**Characterization and sources of colored dissolved organic matter in a coral reef ecosystem subject to ultramafic erosion pressure (New Caledonia, Southwest Pacific)**

Chloé Martias[a,b], Marc Tedetti[a], François Lantoine[c], Léocadie Jamet[d], Cécile Dupouy[a,b]

[a] Aix Marseille Univ, Université de Toulon, CNRS, IRD, MIO UM 110, 13288, Marseille, France

[b] Centre IRD de Nouméa, UMR235-MIO, 101 Promenade Roger Laroque BPA5, 98848 Nouméa Cedex

[c] Sorbonne Universités, UPMC Univ Paris 06, CNRS, Laboratoire d'Ecogeochimie des Environnements Benthiques (LECOB), Observatoire Océanologique, Banyuls sur Mer, France

[d] US191-IMAGO/LAMA, 101 Promenade Roger Laroque BPA5, 98848 Nouméa Cedex

Corresponding author: Chloé Martias, chloe.martias@ird.fr, Centre IRD de Nouméa, UMR235-MIO, 101 Promenade Roger Laroque BPA5, 98848 Nouméa Cedex, phone: +687 80 77 05, +687 26 07 28

**Supplementary Information**

**Table SI-1.** Biogeochemical, biological and CDOM parameters in river, coastal, lagoon and oceanic waters. nd: not determined; bld: below detection limit.

