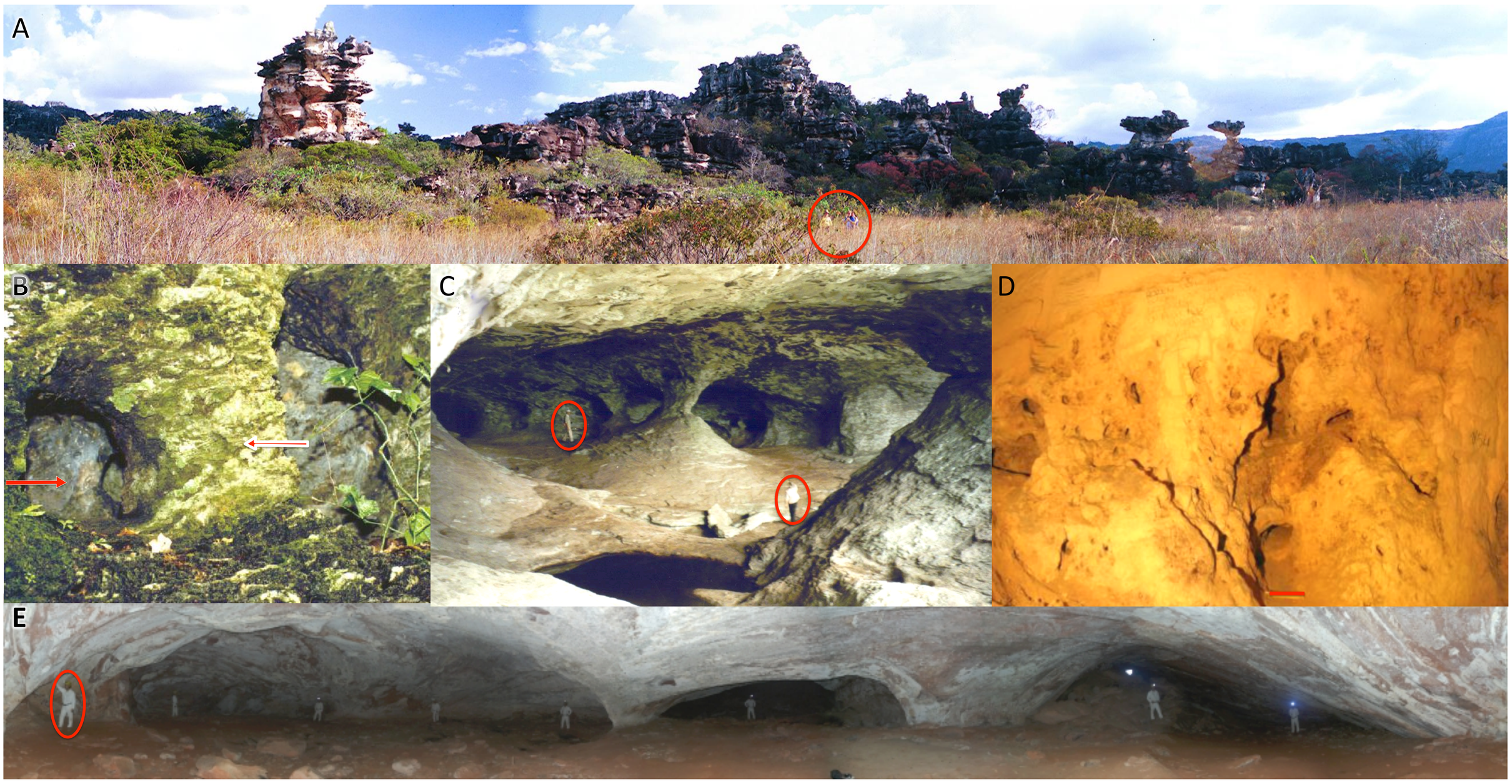
Bacteria, bonds between classical karsts and karsts in silicated non carbonated rocks ?

