Supporting Information

Selenium Dioxide Promoted Selenylation/Cyclization of Leucosceptrane Sesterterpenoids

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1. General Information

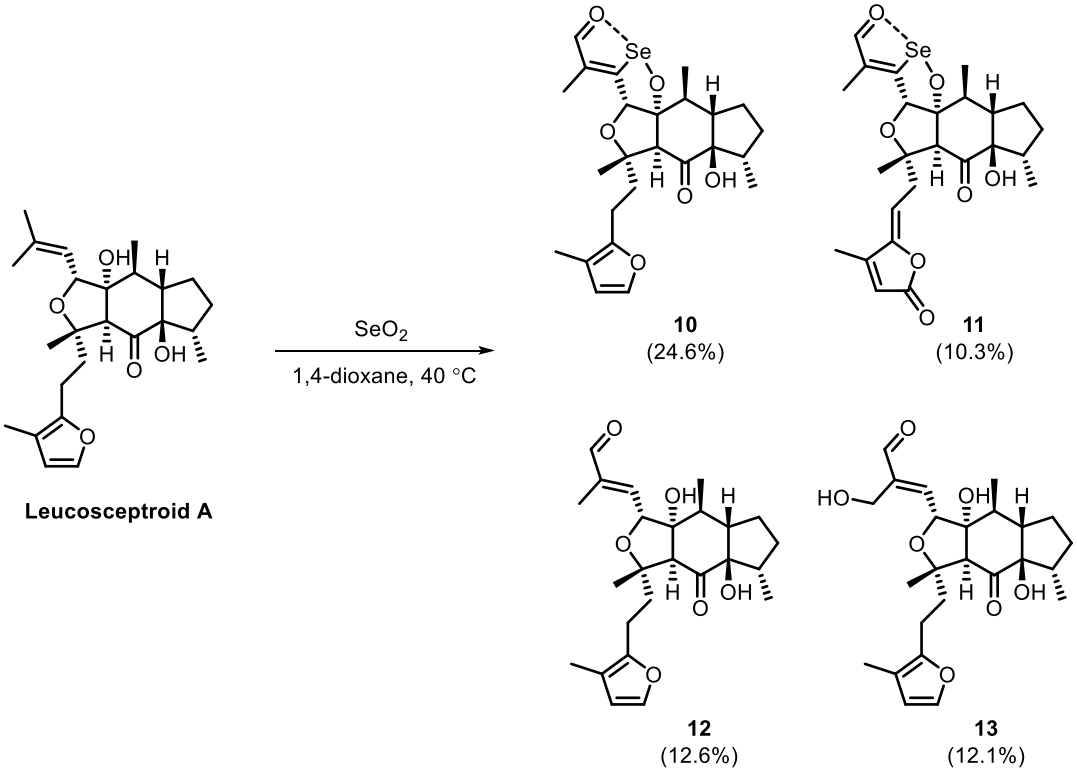
Unless otherwise stated, all oxygen or moisture sensitive reactions were conducted in flame-dried glassware under an atmosphere of nitrogen. All solvents were purified and dried according to standard methods prior to use. All reagents were purchased from commercial sources and were used without further purification.

Chromatographic purification of products was accomplished using forced-flow chromatography on 200-300 mesh silica gel. The TLC glass plates were performed on 0.20 mm or 1.0 mm (preparative) silica gel GF254 plates. Visualization was performed using ultraviolet light (254 nm), potassium permanganate ($KMnO_4$) in EtOH.

^1H and ^{13}C NMR spectra were acquired on Bruker Avance III-500, 600, or 800 spectrometers (Bruker Corp., Germany), and TMS was used as internal standard. Chemical shifts were given in parts per million (ppm) with reference to residual solvent signals [^1H NMR: CD_3COCD_3 (2.05); ^{13}C NMR: CD_3COCD_3 (206.26, 29.84)]. Peak multiplicities were recorded as follows: s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet or unresolved, brs = broad singlet. High resolution mass spectral (HRMS) data were obtained at the mass spectrometry service operated on a Shimadzu UPLC-IT-TOF (Shimadzu Corp., Japan) equipment with electrospray ionization (ESI) and were reported as m/z. Melting points were measured on a WRX-5Amelting point apparatus.

2. Synthetic Procedures and Characterization Data

2.1 Syntheses of compounds 10-13



To a solution of leucosceptroid A (10.0 mg, 0.024 mmol, 1.0 equiv) in 1,4-dioxane (2 mL) was added selenium dioxide (8.0 mg, 0.072 mmol, 3.0 equiv) at room temperature. The resulting solution was stirred at 40 °C for 12 h. Upon complete consumption of the starting material, the reaction mixture was cooled to room temperature and concentrated *in vacuo*. The crude residue was purified by reversed-phase semi-preparative HPLC using acetonitrile/water (75/25, *v*/*v*) as eluent (flow rate: 3.0 mL/min; column: Aglient SB-C18, 10 × 250 mm; detection: 238 nm) to give compounds **10** (3.0 mg, 24.6% yield, retention times: 17.3 min) as a pale yellow needle crystal, **11** (1.3 mg, 10.3% yield, retention times: 18.8 min) as a pale yellow oil, **12** (1.3 mg, 12.6% yield, retention times: 15.2 min) as a colorless oil, and **13** (1.3 mg, 12.1% yield, retention times: 9.1 min) as a colorless oil.

Compound 10

^{1}H NMR (600 MHz, CD_3COCD_3) δ 9.78 (s, 1H, H-1), 7.21 (d, J = 1.9 Hz, 1H, H-20), 6.12 (d, J = 1.9 Hz, 1H, H-19), 5.74 (s, 1H, H-4), 4.21 (s, 1H, 11-OH), 2.93 (s, H-13, 1H), 2.60 – 2.49

(m, 2H, H-16), 2.46 (s, 3H, Me-21), 2.29 (m, 1H, H-10), 2.19 (m, 1H, H-7), 2.10 (m, 1H, H-6), 2.03 (m, 1H, H-9a), 1.95 (m, 1H, H-15a), 1.92 (m, 1H, H-8a), 1.90 (m, 1H, H-15b), 1.80 (s, 3H, Me-25), 1.78 (m, 1H, H-8b), 1.51 (m, 1H, H-9b), 1.35 (s, 3H, Me-24), 0.91 (d, 3H, J = 6.8 Hz, Me-22), 0.88 (d, 3H, J = 7.3 Hz, Me-23);

^{13}C NMR (151 MHz, CD_3COCD_3) δ 210.7 (s, C-12), 188.9 (d, C-1), 176.4 (s, C-3), 151.4 (s, C-17), 140.8 (d, C-20), 126.0 (s, C-2), 114.3 (s, C-18), 113.6 (d, C-19), 97.2 (s, C-5), 88.8 (s, C-14), 85.6 (s, C-11), 85.2 (d, C-4), 70.9 (d, C-13), 50.6 (d, C-7), 46.7 (d, C-10), 42.4 (d, C-6), 42.3 (t, C-15), 31.6 (t, C-9), 30.7 (t, C-8), 23.5 (q, C-24), 21.6 (t, C-16), 16.6 (q, C-23), 15.2 (q, C-22), 13.6 (q, C-21), 9.7 (q, C-25);

HRMS (ESI): *m/z* calcd for $C_{25}H_{32}O_6SeNa$ $[M+Na]^+$ 531.1262, found 531.1260;

Melting point 154 – 156 °C.

Compound 11

^{1}H NMR (600 MHz, CD_3COCD_3) δ 9.79 (s, 1H, H-1), 6.01 (s, 1H, H-19), 5.73 (s, 1H, H-4), 5.40 (t, J = 7.6 Hz, 1H, H-16), 4.25 (s, 1H, 11-OH), 2.99 (s, 1H, H-13), 2.84 (m, 1H, H-15a), 2.71 (dd, J = 15.1, 7.3 Hz, 1H, H-15b), 2.45 (s, 3H, Me-21), 2.26 (m, 1H, H-10), 2.23 (m, 1H, H-7), 2.16 (s, 3H, Me-25), 1.97 (m, 1H, H-9a), 1.96 (m, 1H, H-6), 1.94 (m, 1H, H-8a), 1.84 (m, 1H, H-8b), 1.51 (m, 1H, H-9b), 1.39 (s, 3H, Me-24), 0.91 (d, J = 6.8 Hz, 3H, Me-22), 0.84 (d, J = 7.3 Hz, 3H, Me-23);

^{13}C NMR (151 MHz, CD_3COCD_3) δ 211.0 (s, C-12), 189.3 (d, C-1), 175.5 (s, C-3), 169.3 (s, C-20), 156.1 (s, C-18), 153.0 (s, C-17), 126.0 (s, C-2), 116.9 (d, C-19), 108.3 (d, C-16), 97.6 (s, C-5), 88.3 (s, C-14), 85.8 (s, C-11), 84.9 (d, C-3), 69.4 (d, C-13), 51.4 (d, C-7), 47.1 (d, C-10), 41.5 (d, C-6), 40.2 (t, C-15), 31.8 (t, C-9), 30.5 (t, C-8), 24.3 (q, C-24), 16.4 (q, C-23), 15.8 (q, C-22), 13.7 (q, C-21), 11.8 (q, C-25);

HRMS (ESI): *m/z* calcd for $C_{25}H_{30}O_7SeNa$ $[M+Na]^+$ 545.1054, found 545.1052.

Compound 12

^{1}H NMR (800 MHz, CD_3COCD_3) δ 9.53 (s, 1H, H-1), 7.29 (s, 1H, H-20), 6.88 (d, J = 8.4 Hz, 1H, H-3), 6.18 (s, 1H, H-19), 5.00 (d, J = 8.5 Hz, 1H, H-4), 4.29 (s, 1H, 5-OH), 4.28 (s, 1H, 11-OH), 2.87 (s, 1H, H-13), 2.77 (m, 1H, H-16a), 2.73 (m, 1H, H-16b), 2.31 (m, 1H, H-10), 2.11 (m, 1H, H-7), 2.07 (overlap, 1H, H-15a), 1.97 (m, 1H, H-15b), 1.95 (s, 3H, Me-25), 1.87 (m, 1H, H-6), 1.85 (s, 3H, Me-21), 1.74 – 1.72 (m, 2H, H-8), 1.45 – 1.42 (m, 2H, H-9), 1.28 (s, 3H, Me-24), 0.96 (d, J = 6.8 Hz, 3H, Me-22), 0.85 (d, J = 7.4 Hz, 3H, Me-23);

^{13}C NMR (201 MHz, CD_3COCD_3) δ 212.1 (s, C-12), 195.8 (d, C-1), 151.7 (s, C-17), 149.0 (d, C-3), 141.7 (s, C-2), 140.8 (d, C-20), 114.3 (s, C-18), 113.7 (d, C-19), 85.9 (s, C-5), 85.8 (s, C-14), 85.6 (s, C-11), 76.7 (d, C-4), 72.2 (d, C-13), 50.4 (d, C-7), 46.3 (d, C-10), 43.6 (t, C-15), 42.3 (d, C-6), 31.1 (t, C-9), 30.3 (t, C-8), 23.6 (q, C-24), 21.7 (t, C-16), 17.2 (q, C-23), 14.3 (q, C-22), 10.3 (q, C-21), 9.9 (q, C-25);

HRMS (ESI): *m/z* calcd for $C_{26}H_{34}O_6Na$ $[M+Na]^+$ 453.2253, found 453.2246.

Compound 13

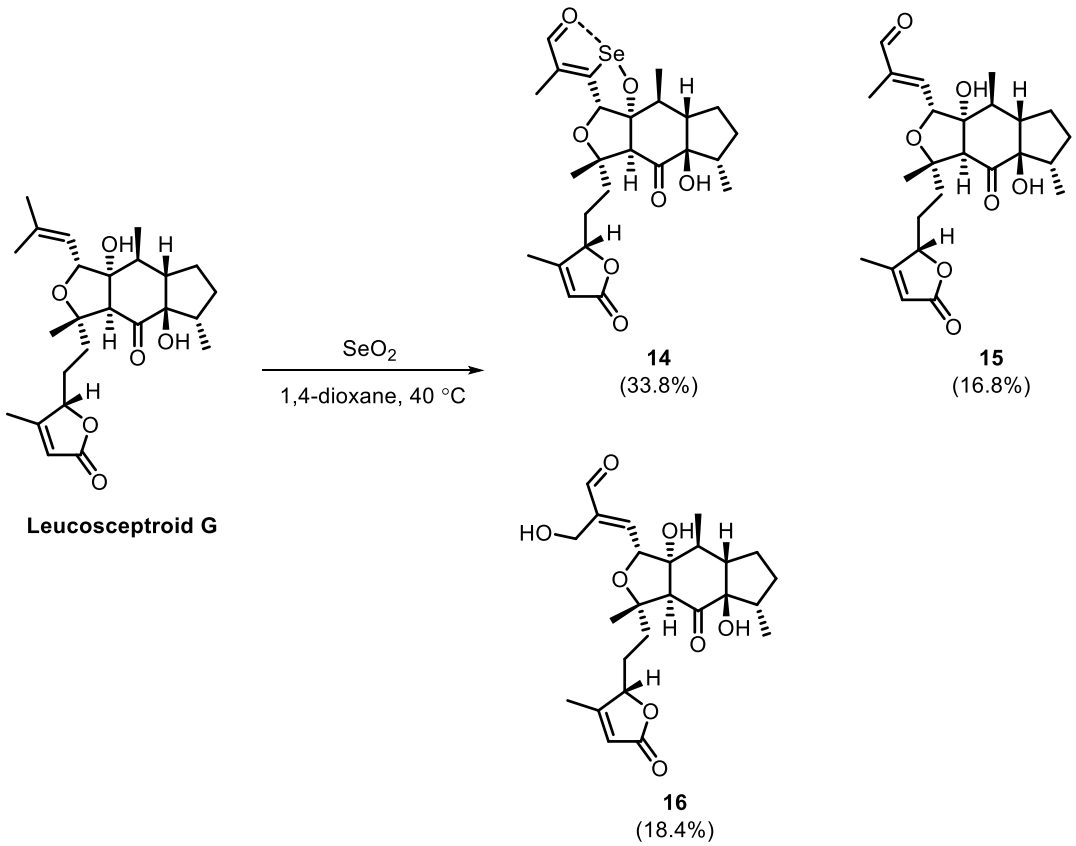
^{1}H NMR (500 MHz, CD_3COCD_3) δ 9.55 (s, 1H, H-1), 7.29 (d, J = 1.8 Hz, 1H, H-20), 6.95 (d, J = 7.7 Hz, 1H, H-3), 6.18 (d, J = 1.8 Hz, 1H, H-19), 5.25 (d, J = 7.7 Hz, 1H, H-4), 4.51 (s, 1H, 5-OH), 4.44 (dd, J = 12.1, 5.2 Hz, 1H, H-21a), 4.38 (dd, J = 12.1, 6.0 Hz, 1H, H-21b), 4.22 (s, 1H, 11-OH), 3.99 (t, J = 5.7 Hz, 1H, 21-OH), 2.86 (s, 1H, H-13), 2.77 (m, 1H, H-16a), 2.72 (m, 1H, H-16b), 2.30 (dd, J = 10.8, 4.9 Hz, 1H, H-10), 2.21 (m, 1H, H-7), 2.08 (m, 2H, H-15), 2.06 (m, 1H, H-9a), 2.05 (m, 1H, H-8a), 1.95 (s, 3H, Me-25), 1.90 (m, 1H, H-6), 1.74 (m, 1H, H-8b), 1.44 (m, 1H, H-9b), 1.29 (s, 3H, Me-24), 1.05 (d, J = 6.8 Hz, 3H, Me-22), 0.85 (d, J = 7.3 Hz, 3H, Me-23);

^{13}C NMR (126 MHz, CD_3COCD_3) δ 212.3 (s, C-12), 195.3 (d, C-1), 151.7 (s, C-17), 150.8 (d, C-3), 144.8 (s, C-2), 140.8 (d, C-20), 114.3 (s, C-18), 113.7 (d, C-19), 86.0 (s, C-5), 85.9 (s, C-11), 85.7 (s, C-14), 77.2 (d, C-4), 72.3 (d, C-13), 55.0 (t, C-21), 50.1 (d, C-7), 46.5 (d, C-10),

43.6 (t, C-15), 42.1 (d, C-6), 31.1 (t, C-9), 30.7 (t, C-8), 23.5 (q, C-24), 21.8 (t, C-16), 17.3 (q, C-23), 14.6 (q, C-22), 9.9 (q, C-25);

HRMS (ESI): *m/z* calcd for $C_{26}H_{34}O_6Na$ $[M+Na]^+$ 469.2202, found 469.2207.

2.2 Syntheses of compounds 14-16



To a solution of leucosceptroid G (10.0 mg, 0.023 mmol, 1.0 equiv) in 1,4-dioxane (2 mL) was added selenium dioxide (7.7 mg, 0.069 mmol, 3.0 equiv) at room temperature. The resulting solution was stirred at 40 °C for 12 h. Upon complete consumption of the starting material, the reaction mixture was cooled to room temperature and concentrated *in vacuo*. The crude residue was purified by reversed-phase semi-preparative HPLC using acetonitrile/water (60/40, *v*/*v*) as eluent (flow rate: 3.0 mL/min; column: Aglient SB-C18, 10 × 250 mm; detection: 238 nm) to give compounds **14** (4.1 mg, 33.8% yield, retention times: 23.6 min) as a pale yellow oil, **15** (1.7 mg, 16.8% yield, retention times: 11.5 min) as a colorless oil, and **16** (2.0 mg, 18.4% yield, retention times: 5.7 min) as a colorless oil.

Compound 14

^{1}H NMR (600 MHz, CD_3COCD_3) δ 9.77 (s, 1H, H-1), 5.78 (s, 1H, H-19), 5.69 (s, 1H, H-4), 4.89 (s, 1H, H-17), 4.23 (s, 1H, 11-OH), 2.91 (s, 1H, H-13), 2.42 (s, 3H, Me-21), 2.28 (m, 1H, H-10), 2.18 (m, 1H, H-7), 2.08 (m, 1H, H-8a), 2.04 (m, 1H, H-16a), 2.01 (m, 1H, H-9a), 1.97 (s, 3H, Me-25), 1.93 (m, 1H, H-6), 1.81 (m, 1H, H-8b), 1.80 (m, 1H, H-15a), 1.67 (m, 1H H-15b), 1.54 (m, 1H, H-16b), 1.52 (m, 1H, H-9b), 1.31 (s, 3H, Me-24), 0.90 (d, *J* = 6.7 Hz, 3H, Me-22), 0.88 (d, *J* = 7.2 Hz, 3H, Me-23);

^{13}C NMR (151 MHz, CD_3COCD_3) δ 211.2 (s, C-12), 189.2 (d, C-1), 175.8 (s, C-3), 173.1 (s, C-20), 170.1 (s, C-18), 125.8 (s, C-2), 117.3 (d, C-19), 97.2 (s, C-5), 88.5 (s, C-14), 85.7 (s, C-11), 84.9 (d, C-17), 84.6 (d, C-4), 70.3 (d, C-13), 50.9 (d, C-7), 46.9 (d, C-10), 41.8 (d, C-6), 37.9 (t, C-15), 31.7 (t, C-9), 30.6 (t, C-8), 27.5 (t, C-16), 23.8 (q, C-24), 16.7 (q, C-23), 15.5 (q, C-22), 13.8 (q, C-25), 13.6 (q, C-21);

HRMS (ESI): *m/z* calcd for $C_{25}H_{32}O_7SeNa$ $[M+Na]^+$ 547.1211, found 547.1209.

Compound 15

^{1}H NMR (600 MHz, CD_3COCD_3) δ 9.52 (s, 1H, H-1), 6.85 (dd, *J* = 8.5, 1.5 Hz, 1H, H-19), 5.83 (s, 1H, H-3), 5.03 (brs, 1H, H-17), 4.97 (d, *J* = 8.6 Hz, 1H, H-4), 4.31 (s, 1H, 5-OH), 4.26 (s, 1H, 11-OH), 2.80 (s, 1H, H-13), 2.30 (m, 1H, H-10), 2.23 (m, 1H, H-16a), 2.15 (overlap, 1H, H-9a), 2.15 (overlap, 1H, H-8a), 2.12 (s, 3H, Me-25), 2.09 (m, 1H, H-7), 1.87 (m, 1H, H-6), 1.86 – 1.84 (m, 2H, H-15), 1.83 (s, 3H, Me-21), 1.72 (m, 1H, H-8b), 1.68 (m, 1H, H-16b), 1.42 (m, 1H, H-9b), 1.24 (s, 3H, Me-24), 0.96 (d, *J* = 6.7 Hz, 3H, Me-22), 0.84 (d, *J* = 7.4 Hz, 3H, Me-23);

^{13}C NMR (151 MHz, CD_3COCD_3) δ 212.1 (s, C-12), 195.8 (s, C-1), 173.3 (s, C-20), 170.4 (s, C-18), 148.9 (d, C-3), 141.7 (s, C-2), 117.3 (d, C-19), 85.7 (s, C-14), 85.7 (s, C-5), 85.6 (s, C-11), 85.0 (d, C-17), 76.5 (d, C-4), 72.2 (d, C-13), 50.3 (d, C-7), 46.2 (d, C-10), 42.3 (d, C-6), 39.2 (t, C-15), 31.0 (t, C-9), 30.6 (t, C-8), 27.6 (t, C-16), 23.7 (q, C-24), 17.2 (q, C-23), 14.2 (q, C-22), 13.9 (q, C-25), 10.3 (q, C-21);

HRMS (ESI): *m/z* calcd for $C_{25}H_{34}O_7Na$ $[M+Na]^+$ 469.2202, found 469.2204.

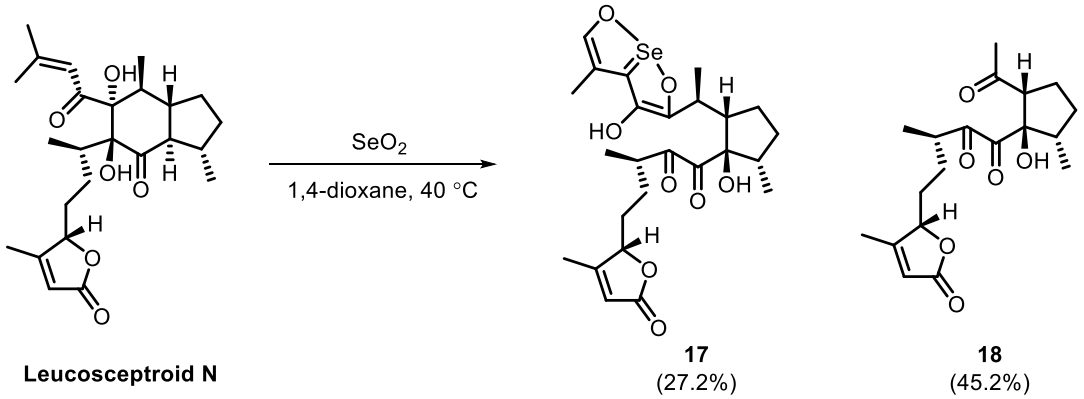
Compound 16

^{1}H NMR (600 MHz, CD_3COCD_3) δ 9.53 (s, 1H, H-1), 6.93 (d, J = 7.8 Hz, 1H, H-3), 5.83 (t, J = 1.6 Hz, 1H, H-19), 5.22 (d, J = 7.8 Hz, 1H, H-4), 5.03 (dd, J = 7.9, 3.6 Hz, 1H, H-17), 4.51 (s, 1H, 5-OH), 4.41 (dd, J = 12.2, 5.2 Hz, 1H, H-21a), 4.36 (dd, J = 12.2, 6.1 Hz, 1H, H-21b), 4.23 (s, 1H, 11-OH), 3.98 (t, J = 5.7 Hz, 1H, 21-OH), 2.80 (s, 1H, H-13), 2.30 (m, 1H, H-10), 2.27 (m, 1H, H-16a), 2.21 (m, 1H, H-7), 2.12 (s, 3H, Me-25), 2.09 (m, 1H, H-9a), 2.07 (m, 1H, H-8a), 1.88 (m, 1H, H-6), 1.86 – 1.83 (m, 2H, H-15), 1.73 (m, 1H, H-8b), 1.69 (m, 1H, H-16b), 1.43 (m, 1H, H-9b), 1.25 (s, 3H, Me-24), 1.03 (d, J = 7.0 Hz, 3H, Me-22), 0.84 (d, J = 7.5 Hz, 3H, Me-23);

^{13}C NMR (151 MHz, CD_3COCD_3) δ 212.3 (s, C-12), 195.3 (d, C-1), 173.3 (s, C-20), 170.4 (s, C-18), 150.6 (d, C-3), 144.7 (s, C-2), 117.3 (d, C-19), 85.8 (s, C-14), 85.7 (s, C-5), 85.6 (s, C-11), 85.0 (d, C-17), 76.9 (d, C-4), 72.2 (d, C-13), 54.9 (t, C-21), 49.9 (d, C-7), 46.4 (d, C-10), 42.0 (d, C-6), 39.2 (t, C-15), 31.0 (t, C-9), 30.6 (t, C-8), 27.6 (t, C-16), 23.7 (q, C-24), 17.3 (q, C-23), 14.4 (q, C-22), 13.9 (q, C-25);

HRMS (ESI): *m/z* calcd for $C_{25}H_{34}O_8Na$ $[M+Na]^+$ 485.2151, found 485.2149.

2.3 Syntheses of compounds 17 and 18



Leucosceptroid N

17
(27.2%)

18
(45.2%)

To a solution of leucosceptroid N (10.0 mg, 0.023 mmol, 1.0 equiv) in 1,4-dioxane (2 mL) was added selenium dioxide (7.7 mg, 0.069 mmol, 3.0 equiv) at room temperature. The resulting solution was stirred at 40 °C for 12 h. Upon complete consumption of the starting material, the reaction mixture was cooled to room temperature and concentrated *in vacuo*. The crude residue was purified by reversed-phase semi-preparative HPLC using acetonitrile/water (80/20, *v*/*v*) as eluent (flow rate: 3.0 mL/min; column: Aglient SB-C18, 10 × 250 mm; detection: 238 nm) to give compounds **17** (3.4 mg, 27.2% yield, retention times: 10.4 min) as a yellow needle crystal and **18** (3.7 mg, 45.2% yield, retention times: 18.1 min) as a colorless oil.

Compound 17

^{1}H NMR (800 MHz, CD_3COCD_3) δ 8.57 (s, 1H, H-1), 7.01 (s, 1H, 4-OH), 5.82 (s, 1H, H-19), 4.87 (brs, 1H, H-17), 3.26 (m, 1H, H-6), 3.12 (q, J = 7.0 Hz, 1H, H-14), 3.07 (t, J = 7.7 Hz, 1H, H-11), 2.75 (m, 1H, H-7), 2.45 (s, 3H, Me-21), 2.08 (s, 3H, Me-25), 2.00 (m, 1H, H-8a), 1.92 (m, 1H, H-10), 1.83 (m, 1H, H-9a), 1.81 (m, 1H, H-16a),1.65 (m, 1H, H-8b), 1.49 (m, 1H, H-15a), 1.38 (m, 1H, H-9b), 1.25 (m, 1H, H-15b), 1.19 (m, 1H, H-16b), 1.16 (d, J = 6.8 Hz, 3H, Me-22), 1.00 (d, J = 7.2 Hz, 3H, Me-24), 0.93 (d, J = 6.7 Hz, 3H, Me-23);

^{13}C NMR (201 MHz, CD_3COCD_3) δ 202.1 (s, C-13), 200.2 (s, C-12), 181.4 (s, C-5), 173.3 (s, C-20), 170.3 (d, C-1), 170.2 (s, C-18), 166.9 (s, C-3), 136.5 (s, C-4), 117.3 (d, C-19), 114.7 (s, C-2), 84.9 (d, C-17), 56.2 (d, C-11), 48.1 (d, C-7), 42.3 (d, C-10), 41.0 (d, C-6), 39.1 (d, C-14), 35.0 (t, C-9), 30.7 (t, C-8), 30.4 (t, C-16), 27.2 (t, C-15), 20.5 (q, C-23), 17.3 (q, C-22), 16.9 (q, C-24), 13.9 (q, C-25), 12.1 (q, C-21);

HRMS (ESI): *m/z* calcd for $C_{25}H_{32}O_7SeNa$ $[M+Na]^+$ 547.1211, found 547.1210;

Melting point 72 – 74 °C.

