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The Geomorphology of Life

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Since geologic time began, Earth's surface has been evolving through natural processes (geologic and climate forcing). Now a new force of global change is altering Earth's morphology in unprecedented ways: humanity. Anthropogenic activities are leaving their fingerprints across Earth, driven by increasing populations, technological capacities, and societal demands (e.g. food). The magnitude of this fingerprint is currently growing, with clear impacts upon in biosphere. The recognition and analysis of these changes represent a challenge for understanding the evolution of the Earth's landscape. The purpose of this talk is focus on a specific aspect of anthropogenic landform modifications and their interaction with climate: agriculture. Agricultural landscapes cover large areas of the world, on the plains but also on high steep hillslopes. Such areas are also served by an articulated network of rural roads. Not optimal tillage practices, poor design and lack of maintenance of the drainage systems, and wrong rural road construction could significantly affect runoff patterns, cause severe erosion or even more articulated mass movements, with a direct consequence to the entire agricultural sector (e.g. productivity, cost of restoration) but also people (safety). Climate change is worsening the entire scenario. It is clear that our society should develop more resilient agriculture, where different practices should be adapted to local conditions such as climate, soil properties, but especially geomorphology. With the help of the recent remote sensing techniques and platforms (e.g., LiDAR, drones) is now possible to provide a high-resolution 3D view of terrain (also multitemporal), providing new opportunities for a better understanding of Earth surface processes based on their geomorphic signatures. In the case of agriculture, through a detailed map of concavities and convexities, and surface roughness, it is possible to recognize the alteration, due to different till practices, of important processes such as infiltration, water storage depression, and soil water erosion. It is also possible to represent in detail surface water flow directions and concentrations along rural roads, thus estimating potential soil erosion patterns or even potential landslides activation in high-steep cultivated landscapes. This work provides an overview of some useful case studies, located in low-land but also high-steep agricultural landscapes in Italy. The purpose is to offer a geomorphologic perspective, on the effects of human activities on the Earth. Understanding and addressing the causes and consequences of anthropogenic landform modifications are a global challenge. But this challenge also poses an opportunity to manage environmental resources better and protect environmental values.

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