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Uncertainties in turbidity-based measurements of suspended sediment load used to quantify the sediment budget on the catchment scale

Felix Op de Hipt (1), Bernd Diekkrüger (2), Gero Steup (3), and Michael Rode (4)

(1) Department of Geography, University Bonn, Bonn, Germany (felixodh@uni-bonn.de), (2) Department of Geography, University Bonn, Bonn, Germany (b.diekkrueger@uni-bonn.de), (3) Department of Geography, University Bonn, Bonn, Germany (g.steup@geographie.uni-bonn.de), (4) Helmholtz Centre for Environmental Research, Leipzig, Germany (michael.rode@ufz.de)

Water-driven soil erosion, transport and deposition take place on different spatial and temporal scales. Therefore, related measurements are complex and require process understanding and a multi-method approach combining different measurement methods with soil erosion modeling. Turbidity as a surrogate measurement for suspended sediment concentration (SSC) in rivers is frequently used to overcome the disadvantages of conventional sediment measurement techniques regarding temporal resolution and continuity. The use of turbidity measurements requires a close correlation between turbidity and SSC. Depending on the number of samples collected, the measured range and the variations in the measurements, SSC-turbidity curves are subject to uncertainty. This uncertainty has to be determined in order to assess the reliability of measure-ments used to quantify catchment sediment yields and to calibrate soil erosion models. This study presents the calibration results from a sub-humid catchment in south-western Burkina Faso and investigates the related uncertainties. Daily in situ measurements of SSC manually collected at one turbidity station and the corresponding turbidity readings are used to obtain the site-specific calibration curve. The discharge is calculated based on an empirical water level-discharge relationship. The derived regression equations are used to define prediction intervals for SSC and discharge. The uncertainty of the suspended sediment load time series is influenced by the corresponding uncertainties of SSC and discharge. This study shows that the determination of uncertainty is relevant when turbidity-based measurements of suspended sediment loads are used to quantify catchment erosion and to calibrate erosion models.