SLOVENIA — Vodna Sled 2010 — Interim Report

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Abstract

Vrtnarija: a new 2.2km, all below -500m

Vodna Sled 2010 was a clear success - in all we discovered 2.2km of new passage, all below -500m, all in Vrtnarija using Camp X-Ray (Reloaded, now a plush four bed camp at -550 m) as a base. The majority of the discoveries lead from a horizontal series near Zimmer chamber with numerous un-pushed leads for next year and over 1.5 km of passage. Significant amounts of exploration also took place in Tolminska Korita concluding with a connection to the 'deep' level at -653 m, and pushing the Republica streamway from -744 to -802 m.

Contents

1 Expedition Overview

Twenty-two expedition members travelled from the UK for a total of 65 person-weeks in the field, with 88 person-trips in our callout roster. Seventeen from the UK stayed at underground camp, along with six Slovenes from the local JSPDT club, a total of 95 people-nights at camp. All successful exploration took place on camping trips. This was the first expedition for three first-year UK students, all of whom stayed at underground camp and discovered significant quantities of new cave.

In all, the cave consumed a kilometre of rope for the rerigging of the main pitch series, and newly explored sections left rigged (or with rope pulled up) for 2011.

No work during the 2010 expedition went into M2 (Kavkna Jama), directed towards forging a connection with Vrtnarija. However, during the early Autumn two JSPDT trips capped through the tight rift at the very end of the cave (~-390m), discovering and then descending a ~60m pitch.

The prospects for 2011 are extremely good. The extensive horizontal development has led to the discovery and initial exploration of a number of independent streamways and associated pitch series, in a horizontal slice of the mountain we have never visited.

2 Tolminski Migovec Exploration Background

The original Migovec discoveries were by the JSPDT in the 1970s (M2, -350m) and 1980s (M16, -547m). ICCC has been going on regular expeditions to Migovec since 1994. With the JSPDT this including the finding of M18 which was connected into M2 and M16 in 1996. This system (SysMig) was explored to chokes at -937 m and -958 m and sumps at -970 m and -967 m (the sumps are at 885 m above sea level). SysMig is 11.5 km in length, most of this length is due to the many vertical shafts (vertical length of survey is 6.8 km).

The focus of expeditions shifted to Vrtnarija in 2000, which was discovered and pushed down to -802m by 2004. This cave was initially thought to be much more linear that SysMig, having a typical vertical entrance series to -550 m, where a large horizontal phreatic (Friendship Gallery) led to a pitch (Big Rock) down to an extensive horizontal level. No true sumps were discovered, the cave was pushed to reach a mud sump with tiny flow.

A complete description of exploration activity on Migovec from 1974–2006 is present in "The Hollow Mountain" (ICCC/JSPDT 2007).

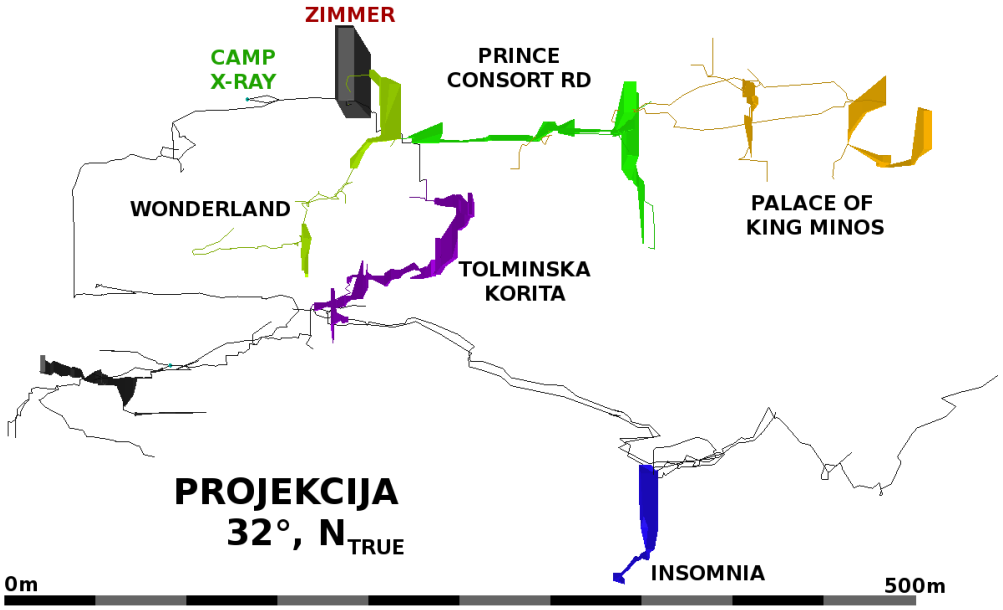


Figure 1: Colour coded diagram of new cave discovered & surveyed in 2010 in Vrtnarija.

During 2005 and 2007 expeditions a small side passage in Vrnarija (Captain Kangaroo) was pushed. Analysis of the survey data before summer 2008 suggested that this passage was within 50 m of the M2 part of SysMig, which no one had been down since the 1970s. Connection of SysMig to Vrtnarija would form the largest alpine system in Slovenia.

During the 2008 expedition, M2 was rerigged. Exploration in Vrtnarija was concentrated within the 'depth range' of a possible M2 connection (the best vertical lead, Dark Tranquility, was abandoned at -338 m). M2, which closes down enormously after -250 m, was slowly pushed with extension persuasion.

In 2009, a camp was made in Vrtnarija near the potential connection to M2. Several climbs and other 'secondary' leads in the vicinity of camp were probed, without finding the connection. Dark Tranquility was pushed well below the bottom of M2. This connected to a passage underneath Friendship Gallery (Falls Road, a small confluence). On a trip to rig ropes from Friendship Gallery to allow the physical connection, an old lead (Korita) was looked at and proved viable.

At the beginning of the 2010 expedition, the known length of Vrtnarija was 6.575 km.

