# Sediment settling properties of freshly eroded aggregates.

V. WENDLING[1], N. GRATIOT[2], C. LEGOUT[1], H. MICHALLET[3], A.J. MANNING[4,5].

[1)] LTHE, Université Joseph Fourier, CNRS, G-INP, IRD. 460 Rue de la Piscine, 38400 Saint Martin d'Hères, France
[2)] LTHE, IRD, Université Joseph Fourier, CNRS, G-INP. 460 Rue de la Piscine, 38400 Saint Martin d'Hères, France
[3)] Laboratoire des Ecoulements Géophysiques et Industriels (UJF, INPG, CNRS) BP53, 38041 Grenoble Cedex 9, France.
[4)] HR Wallingford, Howbery Park, Wallingford, OX10 8BA, UK
[5)] School of Marine Science & Engineering, University of Plymouth, Drake Circus, Plymouth, Devon, PL4 8AA, UK.

## Introduction

Once eroded from hill slopes, the conveyance of soil particles through the hydrological network requires their maintenance in suspension. In physically based models, this condition is formulated by the balance between the particle settling velocity on one hand and the turbulent shear velocity on the other hand (Winterwerp, 2001). Droppo et al (2004) showed that the particles settling velocity changes during their conveyance within the hydrographic network. The present study aims at improving sediment transport parameterization, by examining the kinetics of fine soil aggregates (size, settling velocity, density), once immersed in a turbulent flow. In other words, how soil aggregates become suspended sediment.

## Methods

Particle properties of three Mediterranean materials (clay loam soil, black marl and molasse, both sampled in badlands) were tested in the grid stirred experiment following the protocol previously used by Gratiot and Manning (2004). Hydrodynamic properties were monitored with ADV and turbidity sensors. For each soil, three sediment loads (1.5; 5; 10 $g.l^{-1}$) representative of flood conditions (Navratil et al 2011) were tested. Flocs/aggregates properties were obtained after sampling at four depths above the grid, by video (using the LabSFLOC technique; see Manning, 2006) and laser techniques. These heights are associated with the corresponding turbulence dissipation rate *G* of 1.5, 3, 7 and 19 $s^{-1}$.

## Results

Once particles were injected in the tank, a quasi-equilibrium state was rapidly reached, after one to two minutes. The floc/aggregate properties did not vary with sediment load. The median diameter $D_{50}$ was measured to be around 60µm for the clay loam soil and around 15µm for the two badlands materials. Despite their poor kinetics, particles were undoubtedly aggregated. The aggregation index, as defined by Grangeon et al. (in press) was measured to be of 50% and 90% for badlands materials and soil, respectively.

## Discussion and Conclusion

The hydrodynamic conditions simulated in the grid stirred experiments generated neither flocculation nor desegregation of the soil particles. This behaviour differs significantly from the one observed for estuarine or coastal muds (van Leussen, 1994). In such environments, floc size and settling velocity increases with suspended sediment concentration. Some further investigations will be conducted in the field to confirm the representativeness of the laboratory experiments.

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