STYLOLITES CONTROL KARST FORMATION

Silvana Magni - Phd Student

e-mail: magnisilvana@libero.it

- **Purpose of research.** The karst is strongly influenced by the deformation history and tectonics of the area in which it develops. For this the structural setting of a rock mass (eg. lithology, porosity primary, environmental conditions etc) affects the circulation, influencing the values of permeability and porosity. It is not sufficient the presence of acidified water and adequate rock to begin the karstification process, but it is indispensable that will also establish an hydraulic gradient, after which the water starts to move along the pre-existing network of fractures preferring larger ones (Forti, 1986).Traditionally, in the field of karstology, it is argued that water circulation is essentially related to extensional structures assuming that they are more favourable to water circulation (anticlinalic folds, extensional fault). The study of fractures in fact allows you to speculate on the trend of karst systems and their development (Eraso A., 1986).
- The study was conducted in Puglia (*Fig.1*). Puglia is almost 2/3 of its territory consists of carbonate rocks, limestones of Jurassic-Cretaceous age, and limestones of Plio-Pleistocene age, which from a mechanical point of view, have a considerable secondary permeability (Jurassic-Cretaceous limestones) , and primary, the second.

Fig.1_Area of study in the South Italy and the structure present in the area (From Pieri, 1996).

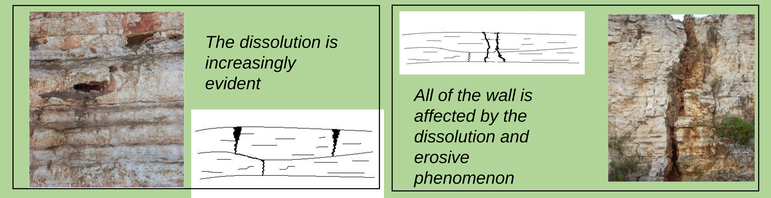

Fig.2_Stages of evolution of a stylolites, from the initial stage up to the formation of a true cavity. (Magni S., 2010)

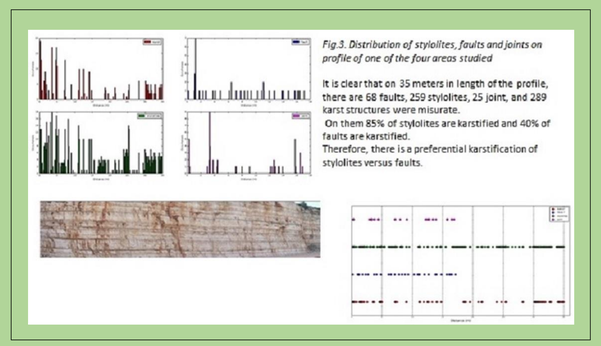

Fig.4. We show two area of the four areas studied. (Magni S., 2010)

Research methods. We are aware that the process karst derives from a complex interaction of several factors and processes (of which we have already discussed earlier) and no claim to believe the influence of the structural setting the most important factor, the present work has focused on relationship between it and the deformation. We wanted to check whether where there is evidence of karst, there are also special kinds of mechanical discontinuity and thus establish their nature (joint, faults, stylolites). It was conducted a structural study (scanline method, *Fig.4*), in four different areas of the same area and we reconstructed the structural setting of the area. We have focused our attention on faults, the stylolites and the joints.

For each area, we have assessed the potential of the fault in respect of the circulation of the fluids, considering the ratio between the area of damage and the sum of this and of the gouge (Caine method 1996,1999). We have also reported the presence of dissolution along the different fractures (*Fig.4*). A preliminary mineralogical and petrographic analysis was perfomed in order to characterize the material within the fractures.

Results. First it was observed that the karst is more widespread along the stylolites rather than along other discontinuities such as joints or mechanical faults. This consideration is in good agreement with the genesis of such discontinuities. Indeed, they are formed by a process of pressure-solution affecting mainly carbonate rocks leads to dissolution of soluble material and an enrichment in insoluble material, fine particle size (i.e. iron and aluminum minerals); these are of finer and therefore are more easily altered and remobilised resulting in fluid flow enhancement resulting in "enlargement" of the void (and therefore greater volume of water present).

In conclusion we believe that there is a relationship between deformation and karst. The phenomenon in fact prefers the tectonic structures, and in particular stylolites because along them because there is the simultaneous presence of two factors for its development:

1) the presence of water;

2) the dissolution, by pressure solution with consequently increase of finer material

The joints and faults in the study area do not seem to be very prone to the diffusion of the karst phenomenon. This is also in. agreement with the relationships deduced from the method of Caine, applied to the area of study. (*Fig.4*), In fact where there are many stylolites there are many karst.

This is important because this relationship is not yet adequately studied and produces errors on karst and especially on water circulation

In Puglia there are no studies on this topic and this work wanted to make a contribution in this direction.

Further studies (mineralogical, petrographic and mathematicians), currently in progress are helping to better understand this phenomenon.

Future research. are focused to understand some questions, to date, unresolved as what is the volume of rock that they affect and the potential amount of fluids that they may allow to pass through itt; the relationship that exists between the amount of water that passes through these structures and other structures such as faults or tension gashes.

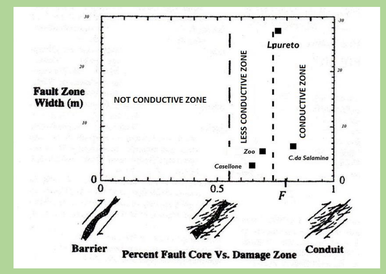

Fig.5_Diagram that explain the behavior of the four zones against permeability.

BIBLIOGRAPHY

Caine J., Evans J., Forester C.,1996. *Fault zone architecture and permeability structure.Geology* ; vol.24,pp.1025-1032;

Caine, J.S., Forster, C.B., 1999. *Fault zone architecture an fluid flow-insights from field data and numeric modelling*. American Geophysics Union Geophysical Monograph 133, 101–27;

Eraso A.,1986. *Propuesta de un nuevo Metodo de peduccio de la direction principales de drenaje en el karst*. Especial Monografico Jumar,1-115;

Forti P., Piccini L.,2007). The Karst process.ISocietà Speleologica Italiana,Project PPT 2007

M agni, S.,2010. Thesis in structural geology- *Deformation and Karst in limestone Formations of Bari and Altamura near Fasano (Br-Italy)* - supervisor D.Liotta(Not fully published);

Pieri P., Festa V., Tropeano M., 1997. *Quaternary tectonic activity of the Murge area* (Apulian foraland, Southern Italy). Annali di geofisica , vol. XL, 1395-1405