Supplementary Material

# CDOM Optical Properties and DOC Content in the Largest Mixing Zones of the Siberian Shelf Seas

**Anastasia N. Drozdova [1,*], Andrey A. Nedospasov [1], Nikolay V. Lobus [2], Svetlana V. Patsaeva [3] and Sergey A. Shchuka [1]**

[1] Shirshov Institute of Oceanology, Russian Academy of Sciences, 117997 Moscow, Russia; nedospasov.aa@ocean.ru (A.A.N.); shchuka@ocean.ru (S.A.S.)
[2] K.A. Timiryazev Institute of Plant Physiology, Russian Academy of Sciences, 127276 Moscow, Russia; lobus.nv@ocean.ru (N.V.L)
[3] Department of Physics, Lomonosov Moscow State University, 119234 Moscow, Russia; patsaeva@physics.msu.ru (S.V.P)
* Correspondence: adrozdova@ocean.ru (A.N.D)

Table S1. Sampling dates during the 63rd and 69th cruises of R/V *Akademik Mstislav Keldysh*.

| Station | mon/day/yr |
|---|---|
| 5216 | 09/08/2015 |
| 5217 | 09/08/2015 |
| 5218 | 09/08/2015 |
| 5220 | 09/08/2015 |
| 5215-2 | 09/09/2015 |
| 5221 | 09/09/2015 |
| 5222 | 09/10/2015 |
| 5223 | 09/10/2015 |
| 5224 | 09/10/2015 |
| 5225 | 09/11/2015 |
| 5226 | 09/12/2015 |
| 5228 | 09/13/2015 |
| 5612 | 09/08/2017 |
| 5613 | 09/08/2017 |
| 5615 | 09/08/2017 |
| 5617 | 09/09/2017 |
| 5619 | 09/09/2017 |
| 5598 | 09/05/2017 |
| 5600 | 09/05/2017 |
| 5602 | 09/06/2017 |
| 5604 | 09/06/2017 |
| 5605 | 09/06/2017 |
| 5606 | 09/06/2017 |

| | |
|---|---|
| 5607 | 09/07/2017 |
| 5586 | 08/27/2017 |
| 5587 | 08/28/2017 |
| 5588 | 08/28/2017 |
| 5642 | 09/25/2017 |
| 5641_2 | 09/26/2017 |
| 5590 | 08/31/2017 |
| 5591 | 09/01/2017 |
| 5627 | 09/17/2017 |
| 5629 | 09/17/2017 |
| 5630 | 09/17/2017 |
| 5631 | 09/18/2017 |
| 5591_2 | 09/18/2017 |
| 5633 | 09/19/2017 |
| 5590_2 | 09/19/2017 |
| 5634 | 09/19/2017 |
| 5592 | 09/02/2017 |
| 5596 | 09/03/2017 |
| 5596_2 | 09/14/2017 |
| 5592_2 | 09/14/2017 |

Table S2. Salinity and DOC concentration of water samples.