Compound 18

^{1}H NMR (600 MHz, CD_3COCD_3) δ 5.82 (s, 1H, H-19), 4.94 (brs, 1H, H-17), 3.49 (t, J = 8.1 Hz, 1H, H-11), 3.36 (m, 1H, H-14), 3.32 (m, 1H, H-7), 2.14 (overlap, 1H, H-10), 2.13 (s, 3H, Me-22), 2.10 (s, 3H, Me-25), 2.09 (m, 1H, H-8a), 1.98 (1H, m, H-16a), 1.89 (m, 1H, H-9a),

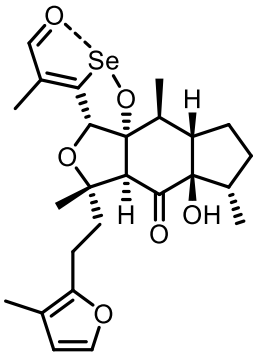
1.85 (m, 1H, H-8b), 1.73 (m, 1H, H-15a), 1.49 (m, 1H, H-16b) 1.42 (m, 1H, H-15b), 1.36 (m, 1H, H-9b), 1.09 (d, J = 7.1 Hz, 3H, Me-24), 1.01 (d, J = 6.7 Hz, 3H, Me-23);

^{13}C NMR (151 MHz, CD_3COCD_3) δ 208.7 (s, C-6), 203.4 (s, C-13), 201.5 (s, C-12), 173.2 (s, C-20), 170.2 (s, C-18), 117.3 (d, C-19), 84.7 (d, C-17), 57.1 (d, C-7), 53.6 (d, C-11), 39.5 (d, C-10), 39.3 (d, C-14), 34.6 (t, C-9), 30.0 (t, C-16), 28.9 (t, C-8), 28.5 (q, C-22), 27.4 (t, C-15), 19.9 (q, C-23), 16.3 (q, C-24), 13.8 (q, C-25);

HRMS (ESI): *m/z* calcd for $C_{19}H_{26}O_5Na$ $[M+Na]^+$ 357.1678, found 357.1672.

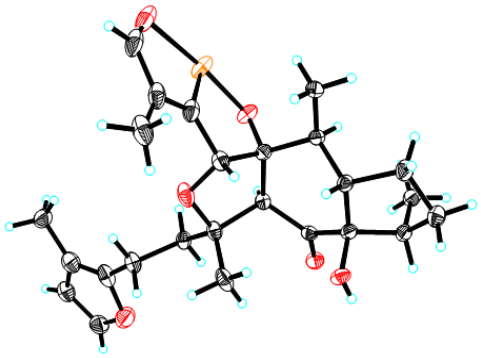
3. X-ray Crystallographic Data

3.1 X-ray crystallographic data of compound 10



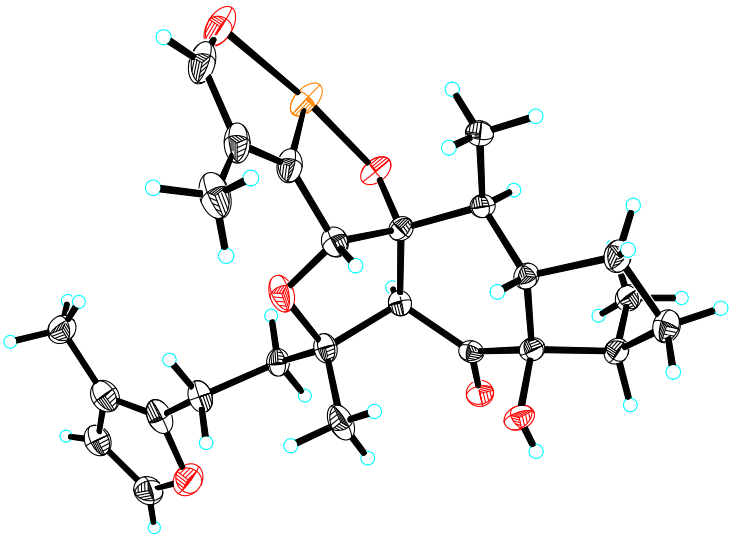
10

≡



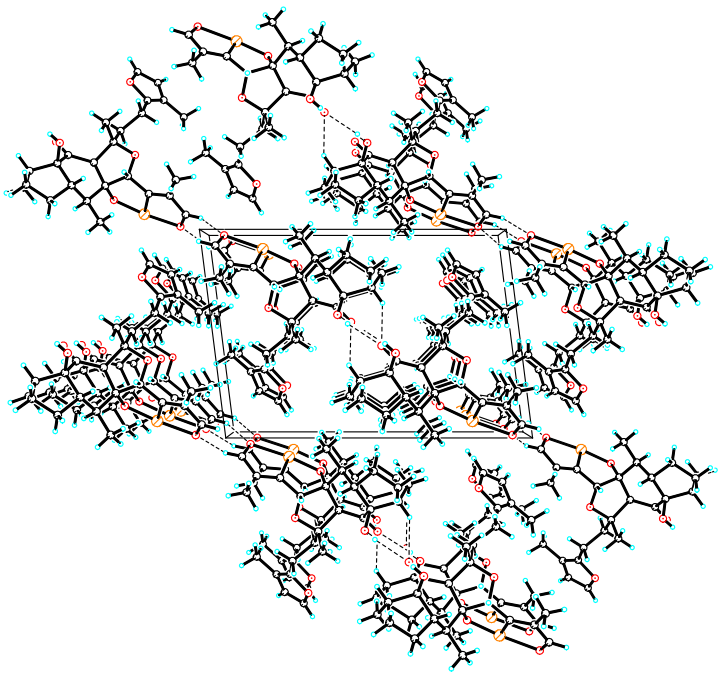
10 (X-ray)

Crystal data for **10**: $C_{25}H_{32}O_6Se$, M = 507.46, a = 11.3051(3) Å, b = 6.2777(2) Å, c = 16.4774(4) Å, α = 90°, β = 97.2010(10)°, γ = 90°, V = 1160.18(6) Å^3, T = 100.(2) K, space group $P1211$, Z = 2, μ(Cu Kα) = 2.516 mm^{-1}, 21368 reflections measured, 4464 independent reflections (R_{int} = 0.0321). The final R_1 values were 0.0398 ($I > 2\sigma(I)$). The final $wR(F^2)$ values were 0.1087 ($I > 2\sigma(I)$). The final R_1 values were 0.0404 (all data). The final $wR(F^2)$ values were 0.1094 (all data). The goodness of fit on F^2 was 1.050. Flack parameter = 0.031(6).



View of a molecule of **10** with the atom-labelling scheme.

Displacement ellipsoids are drawn at the 30% probability level.



View of the pack drawing of **10**.

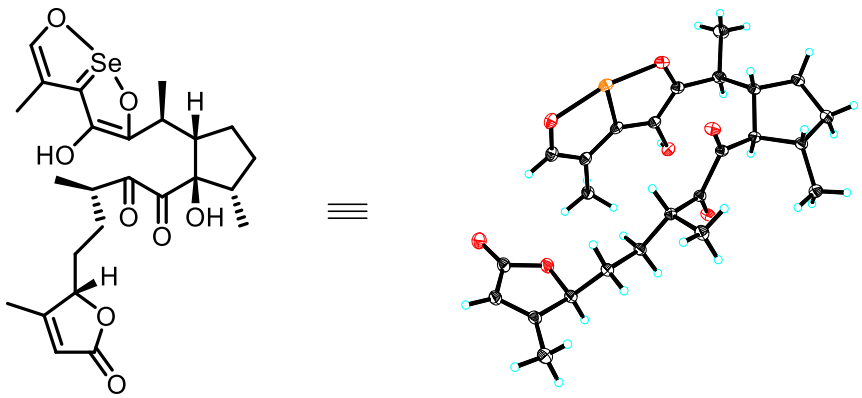
Hydrogen-bonds are shown as dashed lines.

Table S1. **Crystal data and structure refinement for 10.**

Identification code	global	
Empirical formula	C25 H32 O6 Se	
Formula weight	507.46	
Temperature	100(2) K	
Wavelength	1.54178 Å	
Crystal system	Monoclinic	
Space group	P 1 21 1	
Unit cell dimensions	a = 11.3051(3) Å	α= 90°.
	b = 6.2777(2) Å	β= 97.2010(10)°.
	c = 16.4774(4) Å	γ = 90°.
Volume	1160.18(6) $Å^3$	
Z	2	
Density (calculated)	1.453 Mg/m^3	
Absorption coefficient	2.516 mm^{-1}	
F(000)	528	
Crystal size	0.480 x 0.050 x 0.030 mm^3	

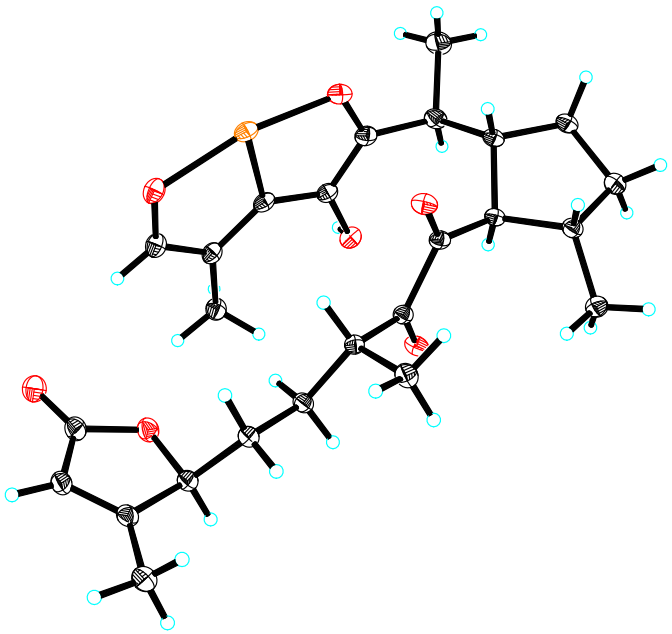
Theta range for data collection	2.70 to 72.29°.
Index ranges	-13<=h<=13, -7<=k<=7, -20<=l<=20
Reflections collected	21368
Independent reflections	4464 [R(int) = 0.0321]
Completeness to theta = 72.29°	99.9 %
Absorption correction	Semi-empirical from equivalents
Max. and min. transmission	0.93 and 0.34
Refinement method	Full-matrix least-squares on F^2
Data / restraints / parameters	4464 / 1 / 296
Goodness-of-fit on F^2	1.050
Final R indices [I>2sigma(I)]	R1 = 0.0398, wR2 = 0.1087
R indices (all data)	R1 = 0.0404, wR2 = 0.1094
Absolute structure parameter	0.031(6)
Largest diff. peak and hole	1.177 and -0.305 e.Å^{-3}

3.2 X-ray crystallographic data of compound 17



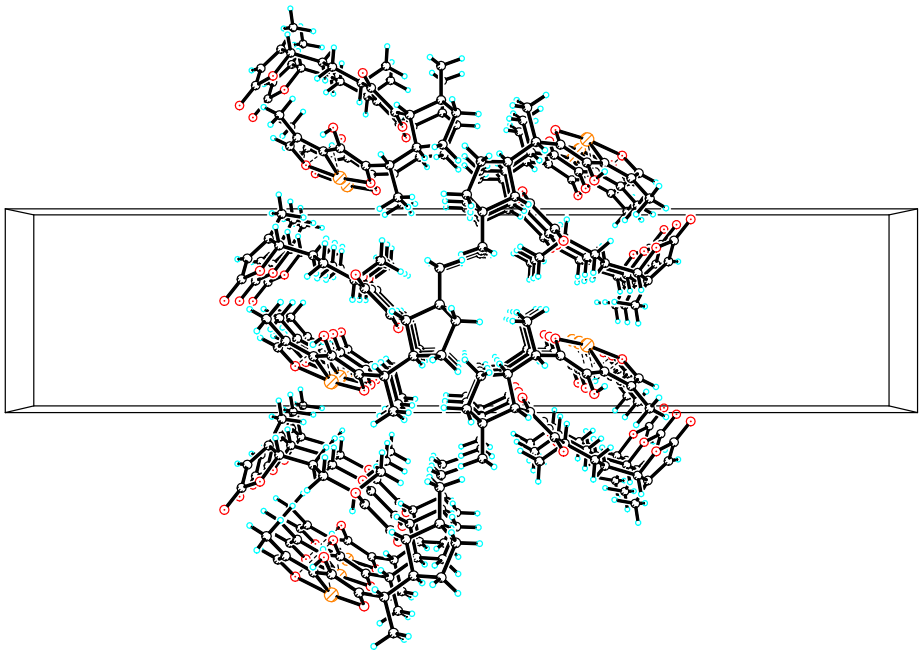
17 ≡ **17** (X-ray)

Crystal data for **17**: $C_{25}H_{32}O_7Se$, M = 523.46, a = 6.4438(2) Å, b = 9.1435(2) Å, c = 40.8405(11) Å, α = 90°, β = 90°, γ = 90°, V = 2406.28(11) Å^3, T = 100.(2) K, space group $P212121$, Z = 4, μ(Cu Kα) = 2.476 mm^{-1}, 21277 reflections measured, 4724 independent reflections (R_{int} = 0.0234). The final R_1 values were 0.0190 ($I > 2\sigma(I)$). The final $wR(F^2)$ values were 0.0514 ($I > 2\sigma(I)$). The final R_1 values were 0.0191 (all data). The final $wR(F^2)$ values were 0.0515 (all data). The goodness of fit on F^2 was 1.075. Flack parameter = 0.039(4).



View of a molecule of **17** with the atom-labelling scheme.

Displacement ellipsoids are drawn at the 30% probability level.



View of the pack drawing of **17**.

Hydrogen-bonds are shown as dashed lines.

Table S2. **Crystal data and structure refinement for 17.**

Identification code	global	
Empirical formula	C25 H32 O7 Se	
Formula weight	523.46	
Temperature	100(2) K	
Wavelength	1.54178 Å	
Crystal system	Orthorhombic	
Space group	$P2_12_12_1$	
Unit cell dimensions	a = 6.4438(2) Å	α= 90°.
	b = 9.1435(2) Å	β= 90°.
	c = 40.8405(11) Å	γ = 90°.
Volume	2406.28(11) $Å^3$	
Z	4	
Density (calculated)	1.445 Mg/m^3	
Absorption coefficient	2.476 mm^{-1}	
F(000)	1088	
Crystal size	0.350 x 0.120 x 0.070 mm^3	
Theta range for data collection	2.16 to 72.37°.	
Index ranges	-7<=h<=7, -11<=k<=10, -50<=l<=50	
Reflections collected	21277	
Independent reflections	4724 [R(int) = 0.0234]	
Completeness to theta = 72.37°	99.9 %	
Absorption correction	Semi-empirical from equivalents	
Max. and min. transmission	0.85 and 0.51	
Refinement method	Full-matrix least-squares on F^2	
Data / restraints / parameters	4724 / 0 / 305	
Goodness-of-fit on F^2	1.075	
Final R indices [I>2sigma(I)]	R1 = 0.0190, wR2 = 0.0514	
R indices (all data)	R1 = 0.0191, wR2 = 0.0515	
Absolute structure parameter	0.039(4)	
Largest diff. peak and hole	0.257 and -0.222 e.$Å^{-3}$	

4. Immunosuppressive Activity Analysis

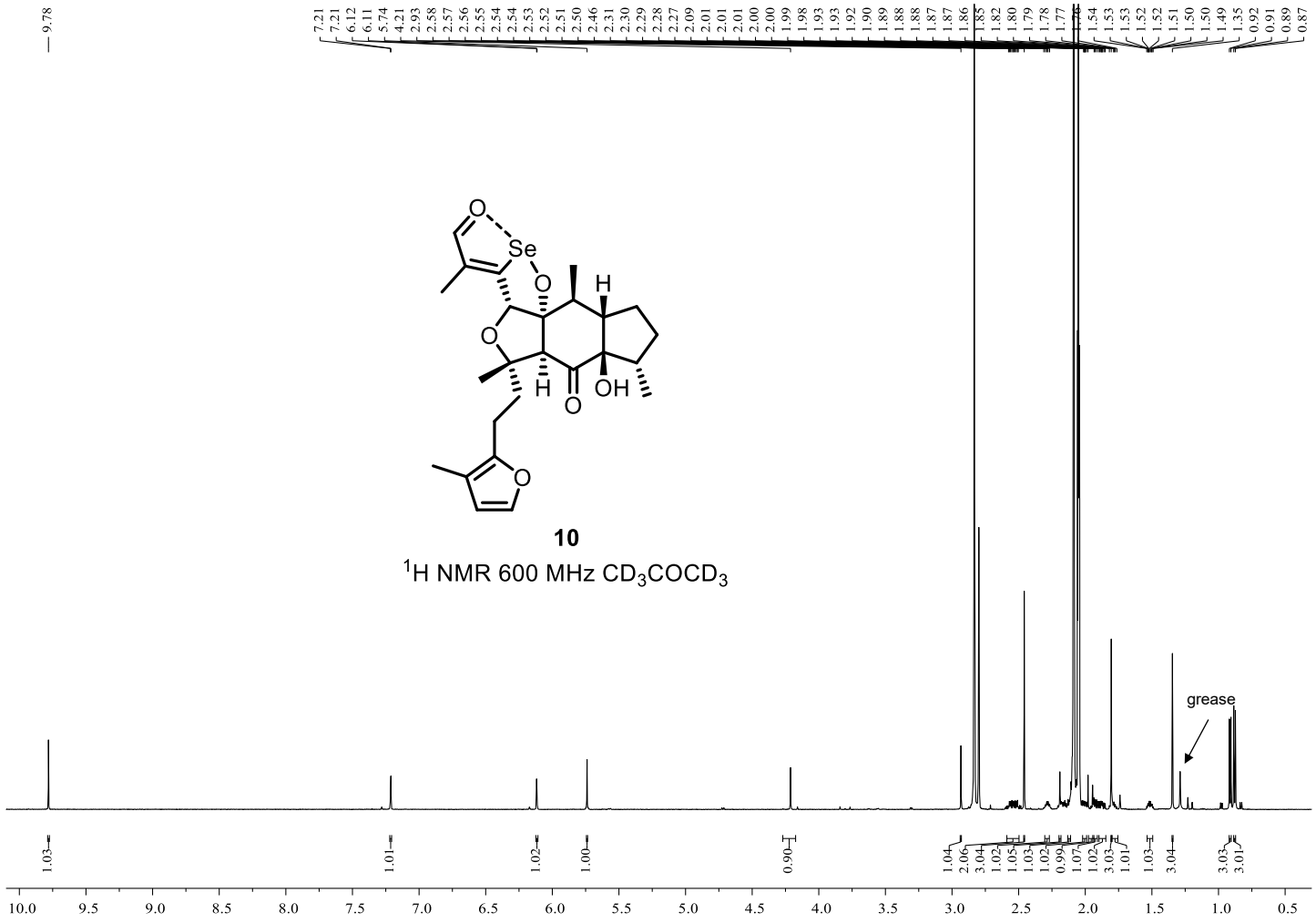
Splenocytes were purified from the spleens of female C57BL/6 mice (6–8 weeks old, sacrificed by cervical dislocation) and cultured in RPMI 1640 medium containing 10% FBS, penicillin (100 U/mL), and streptomycin (100 μg/mL) at 37 °C with 5% CO_2. T cells (4×10^5 cells/well) were cultured in 96-well plates in the presence of anti-CD3 mAb (5 μg/mL) and anti-CD4 mAb (2 μg/mL) for 48 hours with the indicated concentrations (40, 20, 10, 5, and 2.5 μM) of each tested compound. Cyclosporin A (CsA) was used as the positive control. Absorbance values at 450 nm were measured using a micro-plate reader (Molecular Devices). Inhibitory rates were calculated according to the following formula: inhibitory rate = [1 – (Asample – Ablank)/(Asolvent – Ablank)] × 100%. IC_{50} values were analyzed by log(inhibitor) *vs.* normalized response – Variable slope using Prism 8.0 software.

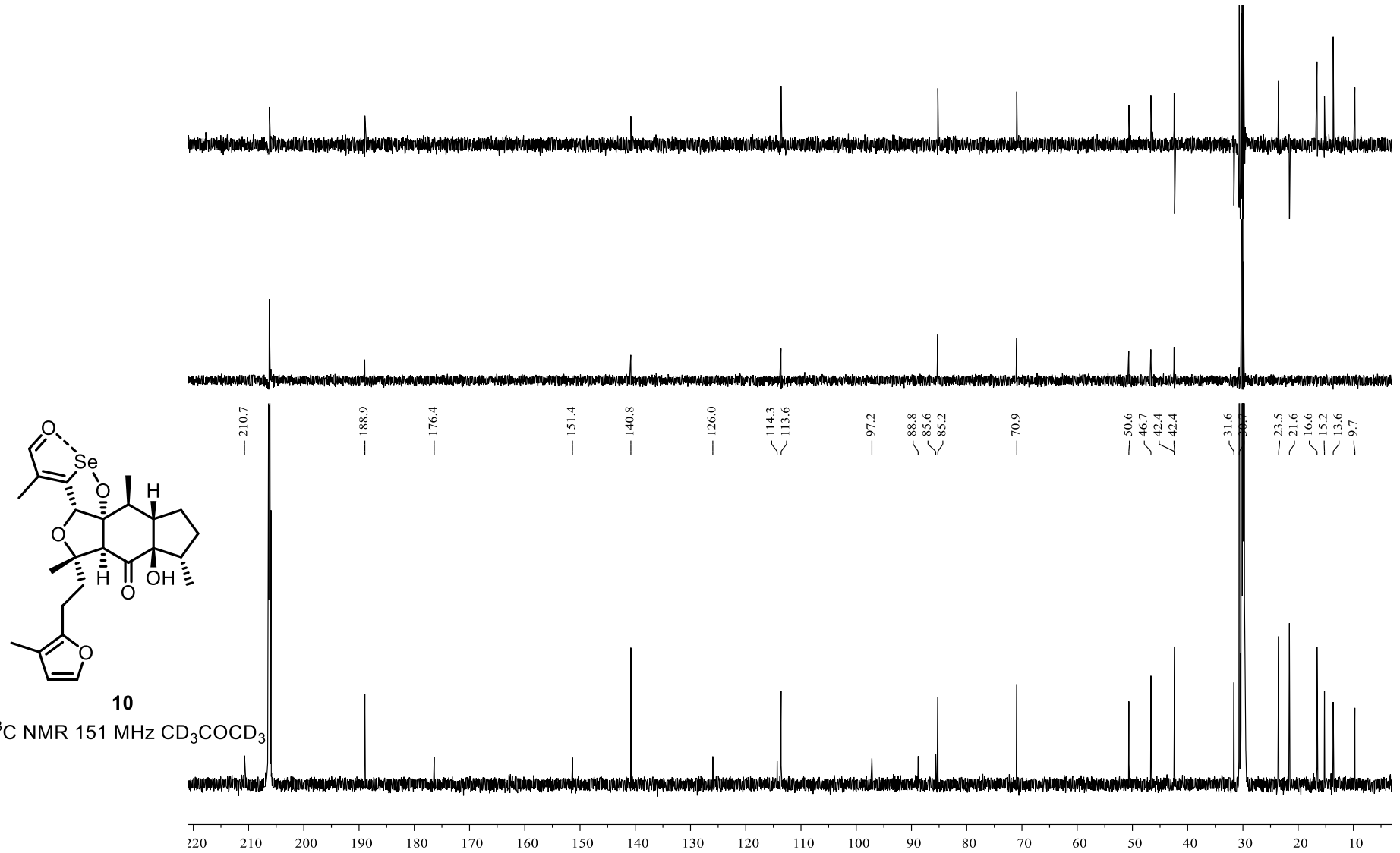
***Table S3*. Inhibitory Effects of Se-containing Compounds and Leucosceptroids on IFN-γ Secretion of Mouse Splenocytes Induced by Anti-CD3/CD4 Monoclonal Antibodies.**

Compound	Inhibition rate (%)[a]	IC_{50} (μM)
10	55.63 ± 5.86	5.29
11	77.27 ± 3.39	17.60
14	< 10	-
17	28.09 ± 5.41	-
Leucosceptroid A	17.69 ± 6.58	-
Leucosceptroid G	16.63 ± 4.94	-
Leucosceptroid N	54.32 ± 6.05	9.94
CsA[b]	67.31 ± 1.38	2.45 nM

[a]Inhibitory rate was performed at the concentration of 20 μM. [b]Cyclosporine A (CsA) was coassayed as a positive control of T cells at the test concentration of 4 nM.

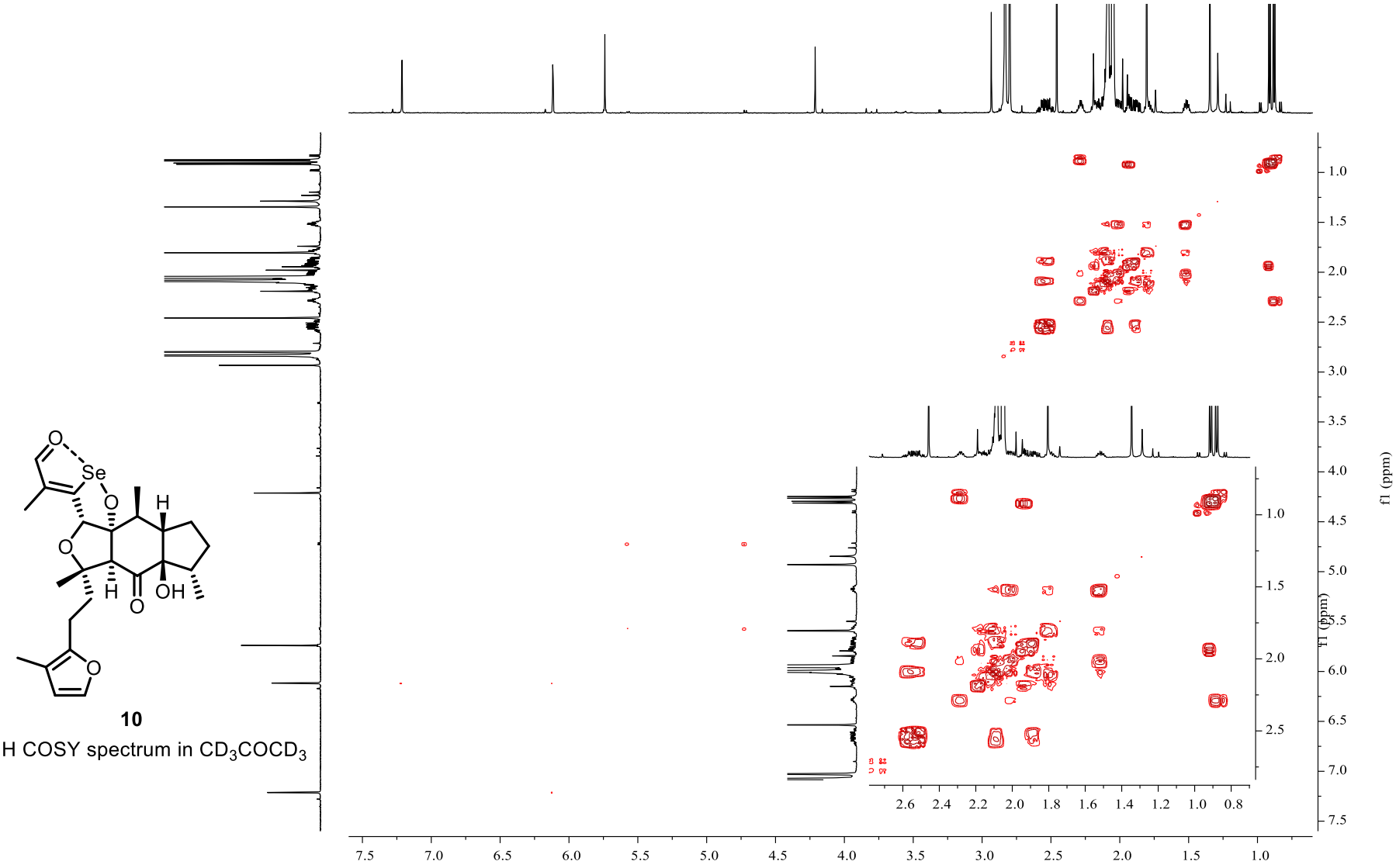
5. Copies of ^{1}H and ^{13}C NMR Spectra





