Innovative instrumentation solutions for marine exploration: the EU FET project RAMONES*

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Natural radioactivity in the marine environment has been present since the Earth's formation, while artificial radionuclides were introduced into the oceans in 1944. More recent direct sources exist that feed the oceans, such as low-level liquid discharges from reprocessing plants, large-scale releases due to disasters (e.g. Fukushima hit by the tsunami in 2011), and smaller-scale radiological events. Exploration of submarine environments should consider the existence of radioactivity in terms of its short- and long-term impact on marine and coastal ecosystems, also in correlation to natural hazards, such as seismic activity over submarine faults.

Significantly undersampled in oceans, radioactivity poses real risks to marine ecosystems and human population, urging for detailed, data-driven modelling. The EU H2020 FET Proactive project RAMONES aimed to offer new and efficient solutions for in situ, continuous, long-term monitoring of radioactivity in harsh subsea environments. A new generation of submarine radiation-sensing instruments, assisted by state-of-the-art robotic and artificial intelligence (AI) has been developed towards understanding radiation related risks near and far from coastal areas, while providing data to shape new policies and guidelines for environmental sustainability, economic growth and human health.

In the present paper, a review of the RAMONES project will be presented, giving particular focus on the innovative radiation instrumentation solutions developed to equip both mobile and static vessels for underwater exploration in an autonomous fashion and at large spatiotemporal scales.

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