| Station | Depth, m | Salinity | DOC, μM | Station | Depth, m | Salinity | DOC, μM |
|---|---|---|---|---|---|---|---|
| **Kolyma** | | | | | | | |
| 5612 | 1 | 29.3 | 156.67 | 5615 | 15 | 28.1 | 425 |
| 5612 | 10 | 29.3 | 125.83 | 5615 | 23 | 28.2 | 222.5 |
| 5612 | 20 | 29.8 | 129.17 | 5617 | 1 | 23.4 | 470 |
| 5612 | 30 | 31.0 | 146.67 | 5617 | 8 | 28.2 | 223.33 |
| 5613 | 1 | 27.6 | 505 | 5617 | 13 | 28.6 | 216.67 |
| 5613 | 8 | 27.6 | 280 | 5619 | 1 | 17.0 | 370 |
| 5613 | 15 | 27.6 | 219.17 | 5619 | 8 | 17.8 | 317.5 |
| 5613 | 25 | 29.8 | 174.17 | 5619 | 14 | 26.6 | 218.33 |
| 5615 | 1 | 28.1 | 179.17 | | | | |
| **Indigirka** | | | | | | | |
| 5598 | 1 | 15.2 | 311.67 | 5604 | 11 | 26.5 | 200.83 |
| 5598 | 6 | 15.2 | 311.67 | 5604 | 15 | 31.7 | 182.5 |
| 5598 | 9 | 24.9 | 285 | 5604 | 20.5 | 31.7 | 171.67 |
| 5598 | 11 | 25.1 | 227.5 | 5605 | 1 | 29.1 | 393.33 |
| 5600 | 1 | 17.6 | 253.33 | 5605 | 10 | 29.2 | 526.67 |
| 5600 | 6 | 17.5 | 280.83 | 5606 | 1 | 30.1 | 520 |
| 5600 | 9 | 27.0 | 221.67 | 5607 | 0 | 30.0 | 363.33 |
| 5600 | 17.5 | 30.1 | 190 | 5607 | 1 | 30.0 | 374.17 |
| 5602 | 1 | 21.2 | 260.83 | 5607 | 1 | 30.0 | 374.17 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5602 | 5 | 21.8 | 245 | 5607 | 10 | 30.1 | 501.67 |
| 5602 | 10 | 28.2 | 462.5 | 5607 | 20 | 30.2 | 319.17 |
| 5602 | 16 | 29.6 | 179.17 | 5607 | 30 | 31.7 | 186.67 |
| 5602 | 20 | 30.8 | 165.83 | 5602_2 | 0 | 24.1 | 350.83 |
| 5602 | 23 | 32.6 | 165 | 5602_2 | 10 | 28.4 | 276.67 |
| 5604 | 1 | 25.6 | 236.67 | 5606_2 | 42 | 31.8 | 231.67 |
| 5604 | 5 | 26.2 | 195.83 | | | | |
| **Kara Sea (2017)** | | | | | | | |
| 5586 | 1 | 31.3 | 164.17 | 5588 | 27 | 32.5 | 146.67 |
| 5586 | 25 | 33.8 | 174.17 | 5588_2 | 1 | 17.9 | 445.83 |
| 5586 | 45 | 34.1 | 160.83 | 5588_2 | 5 | 18.2 | 495.83 |
| 5586 | 55 | 34.1 | 130 | 5588_2 | 11 | 18.3 | 514.17 |
| 5586 | 65 | 34.2 | 175.83 | 5588_2 | 20 | 32.8 | 175.83 |
| 5586 | 75 | 34.3 | 166.67 | 5588_2 | 26 | 32.8 | 170 |
| 5586 | 87 | 34.3 | 174.17 | 5587_2 | 1 | 25.2 | 376.67 |
| 5587 | 1 | 25.9 | 314.17 | 5587_2 | 10 | 25.6 | 415.83 |
| 5587 | 5 | 25.9 | 298.33 | 5587_2 | 16 | 30.3 | 229.17 |
| 5587 | 18 | 33.5 | 156.67 | 5587_2 | 25 | 33.7 | 215.83 |
| 5587 | 30 | 33.9 | 120.83 | 5587_2 | 50 | 34.0 | 147.5 |
| 5587 | 60 | 34.0 | 123.33 | 5587_2 | 150 | 34.3 | 115.83 |
| 5587 | 150 | 34.3 | 128.33 | 5587_2 | 189 | 34.5 | 110 |
| 5587 | 186 | 34.4 | 140 | 5642 | 110 | 34.4 | 96.67 |
| 5588 | 1 | 19.9 | 414.17 | 5641_2 | 15 | 34.1 | 145.83 |
| 5588 | 5 | 20.5 | 575 | 5586_2 | 8 | 31.4 | 257.5 |
| 5588 | 20 | 30.7 | 217.5 | 5586_2 | 25 | 33.7 | 114.17 |
| **Lena (2015)** | | | | | | | |
| 5216 | 1 | 2.5 | 496.7 | 5221 | 14.5 | 28 | 337.5 |