3 Expedition logistics

A nine seater minibus was hired from Imperial College Union for four weeks and two days. This was driven non-stop from South Kensington to Tolmin, Slovenia in just under 24 hours including the ferry journey (Friday – Saturday evening). Special permission had been acquired by the JSPDT to camp in the national park, on top of Migovec in our usual bivouac spot. The van made two trips to Tolminske Ravne (912 m) on Sunday morning, where the equipment was unloaded into the barn of the Skalar family.

The mountaintop was in continual occupation from Sunday evening, with the first caving trips on Tuesday.

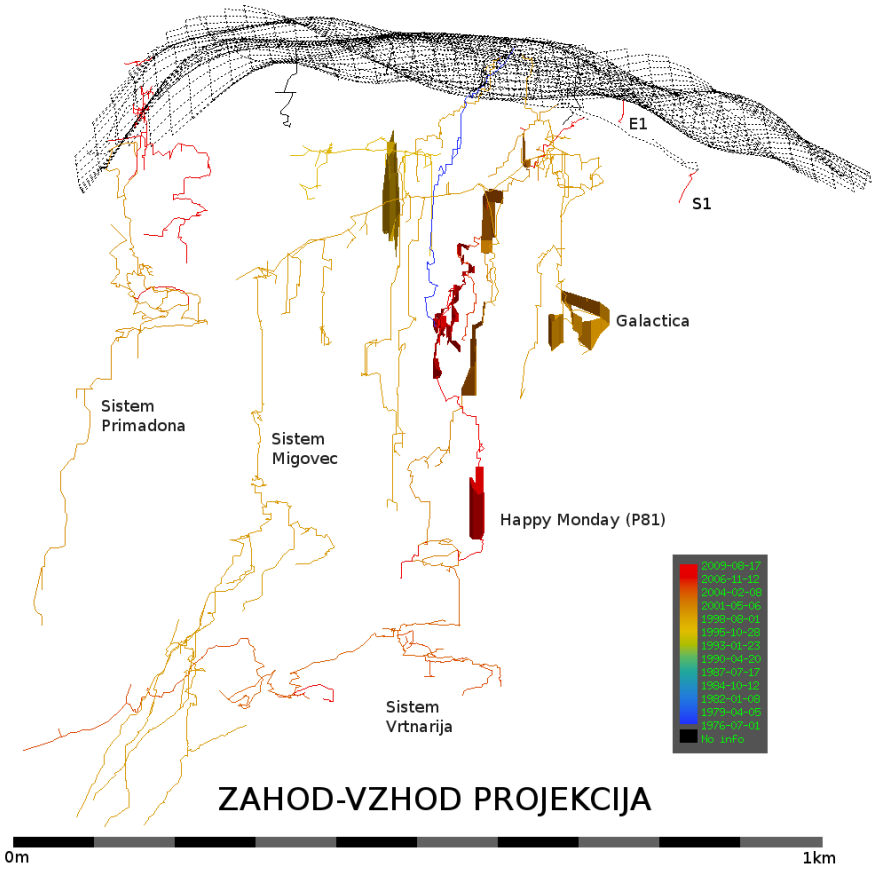


Figure 2: A West—East projection of the 2009 extent of known cave passage in Migovec, with surface topology (Digital Elevation Model from Slovene Karst Institute).

3.1 Caving Logistics

The main route to Friendship Gallery in Vrtnarija contains over 500 m of vertical pitches. Many of these ropes had been in place for some time and it was decided to replace them. Six hundred metres of new ropes were installed in the first few days of caving thanks to concerted effort, multiple waves of rigging teams and an 'all hands on deck' attitude from the whole expedition team. Other factors that aided a quick start to the exploration were:

- the significant amounts of dried foods left in loco at the bivouac site on Migovec (thereby saving on porterage time at the beginning of expedition);
- the sending of an 'advance party' to set up the bivouac and collect drinking water (a day of back breaking snow haulage) before the main group arrived;
- the fact that all underground camping kit was carefully packed in transport sacks in England.

These logistical steps meant that within the first week of the main expedition group arriving in Slovenia most of the porterage had been done, the cave had been re-rigged and a 4-bed underground camp at the X-ray (-550m) site had been set up. In fact, the very first survey data was recorded at -606m exactly seven and a half days after the van left South Kensington.

3.2 Expedition Talks

An expedition slideshow was given by Jarvist Frost, with translation by Jana Čarga, on the Saturday evening at the end of expedition before departing for Britain.

An expedition talk was presented by Jarvist Frost at Hidden Earth 2010.

4 Expedition Findings

The initial effort of the expedition was directed into setting up underground camp. As the first pushing trips from this underground camp came back with positive news, exploration based from camp (i.e. deep in Vrtnarija) quickly became the main focus of expedition effort. This came at the cost of further work in bounce trips down Captain Kangaroo (Vrtnarija, the likely connection region to M2) and M2 / SysMig itself.

The usual surface bashing continued, looking for new cave systems on the plateau. A revisit was made to the area north of Kuk. This region is heavily cratered with clear cave development, but the fear is that the limestone is too broken and chossy for a human sized entrance.

We first visited this region with a serious aim of cave exploration in 2008, and returned in December 2009 on a 'winter recce' by a two person team with ice axe and crampons to identify which surface features were actively linked into extensive underground systems through the holes blown in the snow. Several more entrances were identified during this recce, ones that were likely to be continued to be ignored in the summer due to their unusual position.

These entrances were relocated this summer, but no new descents were made.

4.1 Leopard — 1.5km of new passage

Leopard became the great focus of exploration this year. This lead (a window off Zimmer chamber, now a 15m 'up' pitch) had also been originally discovered in 2001, but the drop that it led to had lain untouched since then. This was partially due to its loose and muddy nature, but also that deep exploration had concentrated on good leads elsewhere (most particularly the lower Vrtnarija level accessed with the bottoming of Big Rock). This took several sessions of rigging and gardening to successfully conquer, and is is now named Cheetah (P35m), because of the sense of having cheated death that it engenders on passing. There are several windows off Cheetah, which are definitely promising, although not easily accessible because of the broken nature of the rock.