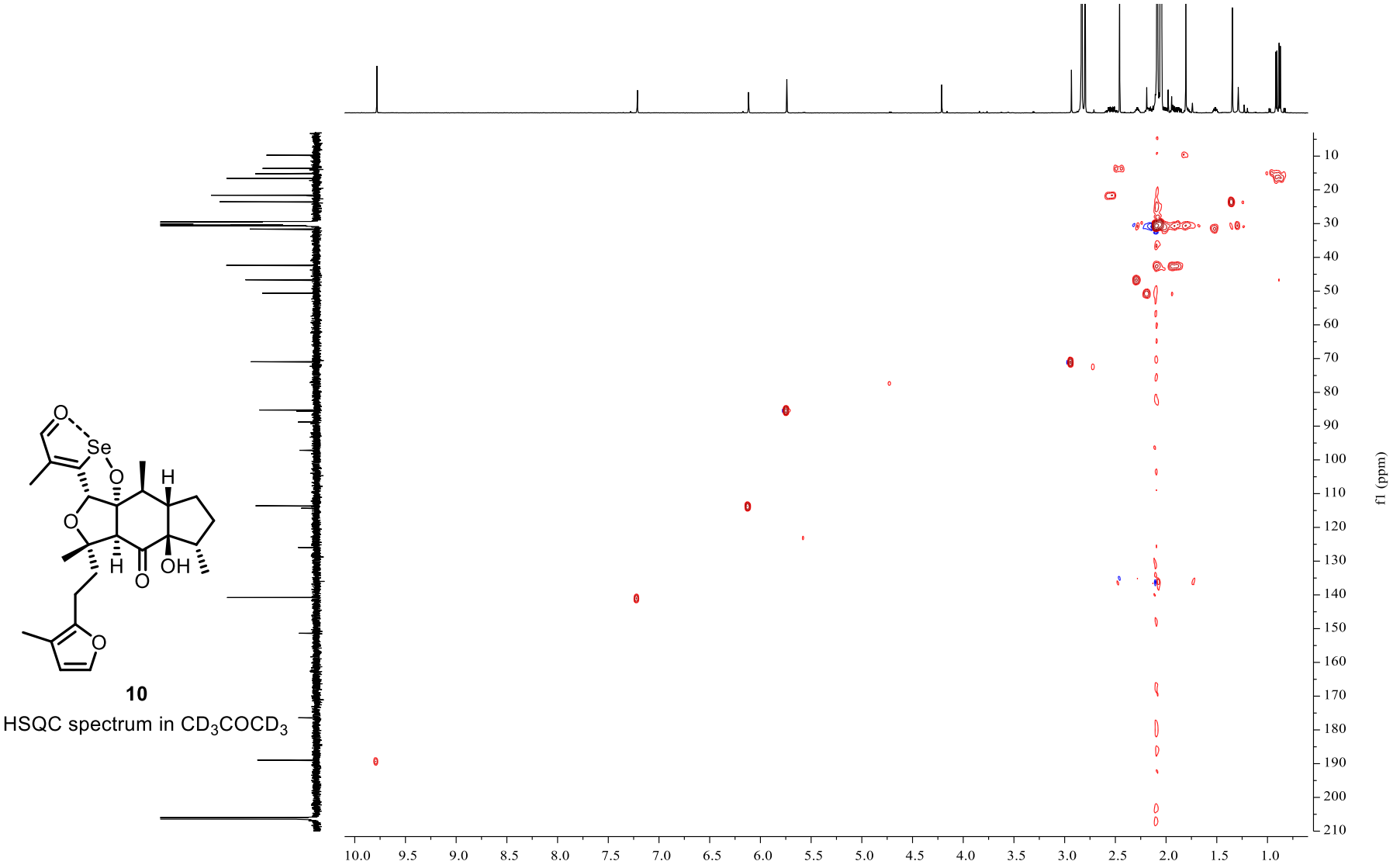
10

^{13}C NMR 151 MHz CD_3COCD_3



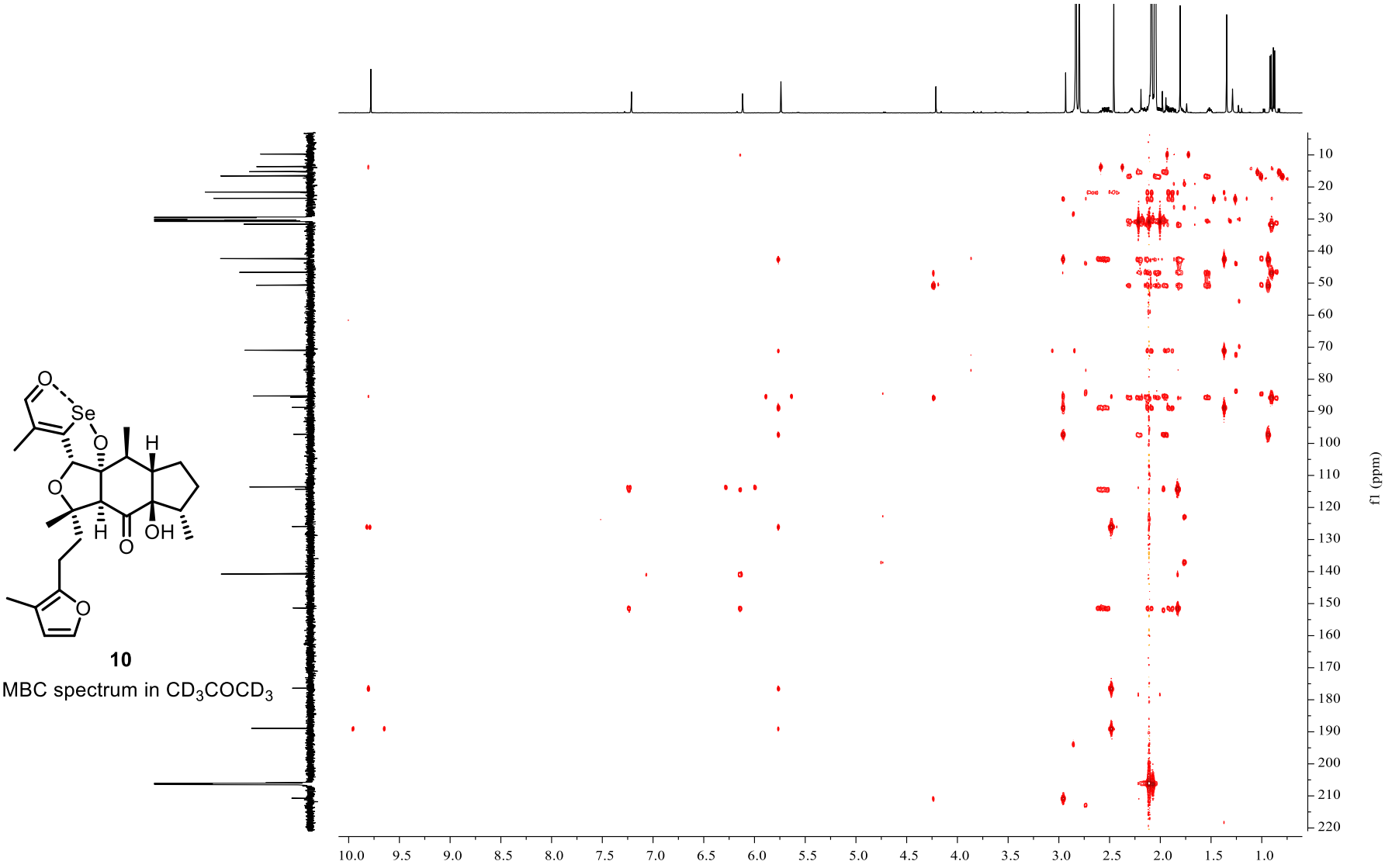
10

^{1}H-^{1}H COSY spectrum in CD_3COCD_3



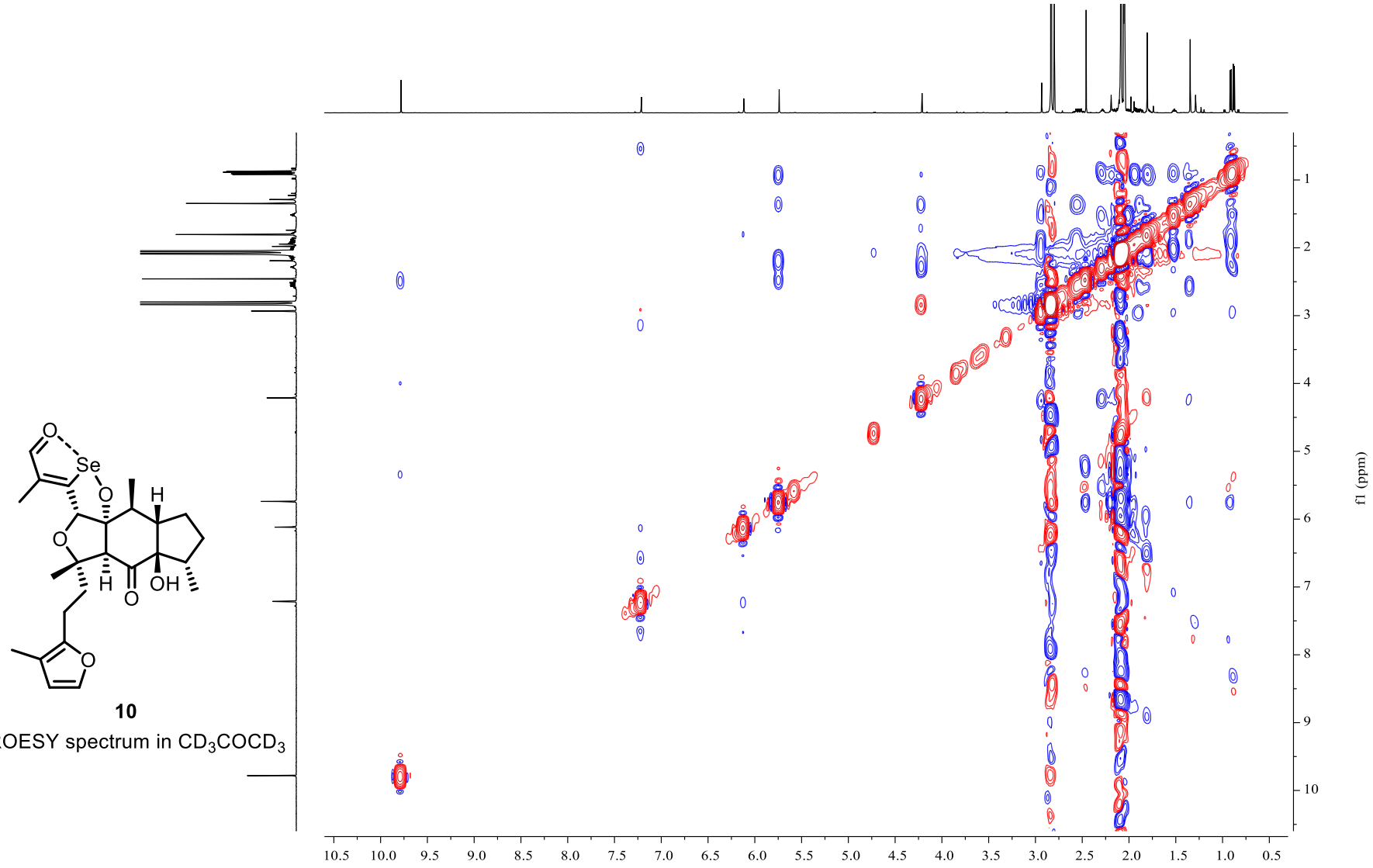
10

HSQC spectrum in CD_3COCD_3



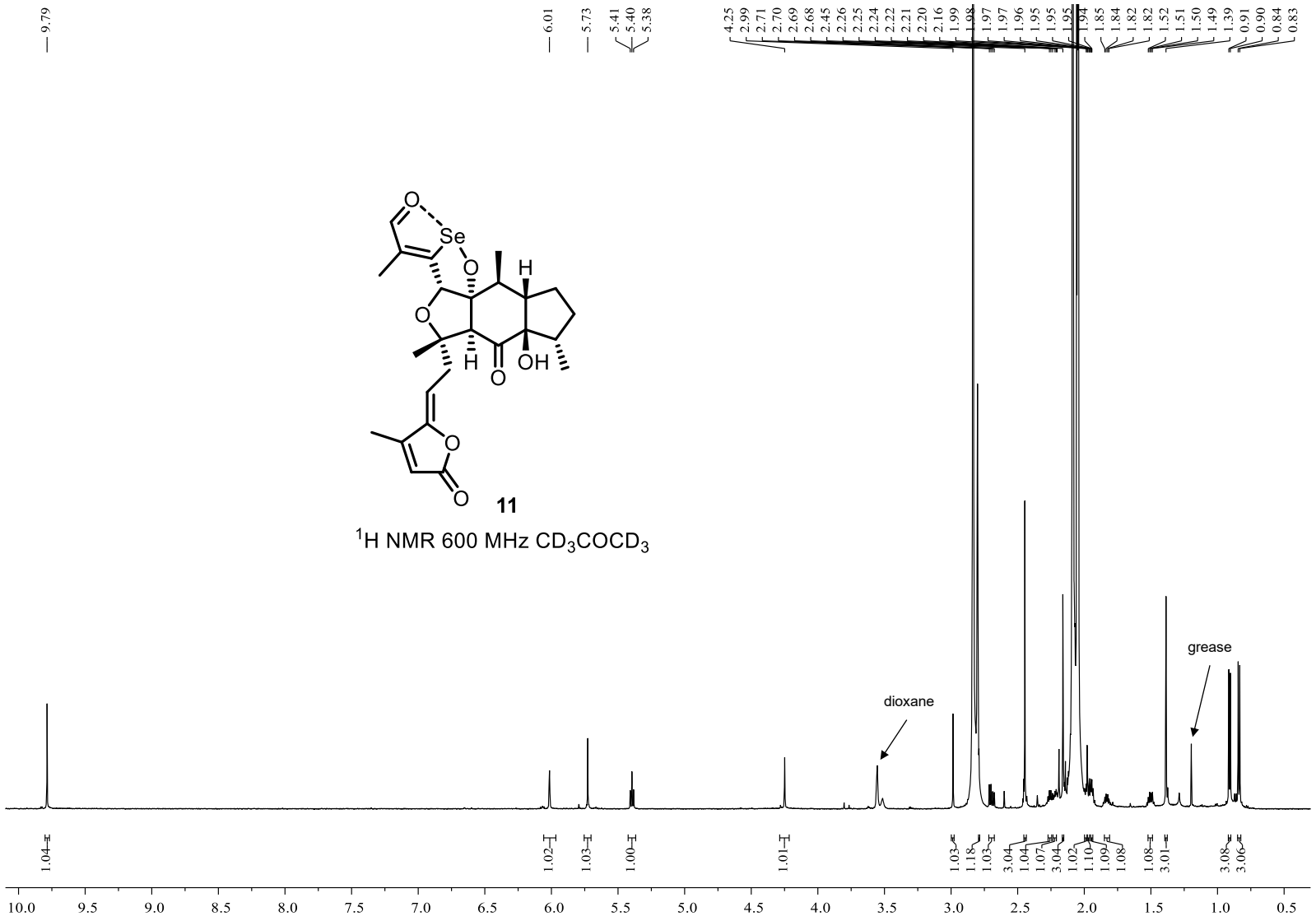
10

HMBC spectrum in CD_3COCD_3

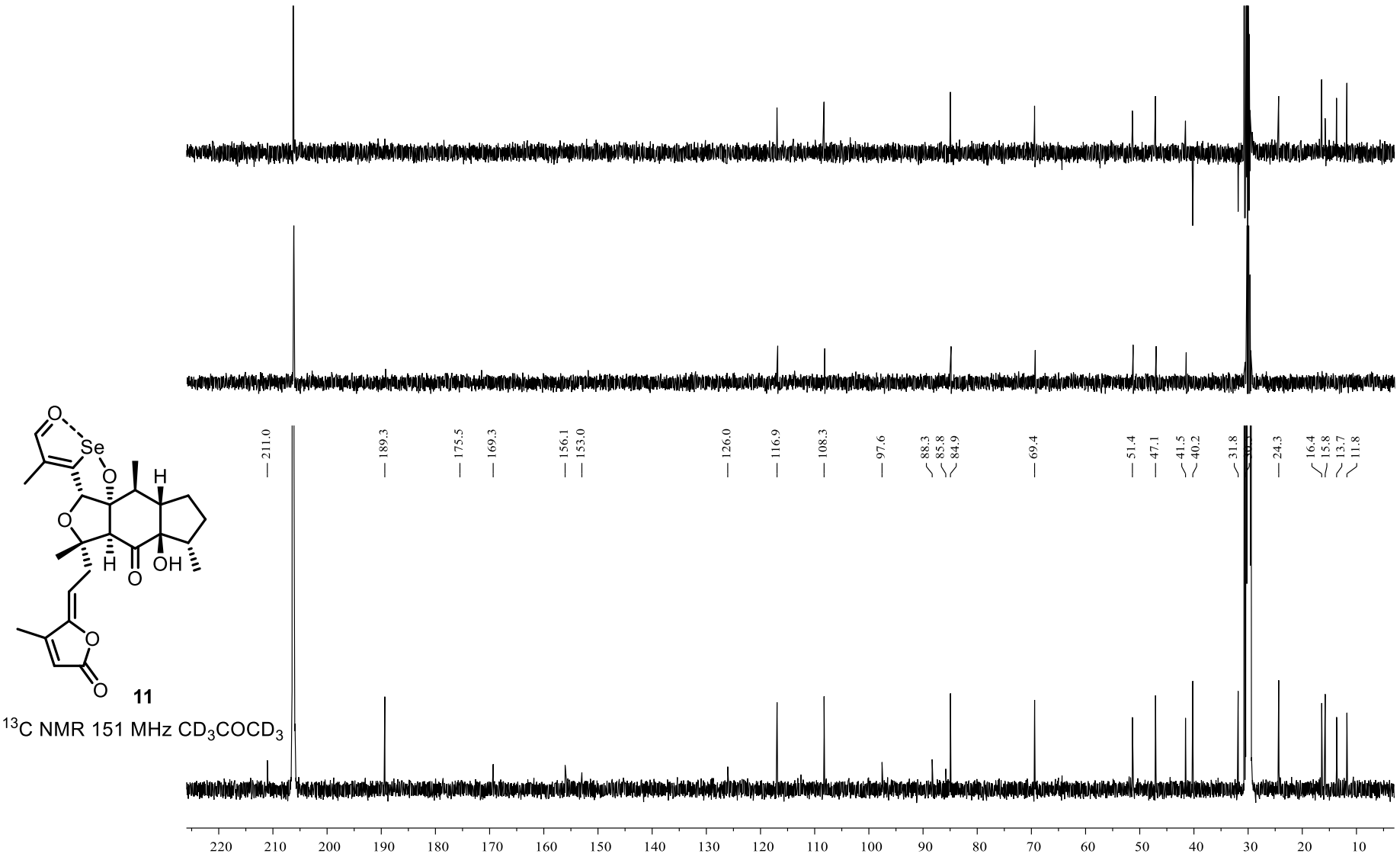


10

ROESY spectrum in CD_3COCD_3

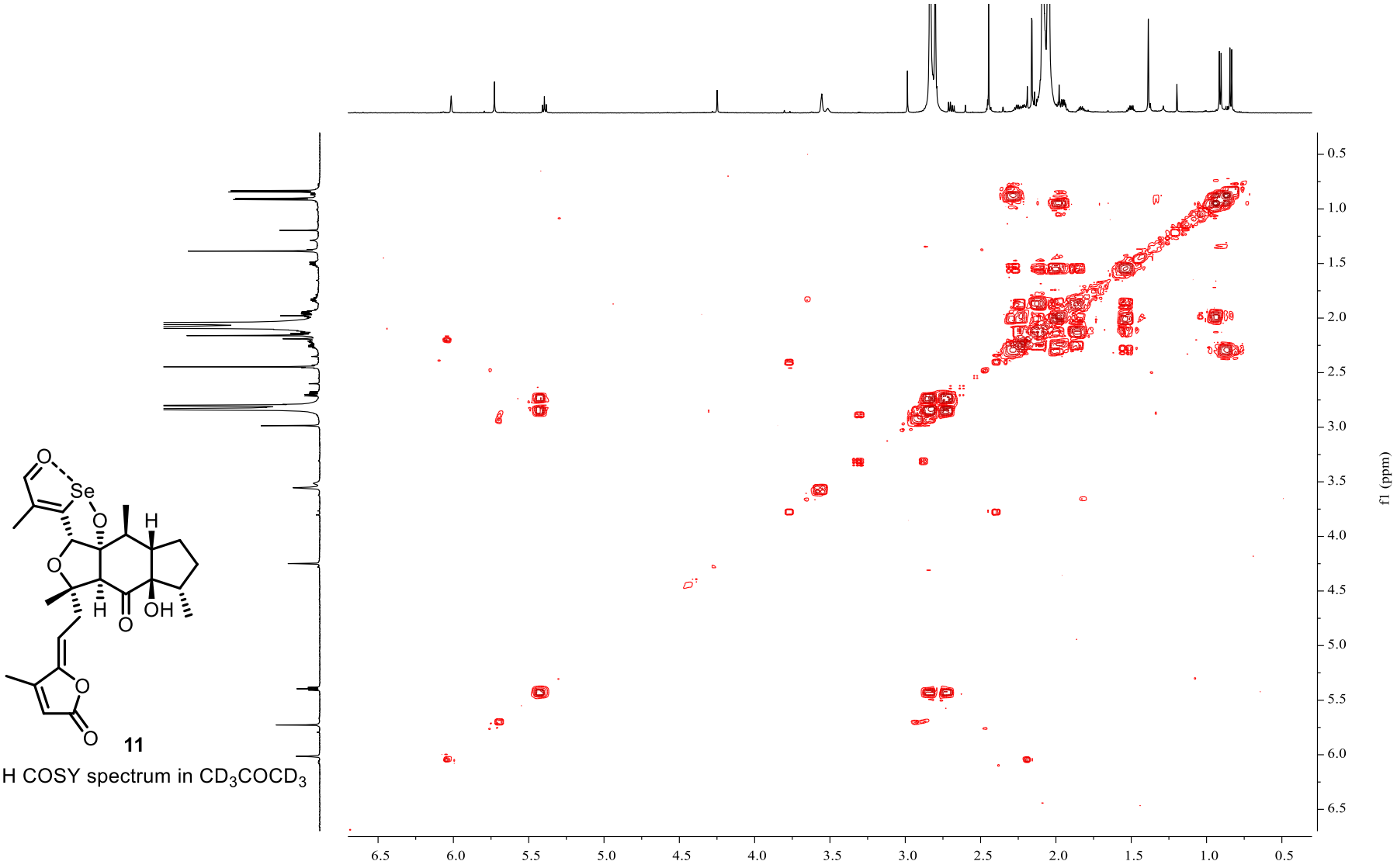


^{1}H NMR 600 MHz CD_3COCD_3



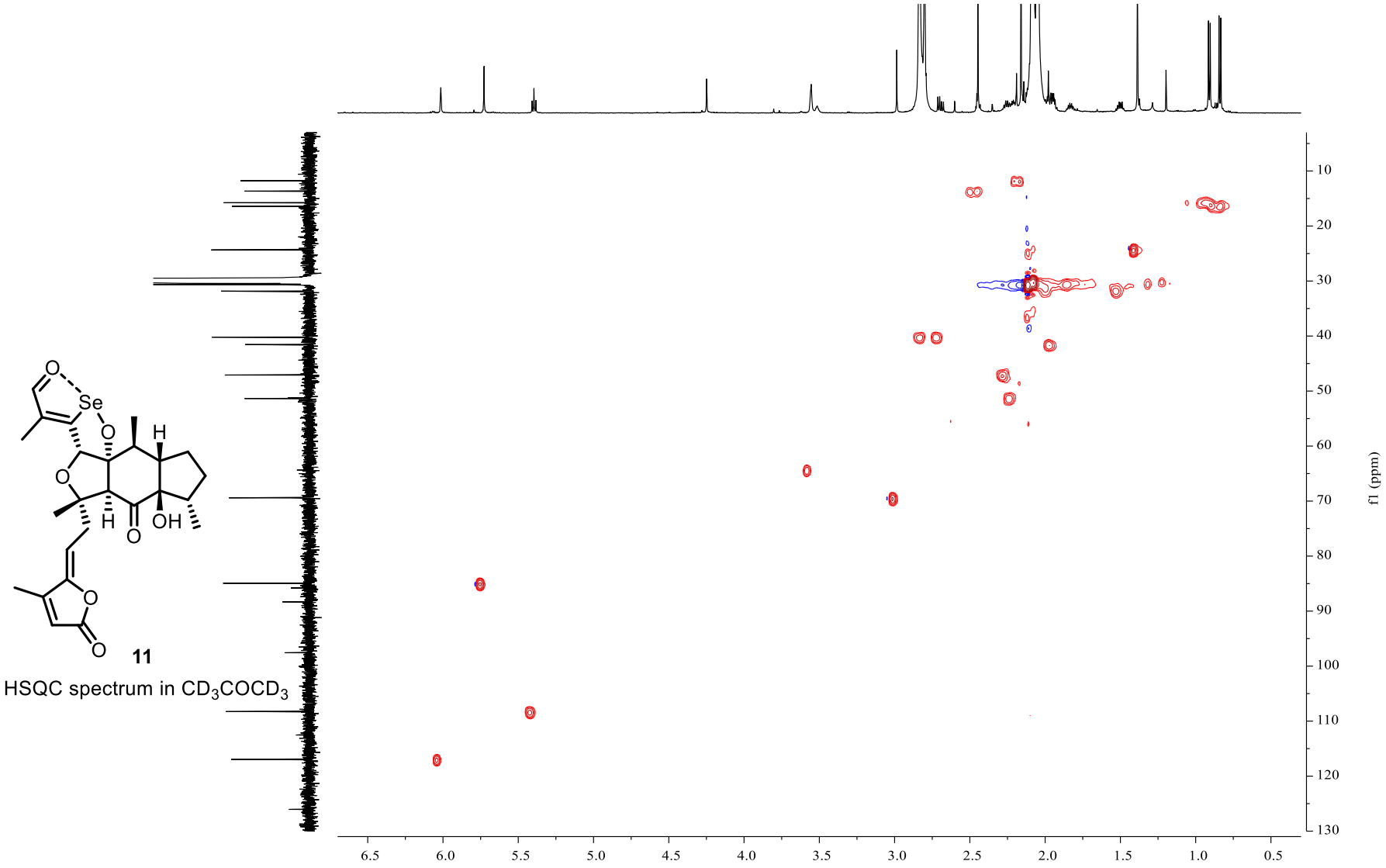
11

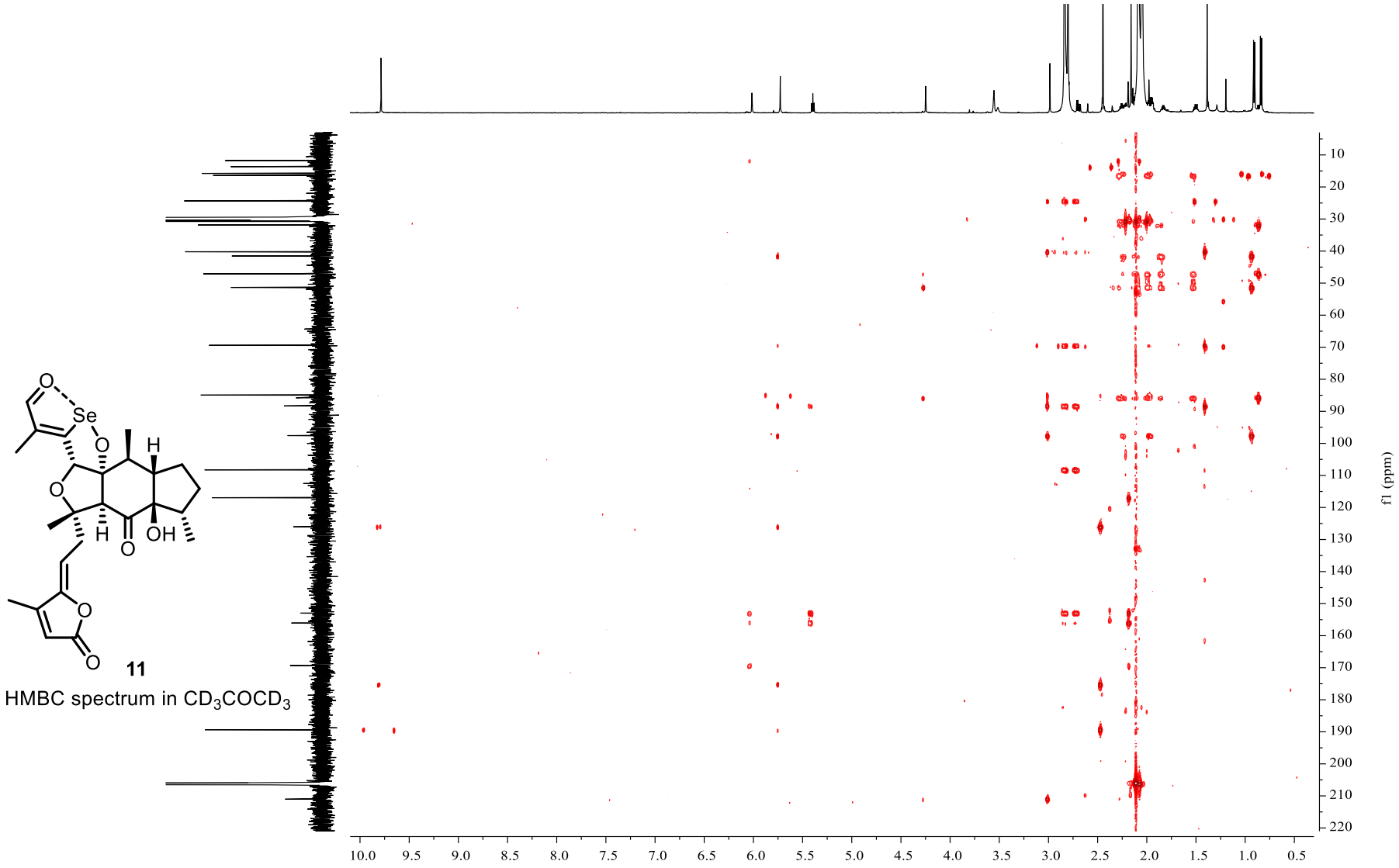
^{13}C NMR 151 MHz CD_3COCD_3



11

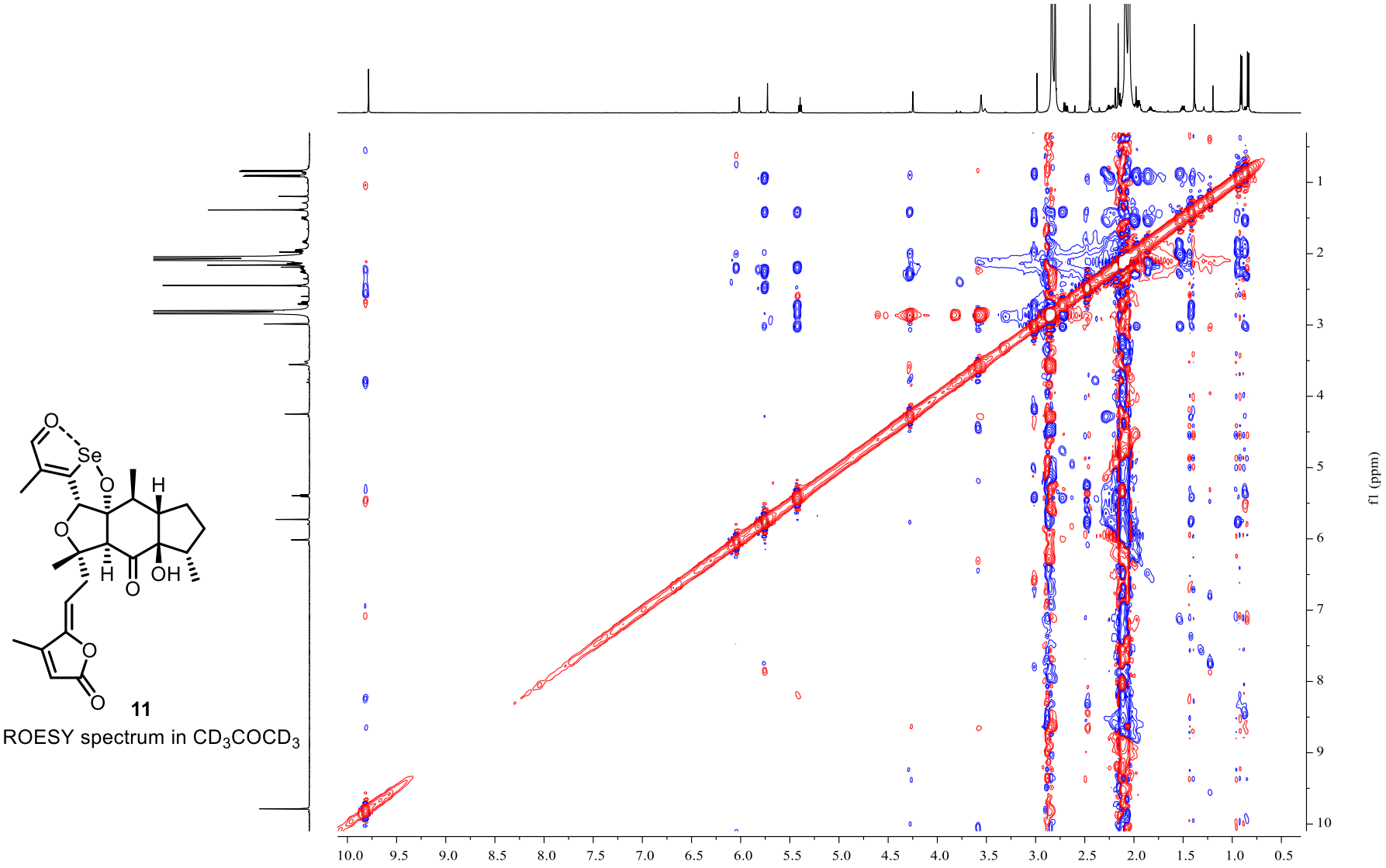
^{1}H-^{1}H COSY spectrum in CD_3COCD_3


Se
O
H
OH
11
HSQC spectrum in CD_3COCD_3
f1 (ppm)
10
20
30
40
50
60
70
80
90
100
110
120
130
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5



