Kelp falling in the deep: characterization, mapping and food fall potential of mesophotic *Laminaria ochroleuca* forest on the Madeira Desertas Ridge (NE Atlantic)

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While marine snow provides a diffuse background flux, episodic inputs of large organic material, so called “food falls”, deliver concentrated pulses of carbon capable of sustaining biomass in food limited environments. Macroalgal detachment represents an understudied food fall pathway. The deep kelp forest of *Laminaria ochroleuca* on the Madeira Desertas Ridge represent a unique case as it grows at 72–91 m depth under exceptional water clarity. Understanding its extent and potential as blue carbon source is important to evaluate the ecosystem value in Madeira waters, also because this forest sits directly above bathyal depths exceeding 1000 m, making it a source of episodic organic carbon to the deep. We combined in situ observations with ROV Phoca and XOFOS towed camera system, orthomosaic photogrammetry, and physical sampling to quantify the spatial extent, density, and carbon stock of this forest, assessing its potential as a carbon source for the bathyal benthos. In total, 1500 living kelp plants were counted along a 12114 m^2 orthomosaic built from video transect over the kelp forest and 54 detached kelp plants, not associated with any scavenging fauna, were observed below 200 m on three additional video transects. Carbon content analysis from four collected detached dead kelp was used to calculate a carbon flux of 0.25 mg C/m^2/d from the living forest to the deep slopes. This quantification suggests a minor role of kelp in the vertical carbon transport, but comparable with other observed food falls in literature and acts as direct express pathway of vegetal carbon to the adjacent deep sea. This pathway is facilitated by the proximity of the forest to the deep sea and the steep slopes of the Madeiran Archipelago. These results establish a baseline for a previously unquantified mesophotic carbon pathway in the subtropical NE Atlantic.