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Heating effect on quart E'center and its potential use in river sediments provenance tracing

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The E'center, one of the best characterized paramagnetic lattice defects in crystalline quartz, has not been believed to be useful for ESR dating and dosimetry. But, in the latest decade, subsequent papers show that the ESR signal intensity of heat treated E'center, after gamma ray irradiation to 2.5 kGy followed by heating at 300°C for 15 min, is proportional to the age of quartz with higher value for quartz from older host rocks. Thus, on the basis of these observations of correlation between the quartz ESR intensity and its host rock age, the heat treated E'center was proposed to be applied for tracing provenance of sediments deposited in present and history. However, previous researching works of the heat treated E'center are mainly focusing on aeolian sediments while absent in fluvial and lacustrine sediments. In addition, even the method has many successfully application examples, the potential use in river sediments remains confusion.

To detect the heating effect on fluvial sediment quartz and whether the heat treated E'center is suitable for river sediments provenance tracing, eight granitic quartz samples either from sediments and its bedrocks with distinct geological age and origins were collected for the experiment evaluation. The heating effect experimental result shows that the quartz maximum heat treated E'center intensity of fluvial sediment also appears on heating at about 300°C, which consistent with the previous works. In addition, the analytical result also indicates that the quartz heat treated E'center is significantly correlated with its formation age, which also consistent with the previous works. In conclusion, we propose that the heat treated E'center, combining with another lithology discrimination indicators, could be served as an effective indicator for river sediment provenance tracing.