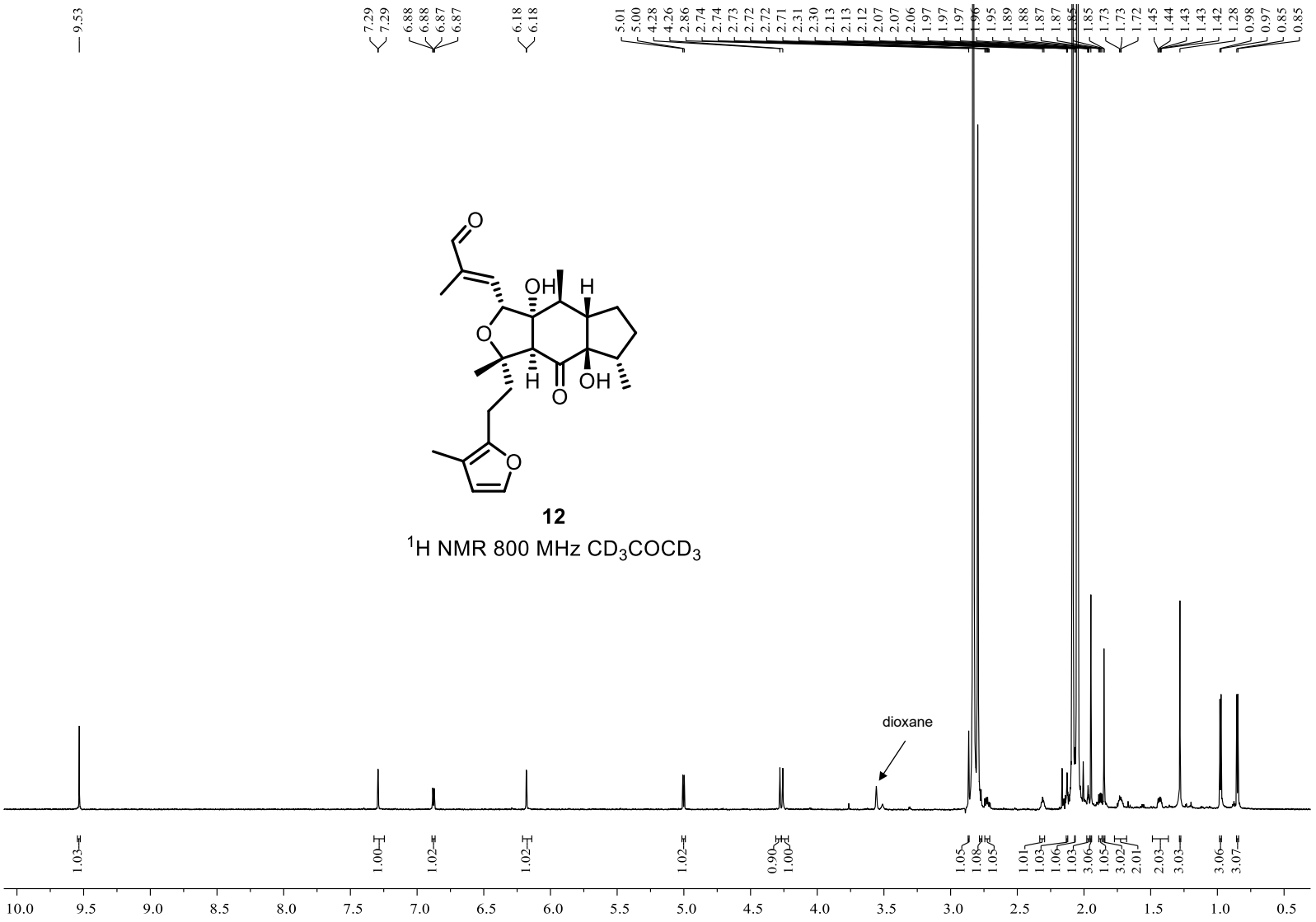
11

HMBC spectrum in CD_3COCD_3



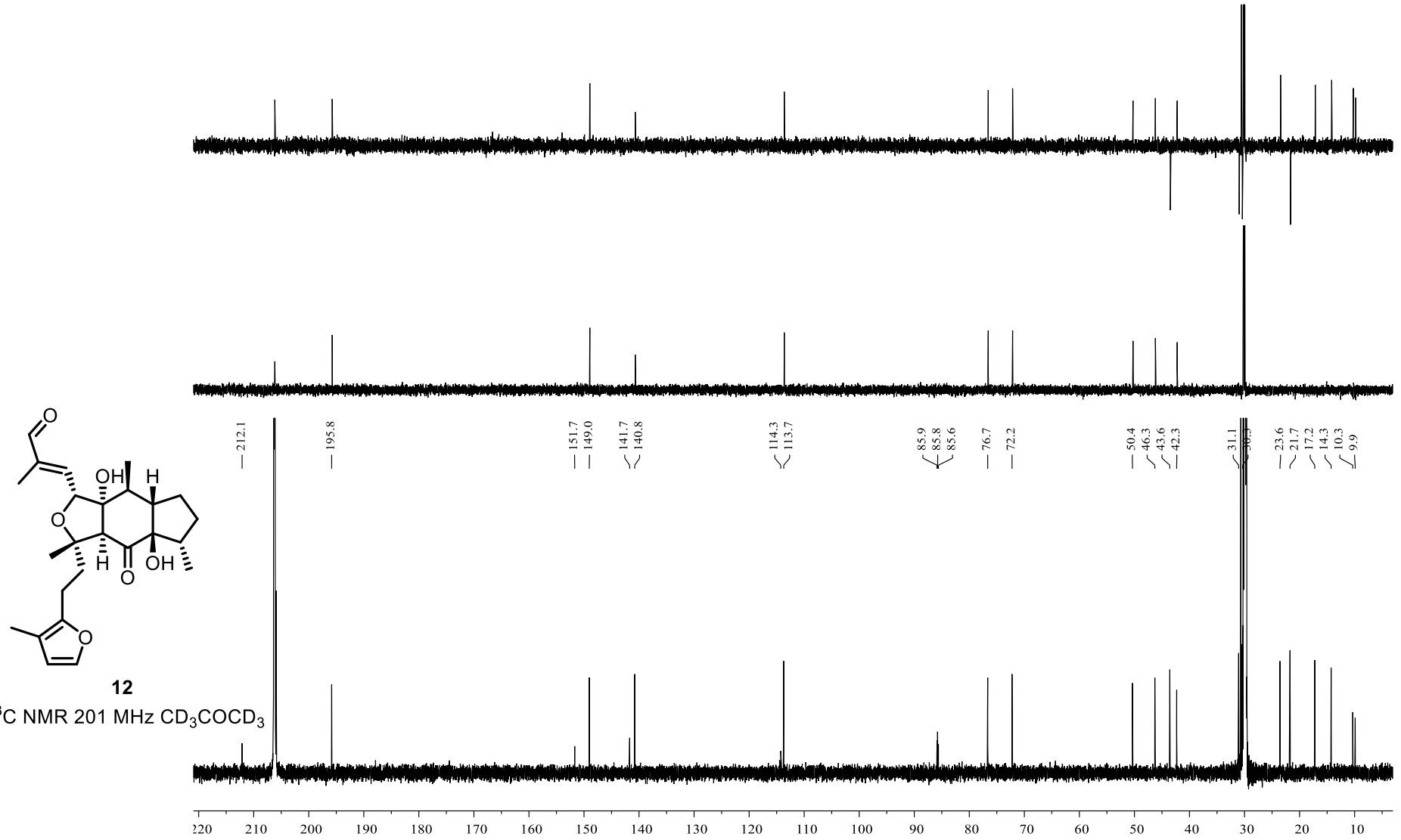
11

ROESY spectrum in CD_3COCD_3



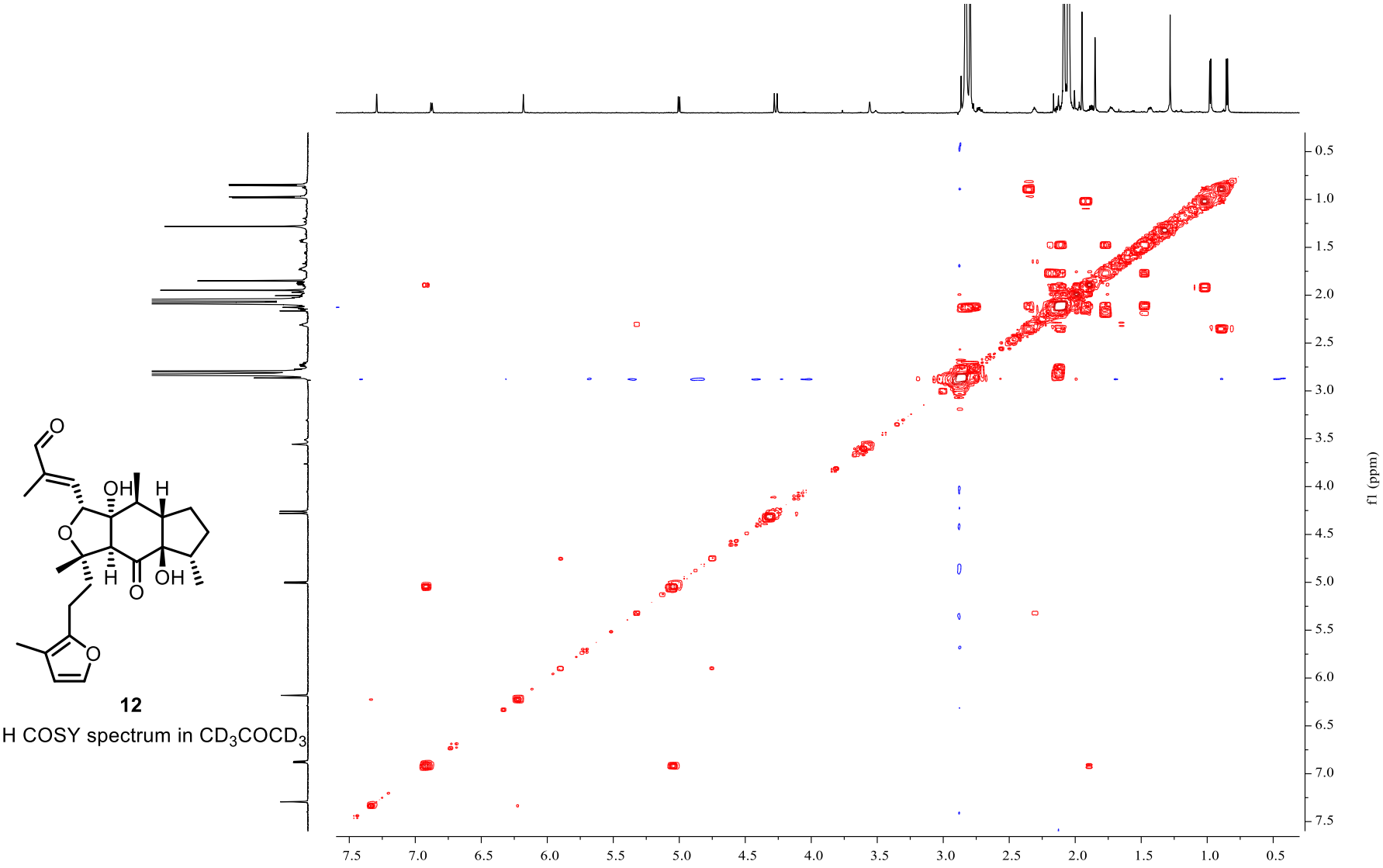
12

^{1}H NMR 800 MHz CD_3COCD_3



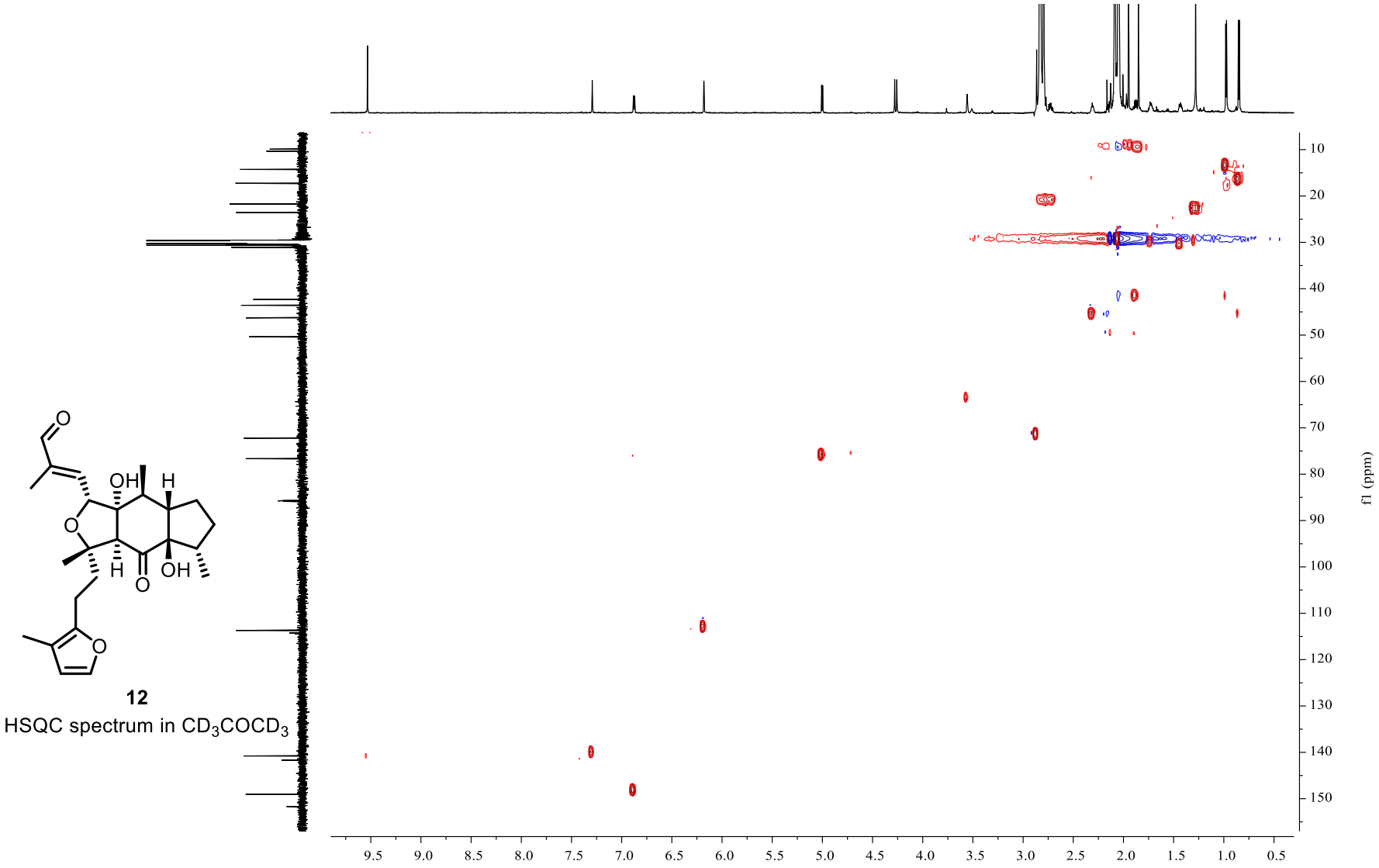
12

^{13}C NMR 201 MHz CD_3COCD_3



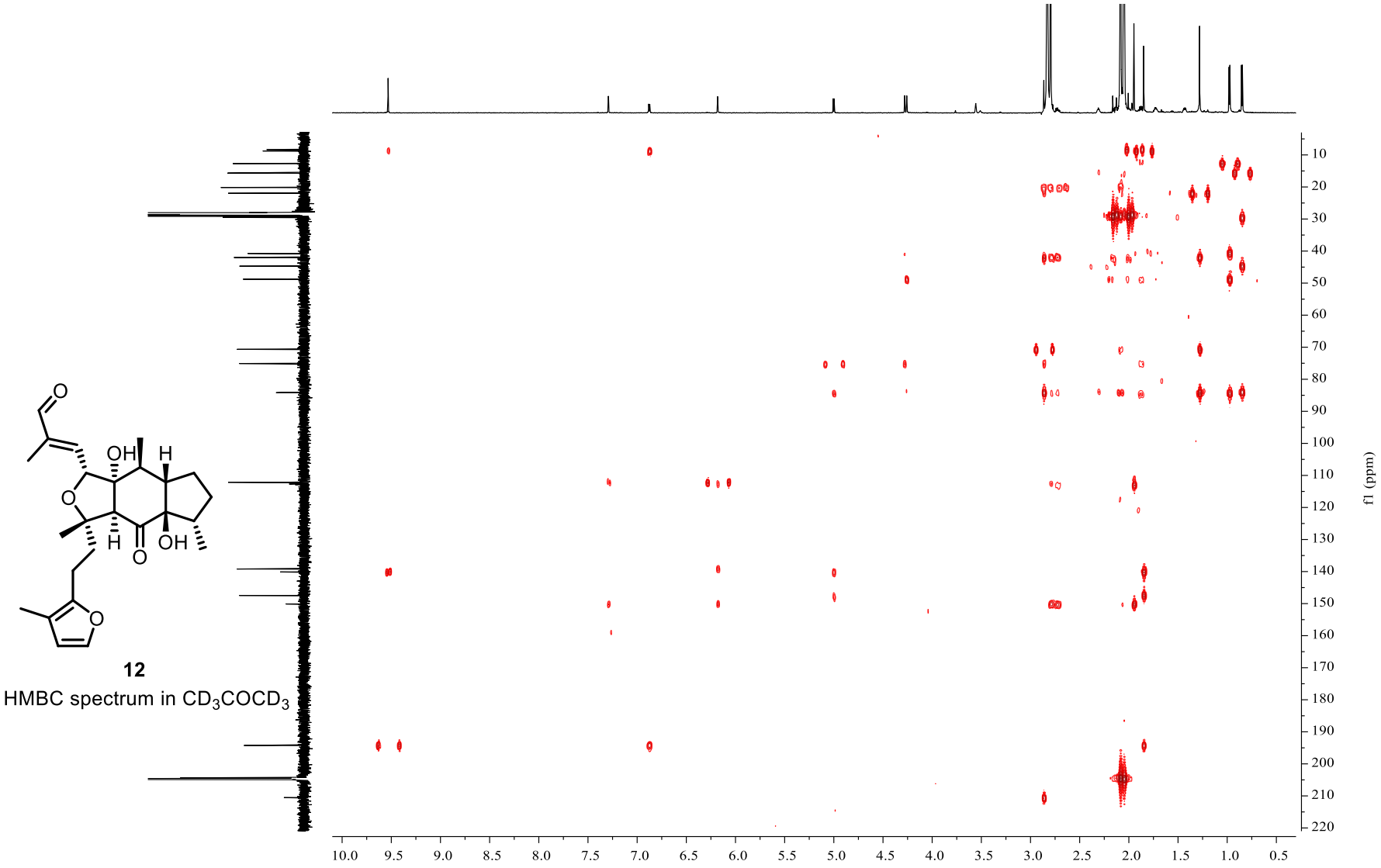
12

^{1}H-^{1}H COSY spectrum in CD_3COCD_3



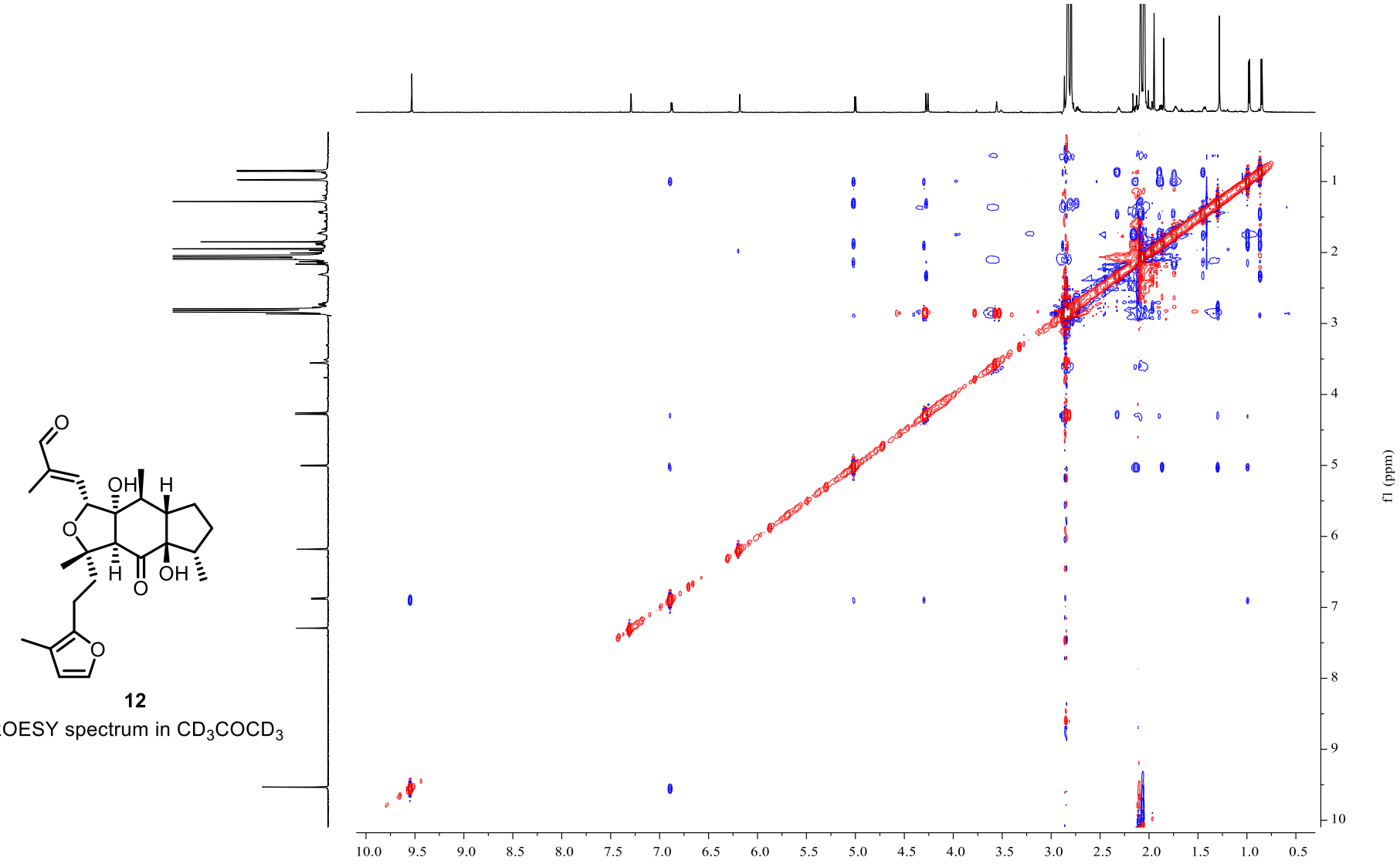
12

HSQC spectrum in CD_3COCD_3



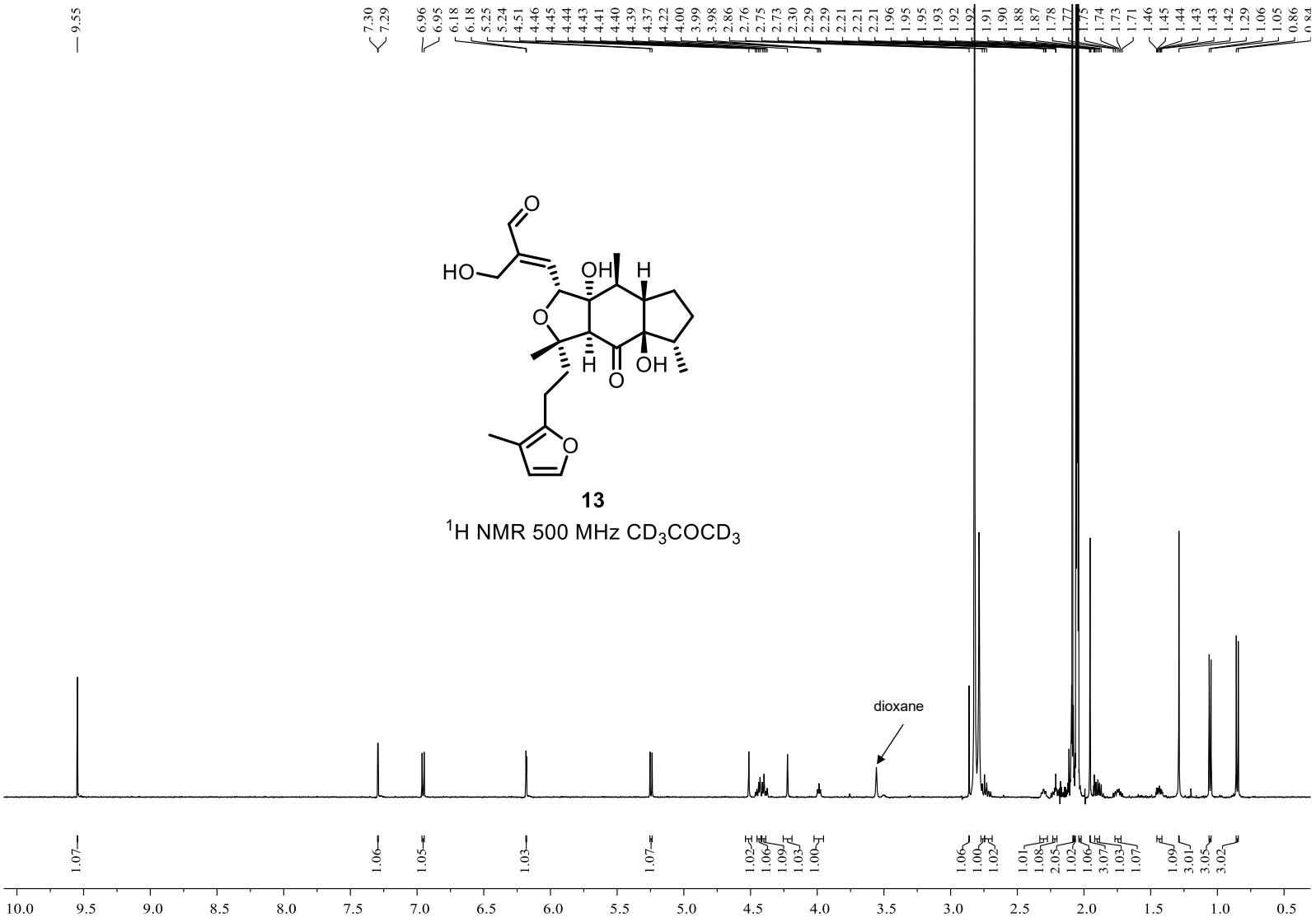
12

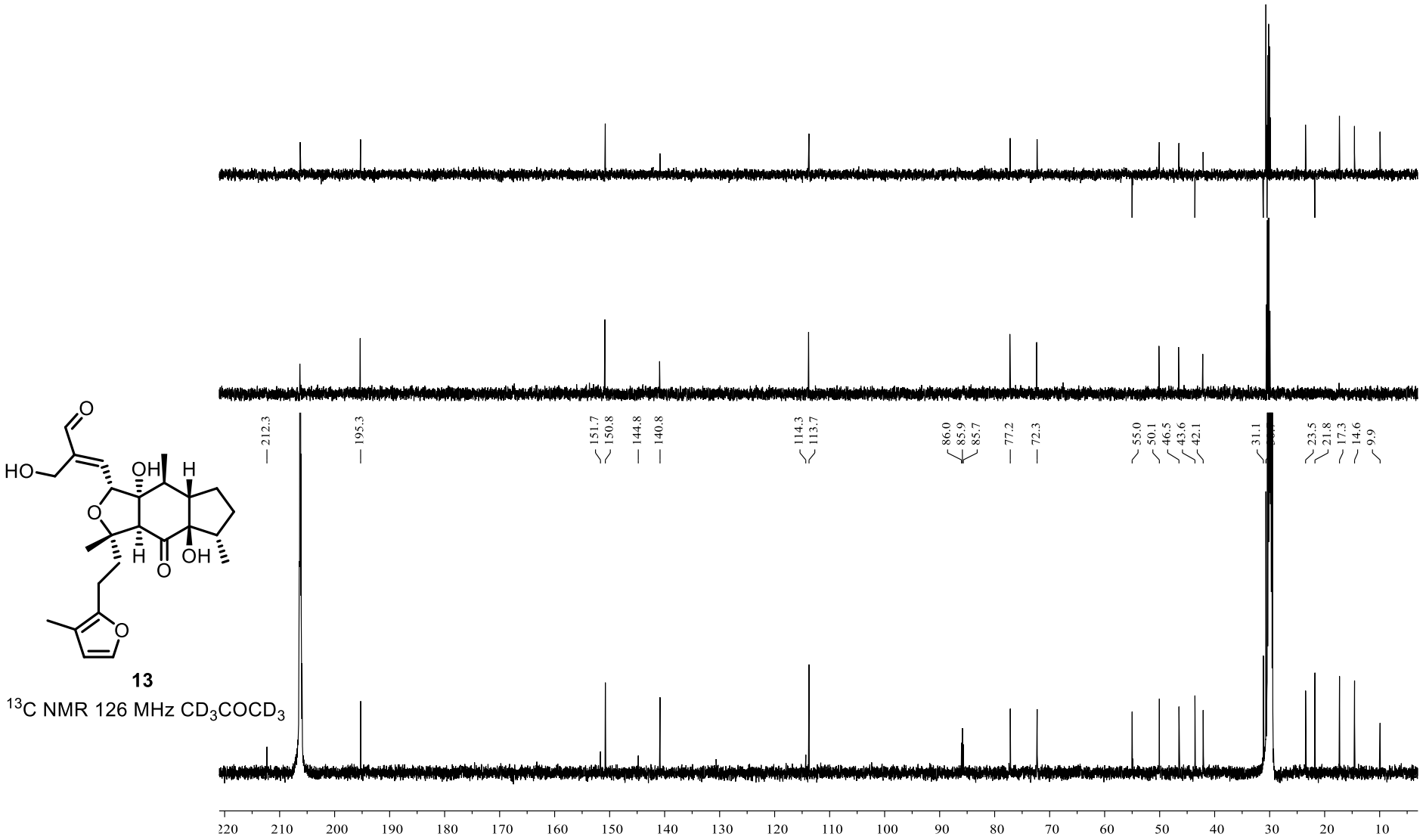
HMBC spectrum in CD_3COCD_3



12

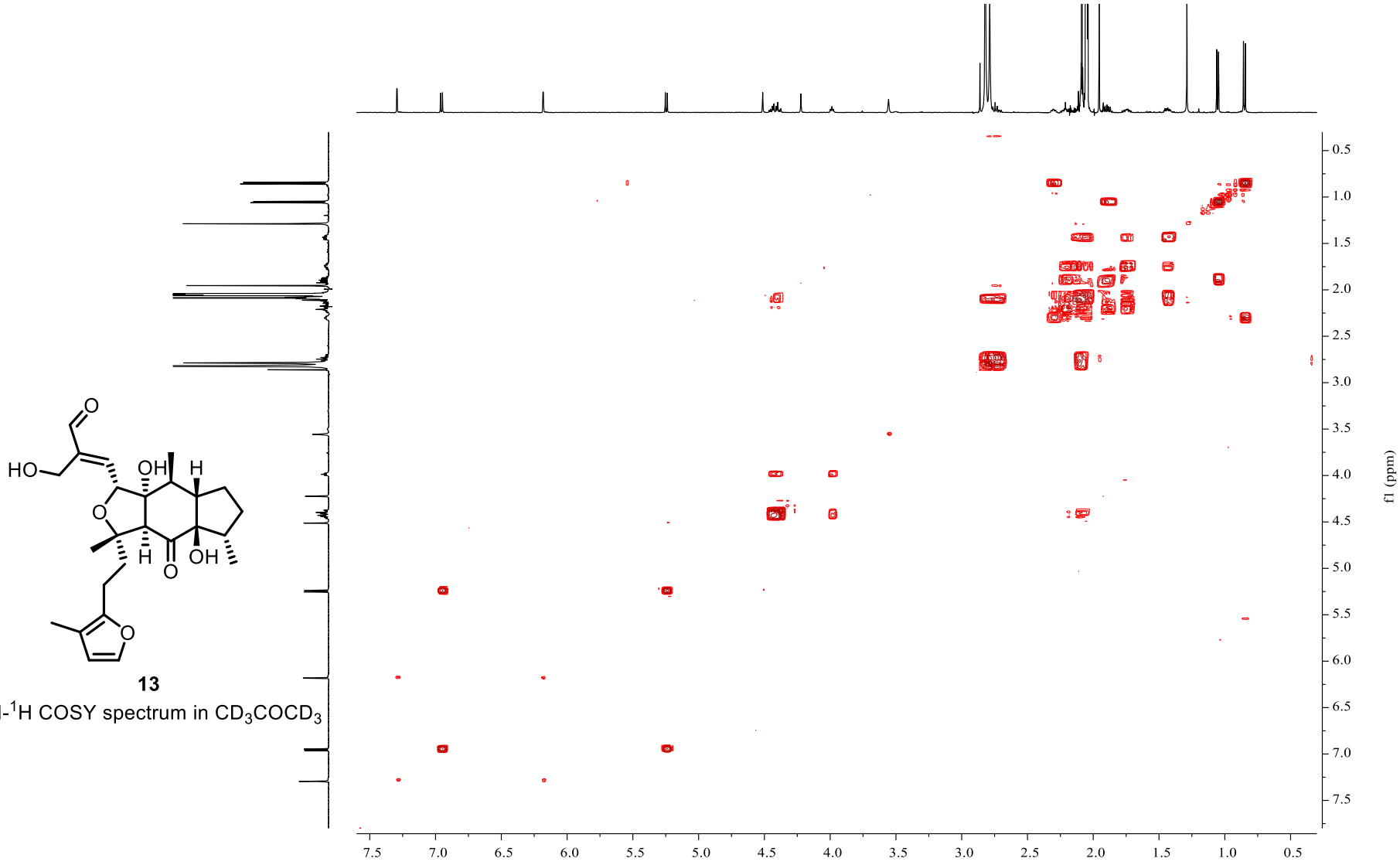
ROESY spectrum in CD_3COCD_3


HO
OH
H
O
O
H
OH
O
O
13
1H NMR 500 MHz CD3COCD3
dioxane



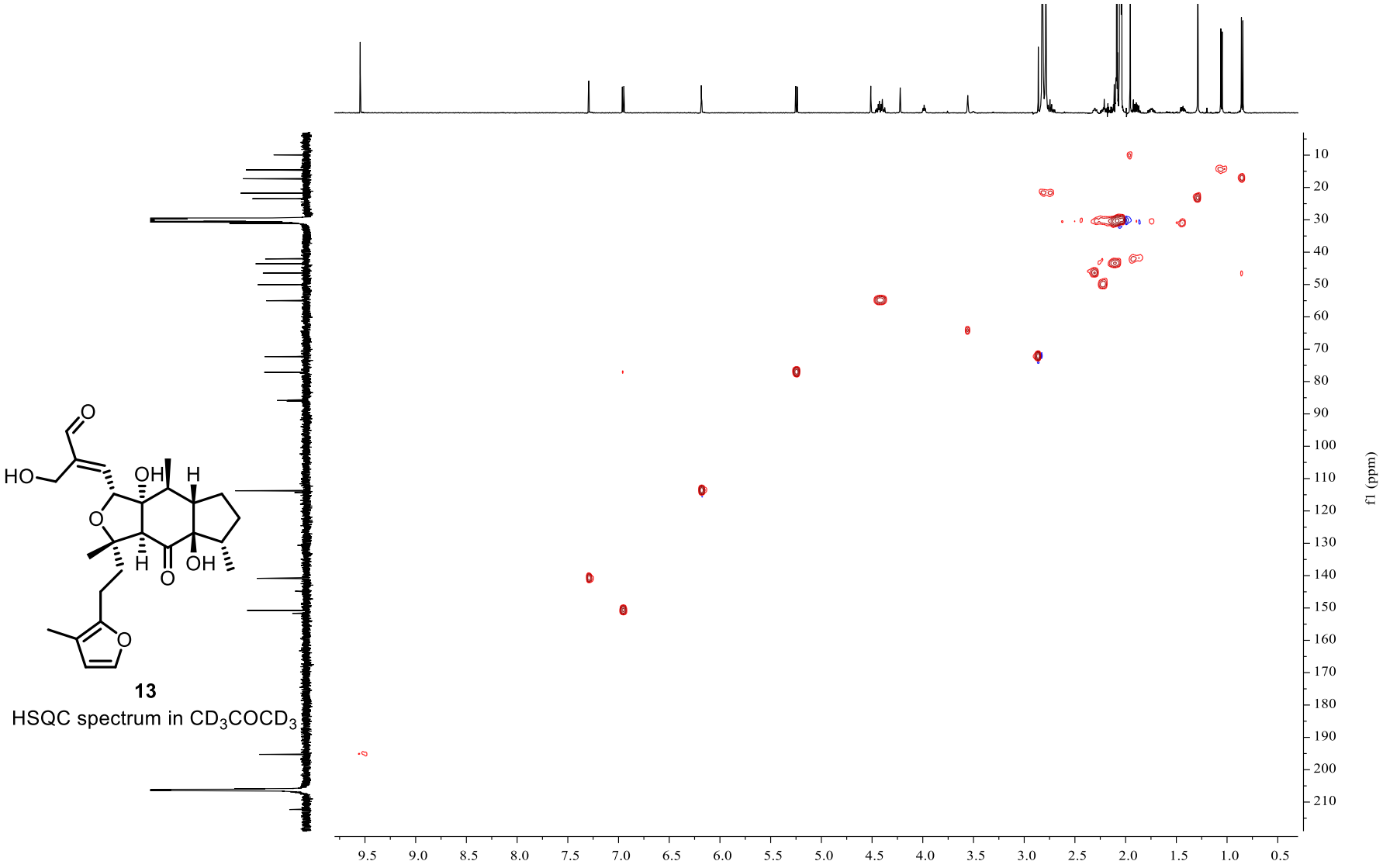
