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Discovery and characterization of environmental hazards by means of dynamic coordination of drones driven by satellite detection maps

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In some environmental applications, satellite acquisitions could not be able to provide all the information necessary to characterize the problem at hand due, for example, to limited spatial resolution or inadequate revisit time. However, in these cases, they can be used for preliminary investigation of the area of interest with the purpose to guide subsequent acquisitions with higher spatial resolution made by means of aerial sensing. This work presents an innovative application combining both satellite acquisitions and aerial close-range sensing implemented via drones in autonomous and coordinated flight. The case study concerns the discovery of illegal micro-dumps and other environmental hazards in Campania Region (Italy). The envisioned workflow includes the detection of target environmental criticalities in very high-resolution optical satellite images and a methodology to plan and adaptively re-plan a survey mission of a team of drones aimed at confirming the presence of a micro-dump and at its characterization. The processing of satellite images is validated on real data in a significative application context, while the performance of the acquisition strategy performed by the drone team are characterized through simulations on a pre-analysed geographical area.