

# REDISSOLUTED FORMS ON STALAGMITES IN BELGIAN CAVES

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## INTRODUCTION

According to Jakucs L (1985) pioneers work we investigated special redissolved forms on the surfaces of stalagmites in Belgian caves. The formation of these phenomena is connected with the effect of acid rain according to Jakucs. We cannot prove this idea but we can also stay that these features are very young forms and the process is opposite to the general stalagmite formation. C. EK also discovered some similar features in Belgian caves in 1985 and after 10 years we have found these forms and a lot of new, young forms formed during this short period. We visited 3 different caves near to Liege where the coauthor L. Mucsi spent 1 year fellowship of Phare ACCORD program in the Laboratory SURFACES, University of Liege.

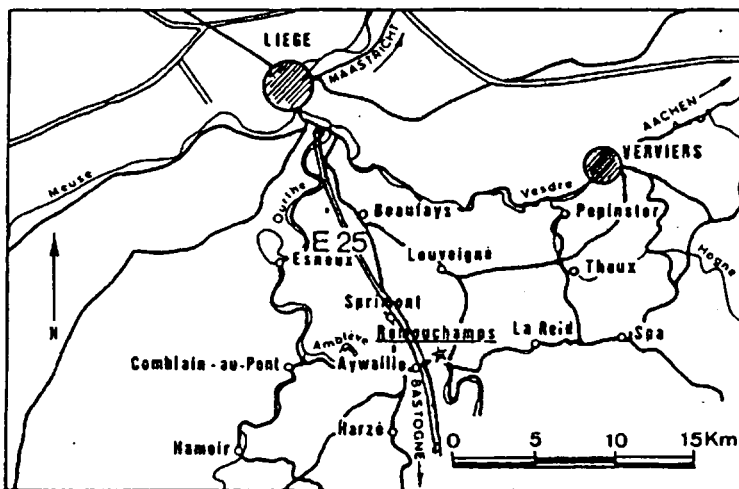


Figure 1 Map of Belgium and the location of Remouchamps and Comblain-au pont

## Remouchamps

The Belgian town of Remouchamps lies some 20 kilometres south-east of Liege. The Ambleve, a tributary of the Ourthe river, flows through the village. The Ambleve passes through the town at an altitude of 130 meters, but the altitude of the surrounding area reaches 510 meters. Access to the village by rail or road is very easy (Fig 1). On the cave of Remouchamps different types of redissolved form can be found. The forms are located at two different levels in the cave.

The most intensive rill formation can be investigated on the upper part of the cave above the Salle de Cathedrale in the Chamber of Shale. These recent forms clearly show the effect of resolution process. These rills are much longer than the same forms in Comblain-au-Pont and much more wider (1-2 cm). This chamber is near to the surface, the thickness of the roof is approximately 5-7 m. It is interesting that beside the redissolved stalagmites we can also find increasing stalagtites. Therefore, the effect of the redissolving water is in connection with local effects. On the wide rills, the , flowing water forms small phenomenon like meanders, therefore it is not so clear that this part of rills can be characterized as a redissolved form rather eroded form. We know that these forms are recent forms and according to some factors we can calculate the maximal age also. Similar to the Hungarian cave Baradla, in Remouchamps was officially opened for tourists in XIXth century, at 1829. At this time the visitors used burning brands, whose smoke and ash accumulated on the wall. If the rills penetrate this grey-black coloured layer of the stalagmite, then we can say that the rills cannot be older the 160 years. On some bright stalagmites, it has to be much younger. This period is called post-soot period after L. Jakucs. On the bottom of the Salle de Cathedral some of redissolved features can be found. These are also long rills, but opposite to the recently forming rills they are deep, narrow - forms rather than wide. Another different character is that they are jointing to each other (share edged corrosion), while the young rills on the Salle de Shale are spreading. Very important fact that these features cannot be touched by visitors because of their position along the tourist road (pavement) is high enough or they are located on unvisited chambers.

