Natural vs. Human forcing: the new challenge for the Earth science community in the Anthropocene

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From the analysis of Earth surface, we are able to learn a lot about its history and processes. Indeed, different landforms bear the signs of different ages, but also of climate and tectonic forcing. In addition to these processes, also the biota forcing has a role in shaping the landscape, of course at different scale and magnitude if compared with geology. In biotic landscapes the vegetation through the roots influences the soil formation and surface erosion. Biota affect also climate, and as a consequence the mechanisms and erosion rates that control the landscape evolution. However, the question is, if we can suppose that there is an evidence of biota forcing, what is the role of humans? Human activities, more than vegetation, are leaving a significant signature on the Earth, by altering its morphology and ecosystems. Also in this case, the temporal and spatial scale (and also the magnitude) are different respect to geological forcing, but the development of the society during the Holocene was significant (from hunting-gathering to farming to complex societies and metropolis): the increase of the population was related to a progressively increase of intensive agriculture and urbanization. This anthropogenic forcing deeply affected the environment, inducing or reducing erosion, and changing the equilibrium of several ecosystems. The recognition and the analysis of the human induced changes, signatures and processes represent a real challenge for the scientific community to better understand the evolution of our Planet. This analysis can help in scheduling a suitable environmental planning for a sustainable development, and to mitigate the consequences of anthropogenic alteration. Wider multidisciplinary groups based on these studies could be able to understand better the evolution of landscapes and ecosystems during the human era, providing a full dataset of multidisciplinary information that can be used by land managers and local authorities, and by the scientific community as well.

The recent remotely sensed technologies (e.g. LIDAR, SAR, SfM) might help to reach part of the mentioned goals. High-resolution topography could really play a strategic and helpful role in the recognition of human-induced geomorphic and anthropogenic features, and the connected erosion. Among the most evident landscape signatures of the human fingerprint, for example, road networks and agricultural practices such as terracing deserve a great importance since significantly affect the erosional processes. A better recognition of these signatures is at the basis to improve the knowledge of the related induced processes. In addition to this, it is necessary to improve, through historical data (e.g. hydrogeological, meteorological, stratigraphy, also archeological data) and modeling, the understanding about the land use changes occurred during the last centuries, focusing on the reasoning behind these changes, and on the analysis of their effects on landscape and processes.

Human society relies on the vast diversity of benefits provided by the environment. Soil biodiversity and conservation are part of the driving force behind its regulation. At the same time, human society is deeply affecting the environment with consequences on the landscape. It is therefore fundamental to establish greater management control over the Earth's rapidly changing ecosystems.