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An adaptive grid to improve the efficiency and accuracy of modelling underwater noise from shipping

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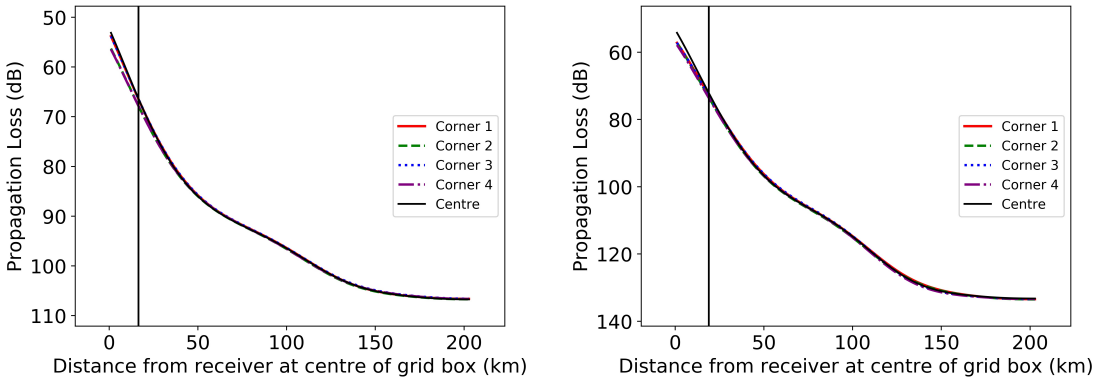
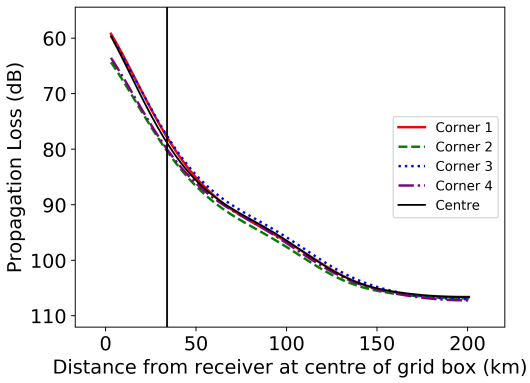
Supplementary Material

The following supplementary document contains the results from propagation loss simulations for conditions not reported in the main text. It also includes the adaptive grids for conditions not shown in the text because they take a similar form to the examples used in the manuscript.