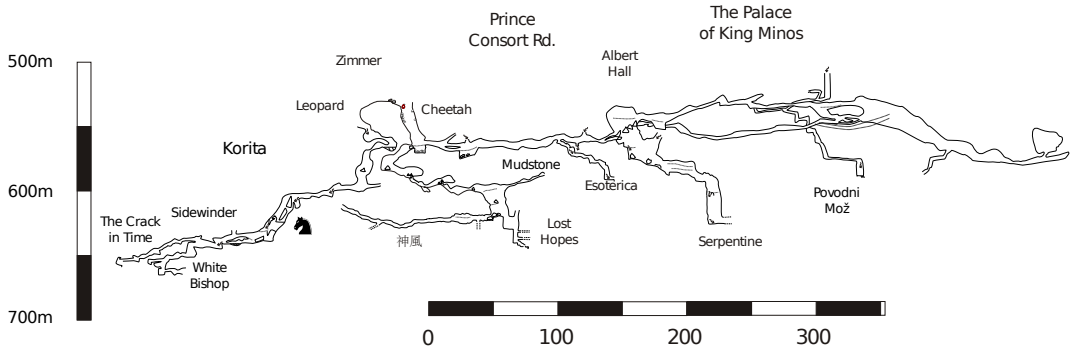


Figure 3: Extended elevation of new cave discovered in TOLMINSKA KORITA and PRINCE CONSORT during 2010 Expedition.

At the bottom, it intersects a horizontal, fossil passage, which has been explored in three main horizontal parts:

Wonderland (heading South) linking into Rolling Stones, Surprise, Mudstone Traverse, Kamikaze and finally Lost Hopes. Mainly dry with large breakdown chambers.

Prince Consort Road (heading North) was initially pushed to The Albert Hall (from where the Serpentine meander leads off to the It Will Rain for a Million Years pitch), bisects three streamways (one of which was pushed and forms the Esoterica series) and includes considerable calcite formations.

From The Albert Hall a climb was made into the Palace of King Minos. This passage is complex, and side branches have neither been fully explored nor surveyed. The known passage leads via Minotaur Rift to terminate in the Queens Bed Chamber where the draught disappears towards the ceiling.

Together this passage leading off from Cheetah has been explored to over 1.5 km in length, and we are sure that more is yet to be found.

A significant volume of air flows through these regions, indicating that there may be further developments.

4.1.1 Wonderland

Wonderland is the southern-most of the horizontal development, leading directly off from Cheetah. It was pushed to a small pitch dropping into a boulder filled chamber, Rolling Stones, which was the limit of the first exploration trip due to the lack of rope. This chamber is situated right below Zimmer, about 40m deeper. There is a further, as yet unpushed, pitch going down between the large, seemingly unstable, boulders on the floor.

A happen stance crawl behind some boulders led to further drafting passage (Hidden Surprise), which, after traversing another chamber and crawl, finishes in a chamber with a massive hole in the floor (Kamikaze pitch). The passage continues on the far side of the pitch (traversed on mud along the left wall), however, due to the collapsed ceiling, these developments are almost two-dimensional (Mudstone Squeeze). The squeeze, which is filled with interesting fossilised mud formations, was pushed to the limits of comfort, although it still continues.

Kamikaze consists of a series of small ledges. From the second ledge a tell tale breeze led to an interesting bedding plane crawl pushed upwind but still untouched downwind. The pitch was bottomed (Lost Hopes), wherein an inlet was followed down a 10m pitch to a series of squeezes and rifts which quickly became tight. There is a ledge halfway down Lost Hopes, with a perhaps larger abandoned rift.

These three leads (Kamikaze, Mudstone, Lost Hopes) are of interest as they now form the most Easterly extent of Vrtnarija at depth, seeming to 'spear' through the large N-S geological feature that

contains the majority of the horizontal passage.

The whole area of Wonderland is extremely dry, quiet and rather spacious in its scope. It is particularly reminiscent of the higher level passage in the Easegill system, Yorkshire.

4.1.2 Prince Consort Road

Prince Consort Road is the passage going north from Cheetah. Several streams intersect it and some formations have been found there. The discovery of stalactites covered with helictites proved particularly exciting! The passage leads to a small boulder choke which was easily surpassed and led to a large chamber (the Albert Hall). Before the Albert Hall, three apparently unique streamways have been found:

One intersecting the passage along a traverse (water chokes into boulder floor), then around a small chamber at about halfway to Albert Hall, on a corner of the main massage approximately 2/3 of the way to the Albert Hall a small rift to the east, and a nice white-sanded water inlet to the west. The latter leads to an unpushed pitch under the main passage, there is a cairn and note mentioning the lead. Of these, only the second has been pushed, into the Esoterica series. Strangely this wet, tight rift has only been visited once during the expedition, even though it is still going!

In the Albert Hall two streams enter the chamber from on high (the ceiling was measured as being over 30m up, by laser disto) and join into a rather beautiful spacious vadose streamway (The Serpentine). Serpentine was pushed and leads to another split pitch (It Will Rain for a Million Years — pushed during a continuing flood pulse). At the bottom of It Will Rain pitch the stream continues and has not been explored.

4.1.3 The Palace of King Minos

North from the Albert Hall a muddy climb lead to The Palace of King Minos. This passage and its continuation (The Minotaur Rift) has some of the most beautiful formations found on Migovec to date, in particular fine walls of calcite, gypsum and aragonite crystals, mud formations and weird soot encrusted floors. The Palace has a labyrinthine nature with several passages leading back to Albert Hall, the largest loop of which was named Ouroboros

The passage has a classic large phreatic lozenge shape, with some parts undercut by fossil vadose passage. Near the start of the passage a significant breeze blew through a small hole. This was enlarged and found to lead to a small phreatic tube which bizarrely led into an active vadose streamway (Povodni Mož — Water Nymph). Povodni Mož has been pushed upstream to a large active aven (and smaller dry parallel shaft), and downstream to a sump (approximately 2mx2m in size in the corner of a small chamber and taking the small flow) and has hence been derigged.

Continuing along the main Palace passage several horizontal tubes have been explored which lead back into the main passage, though not all have been entered in the survey. Eventually the main route leads to a high and wide rift (Minotaur Rift — 20m high, 60m long) beyond which the best formations are to be found. This passage has a few interesting leads in it: a high, dry, circular, muddy window to the right of the passage near a tiny inlet, 2 small tubes leading off the main passage which both need a little mechanical persuasion.

