Can we monitor seasonal changes in shallow water Seagrass Habitats in the Baltic Sea by using a consumer-grade UAV?
Why is seagrass so important and what are its stressors?
Data Acquisition and Methods

UAV:
DJI Inspire 2
20.8 megapixel Zenmuse X5S 15 mm/
1.7 ASPH lens with B&W circular
polarized filter

GCP (Ground Control Points):
Measured and leveled with a Leica
RTK system, lateral resolution of ~2
cm.

Processing of orthomosaic images
and DEM/DSM:
Agisoft PhotoScan™/ Metashape™
Pix4D™
Examples of Orthomosaics off Heidkate, Germany

Orthomosaic 04.05.2018

Orthomosaic 18.02.2019
The Random Forest Model was trained on a dataset of 50000 randomly selected points. It was ascertained that the class distribution of the training set represented the distribution of classes within the whole dataset. A maximum deviation of 5% per class was allowed. The forest was planted with 500 decision trees and an unlimited node depth. NA-values were omitted before modelling.
Changes in Seagrass Abundance between two Scenes

Starting in May 2018 we produced high resolution UAV-borne imagery of the study area in Heidkate, Germany. Over the course of one year we acquired six Orthomosaics, of which three were used for classification.

Top: Orthomosaics of the study area, acquired on 04.05.2018 (left) and 18.02.2019 (right)

Bottom: RF classification of the respective Orthomosaics into three classes (water / substrate, submerged aquatic vegetation and Land surface)

The table below shows the changes in classified areas over the 10 month survey period

<table>
<thead>
<tr>
<th>Class</th>
<th>04. May 2018</th>
<th>%</th>
<th>18. Feb 2019</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>61905.36</td>
<td>68.75%</td>
<td>69584.30</td>
<td>77.33%</td>
</tr>
<tr>
<td>Vegetation</td>
<td>18299.51</td>
<td>20.32%</td>
<td>10368.06</td>
<td>11.52%</td>
</tr>
<tr>
<td>Land</td>
<td>9834325</td>
<td>10.92%</td>
<td>10027.98</td>
<td>11.14%</td>
</tr>
</tbody>
</table>

With this UAV-based method and a semi-automated random forest classifier we were able to observe a loss of around 43% of the extent of the seagrass meadow in our study area between May 2018 and Feb. 2019.
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The surveys show, that it is possible to use UAVs for repeated monitoring of seagrass meadows in the Baltic Sea. In order to better understand the cyclicity as well as the underlying processes governing the decline of the seagrass habitat further data collection over a longer period is necessary.
Thank you for your time and feel free to contact us!

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