13

^{13}C NMR 126 MHz CD_3COCD_3



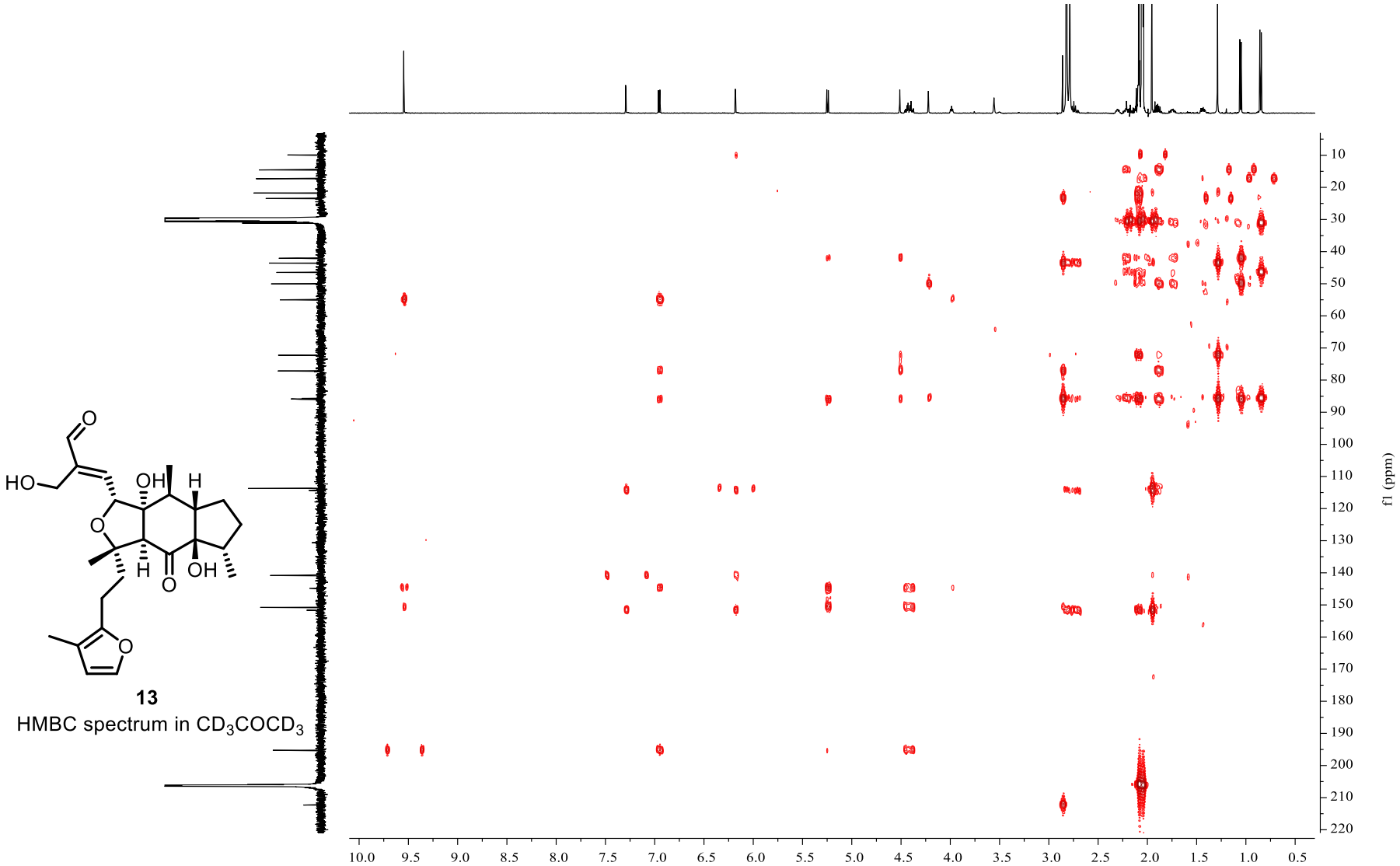
13

^{1}H-^{1}H COSY spectrum in CD_3COCD_3



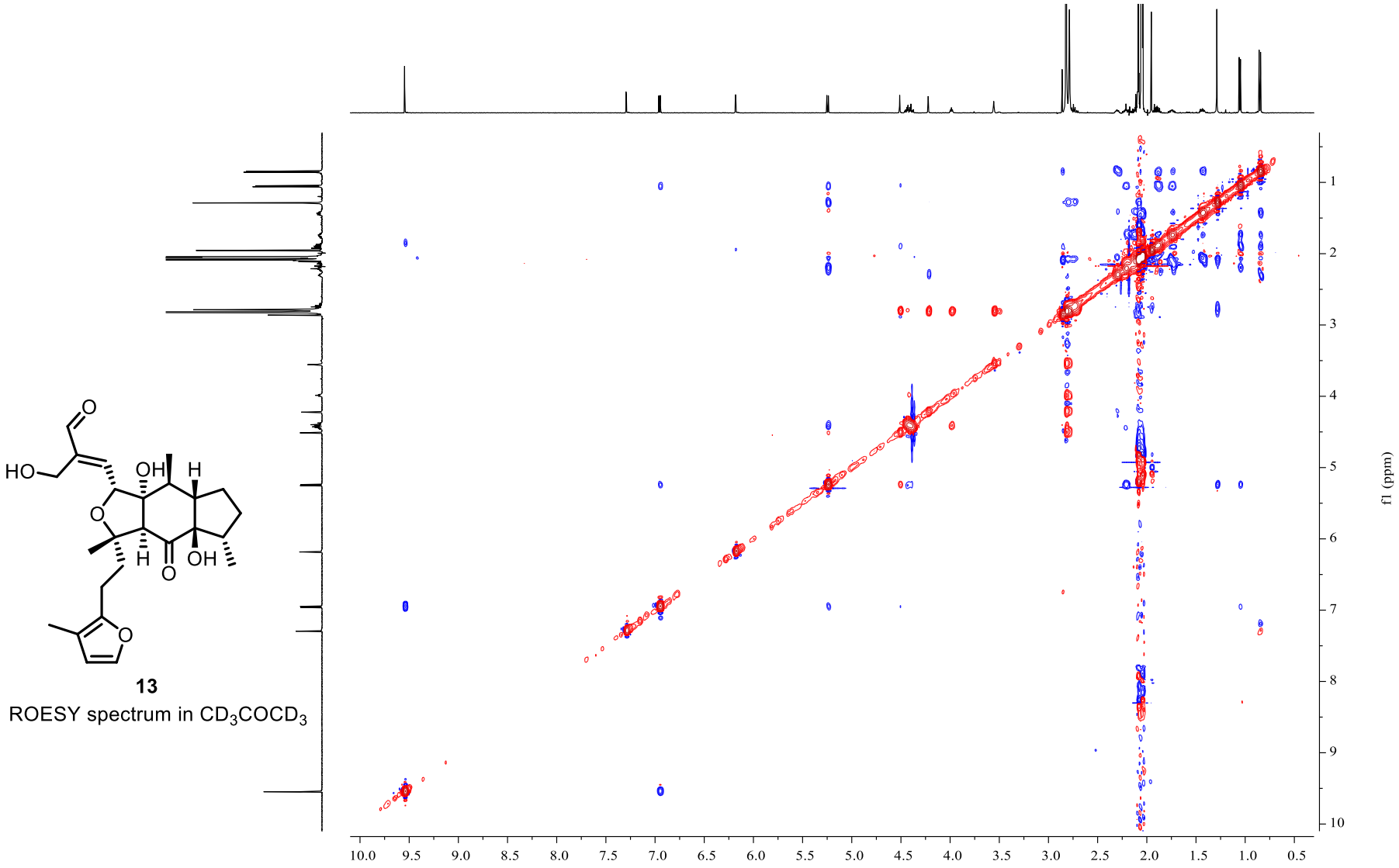
13

HSQC spectrum in CD_3COCD_3



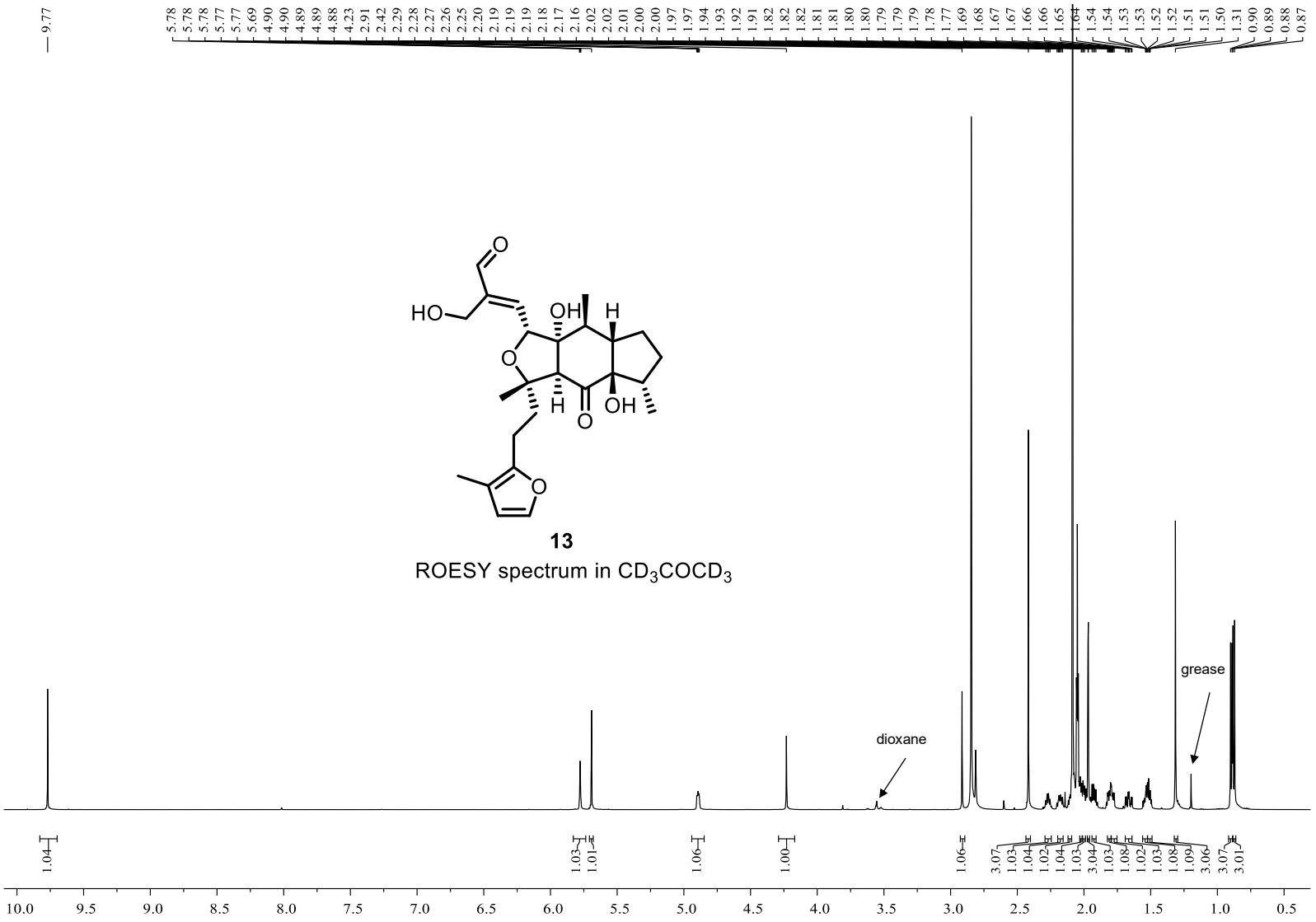
13

HMBC spectrum in CD_3COCD_3



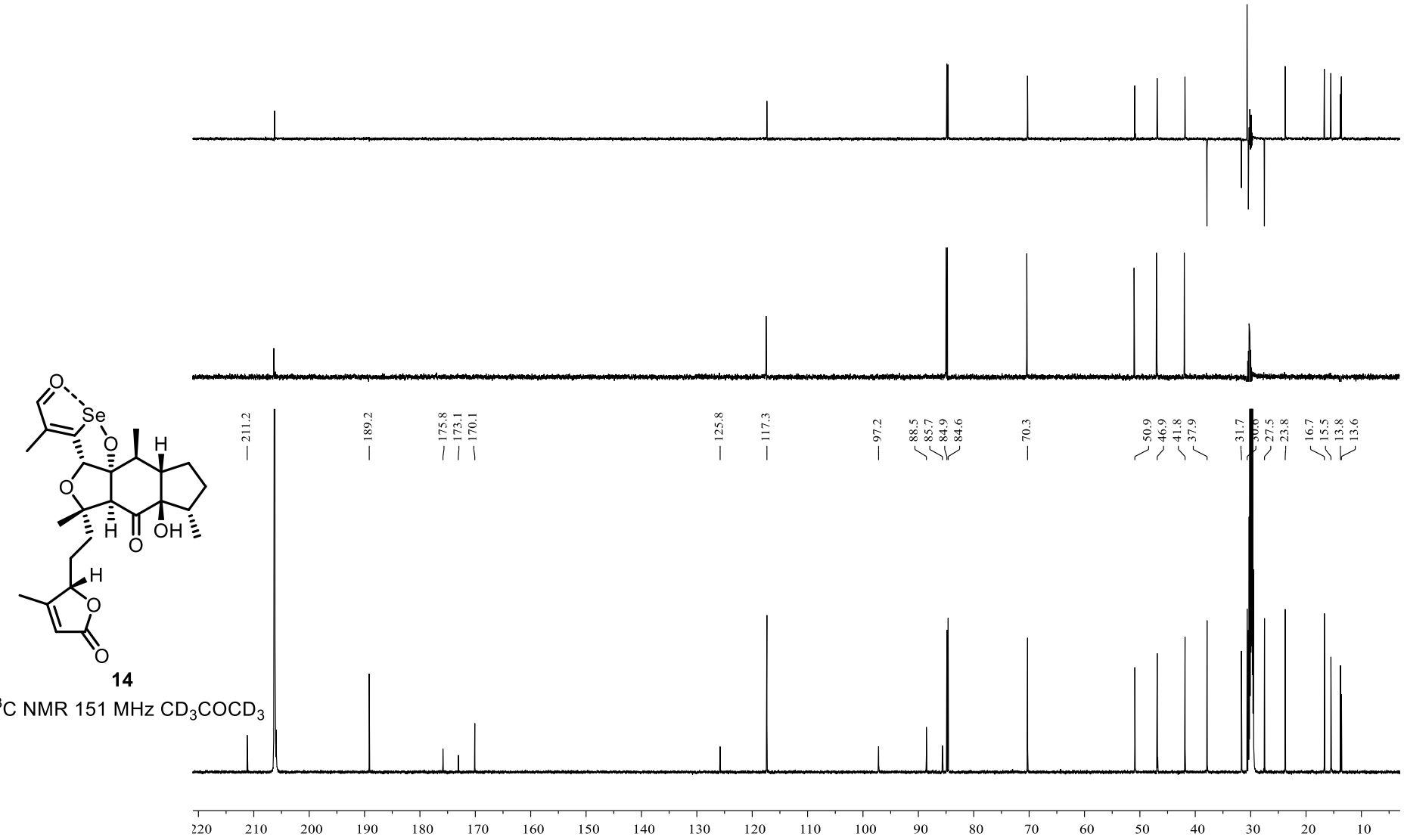
13

ROESY spectrum in CD_3COCD_3



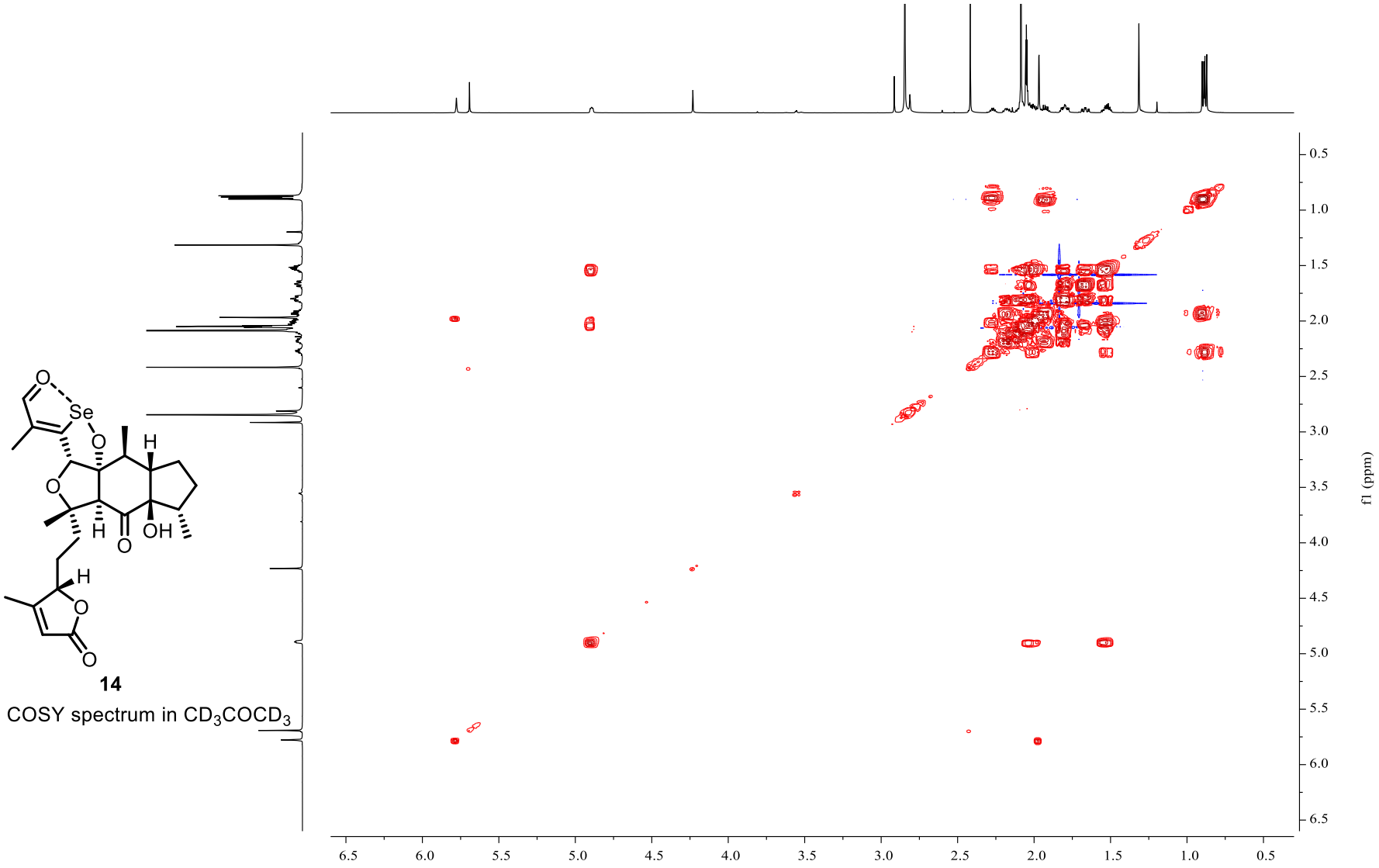
13

ROESY spectrum in CD_3COCD_3



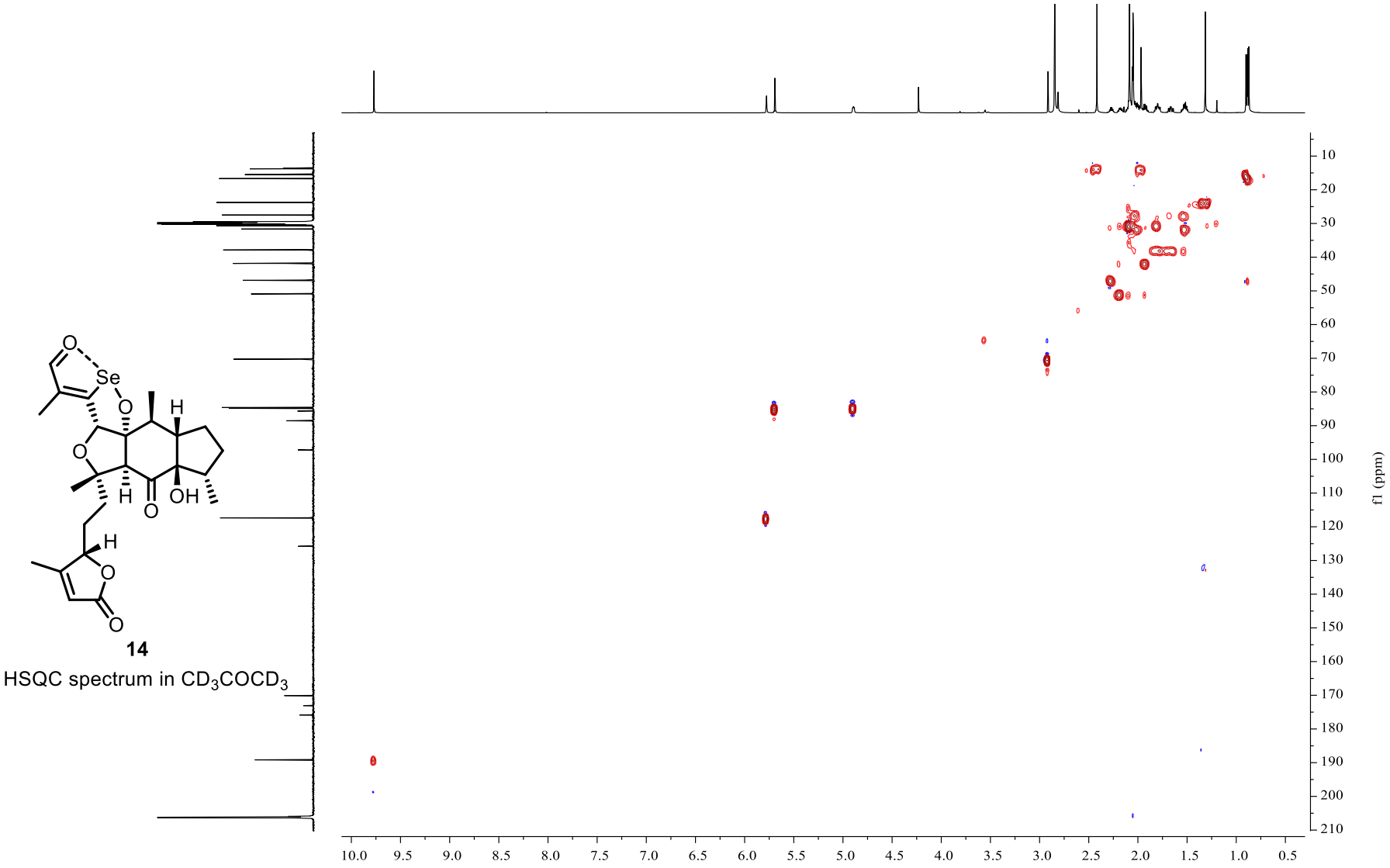
14

^{13}C NMR 151 MHz CD_3COCD_3



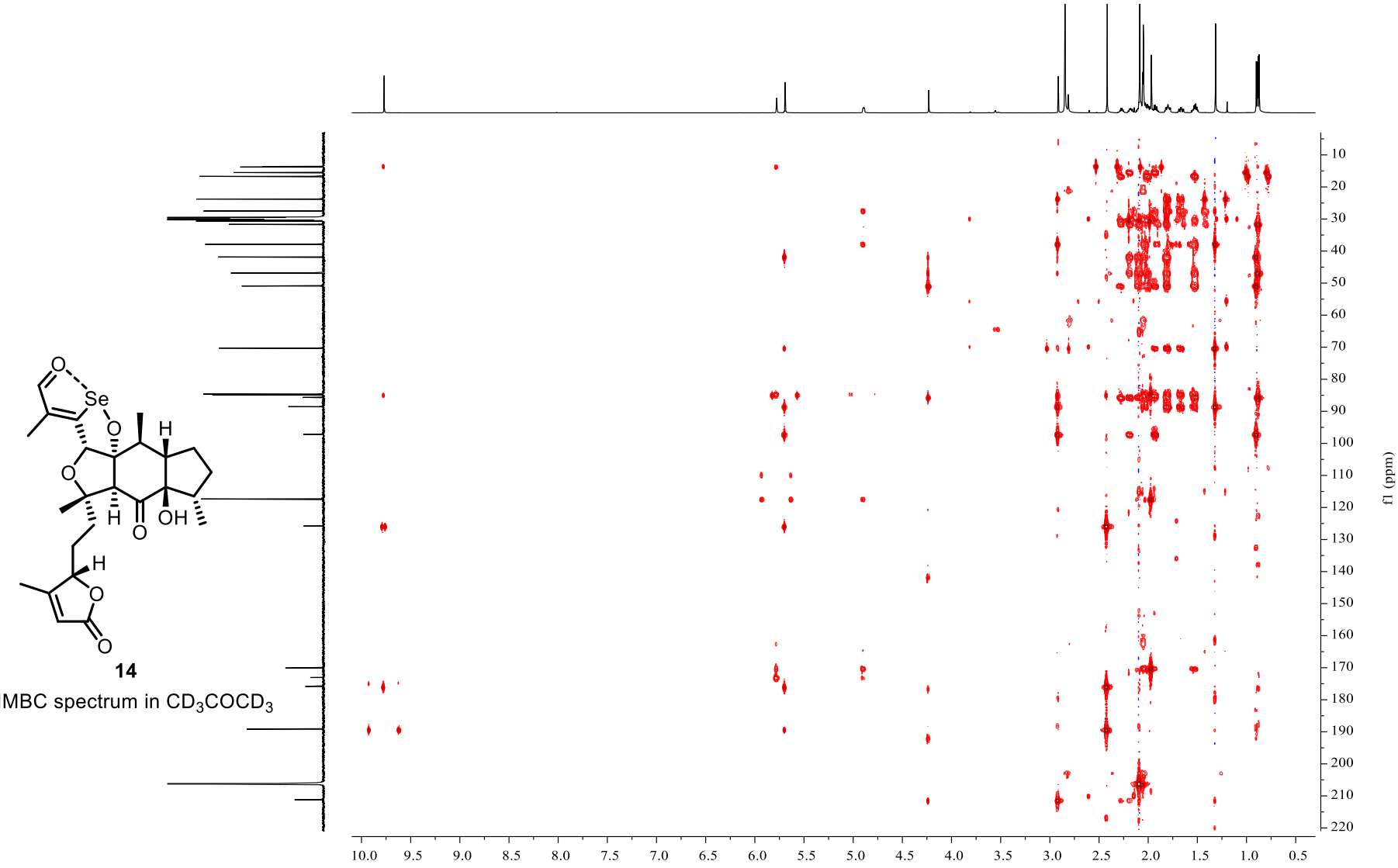
14

^{1}H-^{1}H COSY spectrum in CD_3COCD_3



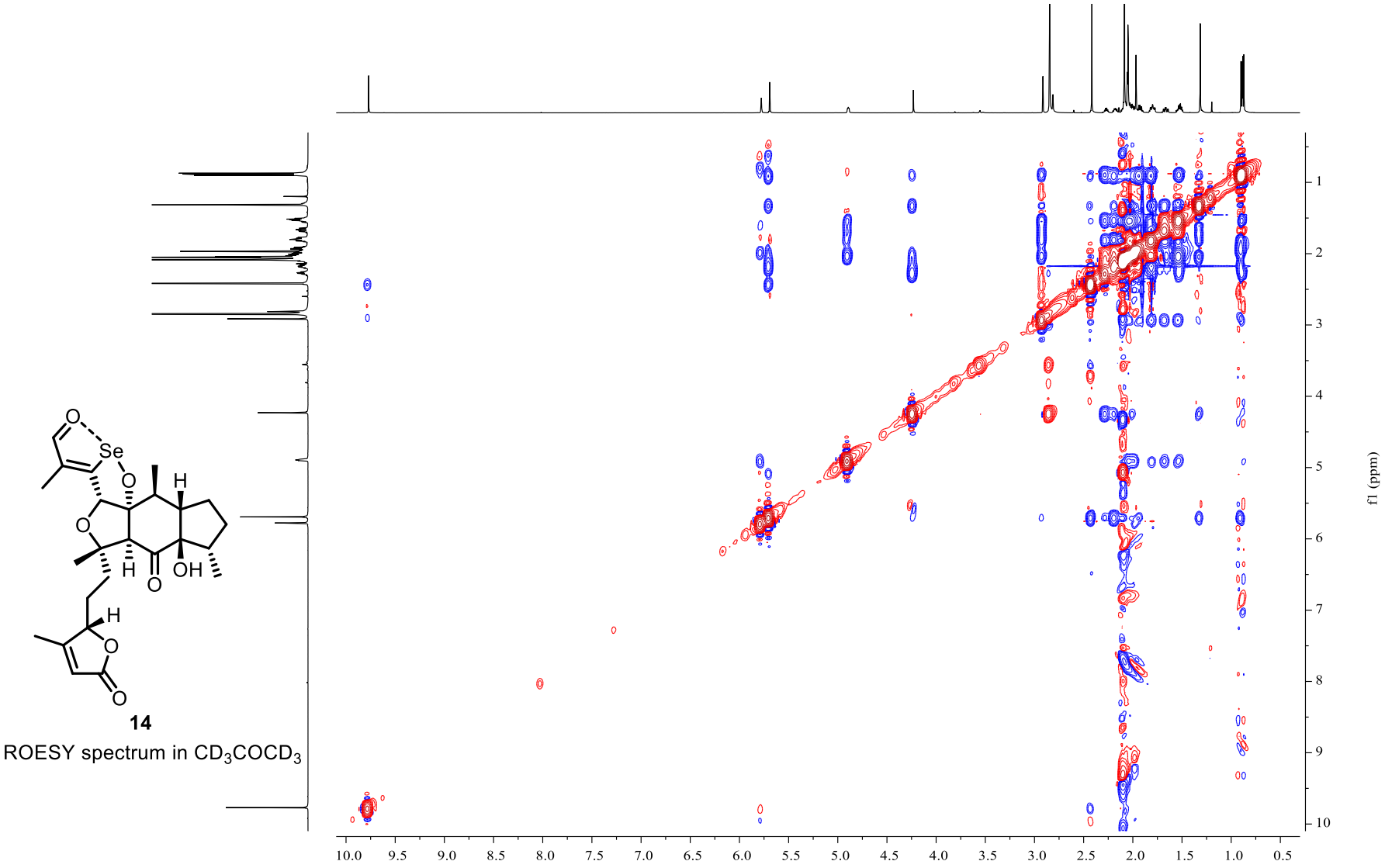
14

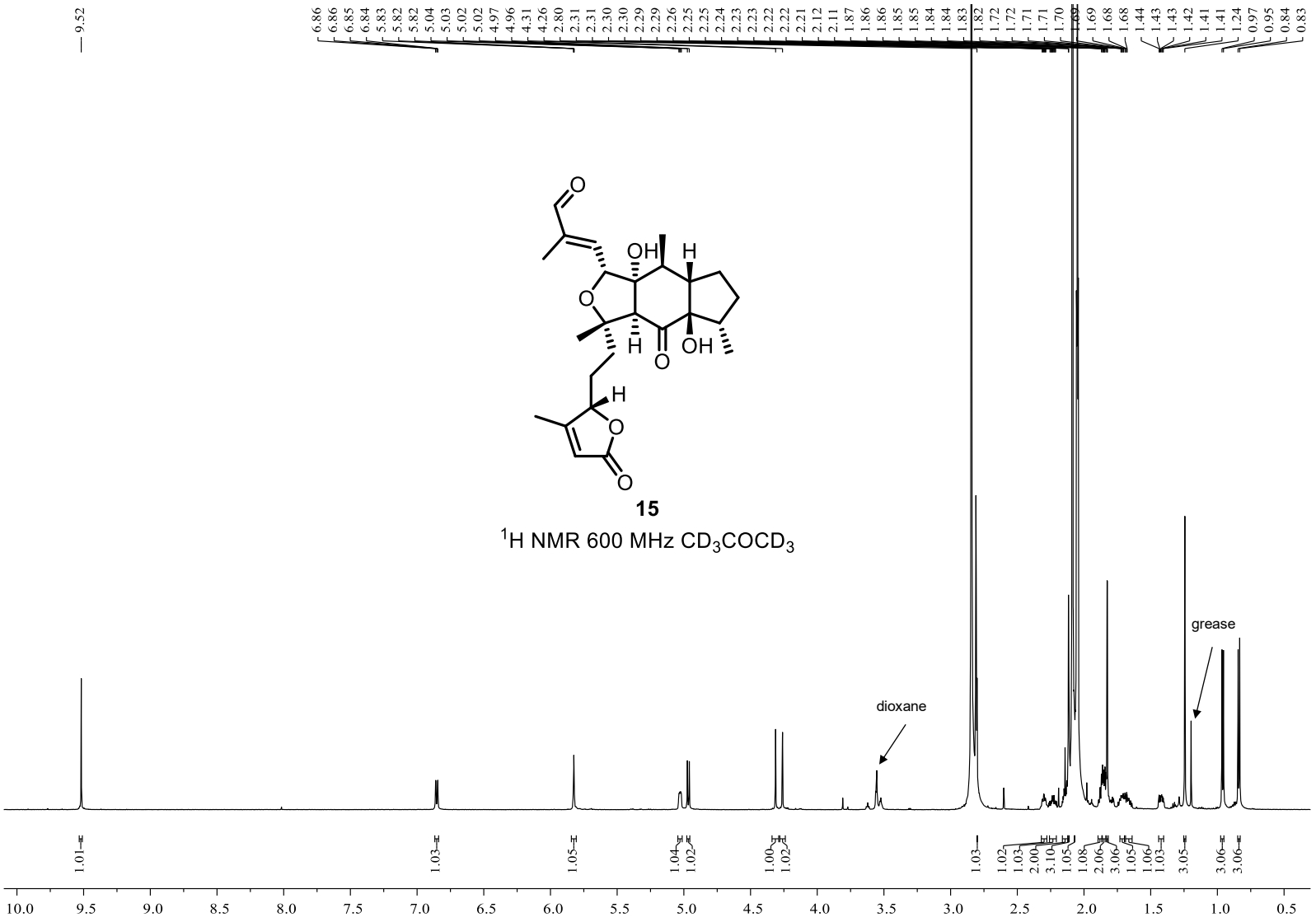
HSQC spectrum in CD_3COCD_3



14

HMBC spectrum in CD_3COCD_3


Se
O
H
OH
14