The chambers beyond Minotaur Rift are spacious and display massive amounts of crystal formation on all available surfaces — there is white 'popcorning' almost everywhere, with regions of more intricate needle and feather formations. The chambers decay into a crawl, which almost unbelievably is over a smooth calcite floor. This leads to a classic boulder choke gallery (choking at the end). On the left a small boulder choke climb leads to the Queens Bed Chamber. In this large room, the draught appears to disappear up towards the ceiling - both ends of the chamber are potential climbing projects ($\tilde{}$+20m).

The region is extremely reminiscent of Ogof Ffynnon Ddu II in Wales.

4.2 Tolminska Korita

This lead of Zimmer chamber had been discovered in 2001 but had lain unexplored until last year, when the first few pits of the active meander were pushed to a larger pitch. Korita developed into cascades of active pitches (Black Knight series) to a duck. The duck was soon bypassed by a 5m free climb into old phreatic level.

The passage beyond soon diverges into two continuations:

4.2.1 Sidewinder, Crack in Time

The higher dust filled dry phreatic level (Sidewinder, Crack in Time) connects into Envy in the low level via free climbs and two small pitches. It is not particularly surprisingly that the 'Crack in Time' was not explored from below, as the connection is made by a long body-sized crawl above a thin (5 cm) crack connecting to known passage (Envy), which happily pops out at the top of a obscure 3 m free climb. Connecting into a 2004 era permanent survey station, Korita now forms a second loop in Vrtnarija, forming Vrtnarija into a figure-8 shape with Friendship Gallery at the waist.

4.2.2 White Bishop, Stalemate

The active streamway descends two 10-15 m pitches connected with a spacious meander incorporating free climbable cascades, before ending in an impassable rift (-662 m).

This water disappears into 'blank mountain' on our survey, but would require considerable effort to progress, and Korita was thus derigged.

4.3 Roaring Floor Tease (Muddy Window off Happy Monday)

This was regained by bolt climbing from the bottom of Happy Monday to regain the Muddy Window. The climb in the mud chamber was made, but quickly led to a large boulder blocking the way. A tight rift taking a large draught was left unpushed. Progress is believed to require expansion.

Similarly the traverse to an inlet on Falls Road, and the continuation of Falls Road itself was left unpushed. A small dig was made in Friendship gallery beyond Prima junction, which led to a small unpushed pitch above a stream.

4.4 Deep Leads (Below Big Rock Candy Mountain)

4.4.1 Insomnia - Republika Streamway

Last year a 'written off' streamway (Republika, leading from Red Cow) was found and pushed upstream to an aven fed watershed, then down the other limb to a rift pitch.

With the promise of being one of the deepest points of the cave a return in 2010 was obligatory. The pitch was found to be 41m and was pushed down a continuing active rift (Insomnia). The end is now only 4m higher than Colorado Sump (the deepest known point of Vrtnarija). Since the limit of exploration is above a small 4-5m pitch it is understood that in 2011 this will inevitably become the deepest passage in the system, and the signs are good for continuing development of depth. The end is 802m below the entrance of Vrtnarija, but the M2 (Kakna Jama) entrance is 75 m higher still, and a connection between the systems would make this point -877m deep overall, with potential for further depth extension.

4.4.2 Balamory

A return to Balamory was thwarted by lack of rope of the exploratory party (one more pitch than expected on route), but the team made good use of the trip to the depths by recovering the camping mats from the deep 2004 camp (The Fridge, near Cactus Junction), and prospecting for other leads with some success.

4.5 M2 — Kavkna Jama

The JSPDT organised a trip based at the mountain hut at Kal on 2nd October 2010. The terminal rift was enlarged to gain a ≈ 20 m pitch and a larger, undescened (due to lack of rope), pitch.

A return trip three weeks later descended the pitch and found it to be ≈ 60 m. The cave closes immediately, with a tight rift taking the water and a slightly larger abandoned rift also offering potential. It draughts strongly.

The M2 cavers returned in thick fog, following their footsteps through the 10 cm deep snow. With the coming winter Migovec is effectively closed for exploration until summer 2011.

5 Exploration Outlook

In all, 2.2km of new cave was found during the 2010 Vodna Sled expedition, taking Vrtnarija to 8.776 km.

We are in the extremely fortuitous circumstance where we finish the year with considerably more leads in the Migovec cave systems than we started with. The Vrtnarija camp was derigged with the certainty that we will be back next year camping in the same location. Gas cylinders and cans of fish were left sealed in Daren drums with a rock of carbide to keep them dry, the carry mats and tents were left standing to air, and we have a considerable armoury of rope brought back from the pushing fronts waiting for the 2011 team.

The work by the JSPDT in the Autumn has 'opened up' M2 once again and brought the possibility of forging a connection back to the table.

The pushing of the Republica streamway (now Insomnia) to within a few metres of the maximum depth of the cave has reawakened the possibility of further depth extension to Vrtnarija. Expedition members have mooted the possibility of establishing an additional 2-man 'deep camp' to benefit pushing trips in the lower reaches of the cave, particularly any revisits to the far North end of the system.

5.1 Migovec's Long Term Prospects

It has been a recurrent discussion in our club as to when we will run out of new cave to discover in Migovec. Almost all of our fruitful exploration has taken place within a single square kilometre of the flat topped mountain.

Migovec, being part of a mountain chain that is the first high altitude interruption to moist air from the Adriatic, receives an extremely significant level of rainfall. This summer, Jaka Ortar, a Slovenian geographer, recorded 210cm of rain on Migovec in 100 days (28th July-3th November) with his network of rain gauges. However we have never found any large rivers underground — the known cave can only account for a tiny percentage of the total drainage for the plateau.

Our current hypothesis is that there is no 'master system' gathering the water, but instead a complex hydrology induced by cave passage intersecting the underlying (as yet, unvisited) band of Cretaceous shales.

For all Vrtnarija's complexity, the entire cave can be fitted into a slab of limestone slanted at 66 degrees and just 1000x150x1000m.