| | River (n = 9) | | | | Coast (n = 12) | | | | Lagoon (n = 20) | | | | Ocean (n = 16) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Average | | Min | Max | Average | | Min | Max | Average | | Min | Max | Average | | Min | Max |
| Salinity | nd | ± nd | nd | nd | 33.13 | ± 1.47 | 31.09 | 35.45 | 34.36 | ± 1.13 | 31.78 | 35.52 | 34.78 | ± 0.72 | 33.11 | 35.52 |
| Temp [°C] | nd | ± nd | nd | nd | 28.40 | ± 0.25 | 28.04 | 28.93 | 28.17 | ± 0.67 | 26.26 | 28.72 | 28.39 | ± 0.65 | 26.86 | 29.41 |
| Chl *a* [µg $L^{-1}$] | 3.51 | ± 0.38 | 3.24 | 3.78 | 0.63 | ± 0.39 | 0.20 | 1.44 | 0.45 | ± 0.22 | 0.21 | 1.25 | 0.38 | ± 0.23 | 0.11 | 1.01 |
| TOC [µM] | 86.88 | ± 4.66 | 83.58 | 90.17 | 79.52 | ± 9.33 | 61.95 | 103.92 | 78.68 | ± 10.19 | 64.59 | 104.25 | 80.84 | ± 8.01 | 69.31 | 101.25 |
| POC [µM] | nd | ± nd | nd | nd | 84.53 | ± 24.39 | 55.84 | 96.02 | 54.75 | ± 12.21 | 38.34 | 90.92 | 50.12 | ± 12.62 | 25.95 | 69.48 |
| $Si(OH)_4$ [µM] | 403.8 | ± 3.5 | 401.3 | 406.3 | 26.2 | ± 48.0 | 1.7 | 175.5 | 6.9 | ± 4.8 | 1.0 | 16.3 | 4.3 | ± 3.2 | 1.5 | 13.6 |
| $NO_X$ [µM] | 15.45 | ± 7.79 | 9.94 | 20.95 | 0.52 | ± 1.22 | 0.04 | 4.37 | 0.14 | ± 0.12 | 0.08 | 0.59 | 0.14 | ± 0.12 | 0.07 | 0.56 |
| SynFL2- [x$10^3$ cell $L^{-1}$] | nd | ± nd | nd | nd | 19 | ± 12 | 4 | 41 | 10 | ± 8 | 1 | 36 | 7 | ± 7 | bld | 23 |
| Croc [cell $L^{-1}$] | nd | ± nd | nd | nd | 9 | ± 22 | bld | 77 | 2 | ± 2 | bld | 7 | 26 | ± 64 | bld | 253 |
| SynFL2 [$10^3$ cell $L^{-1}$] | nd | ± nd | nd | nd | 49 | ± 27 | bld | 92 | 41 | ± 25 | 12 | 115 | 40 | ± 30 | 1 | 83 |
| NanoEuk [$10^3$ cell $L^{-1}$] | nd | ± nd | nd | nd | 1 | ± 0 | bld | 2 | 1 | ± 1 | bld | 3 | 1 | ± 0 | bld | 1 |
| PicoEuk [$10^3$ cell $L^{-1}$] | nd | ± nd | nd | nd | 3 | ± 2 | bld | 6 | 3 | ± 1 | 1 | 6 | 2 | ± 2 | bld | 6 |
| Proc [$10^3$ cell $L^{-1}$] | nd | ± nd | nd | nd | 10 | ± 11 | bld | 39 | 13 | ± 9 | 3 | 33 | 25 | ± 14 | 6 | 50 |
| HNA bacteria [$10^3$ cell $L^{-1}$] | nd | ± nd | nd | nd | 246 | ± 44 | 156 | 288 | 203 | ± 50 | 111 | 303 | 194 | ± 55 | 138 | 342 |
| LNA bacteria [ $10^3$ cell $L^{-1}$] | nd | ± nd | nd | nd | 345 | ± 78 | 267 | 485 | 320 | ± 73 | 189 | 481 | 305 | ± 74 | 193 | 426 |
| Total bacteria [$10^3$ cell $L^{-1}$] | nd | ± nd | nd | nd | 577 | ± 109 | 444 | 753 | 509 | ± 114 | 291 | 741 | 485 | ± 123 | 326 | 748 |
| $a_{350}$ [$m^{-1}$] | 2.33 | ± 0.04 | 2.31 | 2.36 | 0.53 | ± 0.62 | 0.06 | 2.38 | 0.15 | ± 0.11 | 0.01 | 0.41 | 0.09 | ± 0.08 | bld | 0.29 |
| $S_{275\text{-}295}$ [$nm^{-1}$] | 0.003 | ± 0.000 | 0.003 | 0.003 | 0.028 | ± 0.012 | 0.016 | 0.054 | 0.044 | ± 0.020 | 0.002 | 0.076 | 0.063 | ± 0.024 | 0.027 | 0.112 |
| SR | 0.74 | ± 0.04 | 0.71 | 0.77 | 1.55 | ± 0.81 | 0.98 | 3.83 | 1.62 | ± 0.98 | 0.07 | 3.92 | 2.76 | ± 2.20 | 0.62 | 7.90 |
| $SUVA_{254}$ [L mg-$C^{-1}$ $m^{-1}$] | nd | ± nd | nd | nd | 2.00 | ± 0.49 | 1.24 | 2.98 | 1.48 | ± 0.35 | 0.91 | 2.24 | 1.27 | ± 0.21 | 0.93 | 1.68 |
| Tyrosine-like C1 [QSU] | 16.16 | ± 7.56 | 10.81 | 21.50 | 5.25 | ± 7.43 | bld | 24.01 | 2.52 | ± 3.03 | bld | 11.71 | 2.75 | ± 4.11 | bld | 16.24 |
| Humic-like C2 [QSU] | 25.07 | ± 1.44 | 24.05 | 26.08 | 5.93 | ± 8.65 | bld | 26.29 | 1.60 | ± 1.19 | bld | 4.30 | 1.55 | ± 1.64 | bld | 6.00 |
| Tryptophan-like C3 [QSU] | 3.88 | ± 2.57 | 2.06 | 5.70 | 3.35 | ± 6.62 | bld | 24.01 | 1.51 | ± 2.96 | bld | 12.64 | 9.94 | ± 15.13 | bld | 56.79 |
| Tyrosine 2-like C4 [QSU] | 8.26 | ± 0.85 | 7.66 | 8.87 | 9.89 | ± 7.39 | bld | 21.76 | 10.15 | ± 6.71 | 1.25 | 25.32 | 8.81 | ± 5.37 | 0.65 | 16.53 |

**Table SI-2.** Concentrations of dissolved nickel (Ni), cobalt (Co), copper (Cu) and manganese (Mn) in river and coastal waters. "bld" indicate data below the detection limit.

