscape by material traces of the activities of the people who have lived in them. We walk again the old paths, and revisit forgotten places. In this way we re-establish lost and forgotten connections. Our methods are performative, by studying landscapes we are participating in their formation.

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