Certainly, as long as we can continue to find entrances through the frost shattered and heavily cratered surface, there will be enough cave in Migovec for decades more of exploration.

6 Sponsorship and Thanks

- Ghar Parau Foundation — Expedition equipment fund (rope!)
- Beast Products — Sponsorship in Kind (technical fleeces for underground camp)
- Starless River — Starless River for a large discount on expo equipment, and gear advice.

- Imperial College Trust and Imperial College Union — Tour funding (transport)

7 Conclusion

The significant discoveries of this year have been the fruit of the communal effort of ICCC and JSPDT members. When System Vrtnarija and System Mig will be connected, the cave will only be 500m shorter than Postonjska Jama system. Suddenly the plain dwellers will have to rewrite their tourist brochures and the thought of the longest cave in Slovenia will not be a dream. Oh, and the cave has the potential to be 1km deep (requiring an additional 120m of depth from Insomnia).

As well as being proud of each metre of survey we should also think about each metre that a tackle sack was carried, each meal cooked, each bottle of booze safely ferried to camp. A significant factor in our success is evident because it needs not mentioning: thanks to efficient and thoughtful organization we did not run out of any goods, the stereo batteries were always full, the food supplies always high. And most importantly, we have no accidents to report.

8 Supporting Information

8.1 Rope Testing

The rope removed from the main pitch series in Vrtnarija is currently being drop tested by Bob Mehew on the BCA rope testing rig. This will hopefully provide some useful information the extent of degradation of SRT ropes used in Alpine exploration, and the associated 'permanent' rigging.

8.2 Expedition Photos

Expedition photos are available on the Imperial College Caving Club website at the following address:

`http://www.union.ic.ac.uk/caving/photo_archive/slovenia/2010/`

8.3 Surveyed Discoveries

Current survey data is available for the entire Tolminski Migovec plateau on the Imperial College Caving Club website in Survex format:

`http://www.union.ic.ac.uk/rcc/caving/slovenia/MigSurveyData/`

An alphabetically sorted list of new discoveries during Vodna Sled 2010 is presented here:

Name	Polygon Length
Black Knight	116.08 m
Prince Consort Road	239.99 m
Crack in Time	44.60 m
Esoterica	63.24 m
Insomnia	100.30 m
It Will Rain	48.92 m
Kamikaze	159.60 m
Korita	86.39 m
Lost Hopes	35.62 m
Palace of King Minos	589.63 m
Mudstone	53.36 m
Povodni Moz2	161.20 m
Povodni Moz	27.69 m
Rolling	48.27 m
Serpentine	70.53 m
Sidewinder	23.86 m
Stalemate	35.73 m
Surprise	71.24 m
White Bishop	52.86 m
Wonderland	134.29 m
Total	2163.40 m

8.3.1 Vrtnarija Loop Closures

Our survey is now corrected to grid north based on the NOAA American Webservice, with Lat + Long on M10/Bivi, calculated for 1st Aug of each year. This was mainly to agree with surface DEM data & GPS data (declination is approximately 2.5 degrees), as the rate of change of declination is slow (6 minutes a year).

Vrtnarija possess two large loops, making the cave into a 'figure 8' configuration.

During 2009 the Captain Kangaroo — main pitch series loop was closed (consisting of data collected from 2000–2009, approximately 1.8km loop). During 2010 the Tolminska Korita – Big Rock loop was closed (data from 2001–2010, approximately 1.7km loop).

All sampled misclosures were 1.5–2.0 %. Typically the horizontal misclosure was twice that of the vertical (our total plan length of survey polygon is also approximately double the total vertical length).

8.4 Alex Pitcher Awards

As part of the funds coordinated by the Ghar Parau Foundation, we received two Alex Pitcher memorial fund awards for Myles Denton and Kate Smith, who were both first year undergraduate students going on their first caving expedition.

8.4.1 Myles Denton

In July 2010, I was about to embark on my first caving expedition, at the end of a year's caving in the UK. It's easy to say that I was a little excited.

I have always been an adventurous person, I adore the outdoors and I have a great interest in the Earth and thus joining ICCC in October was the inevitable outcome! I had never been caving before, and from the initial presentations and meetings, I was extremely keen to get below-ground. Soon enough, I was hooked and was looking forward to heading off on a 4 week expedition to the Julian Alps in Slovenia.

Slovenia was one of the hardest and most rewarding experiences I have had. After packing up a month's worth of supplies and cramming as much of it into the minibus as possible, our group of intrepid cavers set off towards Slovenia, a journey taking us through six countries over twenty four hours.

Arriving in Slovenia I was immediately taken aback by the country's beauty, and after spending a night eating pizza and sleeping in Tolmin, we began are ascent of Migovec. The mountain plateau where our base camp was set up is at an altitude between 1800m and 2000m. Driving to a farm at Ravne, we shared coffee, packed any remaining space in our bags with food, and headed up Migovec. The first trip to the top was accompanied by a rain cloud, which left us wet, but nicely cool up to the top. The next few days were taken up by cavers making trips up and down the mountain, ferrying equipment, food and most importantly huge volumes of very heavy cheese!

After being showed around the plateau, introduced to the various cave entrances and schooled on the history of the caving on the mountain Nikolas Kral and I prepared for our first sortie underground, with experienced caver James "Tetley" Hooper. Our first trip was in the Vrtnarija cave system. Descending through the entrance dubbed Gardener's World, the three of us made a steady descent to the bottom of the Pico pitch, at about -200 m. This was already deeper than either of us had been in our nine month caving experience in the UK! The following day, infested by the caving bug, Tetley and I again entered Vrtnarija, this time descending to the top of Fistful of Tolars pitch, at -400 m. These trips also doubled up as opportunities to take some of the gear needed to set up camp at -550 m. Several other caving trips were made, taking the nine tackle bags down to the middle of Friendship Gallery. These included Kate Smith, another fresher, on her first expedition with Nick and I.