| Transect | Station | Ni [µg $L^{-1}$] | Co [µg $L^{-1}$] | Cu [µg $L^{-1}$] | Mn [µg $L^{-1}$] |
|---|---|---|---|---|---|
| 1 | S1 | 0.129 | 0.286 | 0.016 | 0.061 |
| 3 | S7 | 12.504 | 0.023 | bld | 1.412 |
| 3 | ST1 | 24.711 | 0.190 | 0.219 | 5.949 |
| 3 | ST2 | 16.500 | 0.212 | 0.013 | 2.430 |
| 6 | S39 | 1.526 | 0.013 | 0.021 | 2.108 |
| 6 | ST16 | 3.910 | 0.088 | 0.041 | 10.598 |
| 6 | ST18 | 0.227 | 0.050 | 0.079 | bld |
| 6 | ST19 | 2.136 | 0.166 | 0.012 | 2.375 |
| 7 | S33 | 1.054 | 0.134 | bld | 0.789 |
| 7 | S34 | 1.227 | 0.048 | 0.029 | 0.071 |
| 7 | ST14 | 0.036 | 0.123 | 0.123 | 2.455 |
| 8 | S28 | 1.937 | 0.127 | 0.015 | 0.084 |
| 8 | ST12 | 0.034 | 0.185 | 0.185 | 2.654 |
| 8 | ST13 | 2.913 | 0.055 | 0.009 | 1.106 |
| 9 | S27 | 1.027 | 0.074 | 0.025 | 0.583 |
| 10 | S21 | 0.142 | 0.022 | 0.013 | 0.127 |
| 11 | S16 | 0.078 | 0.033 | 0.033 | 1.324 |
| 11 | S23 | 0.594 | 0.033 | 0.012 | 1.524 |
| 11 | ST8 | 0.189 | 0.060 | 0.044 | 0.301 |
| 11 | ST9 | 0.032 | 0.017 | 0.017 | 0.135 |
| 12 | S12 | 0.150 | 0.025 | 0.014 | 0.352 |

