

Supporting Information for

**Organic Carbon Stocks and Accumulation Rates in Surface Sediments of the Norwegian Continental Margin**

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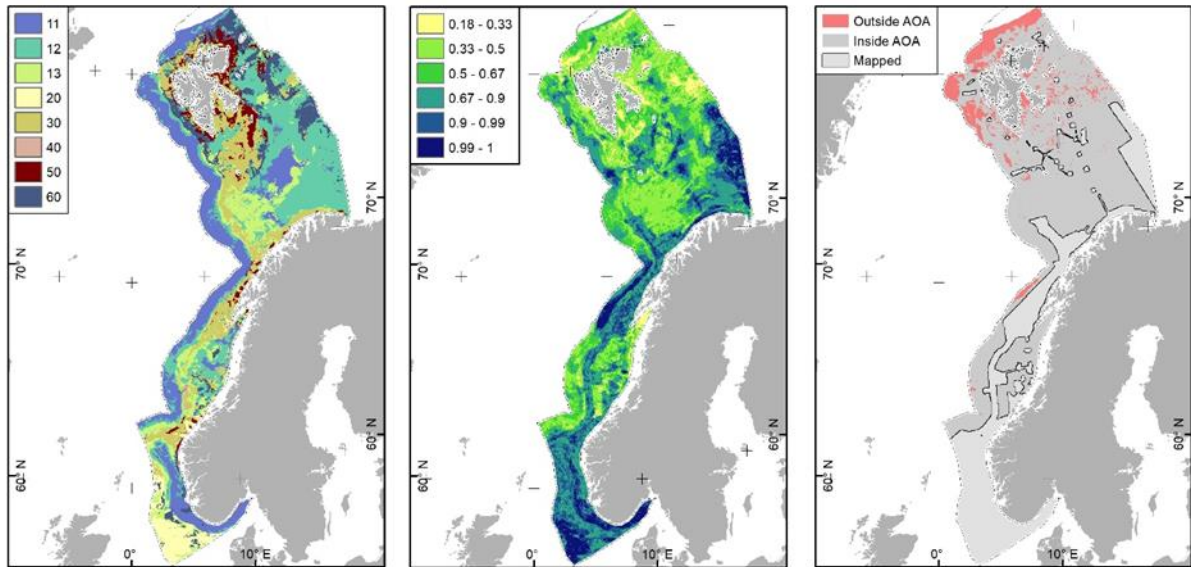
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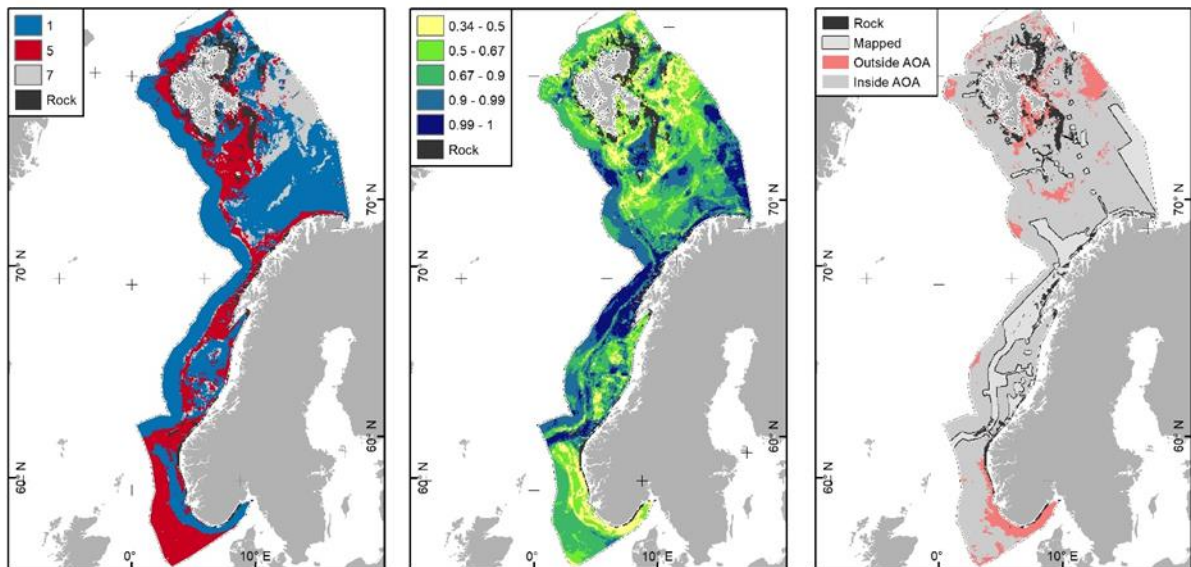
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**Introduction**

