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Interpolating fishing vessel tracks to improve representation of the use of marine space by commercial fisheries in marine spatial planning

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Abstract

Vessel Monitoring Systems (VMS) provide valuable data to fisheries managers to map distribution of fishing effort and landings, hence support planning for offshore renewable energy and marine conservation. However, the low temporal and spatial resolution of VMS data (average polling frequency of 2 hours) may lead to biased estimates of fishing effort and landings data may not be linked accurately to VMS pings, therefore limiting VMS data utility in marine planning. To overcome this limitation, vessel tracks can be reconstructed via a sound interpolating algorithm and the error can be quantified by calculating the distance between real and interpolated tracks. This study optimises the performance of vessel track interpolation methodologies found in literature for the Scottish fleet, in order to derive optimally interpolated fishing tracks from VMS data. Databases containing vessel positions at high spatial resolution are used as tuning fleets to assess interpolation performance accuracy. Furthermore, as different speed rules have been used in other studies to distinguish fishing and steaming activity to further derive layers of fishing effort distribution, there is a need to optimise the fishing activity detection method. Various speed thresholds are compared to hydraulic pressure sensor measurements attached on vessel's winch. Finally, a sensitivity analysis is performed to test the influence of different grid sizes on mapping fishing effort distribution.

Key words: Vessel Monitoring Systems (VMS) – marine spatial planning – fishing effort – vessel track interpolation