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Remote sensing and the global evaluation of erosion and sediment transport responses

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Erosion and sediment transport has lagged behind other disciplines in developing a global view. However, such a view is needed to improve our understanding of the Earth System and to establish common strategies to mitigate erosion and sediment transport impacts. Central to developing a global view is the provision of data at appropriate scales, which are increasingly at the river basin, regional or even global level. Integrated physically based models (which have particular applicability to basins with short time series records) require a wide range of spatially distributed data (including rainfall, soil moisture, land use, erosion and sediment transport). However, hydrometric networks are in decline and surface field studies a have limited capacity. By contrast, remote sensing has an increasing ability to provide the required spatially and temporally distributed data. It is a major challenge, therefore, to assimilate space-based hydrological products into models, in the same way as is done in meteorology and oceanography. Data required in modelling hillslope erosion and sediment yield include land cover, soil type, area of bare soil, fire activity and soil moisture. As yet soil moisture cannot be measured at a spatial resolution of a few metres. However, high-accuracy DEM may allow interpretation of soil moisture levels using space-borne Differential Interferometric SAR (DInSAR). Similarly, Airborne Laser Swath Mapping (or LIDAR) provides a basis for identifying small-scale landslides, where existing topographic maps have neither the sufficient spatial resolution, nor the accuracy. Data needed for modelling sediment transport in rivers include river discharge, sediment concentration and geomorphology and techniques are now being developed to measure all these remotely. Future requirements include the measurement of fine-

resolution variation over large areas and a greatly increased capability in satellite monitoring of surface deformation, high-resolution topography, gravity field variation and full-spectrum imaging. The paper discusses the needs of data provision for supporting the global view, along with developments in remote sensing.