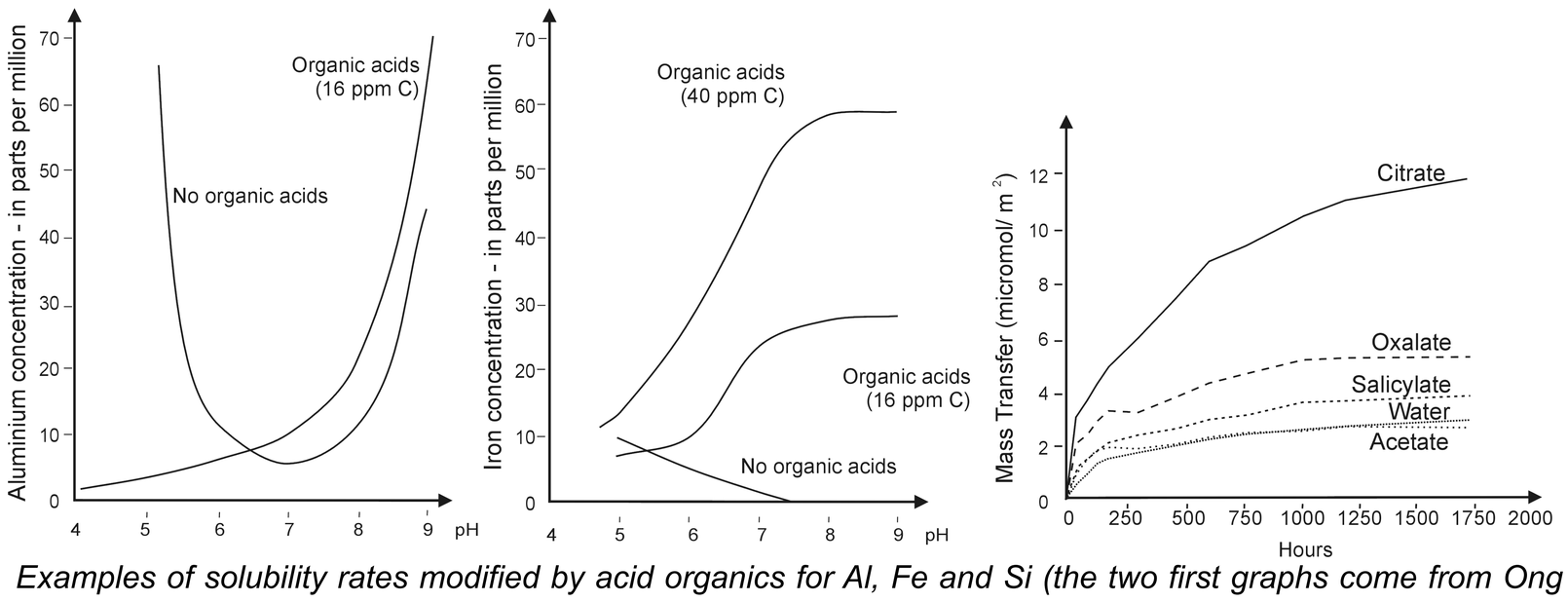
Luc Willems

University of Liège - Sedimentary Petrology (PETROSED) – Belgium, L.Willems@Ulg.ac.be & Charlemagne College- Liège - Belgium

For several years, similar karsts to those found in the limestone have been observed in various silicated non-carbonated rocks. Several morphological arguments show that a complete dissolution of rocks is necessary to explain the formation of some caves and other related forms independently of hydrotermalisme phenomena. However, the physico-chemical processes generally considered do not provide a satisfactory explanation to this dissolution. Bacterial activity found deep in many lithologies provides a solution to this apparent contradiction.

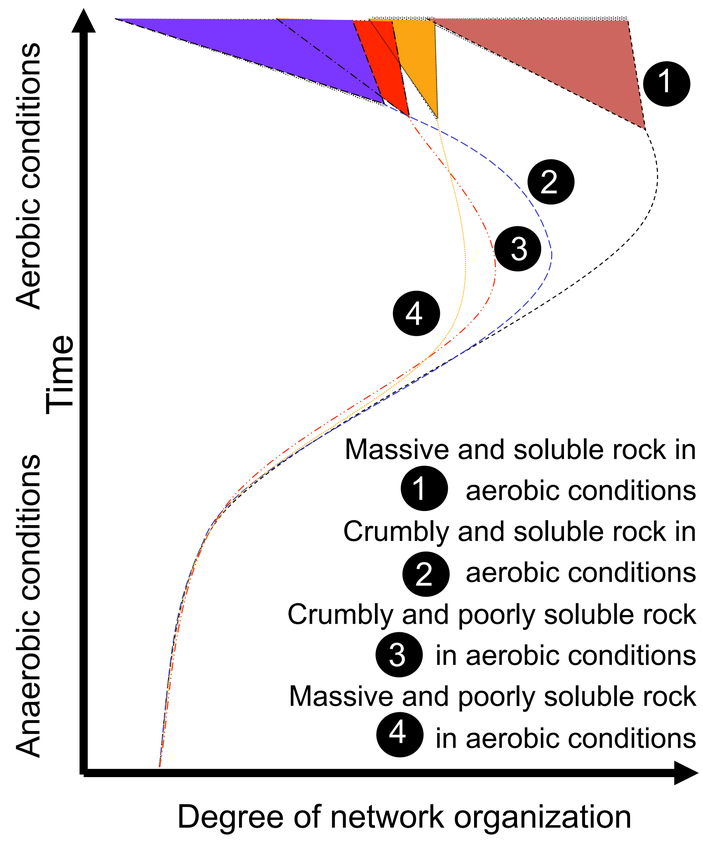


***A**: Ruins-like relief and paleo-polje – Quartzite – Rio Preto – Brazil. **B**: Example of solutional columns protected from meteorological weathering or reshaped by it – micaschist – Akok Bekoé – Cameroon. **C**: Cave of Mfoula (or Mfouda) – gneiss – Cameroon (photo A. Pouclet) – **D**: Micro and macro alveoli (scale bar: 50 cm) – calcarenite – Sint Pieter's Berg – Belgium. **E**: Cave of Boca do Sapo – sandstone – Itaqueri Serra - Brazil*



Examples of solubility rates modified by acid organics for Al, Fe and Si (the two first graphs come from Ong et al., 1970, the last one on the right from Bennet et al., 1988)

Potential evolution of a karst system starting in depth/in anaerobic conditions



Bacteria are found at great depths in many types of rock (e.a. Sinclair and Ghiorse, 1989; Stevens and McKinley, 1995). They have the ability to produce organic and inorganic acids (e.a. Brock *et al*., 1994 Ehrlich, 1998), which in turn can generate soluble organometallic complexes (e.a. Beveridge, 1989; Ugoli and Sletten, 1991). If these are unstable in aerobic conditions, they are stable in anaerobic environment (e.a. Ong *et al*., 1970; Thomas, 1994; Willems, 2000). They may cause the dissolution of the poorly soluble lithologies on the surface of the Earth. If the solutions can be renewed, then the action of bacteria, thanks to these soluble complexes, can initiate karsts and karst systems in silicated and non-carbonated rocks (e.a.: Willems *et al*., 1993, 1996, 2002, 2004; 2009).