Sediment transport in running waters

Sediment transport in running waters (suspended load transport or bed-load transport) can be demonstrated and studied with four GUNT units. For balancing a watercourse it is usually only the bed-load transport that transports or deposits sediment in a control volume that is relevant. Suspended matter passes the control volume and therefore is not part of the transport balance.

Suspended load transport is only relevant to the transport balance if the flow velocity is very small, so that suspended matter can settle out. Suspended load transport is demonstrated with HM 142.

Bed-load transport is demonstrated in HM 166, HM 140 and HM 168. The GUNT experimental flumes HM 160 – HM 163 are also suitable for bed-load transport.

Suspended load transport

HM 142
Separation in sedimentation tanks

In many watercourses fine sediment is in suspension as suspended matter. This suspended matter is not usually taken into account in the transport balance.

At very slow flow velocities, it is possible that suspended matter settles. In storage lakes or dams this can lead to undesired siltation. In wastewater treatment plants on the other hand, there are sedimentation tanks where sedimentation is desirable and is used as a separation process for the treatment of wastewater.

- separation of a suspension in the transparent sedimentation tank
- factors affecting the separation process
  - flow velocity
  - concentration of the sediment
- visualisation of the flow conditions with ink

Bed-load transport

HM 166
Fundamentals of sediment transport

- water is delivered in a circulating channel by a paddle
- deepening along a straight section of the channel as the experimental section
- experimental section with transparent side walls, L x W x H: 660 x 50 x 150 mm
- variable-speed paddle produces flows at a velocity between 0...1 m/s
- start conditions for sediment transport
- demonstration of ripple and dune formation on the river bed
- fluvial obstacle mark of bridge piers (scour formation and siltation)

HM 140
Open-channel sediment transport

- inclining experimental section with transparent side walls
  - length of the experimental section: 1600 mm
  - flow cross-section W x H: 300 x 86 mm
  - inclination adjustment: -1...+3 %
- discharge measurement can be adjusted by valve
- closed water circuit with pump, inlet and outlet element
- open-channel bed-load transport
- observing bed forms: ripples, dunes, antidunes
- sediment transport at structures:
  - bridge piers
  - sluice gate

also:

- basic principles of open-channel flow without sediment transport

Dune migration: the sediment migrates upwards through the flow on the upstream side to remain lying downstream.

HM 168
Sediment transport in river courses

- stainless steel experimental flume
- dimensions of the experimental section, L x W x H: 5 x 0,8 x 0,25 m
- closed water circuit with pump, inlet and outlet element
- discharge measurement can be adjusted in two areas:
  - low discharge: 0...2 m^3/h (e.g. to observe meanders)
  - discharge up to 70 m^3/h (e.g. observe ripple formation)
- open-channel bed-load transport
  - scour formation
  - siltation
  - ripple formation
- observe formation of meanders
- fluvial obstacle marks on structures:
  - various bridge piers
  - island

Erosion and siltation in the river bed