| 5216 | 1.5 | 3 | 443.33 | 5221 | 31 | 34.3 | 210.83 |
| 5216 | 4 | 14.8 | 608.33 | 5222 | 1 | 15.9 | 493.58 |
| 5216 | 8.6 | 29.4 | 261.67 | 5222 | 45 | 34.0 | 162.5 |
| 5217 | 1 | 9.7 | 420.83 | 5223 | 1 | 20.6 | 381.67 |
| 5217 | 9.4 | 26.0 | 245.83 | 5223 | 22 | 33.3 | 146.67 |
| 5218 | 1 | 5.8 | 445 | 5223 | 53 | 33.9 | 135 |
| 5218 | 9 | 21.6 | 296.67 | 5223 | 56 | 33.9 | 125 |
| 5218 | 16 | 31.1 | 244.17 | 5224 | 1 | 21.6 | 342.5 |
| 5220 | 1 | 17.8 | 351.7 | 5224 | 35 | 33.9 | 120 |
| 5220 | 9 | 19.5 | 343.33 | 5224 | 55 | 34 | 117.5 |
| 5220 | 16 | 30.9 | 207.5 | 5224 | 57 | 34 | 130 |
| 5220 | 21.5 | 31.6 | 212.5 | 5228 | 0 | 27.0 | 217.5 |
| 5215-2 | 1 | 22.0 | 300.8 | 5228 | 10 | 27.4 | 210 |
| 5215-2 | 10 | 26.4 | 244.17 | 5228 | 40 | 34.0 | 251.67 |
| 5215-2 | 22 | 33.8 | 169.17 | 5228 | 85 | 34.5 | 85.83 |
| 5215-2 | 25 | 33.8 | 181.67 | 5228 | 88.5 | 34.5 | 100.83 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5221 | 1 | 16.0 | 399.17 | 5226 | 12 | 27.0 | 305 |
| **Khatanga** | | | | | | | |
| 5590 | 1 | 32.2 | 161.67 | 5632 | 22 | 32.5 | 459.17 |
| 5590 | 17 | 32.3 | 159.17 | 5632 | 30 | 33.0 | 311.67 |
| 5590 | 30 | 33.2 | 175.83 | 5591_2 | 1 | 22.3 | 355.83 |
| 5590 | 50 | 33.8 | 166.67 | 5591_2 | 7 | 22.4 | 320 |
| 5590 | 62 | 33.9 | 192.5 | 5591_2 | 13 | 31.4 | 270.83 |
| 5627 | 1 | 3.5 | 727.5 | 5591_2 | 20 | 33.0 | 225.83 |
| 5627 | 5 | 4.0 | 669.17 | 5591_2 | 41 | 33.7 | 205.83 |
| 5627 | 11 | 9.3 | 551.67 | 5633 | 1 | 27.9 | 261.67 |
| 5629 | 1 | 11.1 | 620 | 5633 | 5 | 27.9 | 286.67 |
| 5629 | 5 | 12.1 | 525.83 | 5633 | 10 | 31.7 | 255.83 |
| 5629 | 12 | 14.9 | 678.33 | 5633 | 18 | 32.7 | 213.33 |
| 5629 | 18 | 15.2 | 623.33 | 5633 | 35 | 33.5 | 220 |
| 5630 | 1 | 17.1 | 421.67 | 5633 | 41 | 33.5 | 245 |
| 5630 | 5 | 17.3 | 500.83 | 5590_2 | 1 | 31.6 | 195.83 |
| 5630 | 14 | 19.2 | 445 | 5590_2 | 13 | 32.3 | 224.17 |
| 5630 | 20 | 20.4 | 470.83 | 5590_2 | 24 | 33.1 | 158.33 |
| 5630 | 23 | 25.4 | 360 | 5590_2 | 40 | 33.8 | 205.83 |
| 5631 | 1 | 18.9 | 424.17 | 5634 | 1 | 30.1 | 232.5 |
| 5631 | 10 | 19.2 | 453.33 | 5634 | 10 | 30.1 | 145.83 |
| 5631 | 18 | 25.7 | 422.5 | 5634 | 18 | 33.2 | 458.33 |
| 5631 | 25 | 31.3 | 276.67 | 5634 | 40 | 34.0 | 193.33 |
| 5632 | 1 | 21.9 | 435 | 5634 | 80 | 34.4 | 174.17 |
| 5632 | 10 | 21.9 | 375.83 | 5634 | 100 | 34.5 | 410 |
| 5632 | 17 | 30.9 | 276.67 | 5634 | 175 | 34.7 | 162.5 |
| **Lena (2017)** | | | | | | | |
| 5592 | 1 | 25.7 | 242.5 | 5596 | 22 | 32.5 | 156.67 |
| 5592 | 10 | 26.1 | 260 | 5596_2 | 1 | 6.6 | 886.67 |
| 5592 | 32 | 33.4 | 247.5 | 5592_2 | 1 | 17.9 | 415 |
| 5592 | 43.5 | 33.8 | 210.83 | 5592_2 | 20 | 31.5 | 213.33 |
| 5596 | 1 | 21.8 | 385.83 | | | | |

