

Data description

This document lists and describes the original raw and processed data of the following study that consisted of two separate experiments. To use the data, please contact Pauliina Salmi or any of the other authors.

Rapid quantification of microalgae with hyperspectral camera and vegetation indices

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1. Data and Python codes for Experiment I

1.1. Processed data file: data_vegetation_indices.xlsx

This Excel file contains the following data arranged on separate worksheets:

1.1.1. Sheet 1: Biomass

- Column A: This experiment consisted of two separate culturings. This column indicates whether the data belongs to the first or second culturing.
- Column B: running number for dates during the experiment.
- Column C: dates for sampling, electronic cell counter (Casy, Omni Scientific) and spectral imaging formatted dd.mm.yyyy.
- Column D: genus names for the algae.
- Column E: culturing and sample replicates.
- Column F-H: results of the electronic Casy cell counter
- Column I: Column E: values as micrometers (μm) used to crop out detritus from counts of electronic cell counter. Readings lower than these values were omitted as non-algae.
- Column J: NIR/Red ratio calculated from average spectra, recorded with SpecimIQ, of the samples.
- Column K-M: Spectrophotometer measurements and determination of chlorophyll a.
- Column P-S: Cell diameter readings from Casy measurements at the time of chlorophyll a measurements.

1.1.2. Sheet 2: Abundance

- Column A: This experiment consisted of two separate culturings. This column indicates whether the data belongs to the first or second culturing.
- Column B: running number for dates during the experiment.
- Column C: dates for sampling, electronic cell counter (Casy, Omni Scientific) and spectral imaging formatted dd.mm.yyyy.
- Column D: genus names for the algae.

- Column E: culturing and sample replicates.
- Column F-I: results of the electronic Casy cell counter
- Column J: values as micrometers (μm) used to crop out detritus from counts of electronic cell counter. Readings lower than these values were omitted as non-algae.
- Column K: NIR/Red ratio calculated from average spectra, recorded with SpecimIQ, of the samples.

1.2. Raw data folders: Images taken with SpecimIQ spectral camera

- pikkukamera_2019_11_27
 - 074 – cube1: CryptomonasB, CryptomonasC, cube2: PeridiniumA, PeridiniumB, MicrocystisA
 - 075 – cube3: PeridiniumC, MicrocystisB, MicrocystisC
 - 076 – cube4: WarisA
- pikkukamera_2019_11_29
 - 078 – cube1: PeridiniumA, PeridiniumB
 - 079 – cube2: PeridiniumC, DesmodesmusA, SynechococcusA
 - 080 – cube3: DesmodesmusB, DesmodesmusC, SynechococcusB, SynechococcusC
 - 081 – cube4: not used
 - 084 – cube5: WarisA, WarisB
 - 085 – cube6: not used
- pikkukamera_2019_12_3
 - 089 – cube1: CryptomonasA, CryptomonasB, SynechococcusA, SynechococcusB
 - 090 – cube2: CryptomonasC, PeridiniumA, SynechococcusC, MicrocystisA
 - 091 – cube3: PeridiniumB, MicrocystisB, MicrocystisC
 - 092 – cube4: PeridiniumC
- pikkukamera_2019_12_5
 - 097 – cube1: CryptomonasA, CryptomonasB, SynechococcusA, SynechococcusB
 - 098 – cube2: CryptomonasC, DesmodesmusA, SynechococcusC, MicrocystisA
 - 099 – cube3: DesmodesmusB, DesmodesmusC, MicrocystisB, MicrocystisC
 - 100 – cube4: not used
- pikkukamera_2019_12_9
 - 103 – cube1: PeridiniumA, PeridiniumB, WarisA, WarisB
 - 104 – cube2: PeridiniumC, MicrocystisA, WarisC
 - 105 – cube3: MicrocystisB, MicrocystisC
- pikkukamera_2019_12_11
 - 115 – light source only
 - 116 – cube2: CryptomonasA, CryptomonasB, WarisA, WarisB
 - 117 – cube3: CryptomonasC, WarisC
 - 118 – cube4: not used
 - 120 – light source only
- pikkukamera_2019_12_13
 - 126 – cube1: DesmodesmusA, DesmodesmusB, WarisA, WarisB
 - 127 – cube2: DesmodesmusC, SynechococcusA, WarisC
 - 128 – cube3: SynechococcusB, SynechococcusC
 - 129 – light source only
- pikkukamera_2019_12_16

