CARBONATE DIAGENETIC DEPOSITS – PARALLELS BETWEEN ARENITES AT BAURU REGION, SOUTH AMERICA AND ROCKS AT NILI FOSSAE REGION, PLANET MARS.

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Introduction: Well, in this work we made some parallels between what is known about carbonate diagenetic deposits and petrological studies of arenites, present at the Bauru Group, Brasil, South America, and what is known about intact rocks in contact with clays, rich in olivine, exposed at the surface of planet Mars containing carbonate mineral deposits. The region where the Martian carbonate material was discovered is located within a system of small canyons known as Nili Fossae [1], at the northern hemisphere of Mars. The carbonates were discovered by NASA's Mars Reconnaissance Orbiter robotic spacecraft, in December 2008. It was also discovered plumes of CH_4 above that location [2] [3]. The diagenetic alteration of the subsurface rocks was probably due to hydrothermal activity which might have existed in that region. So, here in this paper, I make specific comparisons among such diagenetic processes on Earth and on Mars to give a contribution – via the use of biased techniques and gained experience – for future exploration and understanding of that Planet. By repeatedly studying geophysical-chemical properties of carbonate diagenetic deposits, it is possible to characterize their minerals each time better and, with that, to better determine the geological evolution of deposits of sediments, gradually altered by physical-chemical-biological processes after their deposition (diagenesis), as, for example, the carbonates – the subject of this work [4] [5]. These practical carbonate sedimentology analysis and comparisons can be applied to more focused robotic and manned *in-situ* search for biogeochemical signatures at past–Earth and present–Mars. The study of the arenites of the carbonate diagenetic deposits present at the Bauru Group, SP, shows evidence of sedimentary homogeneity at different depths of soundings and at different areas. The detritic properties of these arenites are constituted essentialy by quartz and feldspats and, at smaller quantity, by lithic fragments and accessory minerals with great inter-granular porosity. This is a good indicator of shallow eodiagenetic processes with low mechanical pressure, indicating past presence of subsurface waters in that location. The principal diagenetic processes observed were: dissollution of heavy minerals, lithic fragments and alumino-silicates, and cementing by microcrystalline calcite [6] [7]. The author mostly observed negative biaxial-refringe, and formation of clay minerals as montmorillonite and kaollinite. Infrared images by CRISM–MRO show a bedrock containing clays (principally smectites), exposed olivine and carbonates at the same stratigraphic level. Much probably the olivine was altered by hydrothermal action, possible present at that location at ~ 3,6 Gyrs ago, transformed into the found carbonates. It is known that carbonates are formed in neutral or basic waters (pH > 7), which indicates that dissolution of the minerals were not only in acid environment, showing a great pH variation of the waters, interesting to the diagenetic evolution of hydrothermal, volcanic and sedimentary regions on planet Mars, as this carbonatic one being studied here on planet Earth. Other minerals found by CRISM–MRO were alumino-smectite, iron/magnesium-smectite, hydrated sílicates, minerals of the kaolinite group and iron oxides. In 2004, the NASA's robotic rover Opportunity discovered the minerals hematite [iron (III) oxide (Fe_2O_3)], and jarosite [$KFe^{3+}_3(OH)_6(SO_4)_2$] in the Martian surface. Jarosite is formed by the oxidation of iron sulfides in the presence of liquid acid water, which shows (aside several evidences – geomorphic and geologic ones by remote sensing) that Mars much probably had liquid water with relative abundance in its surface and subsurface soils. This potentially demonstrate that, hypothetically, Mars might have had redox mechanisms associated with biogeochemical (bio meaning biomolecules) activity within subsurface hotsprings, with stable liquid H_2O, at least by ~ 3,6 Gyrs ago. The study of carbonate diagenetic deposits uses a large spectrum of techniques, as optical/texture and microscopic/mineralogical (birefringence, pleiocroism, MEV, *etc*.), to characterize a geological evolution of diagenesis of minerals found in sedimentary deposits, and this can be applied to understand such places – via geological comparisons – on planet Earth and on planet Mars. The more different complementary techniques be used in those analysis the more accurate will be the research results out-given. So, this paper is to suggest more practically focused geological comparisons between selected locations on these planets. In the case of Mars, there are still missing much many texture and microscopic analysis of minerals, to diminish the error bars as related as to the Martian hydrogeologic diagenesis. Such studies will be future made by samples–return, *in–situ* and manned missions to that beautiful planet. The evolution of carbonate sedimentary deposits on these worlds is well interesting to Astrobiology, since we can better understand the origin and evolution of life within

Earth, the possibility of that within Mars, and elsewhere in the Cosmos. Nili Fossae has geochemical potential for which it could have had a beginning of biogeochemical processes there – interesting to the multidiscipline field of Astrobiology.

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