

Dating aeolian sediments using ESR Ti-Li center in quartz,

TL and OSL-SAR: Dama Branca , study.

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The physical methods of dating geological crystals or sediments or archaeological ceramics are highly dependents upon Radiation Physics. Basically, all of them depend upon radioactive decay and are divided into two methods. One is based on radioactive disintegration of elements, referred to as Radioactivity Method; the second method is based on energy transferred by radiation to a solid, referred to as Trapped Charge Dating [1]. The accumulated dose (given in Gy) can be measured by Thermoluminescence (TL), Optically Stimulated Luminescence (OSL) and Electron Spin Resonance (ESR). The quotient between accumulated dose (Gy) and annual dose (Gy/year) yields the samples' age.

In this work, was collected sediments from a dunefield known as Dama Branca, in the Rio de Janeiro coast to study its dynamic, this dynamic is influenced by the sea level fluctuations and climatic parameters. The age of a certain volume of sediment is the amount of time since it was last exposed to sun light, i.e, the last time it was carried by the wind to form a sand mound. The accumulated dose measured by OSL applying the SAR protocol (OSL-SAR), and by TL applying the additive method, was compared with accumulated dose obtained by ESR.

Nowadays, ESR dating has been largely studied and Ti-Li center along with Al center have been applied to dating aeolian sediments since those centers are bleached by sunlight. Measurements have been carried out using the MiniScope MS 5000 ESR spectrometer at 103 K (-170 °C) using nitrogen gas flow system to observe Ti-Li center in quartz at $g = 1.913$. The following parameters were used: microwave power of 20 mW, width of magnetic field 10 mT measured within 60 s, with accumulations of 5 scans, modulation amplitude 0.1 mT and frequency of 100 kHz.

Step annealing have been employed to ensure the thermal stability of this center, it was seen that from 80 °C it starts to decrease and is completely annealed at 250 °C, a thermal treatment is proposed to eliminate unstable component of Ti-Li center and the result will be discussed in the presentation.

The OSL ages showed that the studied dunes are formed by three generation of sand deposition. They have ages of 2.22 ± 0.12 kyears, 1.72 ± 0.08 kyears and 0.79 ± 0.04 kyears.

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Keywords: Trapped Charge Dating, ESR, OSL, TL, Ti-Li center, sediments

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