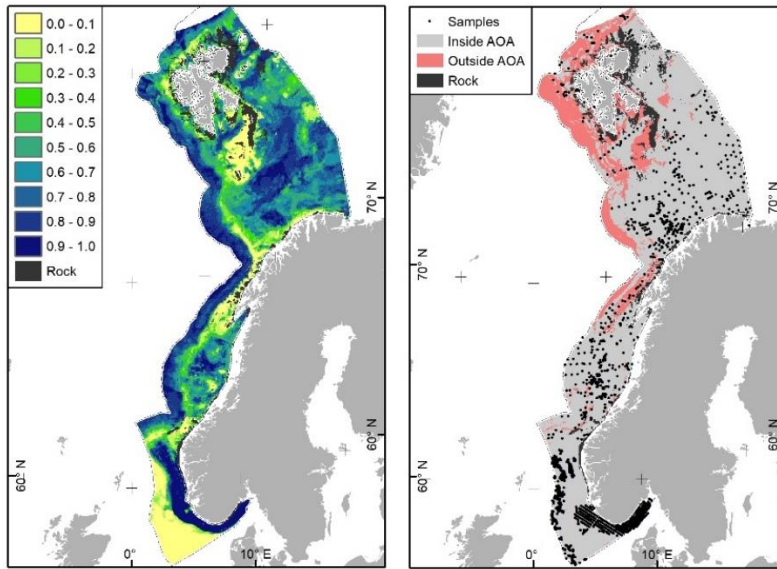
The supporting information includes translation tables that detail the relation between original and predicted substrate classes (Table S1) and depositional environments (Table S2). All spatial models used the same stack of predictor variables (Table S3), but additional predictor variables were also created. These included seabed substrate classes (Figure S1), sedimentary environment (Figure S2) and mud content (Figure S3). Spatial predictions of dry bulk density (Figure S4), organic carbon content (Figure S5) and sediment accumulation rates (Figure S6) were then used to calculate organic carbon stocks and accumulation rates (main document).



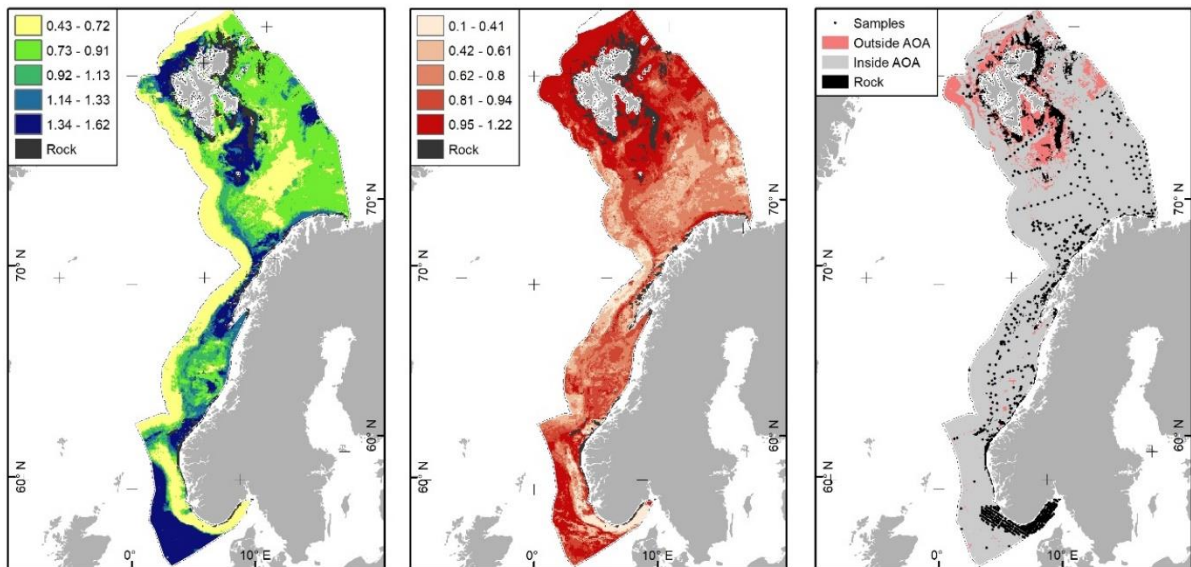
**Figure S1.** Seabed substrate classes on the Norwegian continental margin. Left - Predicted class: 11 – Mud, 12 – Sandy mud, 13 – Muddy sand, 20 – Sand, 30 – Coarse sediment, 40 – Mixed sediment, 50 – Rock and boulders, 60 – Mosaic seafloors. Centre – Confidence in the predictions on a scale between 0 (low) and 1 (high). Right – Area of applicability (AOA) of the model. Also shown are areas that were mapped by expert interpretation as part of the Mareano programme (Mapped).