- 147 – cube1: light source only
- 148 – cube2: PeridiniumA, PeridiniumB, WarisA, WarisB
- 149 – cube3: PeridiniumC, SynechococcusA, WarisC
- 150 – cube4: SynechococcusB, SynechococcusC
- 152 – cube5: light source only
- 154 – cube7: not used
- pikkukamera_2019_12_17
 - 156 – cube1: CryptomonasA, CryptomonasB, WarisA, WarisB
 - 157 – cube2: Cryptomonas C, Microcystis A, Waris C
 - 158 – cube3: MicrocystisB, MicrocystisC
 - 159 – light source only
 - 161 – light source only
- pikkukamera_2019_12_18
 - 165 – cube1: light source only
 - 166 – cube2: DesmodesmusA, DesmodesmusB, WarisA, WarisB
 - 167 – cube3: DesmodesmusC
 - 168 – cube4: not used
 - 170 – cube5: light source only
- IQ_2020_09_08
 - 277 – ds light only
 - 278 – ds2 cube2: Cryptomonas A, Cryptomonas B, Cryptomonas C
 - 279 – ds3 cube3: Peridinium A, Peridinium B, Peridinium C
 - 280 – ds4 cube4: Desmodesmus A, Desmodesmus B, Desmodesmus C
- IQ_2020_09_15
 - 293 – ds5 cube5: Cryptomonas A, Cryptomonas B, Cryptomonas C
 - 294 – ds6 cube6: Peridinium A, Peridinium B, Peridinium C
 - 295 – ds7 cube7: Desmodesmus A, Desmodesmus B, Desmodesmus C
- IQ_2020_09_18
 - 330 – ds10 cube10: Desmodesmus A, Desmodesmus B, Desmodesmus C
- IQ_2020_09_22
 - 349 – ds11 cube11: Cryptomonas A, Cryptomonas B, Cryptomonas C
 - 350 – ds12 cube12: Peridinium A, Peridinium B, Peridinium C
 - 351 – ds13 cube 13: Desmodesmus A, Desmodesmus B, Desmodesmus C
- IQ_2020_09_29
 - 373 – ds14 cube 14: Cryptomonas A, Cryptomonas B, Cryptomonas C
 - 374 – ds15 cube 15: Peridinium A, Peridinium B, Peridinium C
 - 375 – ds16 cube 16: Desmodesmus A, Desmodesmus B, Desmodesmus C
- IQ_2020_10_10
 - 390 – ds17 cube 17: Cryptomonas A, Cryptomonas B, Cryptomonas C
- IQ_2020_10_06
 - 395 – dsD cube D: Cryptomonas A, Cryptomonas B, Cryptomonas C
 - 396 – dsP cubeP: Peridinium A, Peridinium B, Peridinium C
 - 400 – dsY cubeY: Desmodesmus A, Desmodesmus B, Desmodesmus C
- IQ_2020_10_12
 - 422 – dsC cubeC: Cryptomonas A, Cryptomonas B, Cryptomonas C
 - 425 – dsX cubeX: Desmodesmus A, Desmodesmus B, Desmodesmus C
- IQ_2020_08_27

