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A novel application of Unmanned Aerial Systems (UASs) in alpine environment for monitoring gravity-driven natural hazards: BLUESLEMON project

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The project “BLUESLEMON” aims to develop a low-cost automatic system for monitoring landslide surface displacement through the integration of Bluetooth (BT) Beacons localization and UAS also named Remotely Piloted Aircraft System (RPAS) technologies. Two subsystems will assemble the final setup: the ground sensors technology and the periodic localization system composed by UAV and beacon reader. These are designed as an inseparable integrated architecture and each individual subsystem cannot operate on the supposed landslide areas without the cooperation of the other one. Thus, a main challenge consists in the identification of low-power-consumption and high-precision Bluetooth devices, as well as in the development of a UAV platform capable to work even at a limit of feasibility considered for an Alpine scenario (e.g. -20 °C at 2500 m asl). To prevent undesirable collisions with surrounding structures (e.g. trees, powerlines and funicular railways), the UAV platform will be equipped with obstacle-detection sensors and collision-avoidance algorithms.

The proposed architecture aims to exceed the state-of-the-art methodologies by obtaining a single low-cost system adaptable for the inspection of movements related to different types of gravity-driven natural hazards (e.g. slow-moving earth flows, discontinuities in rock walls). In addition, the expected autonomy of the system will allow to avoid the risky operations in-situ. Nowadays, the

current methodologies (with or without UAS) are characterized by a high level of criticality in extreme environments such as the alpine surroundings. The solutions of the project's requirements are of great interest for future reconfigurations of the developed system, in order to extend its use for search and rescue operations in dangerous conditions. Therefore, the suggested method will represent a strong novelty in the reference sector and lead to further application developments with considerable added value elements.