Table S3. Coefficients *a* and *b* of the DOC = *a* +*b* * *Salinity* regression line and corresponding coefficients of determination obtained for the Kara Sea waters during August – September periods 1997-2017.

| Reference | Period | Description | Regression parameters | $R^2$ |
|---|---|---|---|---|
| Amon, 2004 | August – September, 1997, 1999, 2000 | Ob and Yenisei estuaries | *a* = 693.76<br>*b* = -18.442 | 0.91 |
| Meon and Amon, 2004† | August – September, 2001 | surface (1-2 m) | *a* = 800.5±38.3<br>*b* = -22.9±1.9 | 0.86 |
| Belyaev et al. 2010 | September, 2007 | Surface | *a* = 837<br>*b* = -20.8 | 0.89 |
| | | Ob section, 0 – 60 m | *a* = 817<br>*b* = -22.1 | 0.93 |
| Belyaev et al. 2015 | September, 2011 | Yenisei Gulf section, surface | *a* = 715<br>*b* = -17.4 | 0.85 |
| Drozdova et al. 2017 | September, 2015 | Surface | *a* = 695.8<br>*b* = -17.0 | 0.65 |
| Present work | September , 2017 | Surface | *a* = 823.8±95.4<br>*b* = -20.0±3.9 | 0.86 |
| | | 0-189 m | *a* = 927.3±38.3<br>*b* = -23.0±1.2 | 0.91 |

†Parameters of the regression line were obtained by fitting the data, reported by Meon and Amon, 2004.

Table S4. DOC and optical characteristics of the Khatanga transect waters (Laptev Sea).

| | Salinity < 25 | | Salinity > 25 | |
|---|---|---|---|---|
| | min-max | Average | min-max | average |
| DOC (μM) | 261.7-727.5 | 482.8 (21) | 145.8-579.2 | 267.2 (32) |
| $a_{CDOM}(350)$ ($m^{-1}$) | 3.30-10.93 | 6.17 (16) | 0.27-3.57 | 2.86 (19) |
| $a_{CDOM}(375)$ ($m^{-1}$) | 2.29-7.10 | 4.07 (16) | 0.15-3.01 | 0.80 (19) |
| $S_{uvb}$ ($\mu m^{-1}$) | 15.73-17.14 | 16.25 (15) | 14.14-25.24 | 21.72 (19) |
| $S_R$ | 0.92-1.32 | 1.01 (15) | 1.14-2.39 | 1.63 (17) |
| SUVA ($m^2$ g $C^{-1}$) | 0.59-2.25 | 1.76 (15) | 0.32-0.93 | 0.68 (16) |