ROESY spectrum in CD_3COCD_3
f1 (ppm)


9.52
6.86
6.86
6.85
6.84
5.83
5.82
5.82
5.04
5.03
5.02
5.02
4.97
4.96
4.31
4.26
2.80
2.31
2.31
2.30
2.30
2.29
2.29
2.26
2.25
2.24
2.23
2.23
2.22
2.22
2.21
2.12
2.11
1.87
1.86
1.86
1.85
1.85
1.84
1.84
1.83
1.82
1.72
1.72
1.71
1.71
1.70
1.69
1.69
1.68
1.68
1.44
1.43
1.43
1.42
1.41
1.41
1.24
0.97
0.95
0.84
0.83
O
OH
H
O
H
O
OH
H
O
O
15
1H NMR 600 MHz CD3COCD3
dioxane
grease
1.01
1.03
1.05
1.04
1.02
1.00
1.02
1.03
1.02
1.03
2.00
3.10
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1.08
2.06
3.06
1.05
1.06
1.03
3.05
3.06
3.06
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9.0
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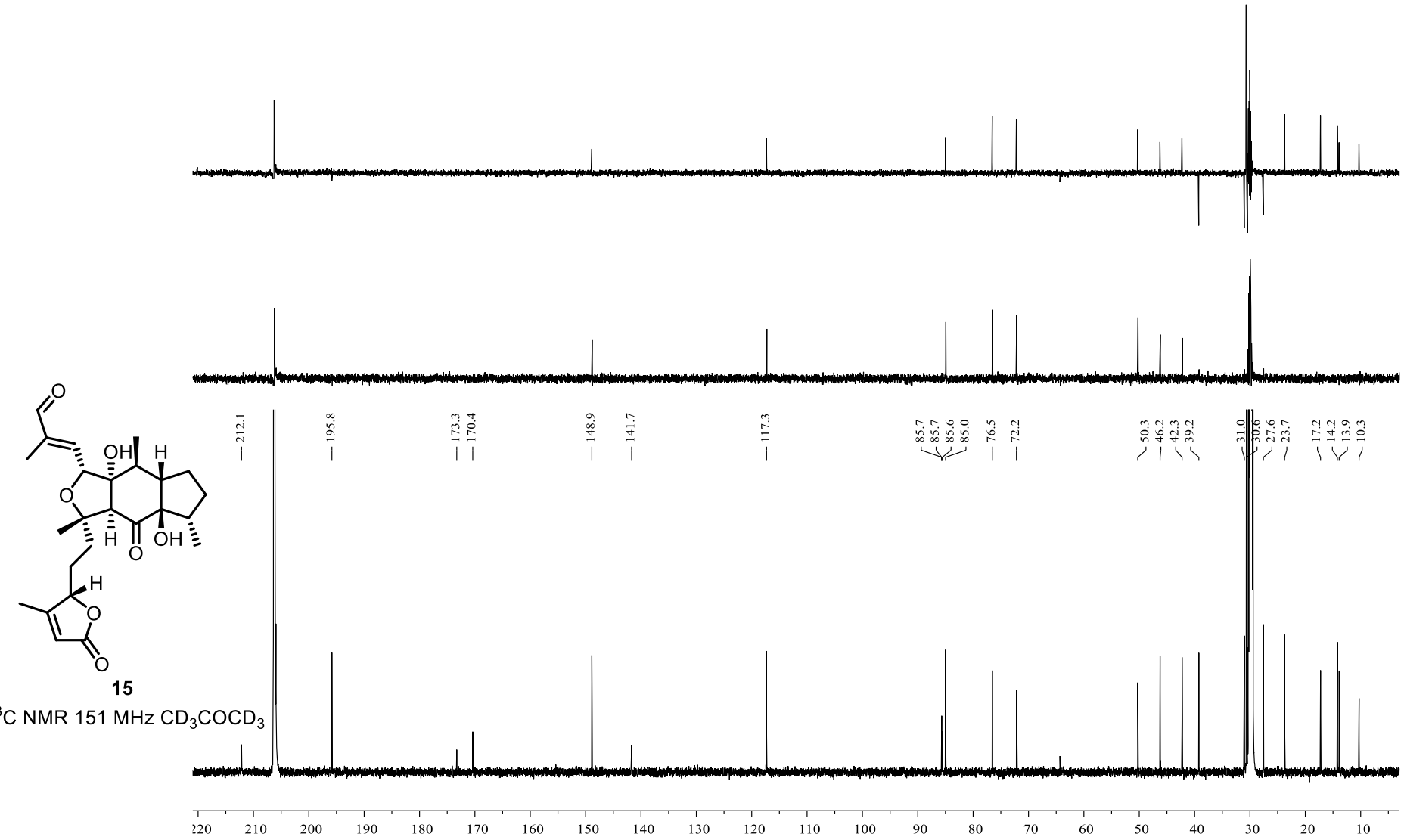
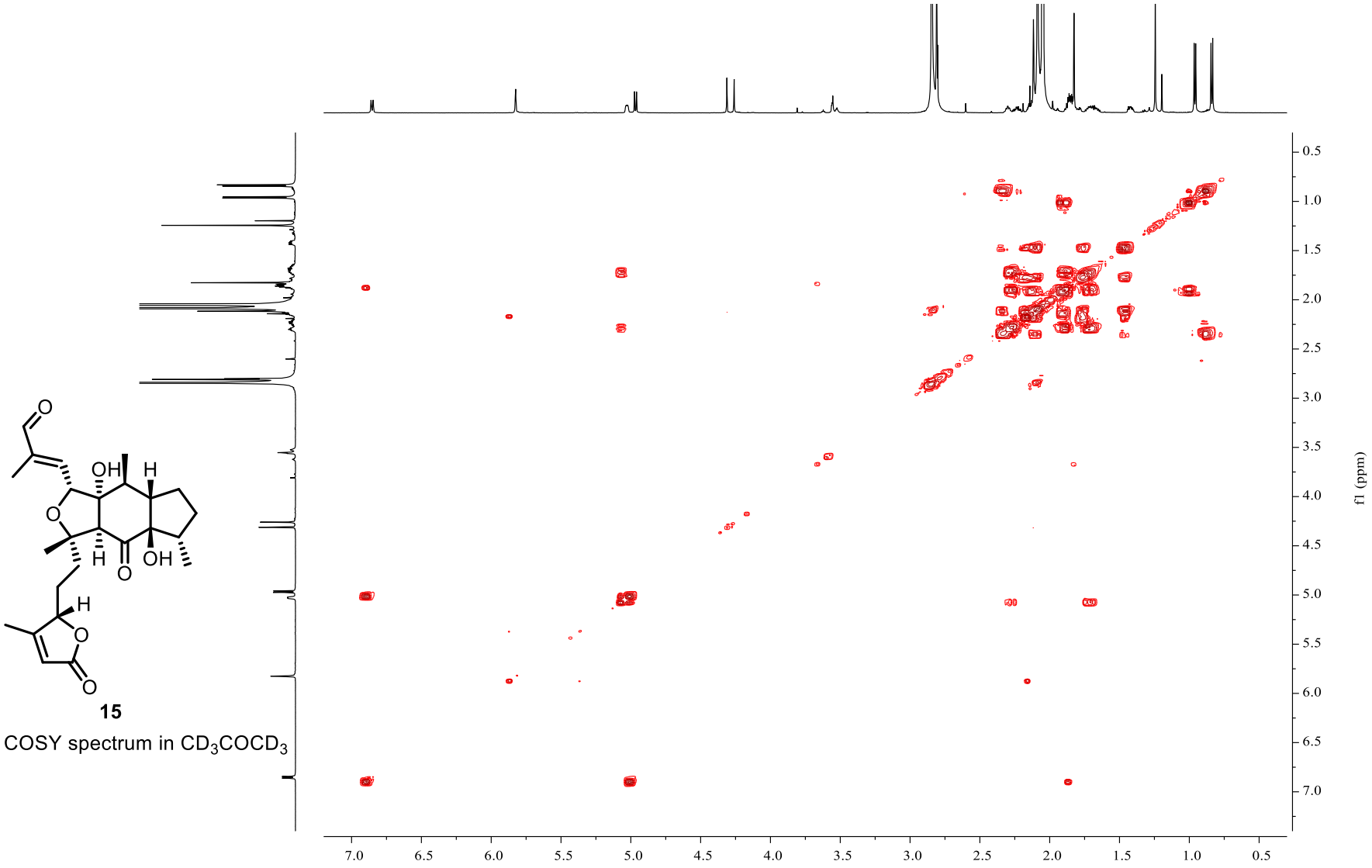