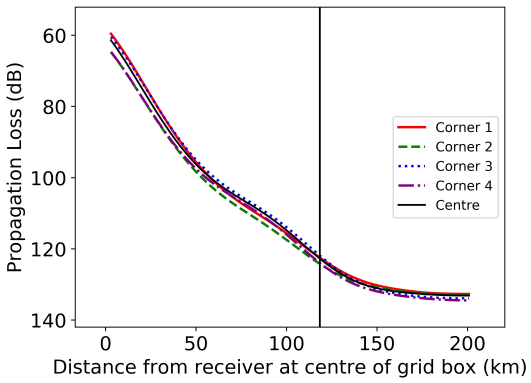


(a) December 1km

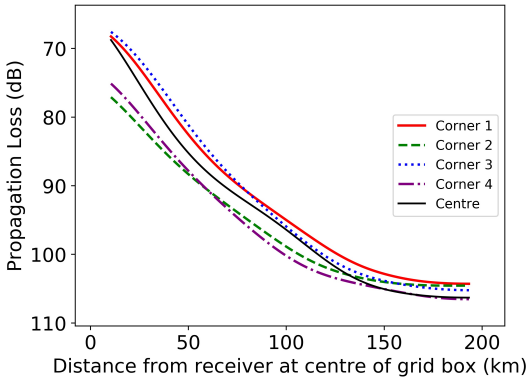
(b) August 1km



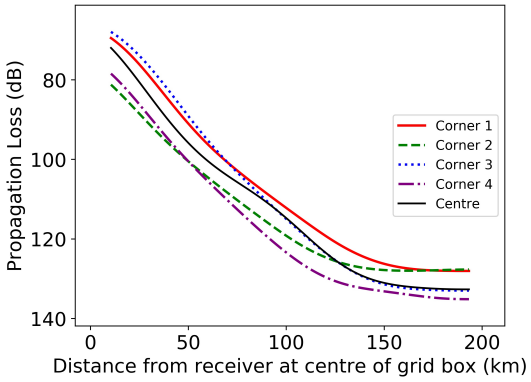
(c) December 5km



(d) August 5km

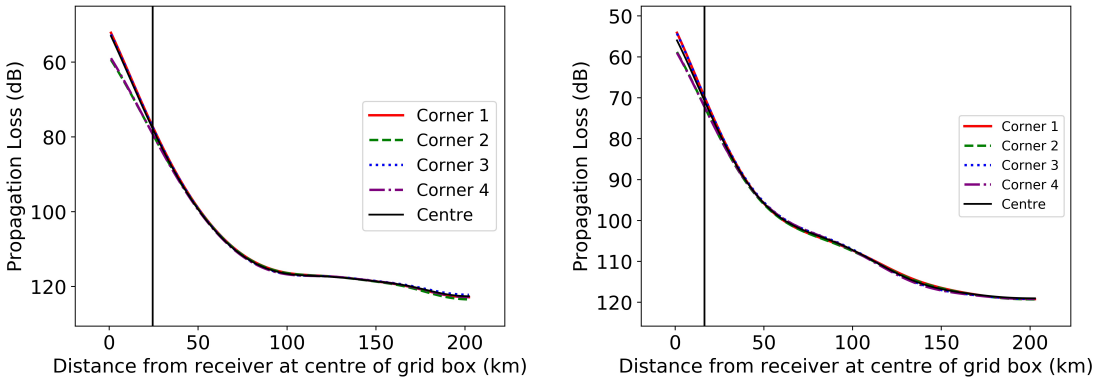


(e) December 20km



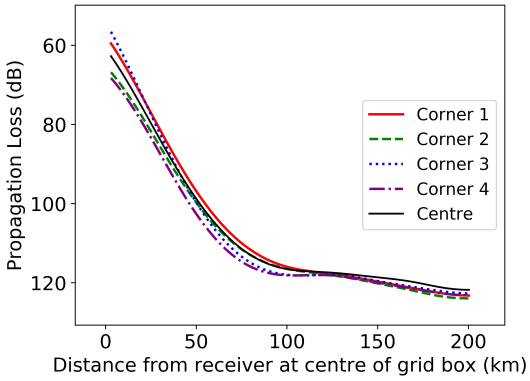
(f) August 20km

Figure 1: Propagation loss at each corner and the centre of grid cells for the downslope condition for grid cell sizes of 1, 5, and 20 km in December and August at a receiver depth of 20 m. When the corner values come to within 1.5 dB of the centre values consistently, propagation loss is considered uniform (vertical line). As distance between the source and receiver increases the difference in propagation loss between each corner and centre decreases until uniform. As the grid sizes become larger the distance of uniform propagation loss becomes much greater. For the 20 km grid cell sizes (e,f) there is still a large difference between each corner and centre at 200 km and at no point is propagation loss considered uniform. It is also possible to note that in December maximum propagation loss is $\sim$ 110 dB but in August this value is $\sim$ 140 dB.