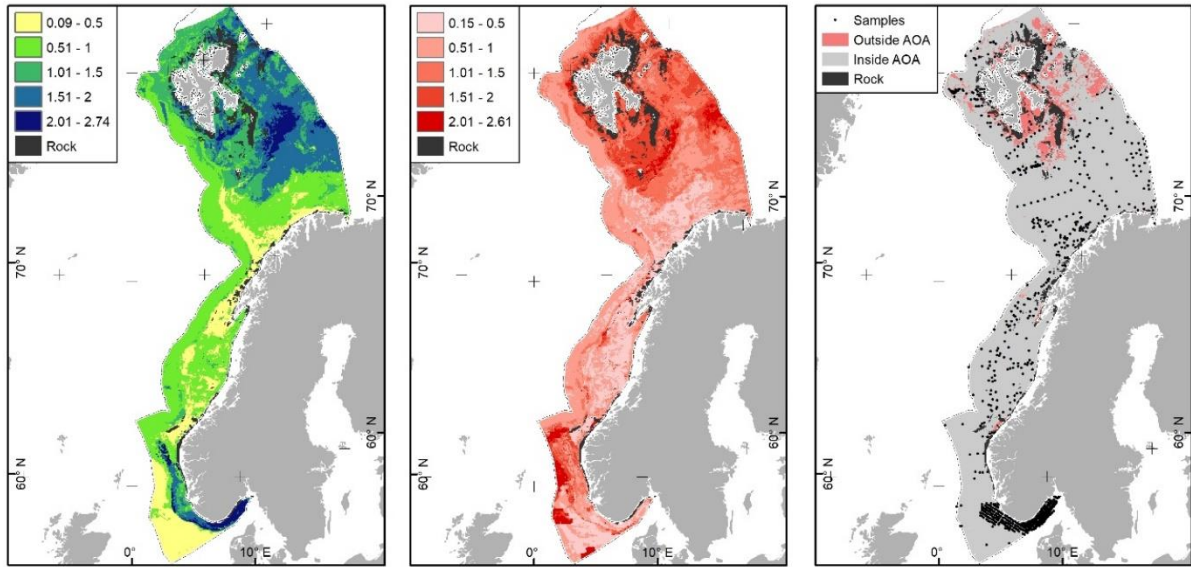
**Figure S2.** Sedimentary environment on the Norwegian continental margin. Left - Predicted environment: 1 – Deposition from suspension, 5 – Erosion or transport, 7 – No or very slow deposition. Centre – Confidence in the predictions on a scale between 0 (low) and 1 (high). Right – Area of applicability (AOA) of the model. Also shown are areas that were mapped by expert interpretation as part of the Mareano programme (Mapped). Areas predicted as rock in the substrate type model (Figure S1) were excluded from the analysis.