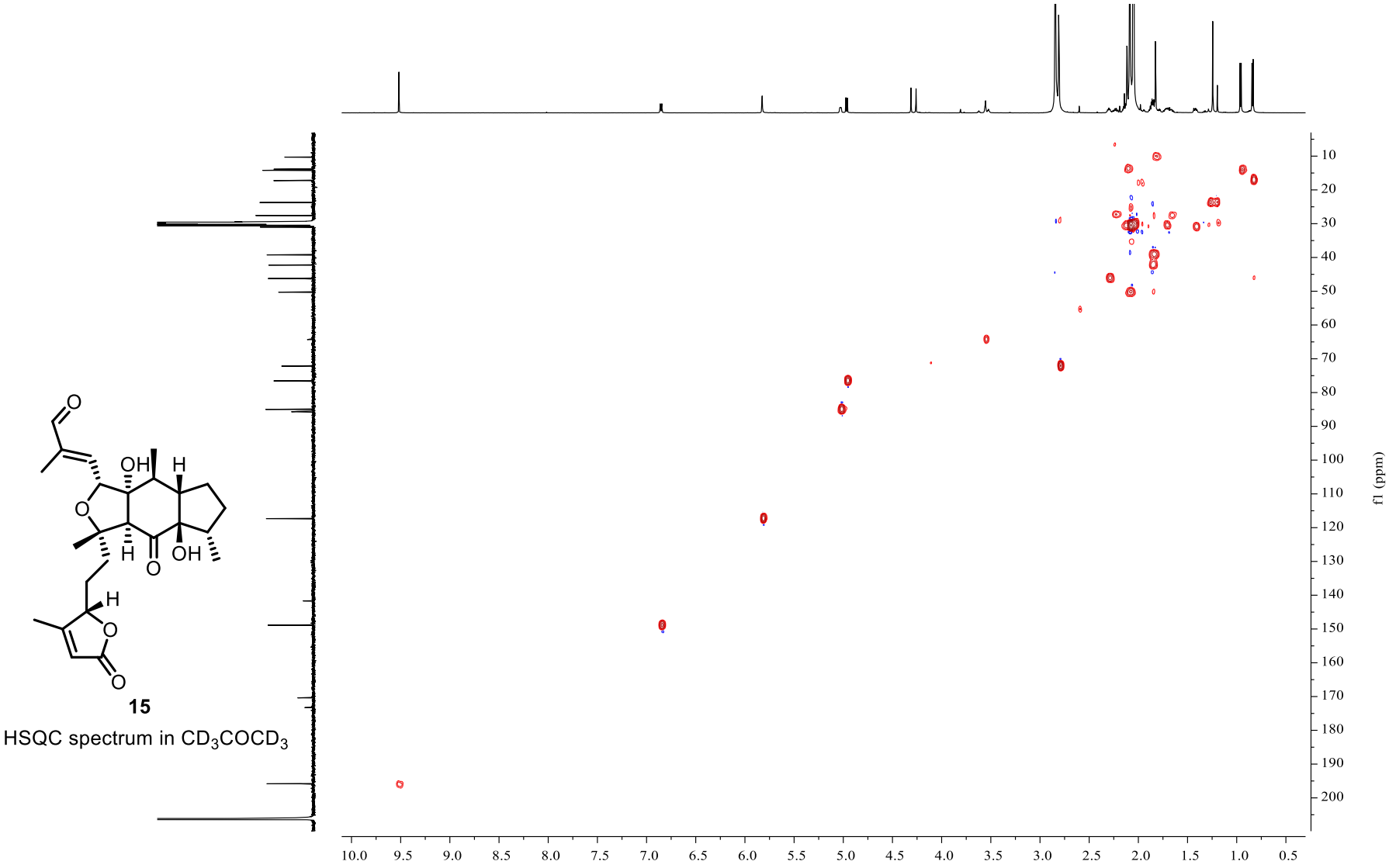
15

^{13}C NMR 151 MHz CD_3COCD_3



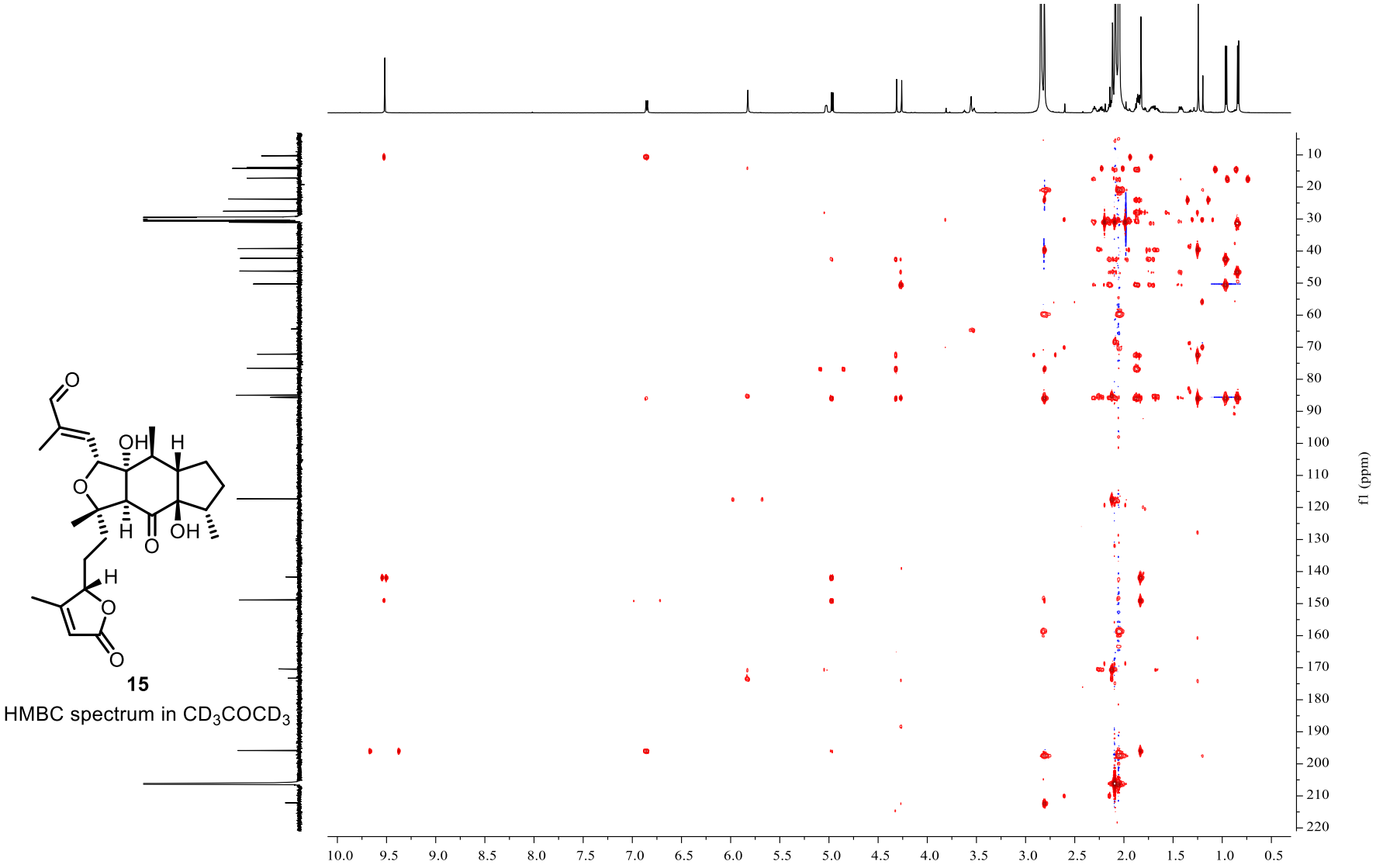
15

^{1}H-^{1}H COSY spectrum in CD_3COCD_3



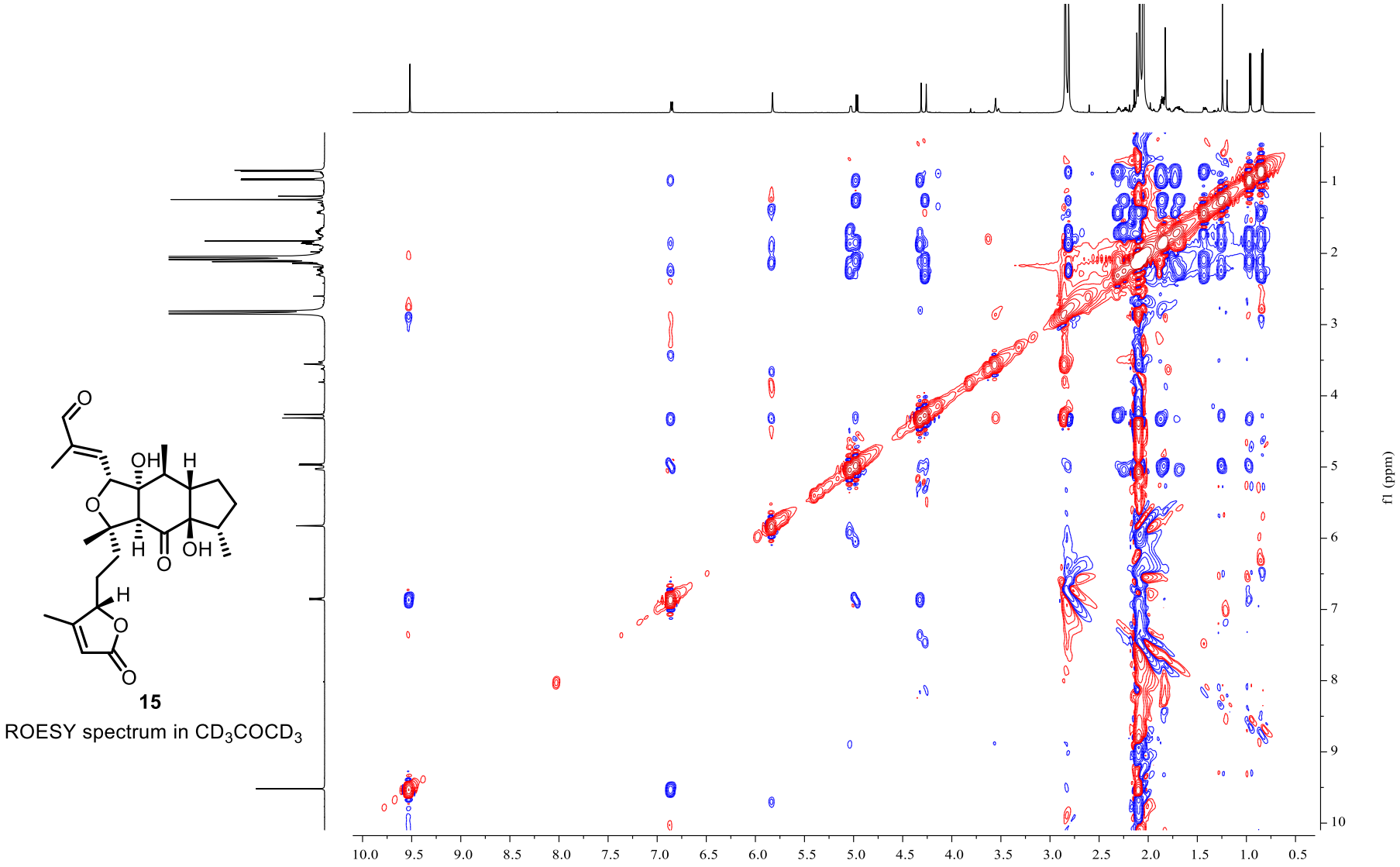
15

HSQC spectrum in CD_3COCD_3



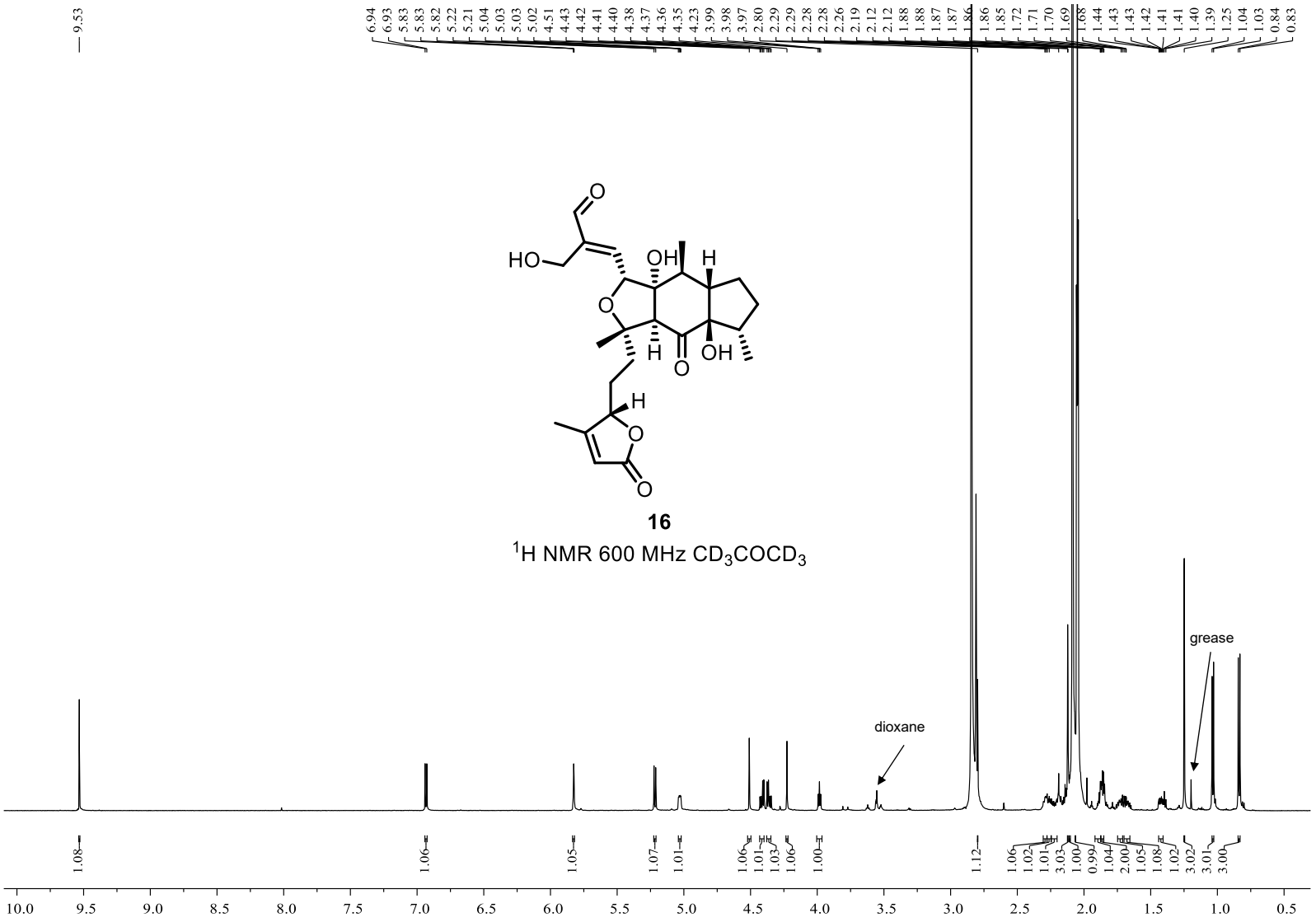
15

HMBC spectrum in CD_3COCD_3



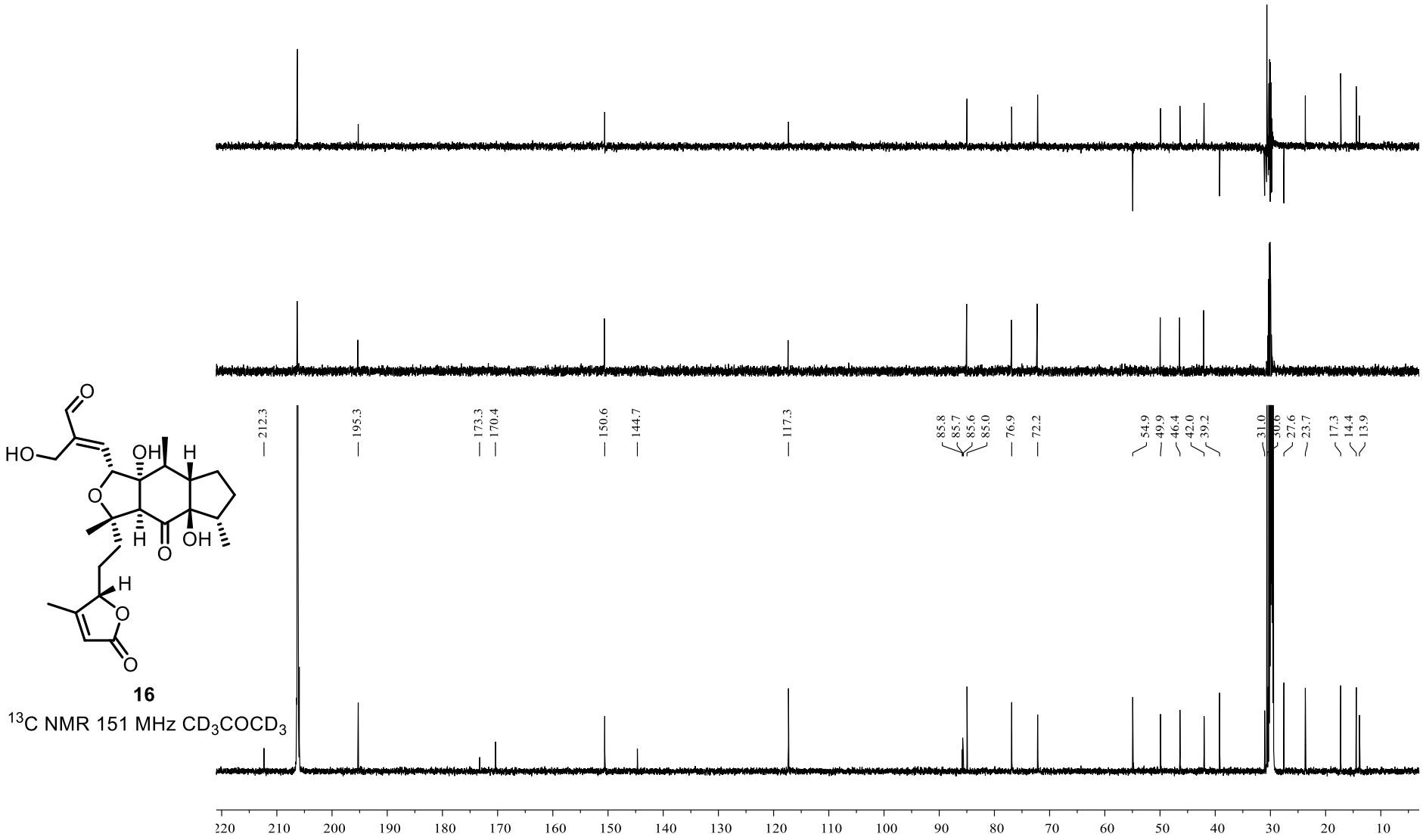
15

ROESY spectrum in CD_3COCD_3



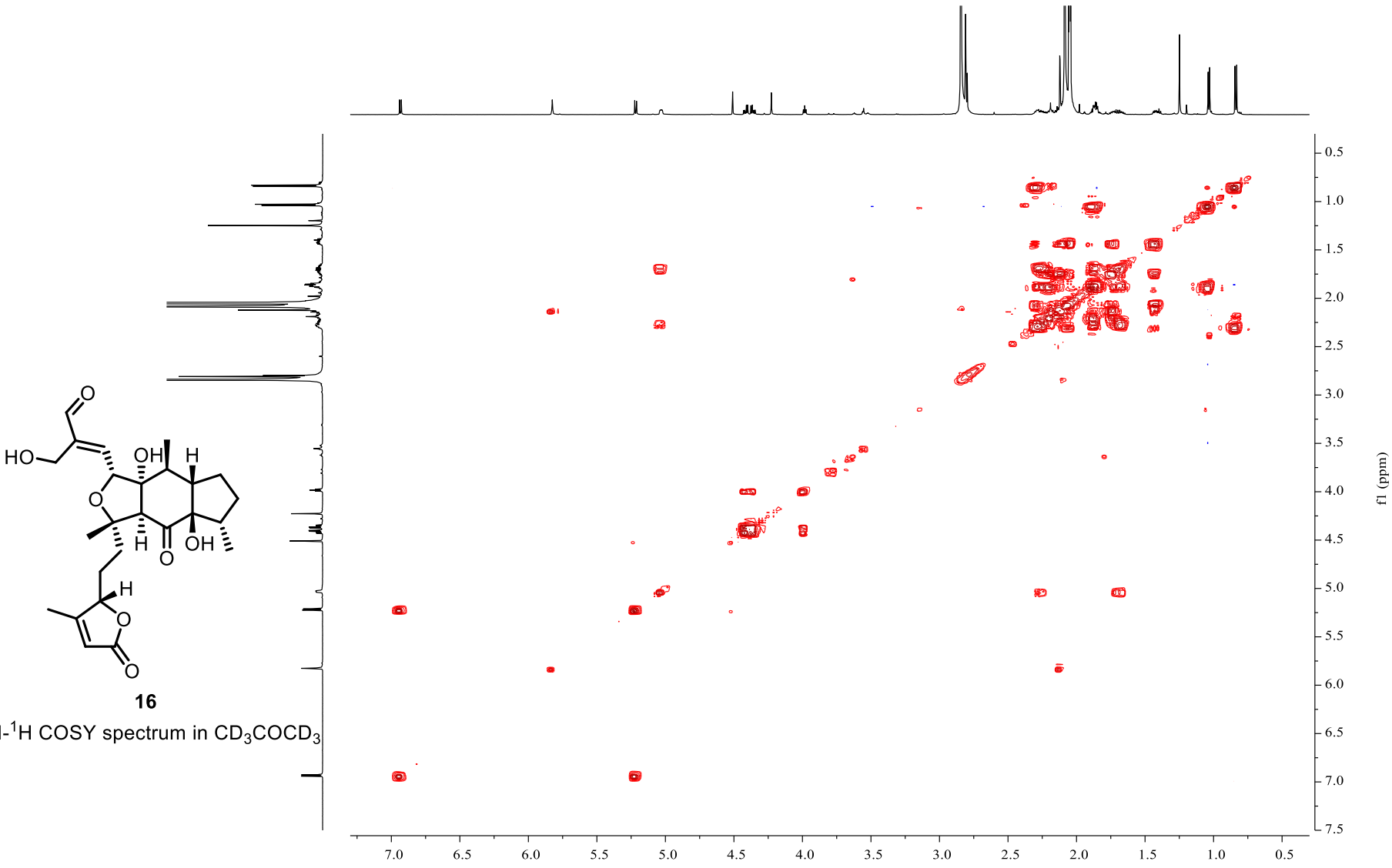
16

^{1}H NMR 600 MHz CD_3COCD_3



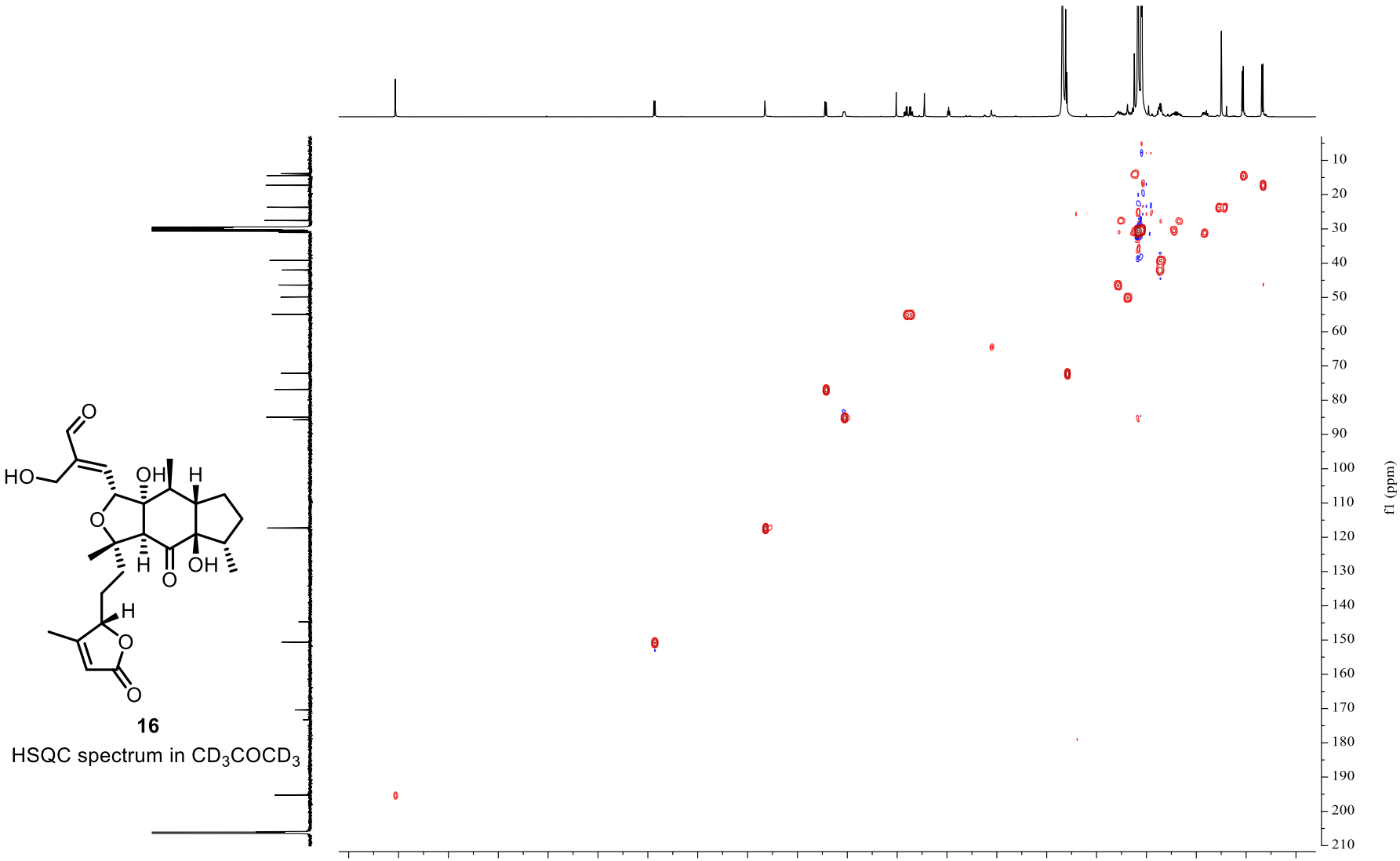
16

^{13}C NMR 151 MHz CD_3COCD_3



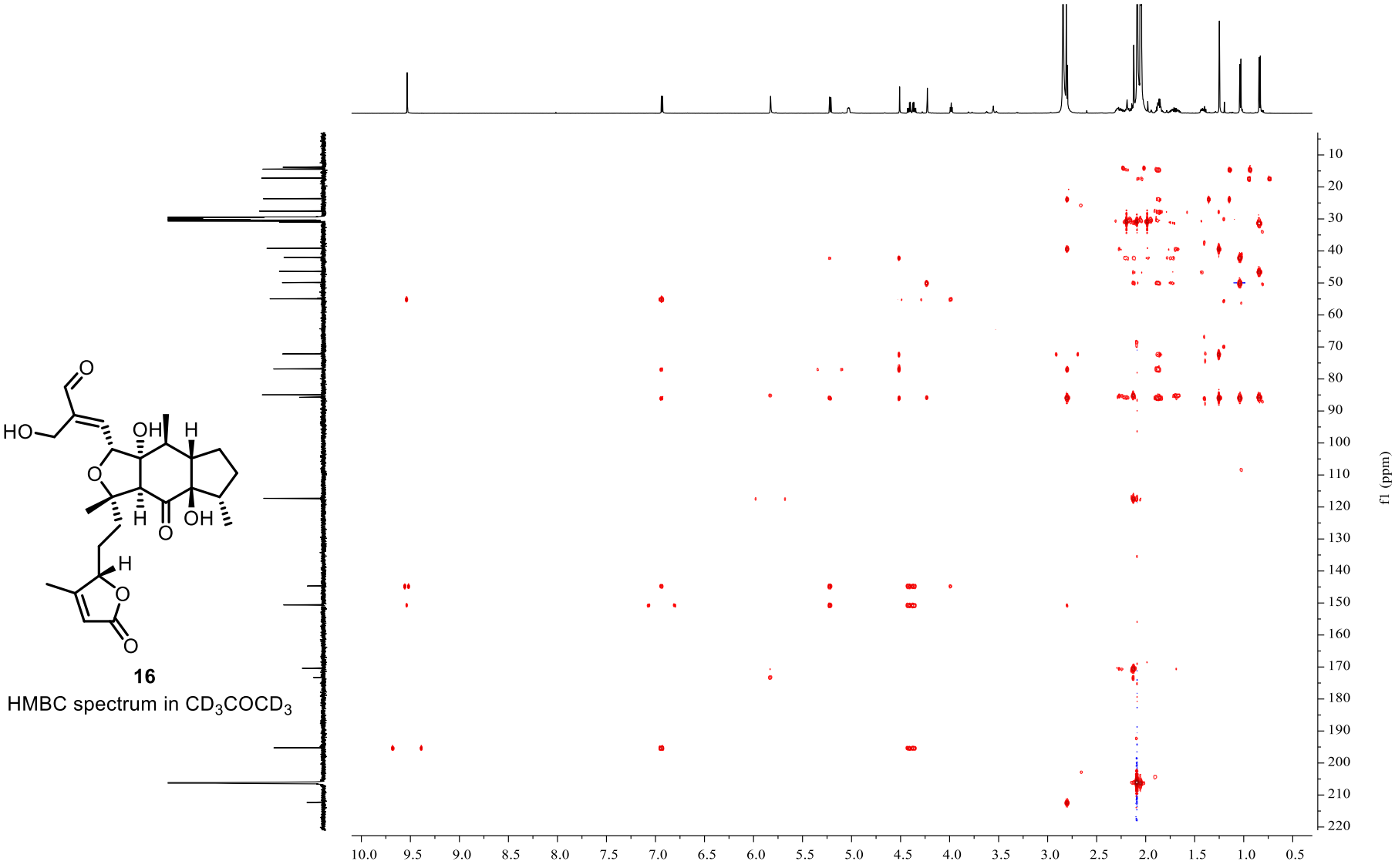
16

^{1}H-^{1}H COSY spectrum in CD_3COCD_3



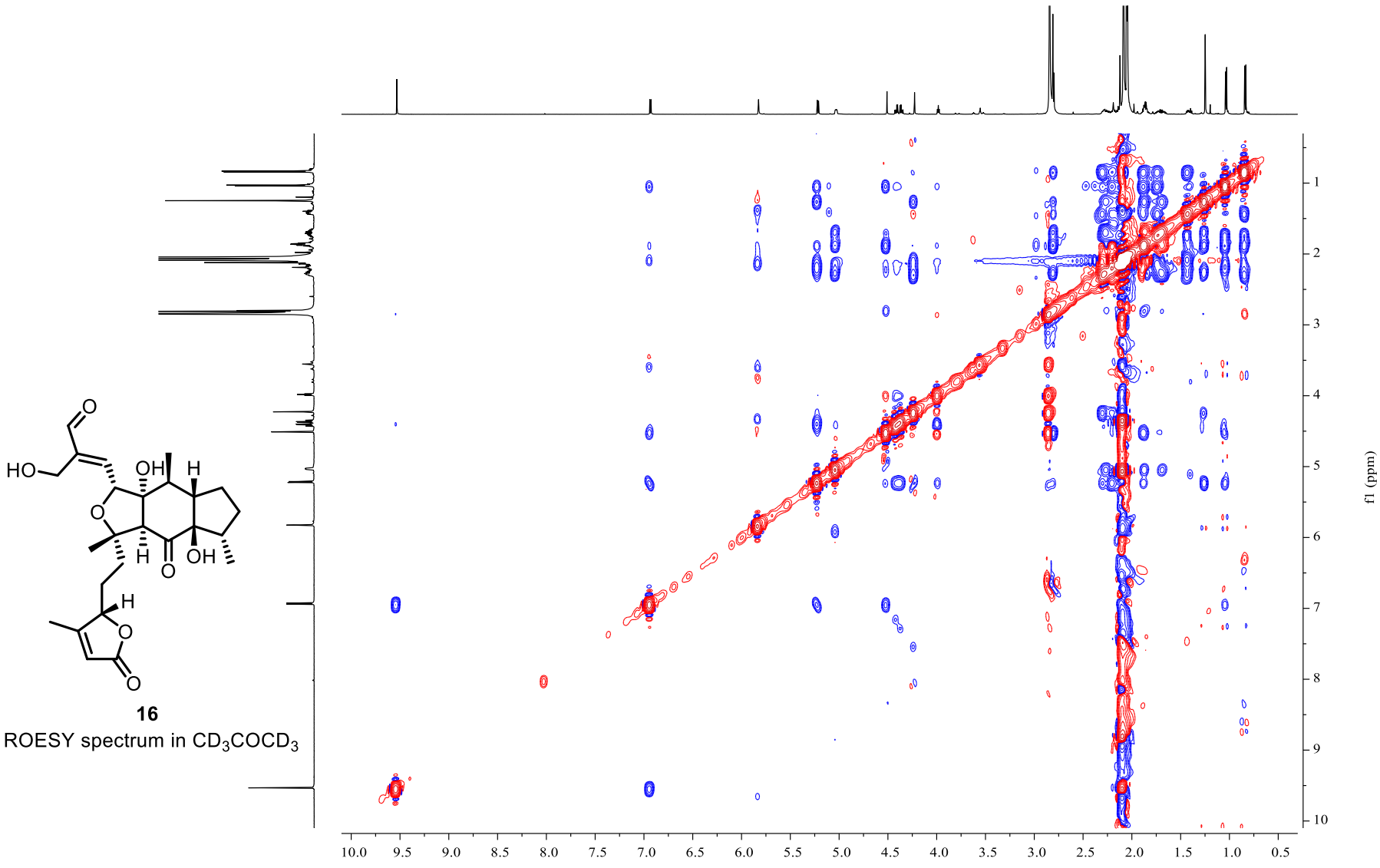
16