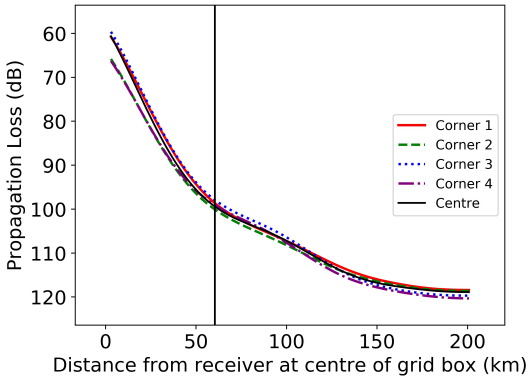


(a) Upslope 1km

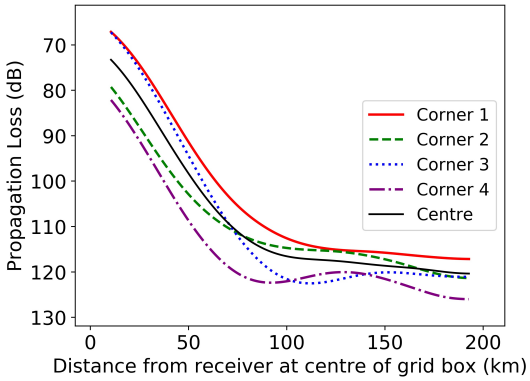
(b) Downslope 1km



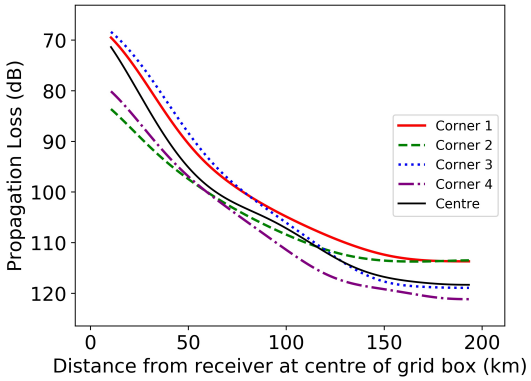
(c) Upslope 5km



(d) Downslope 5km

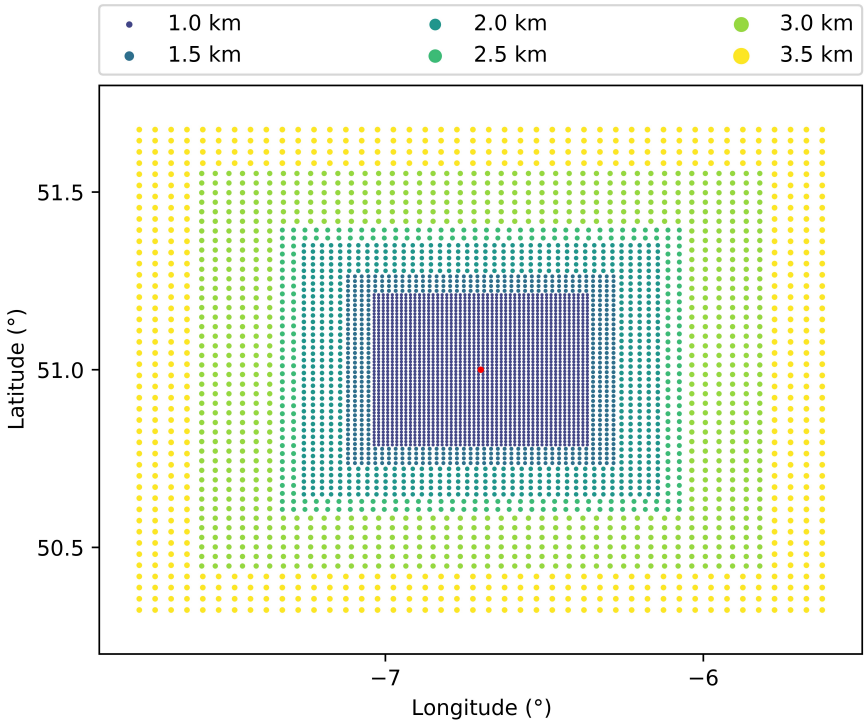


(e) Upslope 20km

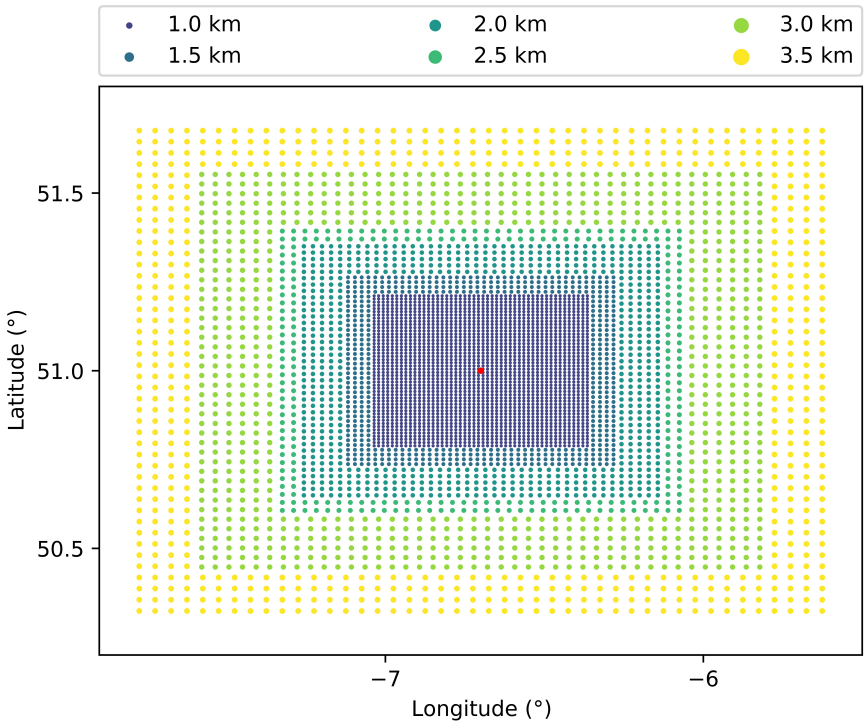


(f) Downslope 20km

Figure 2: Propagation loss at each corner and the centre of grid cells for the upslope and downslope condition for grid cell sizes of 1, 5, and 20 km in August at a receiver depth of 60 m. When the values come to within 1.5 dB of each other consistently, propagation loss is considered uniform (vertical line). As distance between the source and receiver increases the difference in propagation loss between each corner and centre decreases until uniform. As the grid sizes become larger the distance of uniform propagation loss becomes much greater. For the 20 km grid cell sizes (e,f) there is still a large difference between each corner and centre at 200 km and at no point is propagation loss considered uniform.

