7.2.8. Underground connection Malo Polje - the Podroteja and Divje Jezero

For the third combined water tracing in summer 1995 Malo Polje near Col was chosen as it lies on would-be watershed between Podroteja and Hubelj; it is 8,3 km far from Hubelj and 10,7 km from Podroteja. This tracing by Pyranin also did not confirm the supposition of the connection with Hubelj; the tracer appeared in three separated peaks in low concentration in Podroteja and Divje Jezero after 740 to 830 hours with apparent velocity from 13 to 14 m/h. The tracer appeared in both springs after 100 hours after the peak of the first high water pulse, while during the second, substantially lower pulse tracer was no more recorded. Probably this case indicates a trace of secondary washing while true base outflow from Malo Polje is not proved. Water tracing in epikarst watershed zone requires more tracer and a more sensitive one.

7.2.9. Underground connection Lokva (Predjama) - the Vipava (P. HABIČ, V. ARMBRUSTER)

In April 16, 1994 during the second combined water tracing test among the others also the sinking stream Lokva near Predjama was dyed. The permanent springs of the Vipava from V-1 to V-7 and common at water gauge station V-8 were monitored. Hydrological conditions were similar as in the catchment area of other springs in the area of Trnovski Gozd. Two days after the injection at relatively high waters (11,2 m^3/s) a water pulse occurred with peak at 25,2 m^3/s. Later water decreased constantly. After 450 to 500 hours on May 6 a low water pulse, peak 6,3 m^3/s, occurred; after 800 hours since the injection a more abundant water pulse occurred on May 20 with first peak at 26.7 m^3/s and on May 21 with 22,6 m^3/s. The first traces of Uranine appeared in the Vipava after 69 to 74 hours, varying in different springs, and the first peak after 80 to 103 hours. The velocities of the first tracer appearance are between 175 to 185 m/h. In some springs the second peak was more distinctive, between 140 to 166 hours since the injection, velocities from 78 to 126 m/h (See Fig. 6.21 - 6.26). Water pulse accelerated the washing of tracer somewhere in the middle between swallow-hole and spring and at the same time it washed off the retained tracer from the ponor area. Thus two tracer pulses appeared in the springs. The first had higher concentrations only at the common gauge station V-8 and in the spring V-3; the first peak in the spring V-7 was rather diluted, although higher than the second one. The springs V-1, V-2, V-4, V-5 and V-6 had higher concentrations in the second pulse which was certainly much more prominent in all the springs.

The differences in the concentration curves between single springs are partly due to hydrologic connections between feeding channels in common but not entirely homogeneous throughflow system of the aquifer. Jagged concentration curves at some springs, in particular at V-2, V-3 and V-7 are probably due to local hydrological influences and possible pollution and disintegration of tracer in samples (Chapter 6.3). The concentration curves in most springs evenly decreased, only at spring V-4 two separated peaks appeared after 300 and 350 hours probably controlled by different underground flow. Another tracer peak due to water pulse push after 850 hours appr. (May 20 and 21) appeared at lateral springs V-1, V-2 and V-3 and less distinctively at V-7. According to hydrological, physico-chemical and tracing results the main Vipava springs at medium and high water level are V-4, V-5 and V-6 draining the aquifer the most directly exercising the least lateral discharge effects.

During a heavy precipitation event the connection between the sinking Lokve stream on the flysch area near Postojna and Vipava springs could be investigated with the natural tracer silica. On April the 1st and 2nd 1996 heavy precipitation brought 110 mm of rain to the flysch area. The biggest of the sinking streams, Lokve river, showed a very high peak discharge of 4.4 m^3/s. 4 days and 12 hours after the peak silica load in Lokve river, a strong rise in the silica content of Vipava springs was detectable. It occurred long after the peak discharge (HQ: 43 m^3/s) in the Vipava springs. This silica peak could be plausibly attributed to concentrated allogenic water, coming from the flysch area near Postojna. Dispersion has been low and the travel time amounted to 4 days and 12 hours.

7.2.10. Underground connection Slapenski Ledenik (Nanos Mt.) - the Vipava

The fourth combined water tracing test at low waters on October 26, 1995 was aimed to compare the drainage in epiphreatic and vadose zone of Nanos Mt. Pyranin was poured into the sinking stream Lokva near Predjama (13 km far from Vipava), Uranine into a shaft Slapenski Ledenik on Nanos (7,6 km far from the Vipava). Unfortunately Pyranin was not detected in any spring, maybe because of too small an amount; however the drainage towards the nearby aquifer may not be excluded.

Uranine from Slapenski Ledenik appeared after 400 hours in a distinctive tracer pulse, 30 hours before the first, lower and about 100 hours before the high water pulse due to rain on November 16 and 19. Surely the first rain between November 11 and 14 accelerated the outflow of tracer which was already close to the spring in the phreatic zone. The flow velocity up to the first tracer appearance (19,7 m/h) and up to the peak of the pulse (15,9 m/h) are very typical of low waters. After 100 hours tracer concentrations substantially decreased due to dilution because of heavy rain. During the following discharge decrease the concentrations increased accordingly to outflow of less diluted base flow.

Another tracer pulse appeared after 900 hours approximately, between December 1 and 2 slightly after the low water pulse due to rain on November 26 and 29 (20 mm) which was not strong enough to flush the tracer. More probably this is a secondary pulse due to washing off the Uranine from Slapenski Ledenik after the rain on November 19. This pulse required about 300 to 400 hours to reach the spring; this gives the velocity of 20 to 25 m/s and according to higher water level it is slightly higher than was the velocity during the first pulse. The following peaks of the tracer pulse curve appeared in December together with water pulses; they are obviously the result of pushing of dyed water from the underground after 1300 to 1800 hours since the injection. Similar phenomenon was recorded at previous water tracing in August 1995. The last traces after 4600 hours confirmed that water is retained in the Vipava aquifer for at least half a year. Similar conditions were stated during water tracing of the Pivka and Stržen near Postojna in 1988 (HABIČ 1989).

7.3. WATER PROTECTION MEASURES (J. JANEŽ)

7.3.1. Introduction

The first attempts to protect karst water between the valleys of the Vipava, Soča and Idrijca started 25 years ago when the professional foundations and proposition of protection of the recharge area of Podroteja spring near Idrija was being prepared. The decree did not pass. In the early 80' the Karst Research Institute ZRC SAZU, Postojna prepared the professional foundations and the communes Nova Gorica and Ajdovščina passed the communal acts to protect the springs Mrzlek, Vipava and water storage of Čepovan-Lokve water supply. The Mrzlek recharge area was protected by the act issued at Nova Gorica but not at Ajdovščina commune. The Vipava recharge area was protected by the Ajdovščina commune but only the area covered by its own commune while the part that administratively belongs to Postojna was not protected.

Insufficient local and partial measures animated the initiative to prepare a full range of professional foundations for uniform protection of the entire karst aquifer of Banjšice, Trnovski Gozd, Nanos and Hrušica and the recharge areas of all the concerned springs. These foundations were being prepared from 1988 to 1993. The first phase of the project was concluded, including geography,