The cave system within Migovec is genuinely breath taking. Whilst not the most decorated of caves (which we later discover not to be true), the shear nature of the cave is beautiful. Descending through large chambers, with pitches up to 120m, is an exhilarating experience, learning to slide through those tricky parts of the cave and strolling through the large phreatic passages is incredibly liberating.

Soon enough, I was ready to head to Camp X-Ray, our underground camp at -550 m. Our underground camp consisted of a 4 man single layer tent, which helped to raise the temperature of 1° C by a few degrees. We had two Vango Nitestar 450 sleeping bags, which are brilliant, and a set of two buffalo bags, which enabled our camp to become a four man camp. We used methylated spirits and gas stoves to cook with, and had several candles for ambience! As well as a first aid kit, we had a small set of speakers, a small video system and an mp3 full of Blackadder. At -550 m, all this made underground camp a very welcome place indeed.

On my first trip to underground camp Tetley and I spent one night there, pushing the Tolminski Korita series for several hours, and discovering the pitch later named Black Knight. We were joined by Gergely and Andy after our stay at underground camp, who informed us they'd been pushing a messy pitch named Leopard, which had burst into a decorative horizontal passage which had many leads. We were all excited. On the surface, I helped input our survey data into the computer, and reviewed the new passage we had discovered.

Over the next week or so, several caving parties went below, mainly pushing the Leopard series. Tetley and I returned to push Black Knight, which entered further pitches, and then hit a duck. Here I was worried the passage was blocked by the water, however, Tetley cunningly discovered a bypass passage which passed over and around the duck. Jana Carga and Jarvist Moore frost pushed the series and closed on part, Sidewinder, as it dropped into a part of the cave known as Envy, at about -660 m. On my last pushing trip towards the end of expedition, Jarvist and I closed the final part of the Black Knight series, named Stalemate, where the water flowed into a narrow rift too small for us to squeeze through despite our attempts.

Overall, my Slovenian expedition was life changing. 2.2 km of undiscovered cave was found, between about twenty cavers. Personally I discovered around 310m of passage with my partners. More importantly, my caving skills improved hugely, I went from taking 3 hours to get to - 550m to 1 hour 45 minutes, I learnt how to install bolts, how to tie many knots, and where to use them. My techniques for both abseiling and prussiking improved greatly, and overall I became more confident and proficient in all aspects of caving. I don't think twice about hauling several tackle bags down a cave anymore! The funding from Alex Pitcher helped me to purchase a Petzl helmet and Mig light attachment, which I used on every underground trip.

8.4.2 Kate Smith

From 15th July to 15th August 2010, I joined Imperial College Caving Club on their summer expedition to the Julian Alps to explore the expansive Slovenian cave systems there. ICCC have been present in the area almost annually since 1994, running joint exploration with a local club from the town of Tolmin, the JSPDT. From Tolmin we travelled 6km to the large limestone plateau of Tolminski Migovec, within the Triglav national park. Here I lived for 27 days with various members of the expedition, unified by the sole motive to find and survey virgin cave.

Six of us set off to Slovenia in a university minibus that was jam-packed with 2km of rope, food and caving equipment. 24 hours after leaving London and passing through France, Belgium, Germany, Austria and Italy we arrived at a member's flat in Tolmin. We were warmly welcomed by the members of JSPDT and the ICCC members who had arrived some days before to set up camp on the mountain. As one of three new cavers to the expedition (having been caving for barely a year). I was met with much excitement and plans for my first caving trip in the mountains.

The next morning we drove some way up the mountain to a farm belonging to a family kind enough to lend us some barn space to keep our supplies and equipment. From here we carried as much as we could the rest of the way up Migovec to 1880m above sea level, each member making several 'carries' over the course of the expedition.

Camp on Mig consists of tents dotted around the plateau and a communal living space known as the Bivi. The Bivi is a nice big shake hole with a little cave and an impressive stone bridge to provide some shelter. Here we cook, eat, drink and occasionally take naps. Tarpaulin is strategically hung around the Bivi to catch rainwater for consumption. When not underground the members congregate here to discuss the exploration and organise future trips. Because the depths at which we cave cave are so large, there is an underground camp at -550m with a capacity of four so that teams can rest between pushing trips.

The initial plan was to introduce us newbies gently to the huge depth of the Slovenian caves with several trips preparing us for underground camp, although this did not entirely work out. My first trip was to Gardener's world, also known as Vrtnarija, one of the two main cave systems in Migovec. Having heard of how Slovene caves differed enormously to British caves I didn't really know what to expect and found the prospect of entering this alien territory a little daunting. The first thing I noticed was how sharp and jagged the rocks were so that everything from my oversuit to cowstails got caught, frustratingly hindering movement. This wasn't too much of a problem though, as the cave is pleasantly wide and tall with very few passages requiring crawling or squeezing. All of the hard work is in the large proportion of Single Rope Technique needed. On my first trip we went to -130m, the depth of a good-sized British cave, and it was lovely and very much in my comfort zone. We had,

however, only been down small to medium sized pitches; from where we had turned round, at the top of a 60m pitch, things further on looked considerably more intimidating.

After a day off from caving due to mad blisters, the opportunity arose to help set up underground camp. I was initially a bit weirded out by this idea as I came to Slovenia with the eventual goal to make it to underground camp and now I was going to do what I came to do in 3 days time! However I am not one to say no to a challenge so hastily made my way underground before I could change my mind. A team consisting of another eager fresher, two experienced cavers and myself made our way down the largest pitches I had ever seen, the largest being Concorde (my favourite pitch), which at 90m high is big enough to fit a Concorde in and has the most magnificent limestone formations. After a few hours and considerably improving my descending technique we made it to the site of underground camp. It was a long way down and after seeing how much rope we had passed I was dreading prussicking up. I had never prussicked such a huge distance before, how do I know if I can do it? We quickly set up camp by pitching the tent, making the beds and unpacking food. We brought a MP3 player and speakers down so that any fears or panic in my head were soon drowned out by happy music and dancing. One thing I learnt from my month in Slovenia is that David Bowie can make any dire situation a happy one. After having some food and listening to the oh-so-homely Blackadder we went to sleep, 550m beneath (almost) solid rock and completely disconnected from the world.

