Geophysical Research Abstracts
Vol. 20, EGU2018-13949, 2018
EGU General Assembly 2018

Coupling gravimetry and morphometry to quantify and localize mass transfers across scales in geomorphology

Maxime Mouyen (1), Philippe Steer (1), Laurent Longuevergne (1), Kuo-Jen Chang (2), Cheinway Hwang (3), Ching-Chung Cheng (3), Nicolas Le Moigne (4), Louise Jeandet (1), Himanshu Save (5), Alain Crave (1), Cécile Robin (1), and Jean-Michel Lemoine (6)

(1) Université de Rennes 1, Géosciences Rennes, Rennes, France (maxime.mouyen@univ-rennes1.fr), (2) Civil Eng. Dept, National Taipei University of Technology, Taipei 106, Taiwan ROC., (3) Dept. of Civil Engineering, National Chiao Tung University, Hsinchu 300, Taiwan ROC., (4) Géosciences Montpellier, UMR CNRS/UM2 5243, Université Montpellier 2, Montpellier, France., (5) Center for Space Research, The University of Texas at Austin, Austin, Texas, USA., (6) CNES/GRGS, 18 Avenue E. Belin, 31401 Toulouse Cedex, France.

Quantifying continental erosion brings valuable constraints on tectonics, climate or human activities, which all have an active role in surface processes. This quantification is classically done through in-situ measurements of river sediment discharge but often suffers from spatio-temporal scarcity. Here we show that temporal gravimetry, that is, the integrative measure of mass changes through time, is an appropriate tool for such a quantification, at both local and global scales, provided geometric constraints on the redistributed sediment are available. At the local scale, we combined repeated terrestrial gravity and drone photogrammetry surveys, once a year in 2015, 2016 and 2017 over a 1-km^2 area in central Taiwan featuring both a large river and a slow landslide. The good agreement between gravity and terrain changes allowed us to retrieve the mass of sediment transiting locally in this area. At the global scale, we take advantage of satellite gravimetry (GRACE), which has monitored gravity changes worldwide for 15 years. By coupling sedimentations zones estimates derived from sea currents model ECCO$_2$ and GRACE satellite data, we retrieved sediment fluxes consistent with in situ data offshore rivers with the largest sediment loads. At the light of these experimental studies, the ongoing efforts to improve both gravimeters and geomorphometric data open new perspectives in the field of quantitative geomorphology. In particular, key modern challenges such as closing the budget between erosion and sedimentation or monitoring sand mining, a rising societal concern, could be efficiently tackled by this interdisciplinary approach.