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# Influence of flowing water's turbulence to soil erosion

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In literature authors often state that turbulence is an important or even "the critical" factor for soil erosion. But in erosion modelling the influence of turbulence is largely disregarded until now. The Reynolds number is often used as value of turbulence for a flowing liquid. In technical physics for example it is used to test the viscoelastic behavior of diluted polymer solutions and their elastic instabilities, in hydraulic engineering to characterise flow processes. Single factors that are included into the calculation of the Reynolds number (flow length, flow velocity and liqiud density) are used in many models but not the viscosity.
In a study of rill erosion dynamics in Andalusia the Reynolds number is calculated for the collected samples. The scientific question reads as follow: Is there a correlation between turbulence (Reynolds number) and soil erosion (sediment concentration)? And what kind of influence has the turbulence to soil erosion? The factors for calculation of the Reynolds number are the liquid's density, a characteristic flow velocity, a characteristic flow length and the (dynamic) viscosity. The density of the sample is calculated using sediment concentration and the grain density, the flow velocity has been measured in the field experiments and the viscosity is measured by a cone-plate rheometer. For the flow length, a value of 1 meter is used following the assumption that the processes leading to the measured sediment concentrations mainly take place in the last meter before the sampling point.
In the study it was ascertained that
1) high flow velocities cause high sediment concentrations and
2) viscosity increase with increasing sediment concentration.
So there should be an influence on Reynolds number. Due to the fact that flow velocity is in the numerator and viscosity in the denominator of the Reynolds equation it could be expected that there are two different sections: In one section the Reynolds number increases with increasing sediment concentration, in a second section the Reynolds number decreases with increasing sediment concentration. This consideration could be confirmed in the experiments. Turbulence has a clear influence to soil erosion but is influence is not definite: In the first section the increasing flow velocity causes a higher turbulence and the sediment concentration increases. But this increasing sediment concentration also increases the viscosity of the flowing liquid and the turbulence decreases.