



On the Use of Unmanned Aerial Systems for Environmental Monitoring

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Environmental monitoring is a critical issue for comprehending climate impact on natural and agricultural systems, understanding hydrological processes, optimizing water resources, and preventing natural disasters. Nowadays, most of the available data is obtained from ground-based measurements, manned airborne sensors and satellite observations. These data are critical to describe small scale processes or river basin dynamics over large spatial extent, but are limited in their spatial and/or temporal resolution as well as in their cost. In this context, Unmanned Aerial Systems (UAS) have great potential for environmental monitoring, and their use for this purpose has increased rapidly in recent years. UAS-mounted sensors offer an extraordinary opportunity to fill the existing gap between field observations and traditional air- and space-borne remote sensing, by providing high spatial and temporal resolution measurements over relatively wide areas in a cost effective way. Among its many potential applications, UAS may be used to extend and improve the description of river basin hydrology, agricultural productivity, urban landscape, and natural ecosystems. Several new UAS-based approaches have been recently introduced to monitor vegetation state, soil surface properties and water content, river evolution and stream flow during low-flow and floods. Such measurement practices, algorithms and data assimilation techniques should be harmonized in order to enhance our ability to monitor the environment in an effective way. In this context, a network of scientists is currently cooperating within the framework of a COST (European Cooperation in Science and Technology) Action named “Harmonious”. The intention of “Harmonious” is to promote monitoring strategies, establish harmonized monitoring practices, and transfer most recent advances on UAS methodologies to others within a global network. This manuscript provides an overview on the existing research studies and applications of UASs in environmental monitoring, which represents a starting point for the upcoming activities of the “Harmonious” group, which will integrate more than 70 scientists from 30 countries across the globe for the coming four years.