## Comblain-au-Pont

In this cave the typical redissolved form is the rill. All of this type of forms are located on the surface of stalagmites, or on walls covered by dripstones. The water drops reaching the wall or the stalagmite erode the limestone surface. From the spreaded water, small, linear forms are precipitated. These forms can be found on the lower surfaces in radial direction on splash-spray zone. The result of the kinetic energy of the dropping water is a small shallow which is filled by dropping water. In this phase, the kinetic energy of the water decreases, because the water drops are dropping into water instead of onto the dripstone surface. When the water drops filled the shallow (crater), the water surplus is flowing out, which induces the desolution. If the outflowing water can be solve the dripstone, small rills are forming. We have measured the pH of waterdrops in the case of

Comblain-au-Pont at a special dripstone form. The place where the water is dropping from is about 30 cm above the crater. At this point the pH was 7.5. From the crater, the water is flowing down on the dripstone surface in vertical = direction and the distance between the crater and the new place of the formation of water drops is approximately 20 cm. At this point the pH was 7.8. The temporal difference between the falling down of the upper waterdrops and the occurrence of the water drops below is about 1 sec. The significant difference between the pH values and the short time of the chemical process indicates that this process is very fast and strong.

On the second chamber there is a great group of stalagmites. It is interesting that the small craters do not exist on the surface of stalagmites, because of the small angle of the incidence of water drops. On this surfaces long and relatively deep rills are being formed. In all cases the desoluted stalagmite are indicated by a new, brighter colour.

### **Ste-Anne-cave Tilff**

There are also some typical redissoluted features in this cave. The effect of this process is very intensive on all redissoluted forms. These forms can be compared to the similar phenomena of Remouchamps cave located in Salle de Schiste. The deepness of this craters is ranging from 3-5 mm. Because of the former investigation of C. EK (1985) we can state that these form are very young forms. In some cases the distance between the place of dropping water and the crater is less than 2 cm, therefore the effect of corrosion has to be stronger than the effect of kinetic energy. The effect of redissolutoin is the strongest in the surrounding of the water, the radius of this zone is about 5-7 cm, but the length of the rills is sometimes greater than 50 cm. The effect of redissolution can be seen not only on stalagmites but on soda-straw dripstones whose tips are clearly being recently corroded. The shape of this rills is widening at the bottom, which can be the result of the redissolution getting stronger. On the surroundings of the crater, rather the deepening effect is more significant, while in the = leeward zone the widening effect. The zone, which is covered by redissolution rills, can be 30-50 cm wide. If there are 3-4 craters near to each other then this zone can merge and in this case the effected zone can be 1 m wide.

The most frequent case, if more rills carry away the aggressive water of the crater the effect is divided. We have found such crater, at which just one rill is existing, in this case the effect of aggressive water concentrated into this rill, therefore it becomes deeper than wider. The new brighter colour is also an important characteristic of the redissoluted forms in the Ste-Anne cave, like the other two investigated cave.

