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Terrestrial sediments of the Earth: Development of a Global Unconsolidated Sediments Map database (GUM)

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Mapped unconsolidated sediments cover half of the global land surface. They are of considerable importance for many Earth surface processes like weathering, hydrological fluxes or biogeochemical cycles. Ignoring their characteristics or spatial extent may lead to misinterpretations in Earth System studies. Therefore, a new Global Unconsolidated sediment Map database (GUM) was compiled, using regional maps specifically representing unconsolidated and quaternary sediments. The new map provides insights into the regional distribution of unconsolidated sediments and their properties. The GUM comprises 911,551 polygons and describes not only sediment types and subtypes, but also parameters like grain size, mineralogy, age and thickness, where available. Previous global lithological maps lacked detail for reported unconsolidated sediment areas and missed large areas and reported a global coverage of 25 to 30% ice-free land area. Here, alluvial sediments cover about 23% of the mapped total ice-free area, followed by aeolian sediments (∼21%), glacial sediments (∼20%), and colluvial sediments (∼16%). An additional layer compiling pyroclastic sediment was added, which merges consolidated and unconsolidated sediments. The compilation shows latitudinal abundances of sediment types related to the climate of the past. Together with global lithological maps, the new database allows us to refine the geochemical composition of the Earth's surface (Hartmann et al., 2012), with consequences for estimating global matter fluxes to the ocean.

A specific focus during the creation of GUM was on the distribution of loess deposits, since loess is highly reactive and relevant to understand geochemical cycles related to dust deposition and weathering processes. Quantifying and adding weathering fluxes from loess deposits could increase global land-to-ocean carbon fluxes due to their relatively high carbonate content and typical grain sizes. Weathering flux scenarios since the Last Glacial Maximum will be discussed.

Reference:

Hartmann, J., Dürr, H.H., Moosdorf, N., Kempe, S., Meybeck, M. (2012) The geochemical composition of the terrestrial surface (without soils) and comparison with the upper continental crust. International Journal of Earth Science, 101, 365-376. doi: 10.1007/s00531-010-0635-x