A New Calibration of Raman Spectroscopy of Carbonaceous Materials RSCM: Application in the Helvetic Nappes (Switzerland) and Big Franciscan Complex (California)

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The Raman Spectroscopy of Carbonaceous Materials (RSCM) geothermometer was developed by Beyssac et al. 2002 to estimate maximum paleotemperature in the range 330-650°C for organic bearing rocks. Later we calibrate this tool in the range of temperatures 200-350°C.

To test the new calibration of RSCM, we applied the new method to samples from different contexts. the study of several cross-sections in various tectonic contexts is important to discuss the roles of the rock lithology, CM precursor, deformation history and geological timing rate. We focused our studies on two cross-sections: Morcle cross-section (Helvetics nappes of Switzerland) and Sur area cross-section (Franciscan complex, central California). In the selected areas, the thermal history of the rocks is well described thanks to the systematic combination of various techniques which are probably not perfectly reliable taken individually, but provides a robust estimate when they all converge. These methods are fluid inclusion thermometry, vitrinite reflectance, index mineralogy, illite cristallinity and low-T thermochronology.

Data of RSCM show variations with temperature increase. In both cross sections, RSCM temperatures evolve from diagenesis to epizone conditions.

RSCM results of Morcle area concord with data provided by other methods used by Burkhard and Goy-Eggenberger (2001). We note the same observation in Big Sur area after confronting RSCM data and classical methods information. The carbonaceous material was analysed under transparent minerals such as quartz or carbonates (sometimes in the same sample we find quartz and carbonates). We did not notice any influence of the lithology on structural evolution of CM with temperature increase.

RSCM geothermometer is a reliable method to constrain temperatures in the range 200-350°C. It constitutes a useful tool for a better estimate of the thermal history of rocks and to calibrate basin modelling studies.