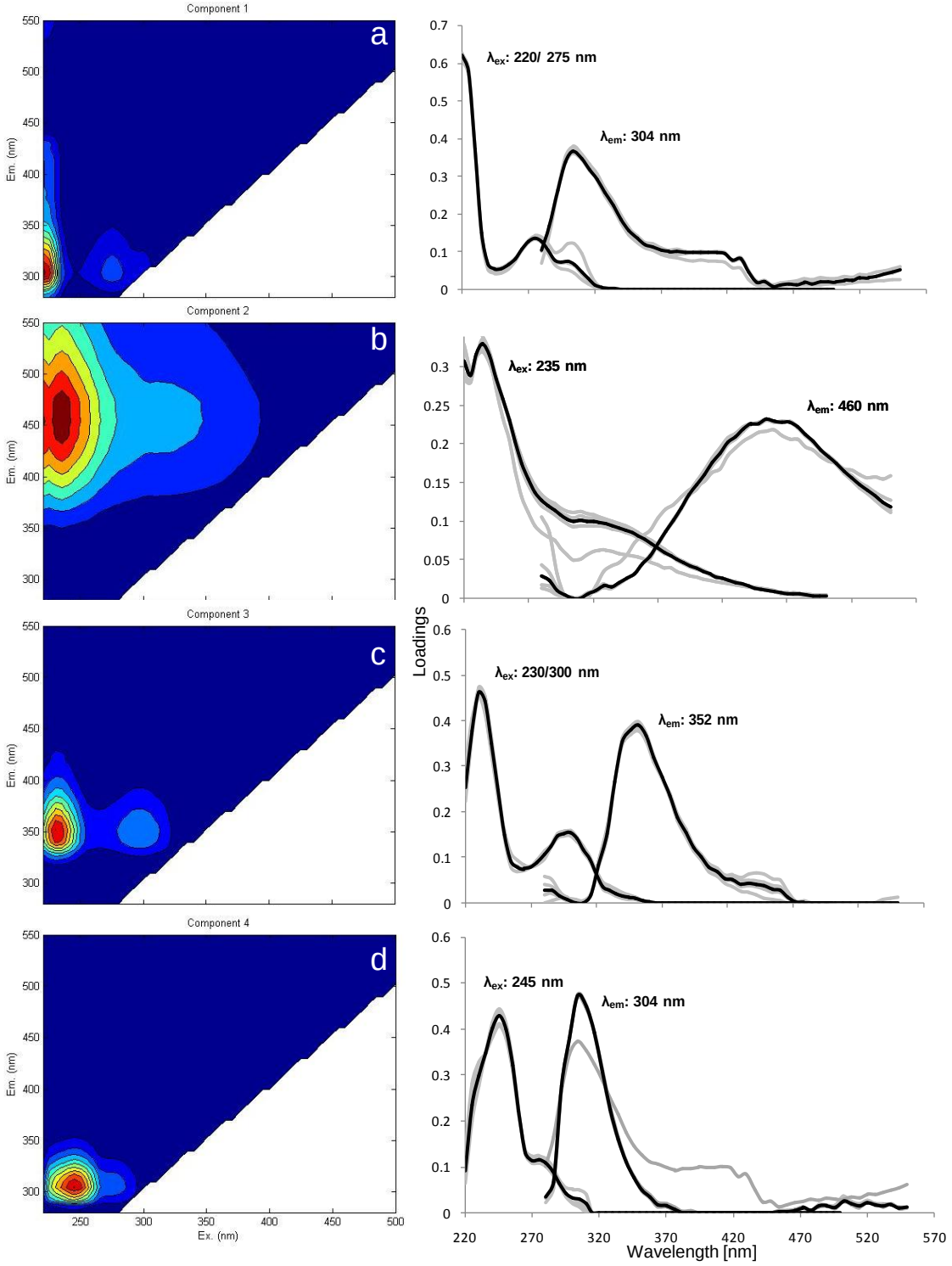


**Figure SI-1.** Spectral characteristics of the four CDOM fluorescent components validated by the parallel factor analysis (PARAFAC) model: a) component 1 (C1), b) component 2 (C2), c) component 3 (C3), and d) component 4 (C4). Left column: contour plots, right column: line plots. The line plots show the excitation (left side) and emission (right side) fluorescence spectra. The grey lines correspond to split half validation results. The excitation and emission maxima ($\lambda_{ex}$ and $\lambda_{em}$) of each component are given.

**Table SI-3.** Pearson's correlation matrix between CDOM, biogeochemical and biological parameters based on 47 samples collected in coastal lagoon and oceanic waters during the CALIOPE 3 cruise.