- 263 – ds light only
- 265 – ds3 cube3: Microcystis A, Microcystis B, Microcystis C
- 266 – ds4 cube4: Synechococcus A, Synechococcus B, Synechococcus C
- IQ_2020_09_02
 - 274 – ds6 cube6: Microcystis A, Microcystis B, Microcystis C
 - 275 – ds7 cube7: Synechococcus A, Synechococcus B, Synechococcus C
- IQ_2020_09_09
 - 286 – ds9 cube9: Microcystis A, Microcystis B, Microcystis C
 - 287 – ds10 cube 10: Synechococcus A, Synechococcus B, Synechococcus C
- IQ_2020_09_17
 - 321 – ds12 cube 12: Microcystis A, Microcystis B, Microcystis C
 - 322 – ds13 cube 13: Synechococcus A, Synechococcus B, Synechococcus C
- IQ_2020_09_23
 - 355 – ds15 cube 15: Microcystis A, Microcystis B, Microcystis C
 - 356 – ds16 cube 16: Synechococcus A, Synechococcus B, Synechococcus C
- IQ_2020_09_25
 - 369 – ds17 cube 17: Microcystis A, Microcystis B, Microcystis C
- IQ_2020_09_30
 - 379 – ds19 cube 19: Microcystis A, Microcystis B, Microcystis C
 - 381 – ds20 cube 20: Synechococcus A, Synechococcus B, Synechococcus C
- IQ_2020_10_07
 - 404 – ds21 cube 21: Microcystis A, Microcystis B, Microcystis C
 - 405 – ds22 cube 22: Synechococcus A, Synechococcus B, Synechococcus C

1.3. Casy electronic cell counter results

These can be opened with CasyworX_1.26 Excel Macro (Omni Life Sciences). The file names show the analyst name (Pauliina Salmi, the main author) and date of the analysis.

- Pauliina_2020_10_12
- Pauliina_2020_10_07
- Pauliina_2020_10_06_2
- Pauliina_2020_10_06
- Pauliina_2020_10_02
- Pauliina_2020_09_30
- Pauliina_2020_09_29
- Pauliina_2020_09_25
- Pauliina_2020_09_23
- Pauliina_2020_09_22
- Pauliina_2020_09_18
- Pauliina_2020_09_17
- Pauliina_2020_09_15
- Pauliina_2020_09_09
- Pauliina_2020_09_08
- Pauliina_2020_09_02
- Pauliina_2020_08_27

- Pauliina_2019_12_18
- Pauliina_2019_12_17_continues
- Pauliina_2019_12_17
- Pauliina_2019_12_16
- Pauliina_2019_12_13
- Pauliina_2019_12_11
- Pauliina_2019_12_09
- Pauliina_2019_12_05
- Pauliina_2019_12_03
- Pauliina_2019_11_29
- Pauliina_2019_11_27

1.4. Python codes

Notebooks that contain extraction of ROI's and calculation of absorbance spectra, average transmittances and absorbances and in Experiment I:

In the file names the dates are: YYYY_MM_DD

2019_12_9, 2019_12_11 and 2019_12_13 also contain extraction of endmembers.

- SpecimIQ_2019_11_27-notfiltered-means.ipynb
- SpecimIQ_2019_11_29-notfiltered-means.ipynb
- SpecimIQ_2019_12_03-notfiltered-means.ipynb
- SpecimIQ_2019_12_05-notfiltered-means.ipynb
- SpecimIQ_2019_12_09-notfiltered-means.ipynb
- SpecimIQ_2019_12_11-notfiltered-means.ipynb
- SpecimIQ_2019_12_13-notfiltered-means.ipynb
- SpecimIQ_2019_12_16-notfiltered-means.ipynb
- SpecimIQ_2019_12_17-notfiltered-means.ipynb
- SpecimIQ_2019_12_18-notfiltered-means.ipynb
- IQ_CCAC_browngreen.ipynb
- IQ_CCAC_cyanobacteria.ipynb

Notebooks that contain index calculations, correlations to the used reference methods and graphs for Experiment I:

- CCAC_correlations_all_dates.ipynb
- CCAC_mixtures_correlations.ipynb
- IQ_CCAC_browngreen.ipynb
- IQ_CCAC_cyanobacteria.ipynb