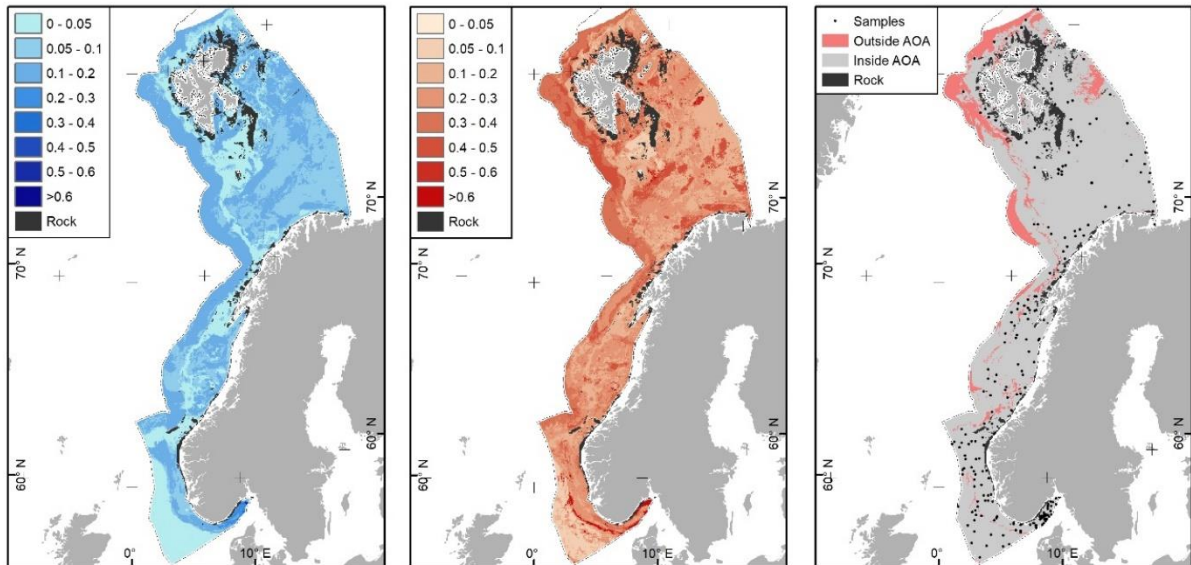
**Figure S3.** Mud (silt and clay) content of surficial sediments on the Norwegian continental margin. Predicted mud content expressed as fraction ranging between 0 and 1. Areas predicted as rock in the substrate type model (Figure S1) were excluded from the analysis. Note that mud content was only used as a predictor variable and predicted with random forest. Therefore, no estimates of prediction uncertainty were made.



**Figure S4.** Dry bulk density of the upper 10 cm of surficial sediments on the Norwegian continental margin. Left – Predicted median value ( $\text{g cm}^{-3}$ ). Centre – Prediction uncertainty ( $\text{g cm}^{-3}$ ), expressed as the 90% prediction interval. Right – Area of applicability (AOA) of the model. Areas predicted as rock in the substrate type model (Figure S1) were excluded from the analysis.



**Figure S5.** Organic carbon content of the upper 10 cm of surficial sediments on the Norwegian continental margin. Left – Predicted median value (weight-%). Centre – Prediction uncertainty (weight-%), expressed as the 90% prediction interval. Right – Area of applicability (AOA) of the model. Areas predicted as rock in the substrate type model (Figure S1) were excluded from the analysis.



**Figure S6.** Sediment accumulation rates based on  $^{210}\text{Pb}$  on the Norwegian continental margin. Left – Predicted median value ( $\text{cm yr}^{-1}$ ). Centre – Prediction uncertainty ( $\text{cm yr}^{-1}$ ), expressed as the 90% prediction interval. Right – Area of applicability (AOA) of the model. Areas predicted as rock in the substrate type model (Figure S1) were excluded from the analysis.