| | Salinity | Chl *a* | TOC | $NO_X$ | $Si(OH)_4$ | SynFL2- | SynFL2 | Croc | NanoEuk | PicoEuk | Proc | HNA bacteria | LNA bacteria | Total bacteria | $a_{350}$ | $S_{275-295}$ | SR | $SUVA_{254}$ | Tyrosine-like | Humic-like | Tryptophan-like |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chl *a* | -0.24 | | | | | | | | | | | | | | | | | | | | |
| TOC | 0.11 | 0.27 | | | | | | | | | | | | | | | | | | | |
| $NO_X$ | **-0.32** | -0.13 | -0.02 | | | | | | | | | | | | | | | | | | |
| $Si(OH)_4$ | **-0.54** | -0.12 | -0.09 | **0.95** | | | | | | | | | | | | | | | | | |
| SynFL2- | **-0.60** | **0.76** | 0.24 | 0.17 | 0.24 | | | | | | | | | | | | | | | | |
| SynFL2 | -0.26 | **0.62** | 0.05 | -0.01 | 0.02 | **0.68** | | | | | | | | | | | | | | | |
| Croc | 0.27 | -0.19 | 0.09 | -0.07 | -0.10 | -0.24 | -0.29 | | | | | | | | | | | | | | |
| NanoEuk | -0.18 | **0.81** | 0.20 | 0.04 | 0.04 | **0.72** | **0.62** | -0.11 | | | | | | | | | | | | | |
| PicoEuk | **-0.56** | **0.54** | -0.03 | 0.08 | 0.17 | **0.61** | **0.55** | **-0.38** | **0.46** | | | | | | | | | | | | |
| Proc | **0.57** | -0.14 | 0.12 | -0.22 | -0.28 | **-0.40** | -0.09 | **0.56** | 0.00 | **-0.31** | | | | | | | | | | | |
| HNA bacteria | **-0.48** | **0.50** | 0.21 | 0.20 | 0.20 | **0.78** | **0.56** | -0.17 | **0.51** | **0.42** | **-0.37** | | | | | | | | | | |
| LNA bacteria | -0.13 | **0.58** | 0.25 | 0.05 | -0.01 | **0.69** | **0.66** | -0.18 | **0.60** | 0.28 | -0.13 | **0.78** | | | | | | | | | |
| Total bacteria | -0.29 | **0.58** | 0.25 | 0.12 | 0.08 | **0.77** | **0.66** | -0.18 | **0.59** | **0.36** | -0.24 | **0.92** | **0.96** | | | | | | | | |
| $a_{350}$ | **-0.53** | 0.18 | 0.11 | **0.91** | **0.91** | **0.47** | 0.16 | -0.14 | 0.25 | 0.30 | -0.30 | **0.42** | 0.26 | **0.35** | | | | | | | |
| $S_{275-295}$ | **0.52** | **-0.55** | -0.10 | -0.23 | -0.26 | **-0.67** | **-0.34** | **0.50** | **-0.51** | **-0.56** | **0.45** | **-0.59** | **-0.48** | **-0.55** | **0.49** | | | | | | |
| SR | **0.31** | **-0.40** | 0.15 | -0.11 | -0.13 | **-0.45** | **-0.34** | **0.35** | **-0.35** | **-0.48** | **0.37** | **-0.40** | **-0.41** | **-0.42** | 0.27 | **0.68** | | | | | |
| $SUVA_{254}$ | **-0.67** | **0.42** | 0.03 | **0.57** | **0.61** | **0.71** | 0.28 | -0.24 | **0.42** | **0.45** | **-0.44** | **0.66** | **0.45** | **0.57** | **0.81** | **-0.76** | **0.48** | | | | |
| Tyrosine-like | **-0.37** | -0.01 | 0.02 | **0.63** | **0.65** | 0.22 | 0.08 | -0.11 | -0.05 | 0.15 | -0.29 | 0.13 | 0.03 | 0.08 | **0.64** | -0.20 | 0.09 | **0.50** | | | |
| Humic-like | **-0.39** | **0.32** | 0.13 | **0.56** | **0.57** | **0.42** | 0.23 | -0.10 | 0.23 | 0.28 | -0.24 | **0.33** | **0.34** | **0.35** | **0.73** | **-0.33** | 0.12 | **0.65** | **0.62** | | |
| Tryptophan-like | -0.09 | -0.12 | 0.03 | -0.05 | -0.03 | 0.00 | 0.01 | -0.10 | -0.15 | -0.01 | -0.15 | -0.06 | -0.11 | -0.09 | -0.07 | 0.11 | 0.05 | -0.07 | **0.53** | -0.06 | |
| Tyrosine 2-like | 0.29 | -0.30 | -0.08 | 0.17 | 0.06 | **-0.38** | **-0.35** | 0.21 | -0.24 | -0.30 | **0.39** | -0.17 | -0.19 | -0.19 | 0.02 | 0.06 | 0.03 | -0.11 | -0.08 | -0.28 | -0.16 |

**Table SI-4.** Pearson's correlation matrix between CDOM fluorophores and dissolved metal concentrations based on 21 samples collected in river and coastal waters during the CALIOPE 3 cruise.

| | Ni | Co | Cu | Mn | Tyrosine-like | Humic-like | Tryptophan-like |
|---|---|---|---|---|---|---|---|
| Co | 0.33 | | | | | | |
| Cu | 0.38 | 0.36 | | | | | |
| Mn | 0.43 | 0.19 | 0.37 | | | | |
| Tyrosine-like | -0.20 | -0.03 | -0.08 | **0.46** | | | |
| Humic-like | -0.07 | -0.13 | -0.19 | **0.50** | **0.70** | | |
| Tryptophan-like | -0.23 | 0.03 | 0.03 | 0.00 | 0.29 | -0.17 | |
| Tyrosine 2-like | **0.53** | **0.54** | 0.18 | 0.18 | 0.02 | -0.16 | -0.11 |