Notebook that contains calibration check for SpecimIQ spectral camera:

- Specim-IQ calibrationCheck_2020_04_24.ipynb

2. Data and Python codes for Experiment II

2.1. Raw data folders: Images taken with SpecimIQ spectral camera

- pikkukamera_2019_12_13
 - 131 – light source only
 - 138 – cube2: wells_B1_4, wells_C1_4, wells_D1_4
 - 139 – cube3: wells_E1_4, wells_F1_4, wells_G1_4
 - 140 – cube4: wells_E9_11, wells_F9_11, wells_G9_11
 - 141 – cube5: wells_B9_11, wells_C9_11, wells_D9_11
 - 142 – cube6: wells_E5_8, wells_F5_8, wells_G5_8
 - 143 – cube7: wells_B5_8, wells_C5_8, wells_D5_8
- pikkukamera_2020_02_06
 - 174 – light source only
 - 175 – cube2: wells_B1_4, wells_C1_4, wells_D1_4
 - 177 – light source only
 - 178 – cube2: wells_E1_4, wells_F1_4, wells_G1_4
 - 179 – cube2: wells_E9_11, wells_F9_11, wells_G9_11
 - 180 – cube2: wells_E5_8, wells_F5_8, wells_G5_8
 - 181 – cube2: wells_B5_8, wells_C5_8, wells_D5_8
 - 183 – cube2: wells_B9_11, wells_C9_11, wells_D9_11
- pikkukamera_2019_05_07
 - 228 – light source only
 - 229 – cube2: wells_B1_4, wells_C1_4, wells_D1_4
 - 230 – light source only
 - 231 – cube2: wells_B2_4, wells_C2_4, wells_D2_4
 - 232 – cube2: wells_E2_4, wells_F2_4, wells_G2_4
 - 233 – cube2: wells_B5_9, wells_C5_9, wells_D5_9
 - 234 – cube2: wells_E5_9, wells_F5_9, wells_G5_9
 - 235 – cube2: wells_E10_11, wells_F10_11, wells_G10_11
 - 236 – cube2: wells_B10_11, wells_C10_11, wells_D10_11

2.2. Python codes

Notebooks that contain extraction of ROI's and calculation of absorbance spectra, average transmittances and absorbances for experiment 2:

- SYKE_2019_12_13_KDK_Images1_2and3-SPIE.ibynp
- SYKE_2019_12_13_KDK_Images4and5-SPIE.ibynp
- SYKE_2019_12_13_KDK_Images6and7-SPIE.ibynp

- SYKE_2019_02_06_KDK_Image2-SPIE.ibynp
- SYKE_2019_02_06_KDK_Image3-SPIE.ibynp
- SYKE_2019_02_06_KDK_Image4-SPIE.ibynp
- SYKE_2019_02_06_KDK_Image5-SPIE.ibynp

- SYKE_2019_02_06_KDK_Image6-SPIE.ibynp
- SYKE_2019_02_06_KDK_Image7-SPIE.ibynp

- SYKE_2019_05_07_KDK_Image2-SPIE.ibynp
- SYKE_2019_05_07_KDK_Image3-SPIE.ibynp
- SYKE_2019_05_07_KDK_Image4-SPIE.ibynp
- SYKE_2019_05_07_KDK_Image5-SPIE.ibynp
- SYKE_2019_05_07_KDK_Image6-SPIE.ibynp
- SYKE_2019_05_07_KDK_Image7-SPIE.ibynp
- SYKE_2019_05_07_KDK_Image8-SPIE.ibynp

Notebooks that contain index calculations, correlations to the used reference methods and graphs for Experiment II:

- SPIE_index_calculations_2019_12_13.ibynp
- SPIE_index_calculations_2020_02_06.ibynp
- SPIE_index_calculations_2020_05_07.ibynp

- SPIE_correlations_all_dates.ibynp