**Table S1.** Table detailing how the original substrate classes were translated into a simplified classification.

<b>Original class</b>	<b>Simplified class (code)</b>
Clay	Mud (11)
Mud	Mud (11)
Mud with sediment blocks	Mud (11)
Sandy clay	Sandy mud (12)
Sandy mud	Sandy mud (12)
Silt	Mud (11)
Muddy sand	Muddy sand (13)
Silty sand	Muddy sand (13)
Sand	Sand (20)
Gravelly mud	Mud (11)
Gravelly sandy mud	Sandy mud (12)
Gravelly muddy sand	Muddy sand (13)
Gravelly sand	Coarse sediment (30)
Muddy gravel	Mixed sediment (40)
Muddy sandy gravel	Mixed sediment (40)
Sandy gravel	Coarse sediment (30)
Gravel	Coarse sediment (30)
Gravel and cobbles	Coarse sediment (30)
Gravel, cobbles, and boulders	Rock and boulders (50)
Sand, gravel, and cobbles	Coarse sediment (30)
Mud/sand with cobbles/boulders	Mosaic seafloor (60)
Mud and sand with gravel, cobbles, and boulders	Mosaic seafloor (60)
Sand, gravel, cobbles, and boulders	Coarse sediment (30)
Compacted sediments or sedimentary bedrock	Rock and boulders (50)
Thin or discontinuous sediment cover on bedrock	Rock and boulders (50)

**Table S2.** Table detailing how the original sedimentary environment classes were translated into a simplified classification.

<b>Original class</b>	<b>Simplified class (code)</b>
Deposition from suspension	Deposition from suspension (1)
Deposition from suspension, local erosion of fine-grained sediments	Deposition from suspension (1)
No or very slow deposition	No or very slow deposition (7)
Deposition from bottom currents	Erosion or transport (5)
Erosion, local deposition of sediments in topographic lows	Erosion or transport (5)
Erosion	Erosion or transport (5)

**Table S3.** Summary of predictor variables used for spatial prediction.

Variable	Unit	Statistics	Time period	Source
<b>Bathymetry</b>	m	-	-	(GEBCO Bathymetric Compilation Group, 2019)
<b>Topographic position index</b>	m	Focal window sizes 25, 75, 125	-	Calculated from bathymetry
<b>Distance to coastline</b>	m	-	-	Calculated
<b>Primary productivity</b>	mg m <sup>-2</sup> d <sup>-1</sup>	Mean, maximum	2010 – 2019	Copernicus-GlobColour ( <a href="https://doi.org/10.48670/moi-00281">https://doi.org/10.48670/moi-00281</a> )
<b>Chlorophyll-a concentration</b>	mg m <sup>-3</sup>	Mean, maximum	2010 – 2019	Copernicus-GlobColour ( <a href="https://doi.org/10.48670/moi-00281">https://doi.org/10.48670/moi-00281</a> )
<b>Suspended particulate matter</b>	g m <sup>-3</sup>	Mean, maximum	2010 – 2019	Copernicus-GlobColour ( <a href="https://doi.org/10.48670/moi-00281">https://doi.org/10.48670/moi-00281</a> )
<b>Surface partial pressure of CO<sub>2</sub></b>	Pa	Minimum, mean, maximum, range	2010 - 2019	PISCES GLOBAL_REANALYSIS_BIO_001_029 ( <a href="http://dx.doi.org/10.25607/OBP-490">http://dx.doi.org/10.25607/OBP-490</a> )
<b>Sea ice concentration</b>	-	Minimum, mean, maximum, range	2010 - 2019	GLORYS12V1 ( <a href="https://doi.org/10.48670/moi-00021">https://doi.org/10.48670/moi-00021</a> )
<b>Dissolved molecular oxygen</b>	mol m <sup>-3</sup>	Minimum, mean, maximum, range	2000 - 2014	Bio-ORACLE v2.2 ( <a href="https://www.bio-oracle.org/index.php">https://www.bio-oracle.org/index.php</a> )
<b>Surface swept area ratio</b>	-	Minimum, mean, maximum, range	2009 -2016	OSPAR ( <a href="https://odims.ospar.org/en/search/?dataset=bottom_f_intensur">https://odims.ospar.org/en/search/?dataset=bottom_f_intensur</a> )
<b>Bottom current speed</b>	m s <sup>-1</sup>	Mean, maximum	2005 -2007	Nordic4k ( <a href="http://hdl.handle.net/11250/113861">http://hdl.handle.net/11250/113861</a> )
<b>Bottom temperature</b>	°C	Minimum, mean, maximum, range	2005 -2007	Nordic4k ( <a href="http://hdl.handle.net/11250/113861">http://hdl.handle.net/11250/113861</a> )
<b>Bottom salinity</b>	PSU	Minimum, mean, maximum, range	2005 -2007	Nordic4k ( <a href="http://hdl.handle.net/11250/113861">http://hdl.handle.net/11250/113861</a> )