We were awoken by members who were on the night train (caving at night, sleeping in the day) — they had already been pushing and wanted our beds. We reluctantly crawled out of our snugly sleeping bags into the 1oC cold and quickly changed into our cold and wet caving gear. Next was the gruelling ascent. Due to fear of exhausting myself I adopted a relaxed pace, taking a whopping 8 hours to get out of the cave. Unfortunately for the member behind, this meant waiting for me and led to attempts to speed me up such as force feeding me chocolate and even singing. At the first glimpse of sunlight I thought I was going to cry with happiness. It's strange that after a mere 24 hours without sunlight you miss it so much and all that physical effort just to see it again makes it all the more magnificent. Unfortunately after this feeling subsides you realise things were a lot more exciting underground and that perhaps going back down is on top of the list of things to do.

The next few days were dedicated to treating blisters, nursing sore hands and resting strained muscles. When I was suitably fit and there was a bed free in underground camp the time arrived for my first pushing trip. We went down in a team of three and shortly after entering the cave met another team who had tales of their discovery of 'Wonderland', a passage with lots of promising leads and pretty stals. Knowing these leads were ours to follow we eagerly descended to underground camp. Some interesting incidents on the way down such as my hair getting jammed in the descender and a scary slip ensured things stayed exciting. I was glad to be back at underground camp, home sweet home.

Kicked out of bed at seven by the night train, I gingerly put on cold caving gear, ate some fishy cheesy soupy smash and headed off to 'Wonderland'. Unfortunately this involved an encounter with the scariest pitch I have ever and hopefully will ever come across. Initially named Leopard due to the Leopard spot shaped mud splats on the walls, it soon became known instead as Cheatah, due to that fact that a successful passage elicits a feeling nothing less than one of cheating death. Whilst waiting for the pitch to be rerigged in a safer fashion, a good deal of dancing was required to keep warm. The caves after Cheatah are majestic. Large amphitheatre-like holes, gloriously decorated passages and chambers full of large rocks to climb over, wiggle between and slide under. The name Wonderland was well deserved.

However, as wondrous as it all was, exploring this only recently discovered cave and wandering further and further away from camp really scared me. Sleeping so deep underground, waking up and travelling even further into the abyss sent me a little crazy. Normal life has never seemed so far away. Thankfully a new, never explored pitch was quickly rigged and as the newbie I was allowed to descend first into the virgin cave. Fear was soon replaced with excitement, I would be the first person ever in the history of everything to see and touch and just be in this part of the world. The pitch led to a nice sized chamber with a stream way at the bottom. No waiting for the other two, I scampered into the narrow passage, which became a pretty, winding stream way with crystal clear water and white

limestone. This ended with a pitch that ended our pushing (but began someone elses). After agreeing on the name 'Serpentine', due to its snake-like meandering and association with the Serpentine Lake, we began the arduous task of surveying the new cave. After surveying we headed back to camp, tired and emotionally drained. Cheatah was no more pleasant going up than coming down, the slippery mud made it frustratingly tricky to reach the top. Glad to be back at camp.

After 6 hours of prussicking we made it for sunset and enjoyed the relaxed life of the plateau. The next day the survey data was entered into the computer and we saw our new passage in 3D and linked to the rest of the system. One week of caving and already 1.5km of cave ha been discovered! Over the next few days the rain came which kept the cavers underground and the rest of us huddled in the bivi. These days were dedicated to games of chess and cards. After the rain had ceased I had a little trip down system Migovec, the more thoroughly explored system that it is hoped connects with Vrtnarija. We had a day dedicated to scaling the nearby peaks, which provided some exhilarating climbing. We then travelled down to Tolmin and enjoyed luxuries such as pizza and swims in the emerald green water of the Soča river.

Showered and rejuvenated we headed back to the plateau, anxious to get back underground. Due to the amount of interest from Slovenians and ICCC members alike to get in on the action it wasn't till the final days of the caving period that I got to return to camp. Two of us were to pack up camp and hopefully get some pushing done in-between. Camp was not as friendly as in the early days with piles of litter, waiting to be carried out, tarnishing the once pure environment. After a long sleep with no one on the night train to wake us up we reluctantly got out into the cold and made our way to the pushing front. Although we found no further leads I was given a tour of the majority of the new findings this year. We saw some of the strangest formations such as several spirals of mud that looked like a plug had been pulled beneath them. The huge rifts and chambers are glorious and lots of fun to explore. We headed back to camp to finish the pack up and slept at camp for the final time this year. Had my last serving of fishy soupy cheesy smash (Thank god!) and went on my way. Heading out we met the various teams sent down to carry the remaining bags who made their presence known with singing heard from many pitches away.

The next few days were spent packing away the bivi, removing all evidence of our presence in the national park. After saying goodbye to the plateau we travelled to Tolmin and stayed in a member's flat. The next few days were spent giving presentations to the enthusiastic locals about our exploration. A total of 2.2km of new cave all below -550m left spirits on a high. A connection between the two systems now looks ever more likely which, if found, would bring it close to being the longest cave in Slovenia. On our final night we celebrated our achievements with the JSPDT with traditional Slovenian music, dancing and drinking.

Very hungover, we packed the minibus and reluctantly left Tolmin. This will be an experience I will never forget. Not only has my caving vastly improved and my thirst for caving increased but it was the first of many caving expeditions I will be part of. The excitement of caving in new countries will always enthuse me but I have the feeling that as many times I may explore the deep caves of Tolminski Migovec we will always have unfinished business.

9 Rainfall Response of Vrtnarija

Assessing the flood response of the cave is obviously extremely important with respect to the safety of the expedition members and continued cave exploration. This year we had several periods of extended, extremely heavy rain, whilst people were underground and the nature of the pitches was inspected.

As well as for reasons of safety, due the expected difficulty in acquiring permission to internally dye trace streams, comparing flow volumes is the best method we have of understanding the hydrological connections within our cave.