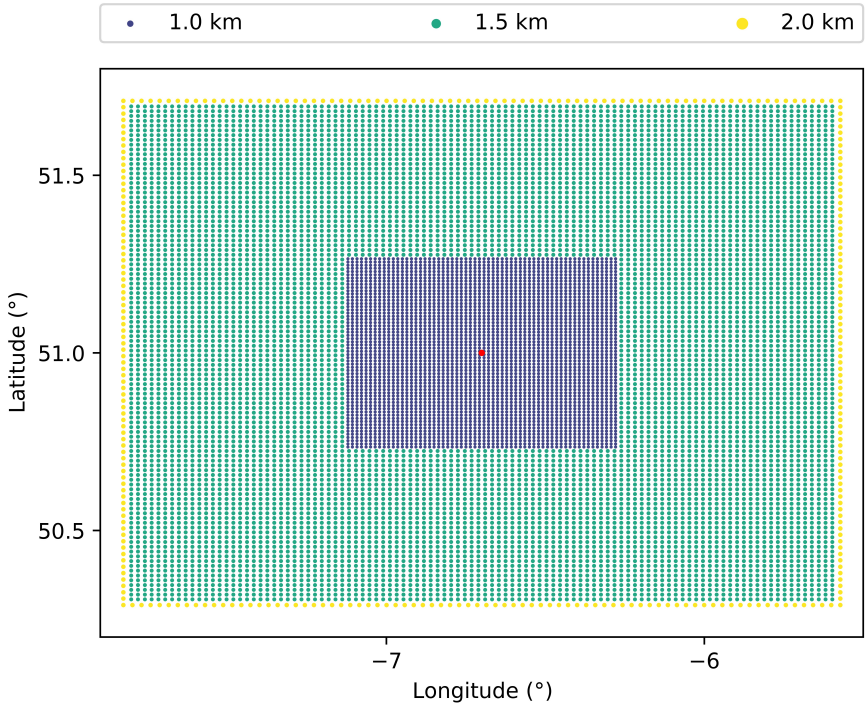


(a) Downslope December 20m

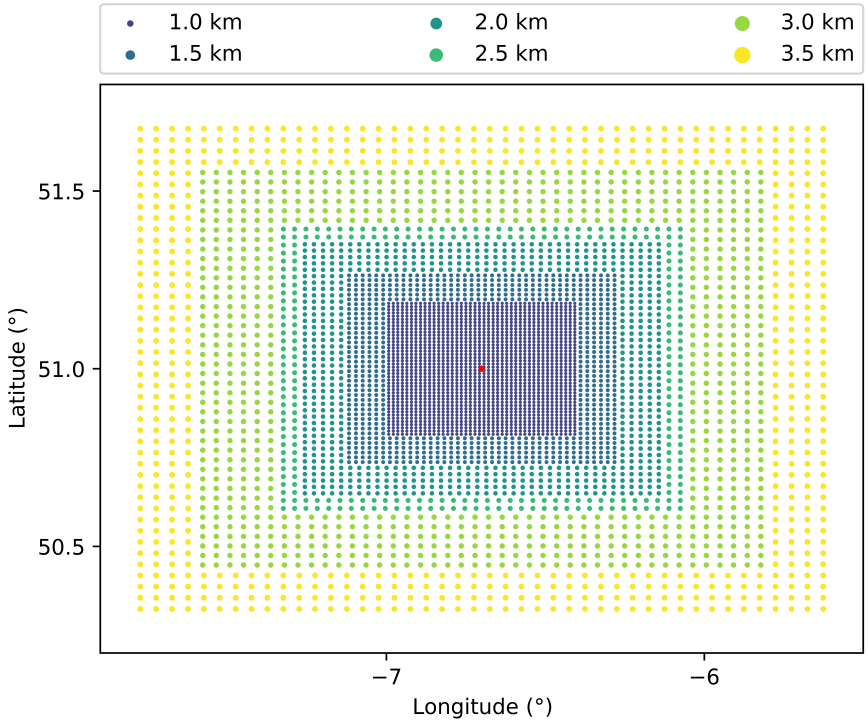


(b) Downslope August 20m

Figure 3: Example adaptive grids for a 160×160 km area of the Celtic Sea for the downslope conditions in December and August for a receiver depth of 20 m. Each dot indicates the centre of a cell, the size of which is shown in the key above the grid. Red dot indicates the receiver and each color indicates a new grid size.



(a) Upslope August 60m



(b) Downslope August 60m

Figure 4: Example adaptive grids for a 160×160 km area of the Celtic Sea for the upslope and downslope conditions in August for a receiver depth of 60 m. Each dot indicates the centre of a cell, the size of which is shown in the key above the grid. Red dot indicates the receiver and each color indicates a new grid size.