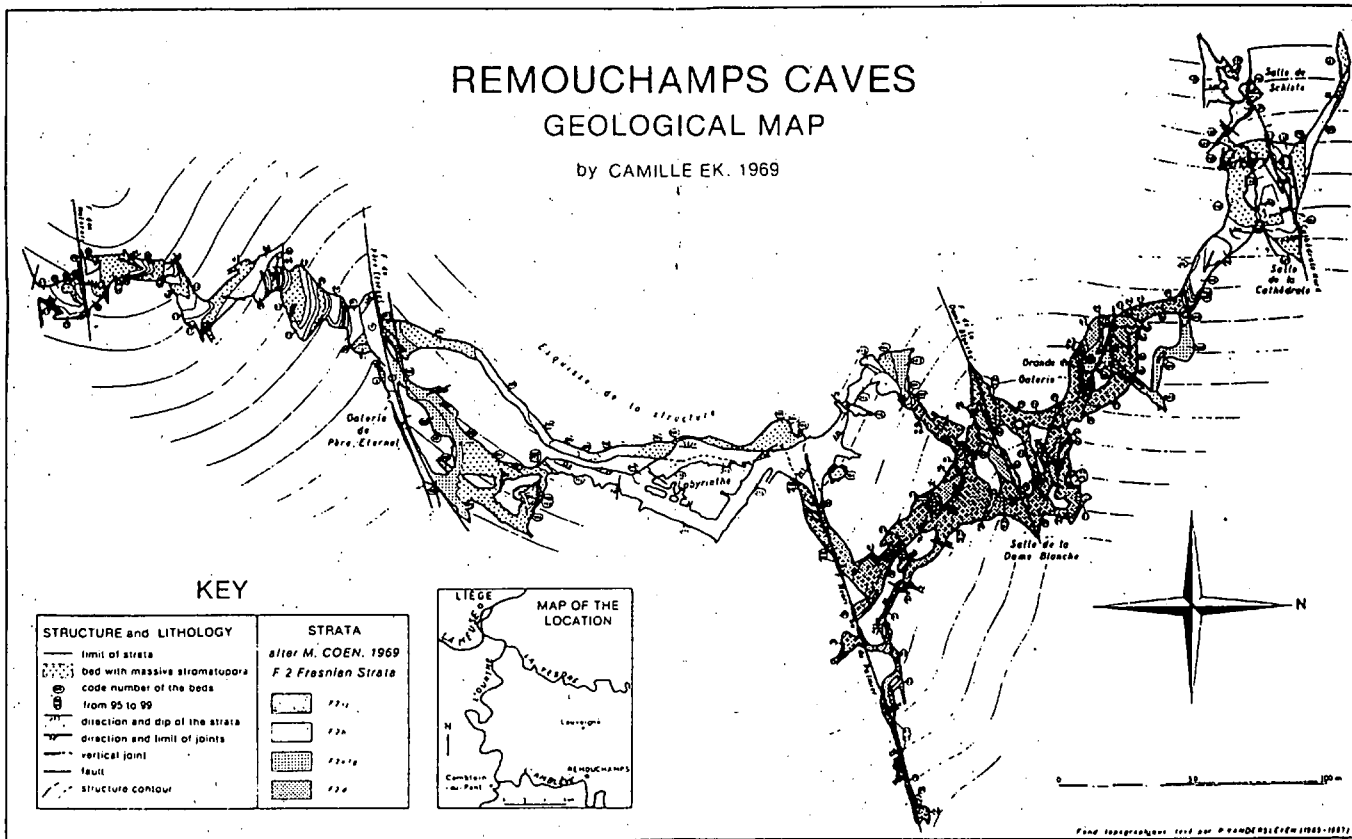
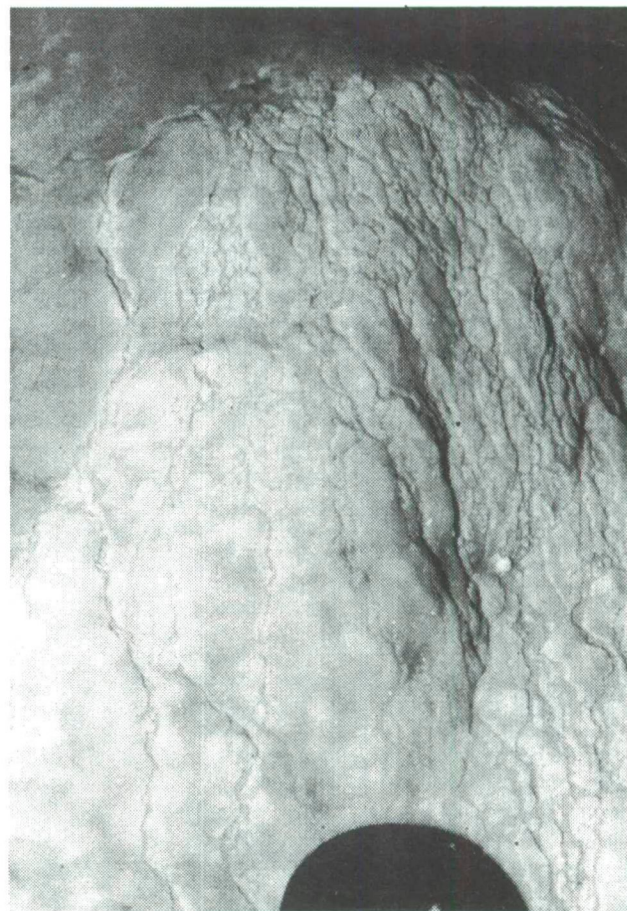
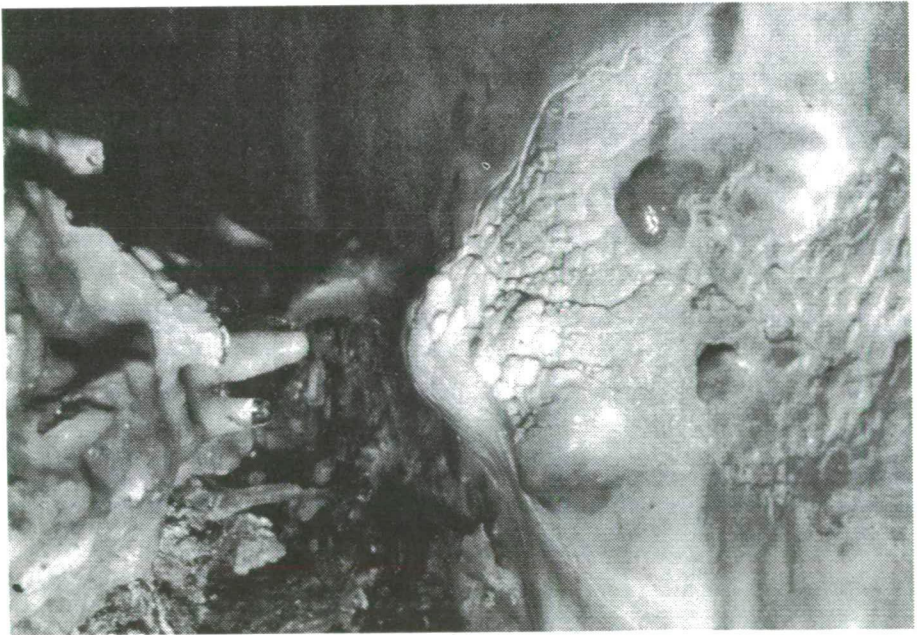
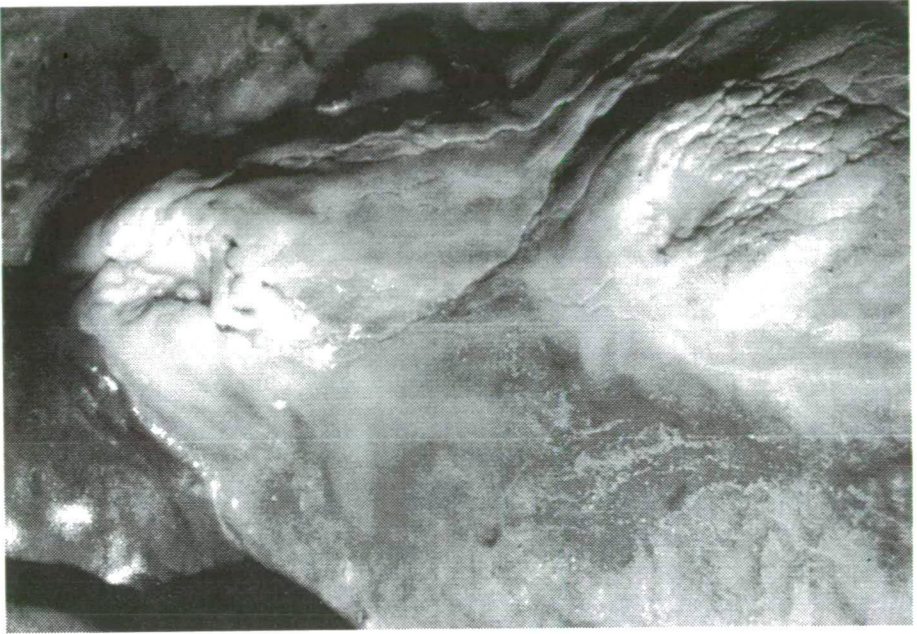


Figure 2 Geological map of Remouchamps Caves (C. Ek, 1969)



**Photo 1-2** *Redissoluted speleotherms in the Remouchamps Cave and in Cave Comblain au Pont*





**Photo 3-4** *Redissolved speleotherms in the Cave Comblain au Pont*

## Conclusion

According to our common study we can say that there are much more redissolved features in the Belgian cave then 10 years before. The decreasing number of these forms shows that we have to pay more attention to the environmental monitoring and protection of limestone surfaces and caves, because the karst areas are very sensitive for the environmental changes and polluting materials.

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