9.1 Vrtnarija Main Pitch Series

9.1.1 Laurel to Pico

Laurel gets very drippy during heavy rain (with a small stream entering through an immature development part way down), but quickly clears after the end of the storm. This water is followed to the top of Pico (supplemented by a usually dry inlet below I Scream), but all pitches are rigged dry and fully passable. The water disappears below boulders at the top of Pico, and is possibly regained a short distance into Captain Kangaroo where it forms the mostly hidden stream in the immature rift which is followed to Bonus Chamber where it flows into a narrow rift (unpushed) below a boulder choke.

9.1.2 Pico to Pink

Pico itself is rigged entirely dry, but an inlet splashes the far side of the pitch. Again, this water is then followed down Terra, Nova and Swing, but these are also rigged dry. The water flows into a pool in The Officer's Club, whereas the main route follows a higher abandoned level. Tessellator and the first hang of Space Odyssey are entirely dry, a considerable volume of water enters on the bottom hang of Space Odyssey. The rigging is entirely clear of the water. This water then disappears down a hole down 'the back of' Concorde.

Concorde itself is then mostly dry, with the last two rebelays being slightly drippy. Strangely, the volume of drips does not seem to vary much with rain on the surface. This small volume then flows down Alchemy, Zlatorog and Fistful of Tolars (again, entirely separate from the rope) and is believed to flow into the Banzai streamway.

9.1.3 Pink to Zimmer

The first pitch in Pink is dry under normal conditions — with a considerable volume of water entering out of a bedding plane in the rock and flowing over the pitch about ~5m from the rigged location. However, heavy rainfall can result in a sheet of water flowing closer to the final hang, and even reaching it.

The volume present on the first pitch in Pink seems comparable to the amount present on Space Odyssey and it is thus hypothesised that the streams are the same (i.e. there is a wet parallel pitch series). This water then disappears (into an unpushed streamway, possibly joining into Banzai). The rest of the Pink series is dry.

The lower hang in Sky Net takes a small stream during continual rain. The bottom hang of Zimmer and the rebelay is extremely wet during heavy rain — the lower half of the chamber is filled with heavy flying spray. The water from Skynet enters through a cut-back slot and bounces off a series of ledges arriving at the floor in a chaotic mess. There is an additional, larger, volume of water that enters on the far side of the Zimmer pitch. The region of Zimmer pitch between the Leopard window and Korita remains dry, and this may offer an alternative, dry, SRT route.

We currently believe that the water on Zimmer collects under the boulders, then flows down Korita and is followed all the way to Crack in Time.

Interestingly, during heavy rain, the draught changes direction in Friendship gallery. The usual direction is from Zimmer into Friendship Gallery. This reverses and strengthens during storms on the surface.

The first pitch in Pink and Zimmer are rerig targets for 2011. Once rerigged, Vrtnarija should be fully passable to and from camp, if not pleasant, in all water conditions.

9.1.4 Leopard

The main horizontal passages are entirely dry - except for passing the first streamway, where a rebelay on the traverse was found to be under the main flow during a flood pulse! Rerigging with a short pitch down to the boulder choke pit and another at the far side has been hypothesised for 2011. All of Wonderland and the Palace of King minos is dry. The vertical leads following streamways, naturally, are not.

9.1.5 Korita

During a flood pulse all the pitches were found to be passable, except for the top hang of Black Knight pitch, where the deviation was found to be submarine. A considerable flow existed in the tight rifts and so drenched feet were a constant risk.

9.1.6 Republica

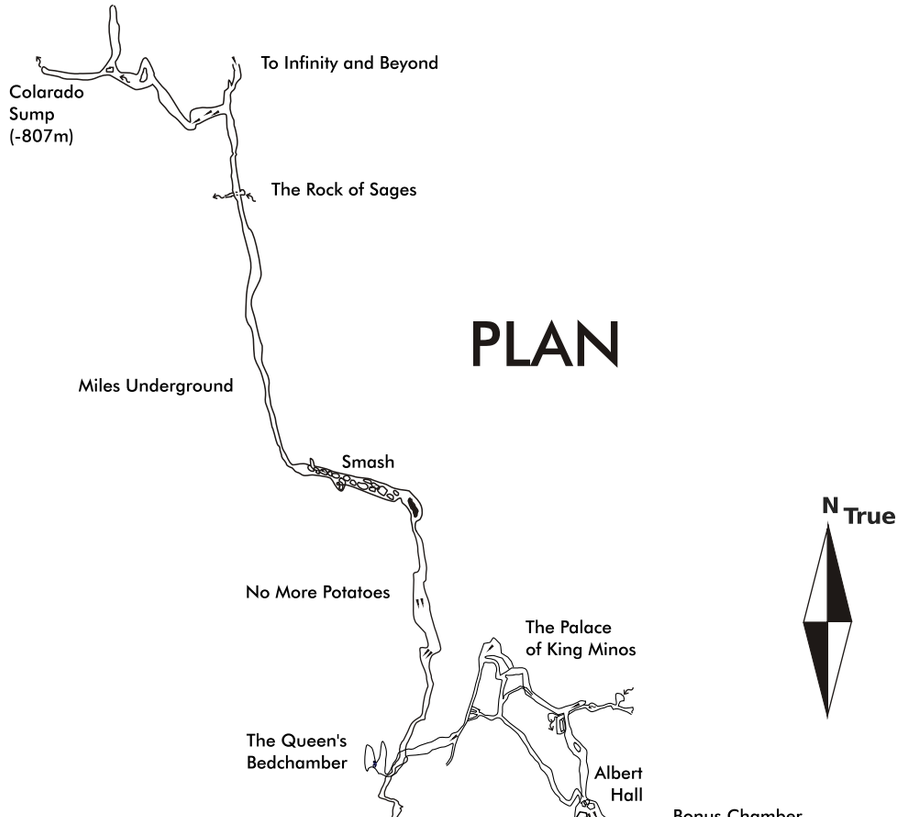
The region was found to be fairly damp - with falling water in heavy conditions soaking a rebelay.

Big Rock is drippy, but entirely passable.

VRTNARIJA

Tolmin, Julian Alps, Slovenia
Altitude 1794m
Depth 807m, Length 8776m
Location 540510 / 512398
Drawn by ICCC/JSPDT 2010
Surveyed to BCRA Grade 4B
Exploration 2000-2010

PLAN



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