



Tracers in the laboratory and field investigation of bed-load movement

L. Rákóczy

Research Institute for Environment and Water Resources VITUKI, Budapest, Hungary

Two main types of tracers have been used for marking natural sediment grains: (i) Luminescent, (ii) Redioactive tracers. The *former* method is inexpensive, the marking and recovery procedure constitutes no health hazard, the release of marked grains into the environment does not require special permissions and controls. The above mentioned procedures at the *isotope* method are more expensive and hazardous, therefore its field application is forbidden in several countries.

The main advantage of using *luminescent tracers at laboratory* research of sediment movement is that nature-like grain mixtures can be investigated and the initiation of movement of pre-selected and marked grain-size fractions can be visually observed under UV light. The “critical” flow velocities belonging to these phases of sediment movement are realistic because they involve also the *effect of the grain mixtures to the given grain sizes*.

The *simultaneous* application of *different luminescent colours* can be advantageous both in the laboratory and the field studies. In the latter case, the differently marked grain-groups can be placed on different places of the river channel. Thus, by repeated sampling and counting the differently marked grains in the samples, not only the *direction* and *celerity of bed-load movement* can be measured, but also the *lateral mixing of bed material* demonstrated.

When the field dynamic behaviour of fine sand and silt grains has to be studied and they would be stucked together during the marking procedure, *artificial tracer grains* are produced, e.g. *luminescent glass* can be cast and ground to the desired fine grain sizes. Their movement is also followed by sampling and every sample is analyzed under UV light, where the brilliantly shining tracer grains can easily be detected, even counted.

The potential sphere of tracer applications in the sediment research is wider than the above presented examples show. Here only the advantages of the luminescent tracing techniques were briefly summarized based on the results of wide-range applications in Hungary, Sweden and Thailand in the recent decades.