HSQC spectrum in CD_3COCD_3



16

HMBC spectrum in CD_3COCD_3



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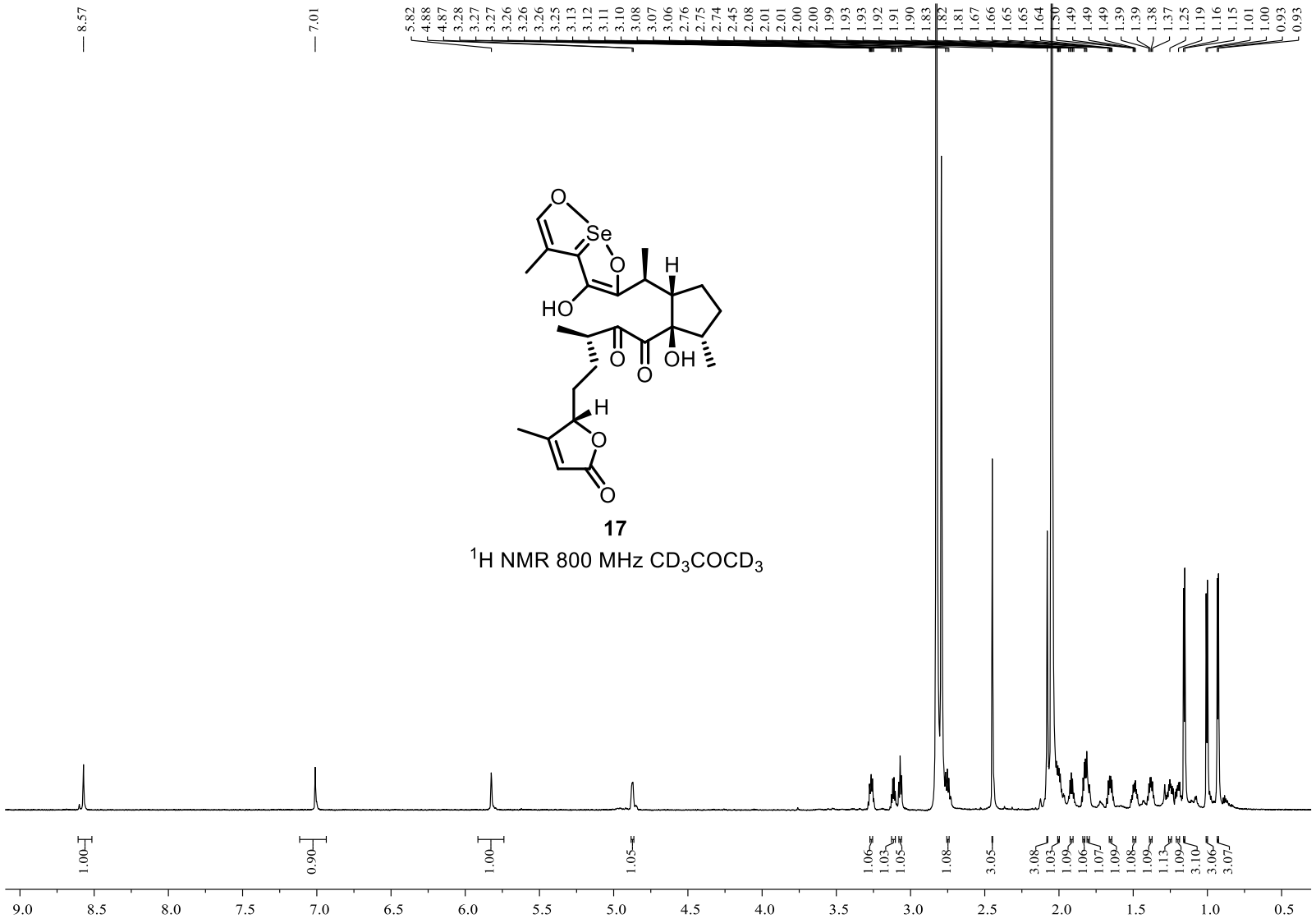
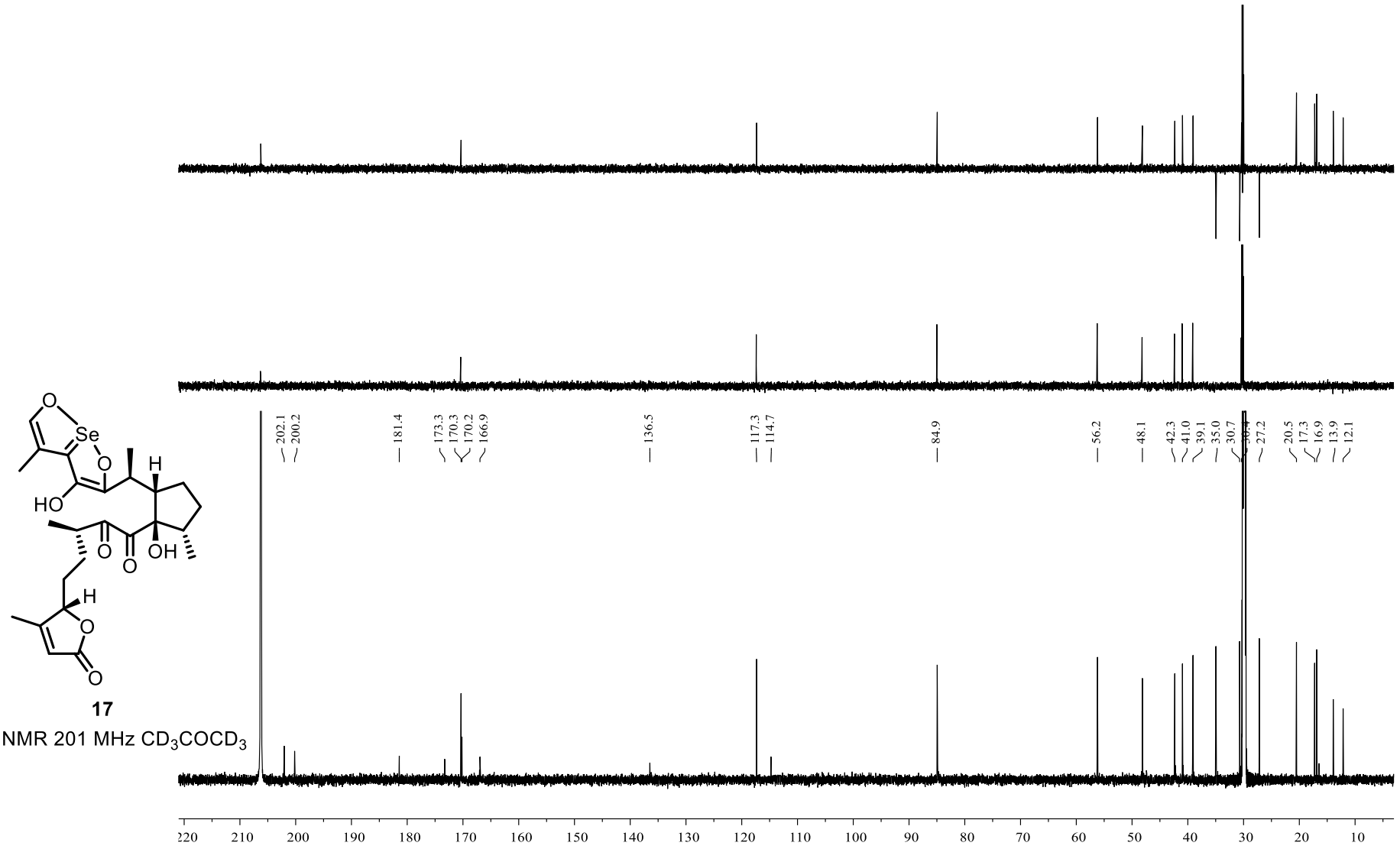
ROESY spectrum in CD_3COCD_3



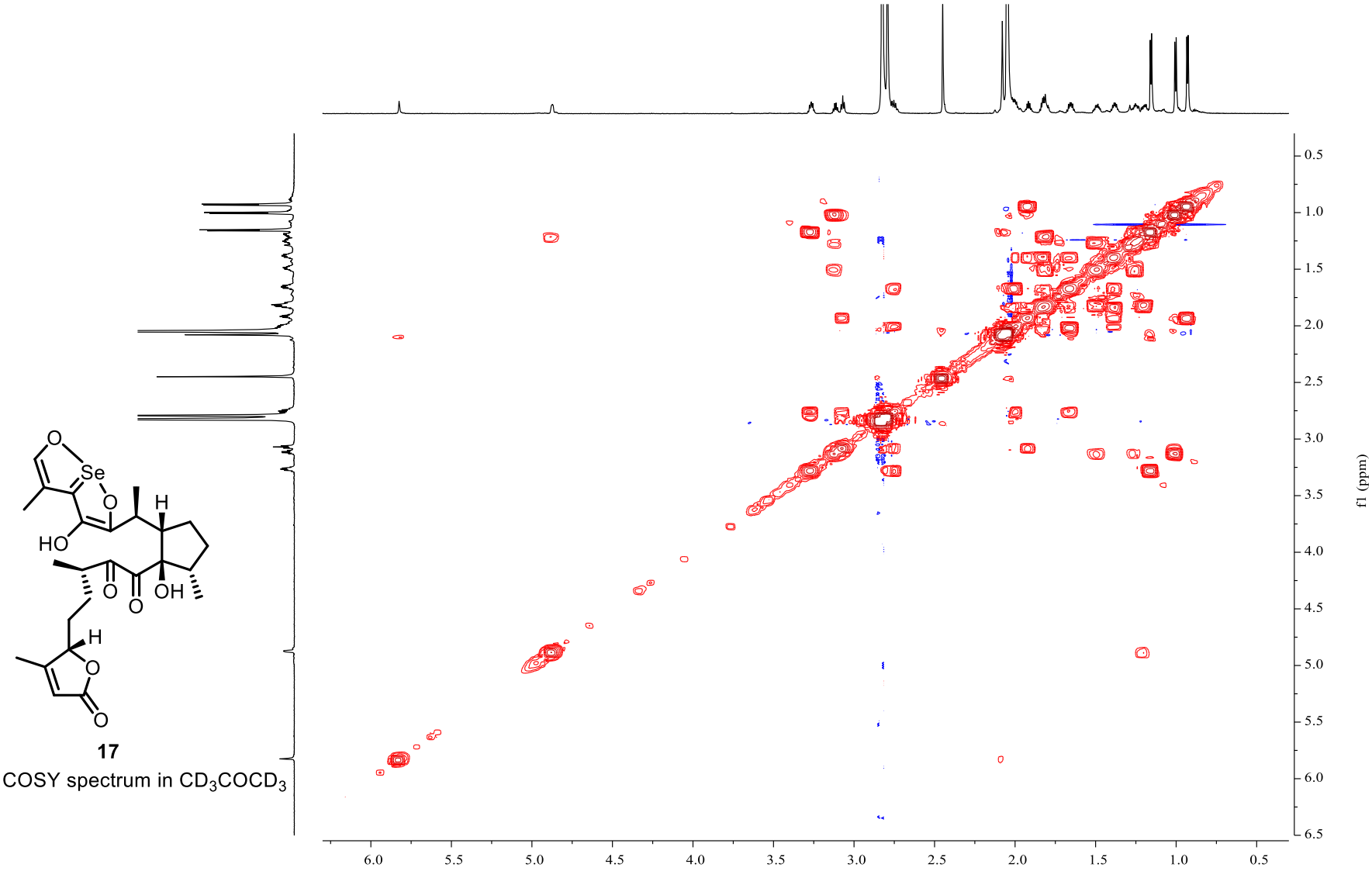
17

^{1}H NMR 800 MHz CD_3COCD_3



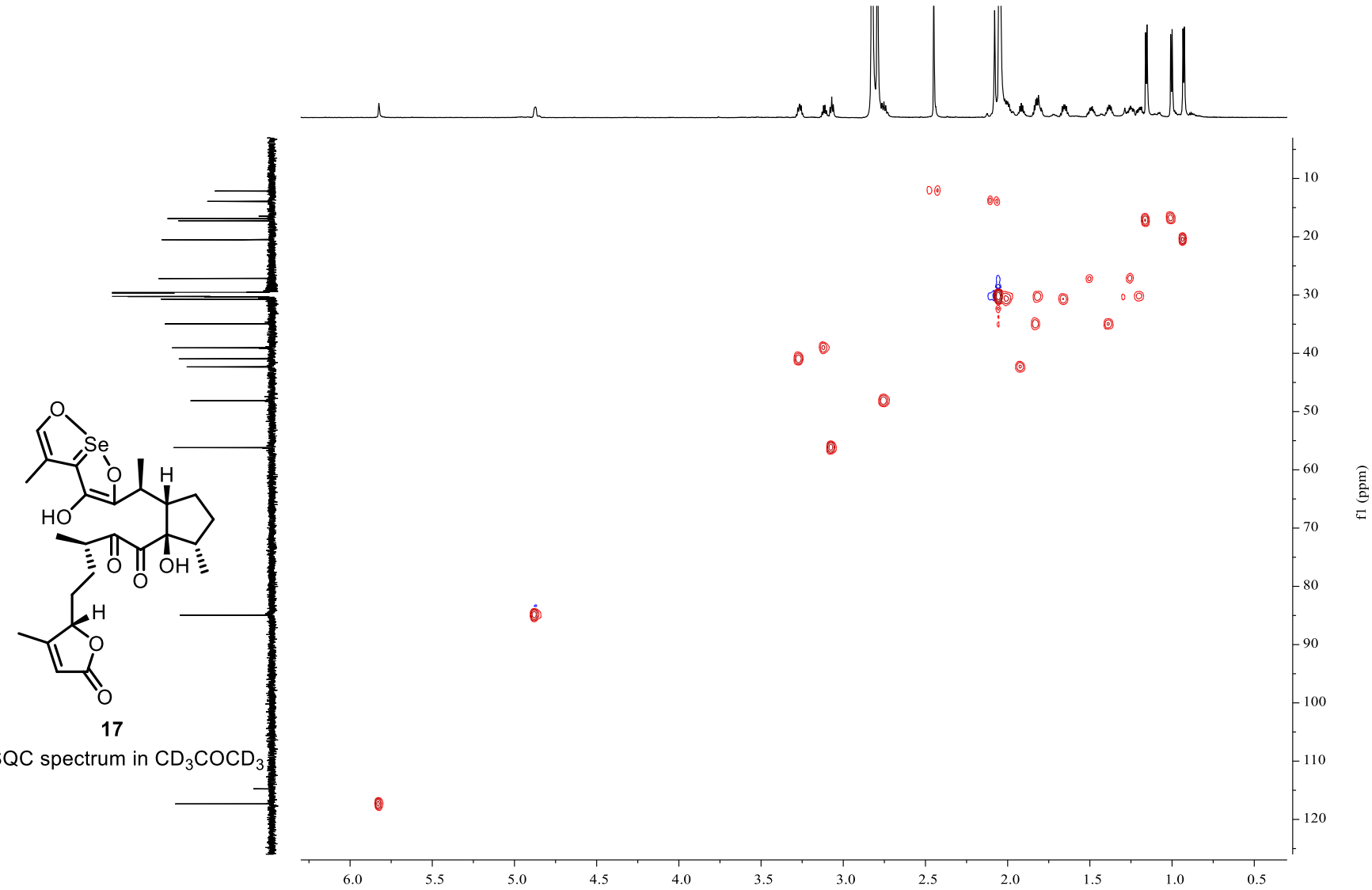
17

^{13}C NMR 201 MHz CD_3COCD_3



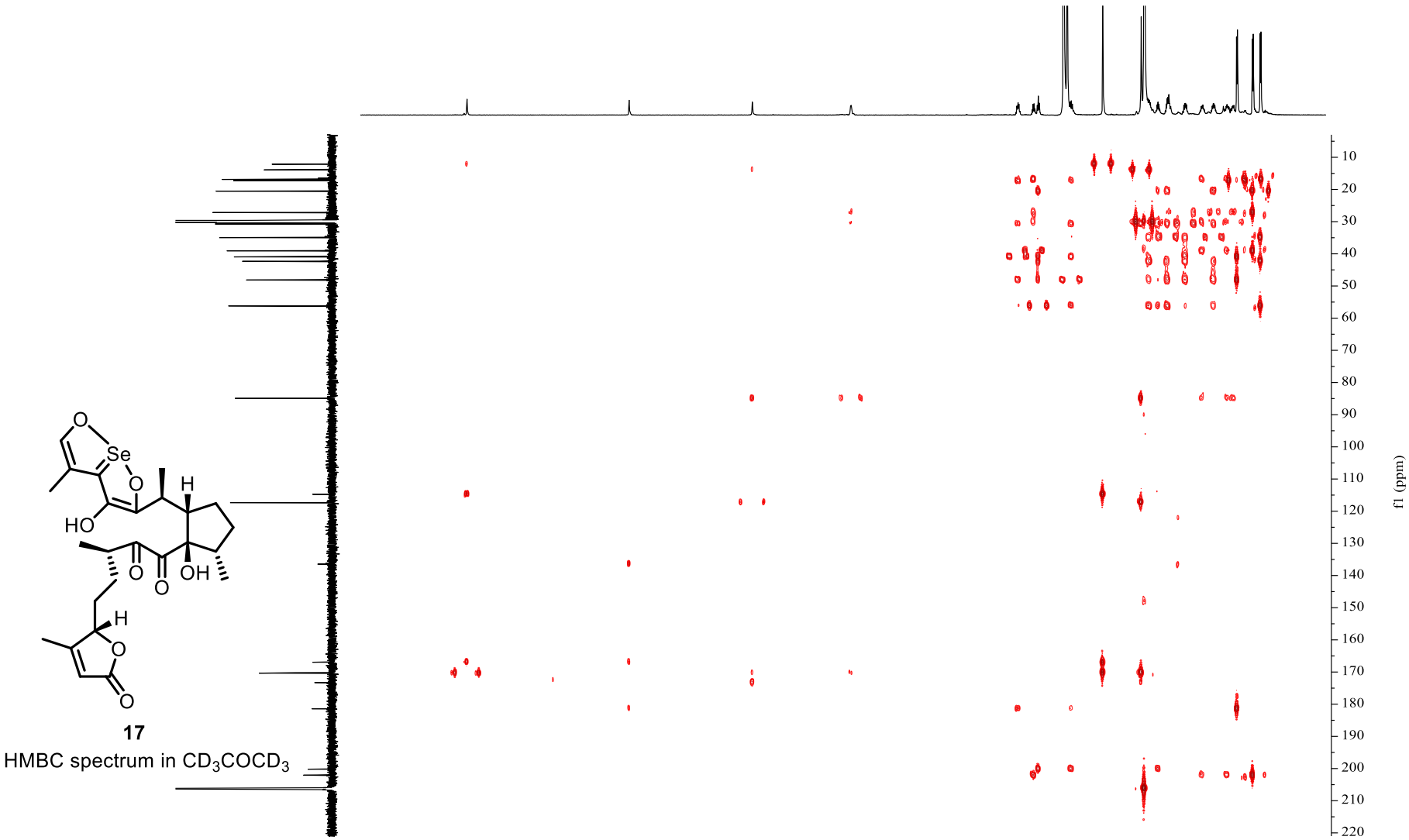
17

^{1}H-^{1}H COSY spectrum in CD_3COCD_3



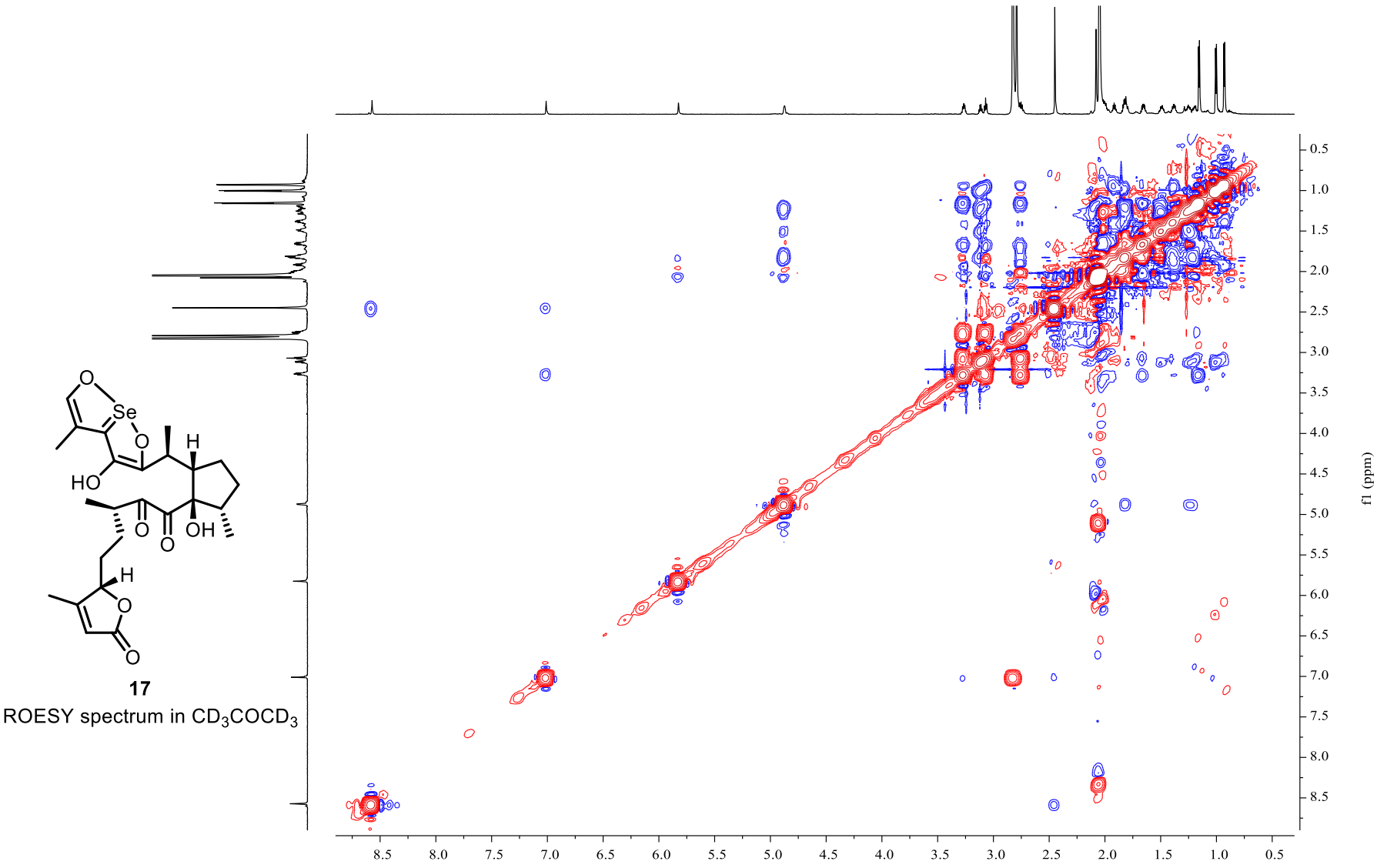
17

HSQC spectrum in CD_3COCD_3



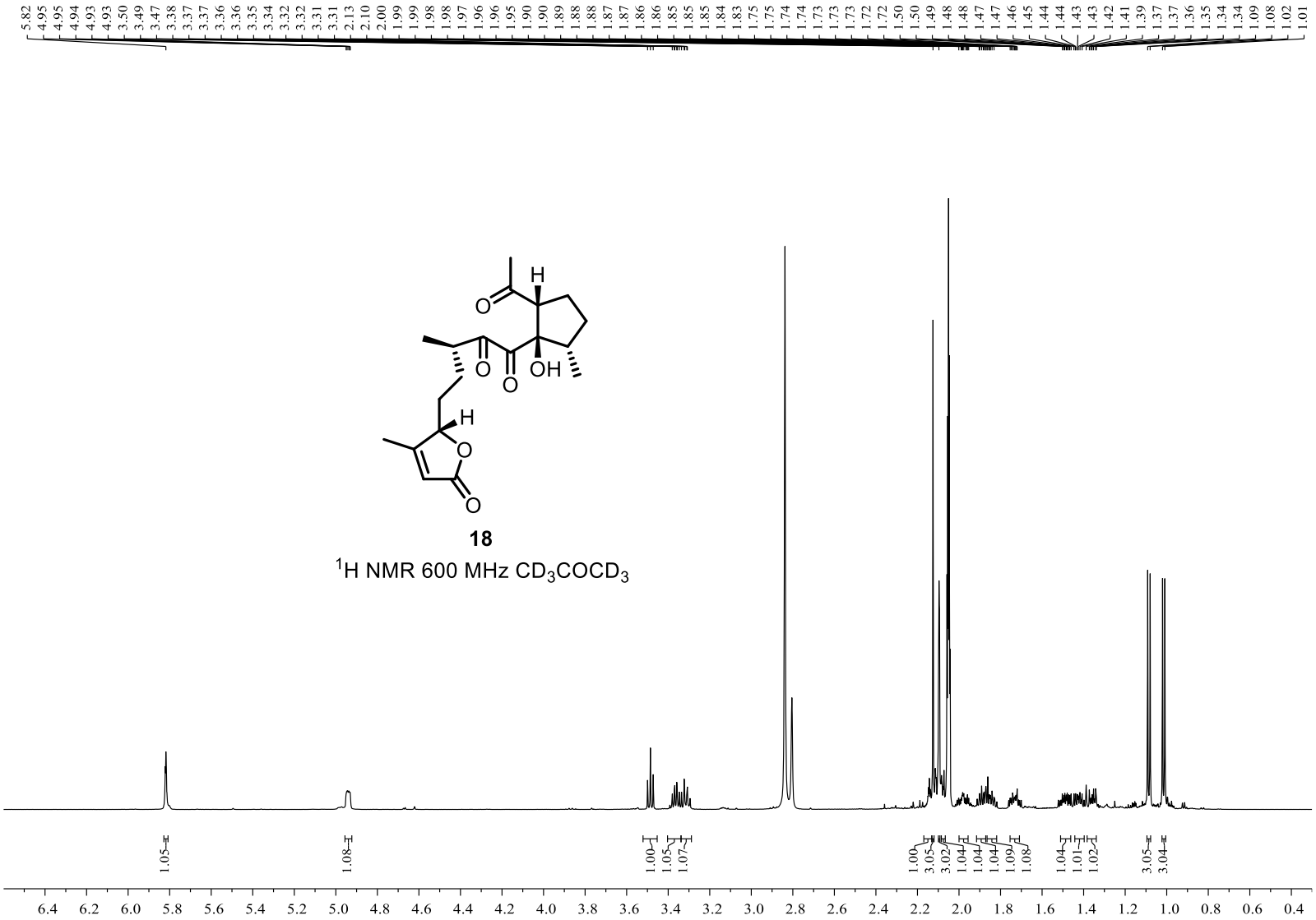
17

HMBC spectrum in CD_3COCD_3



17

ROESY spectrum in CD_3COCD_3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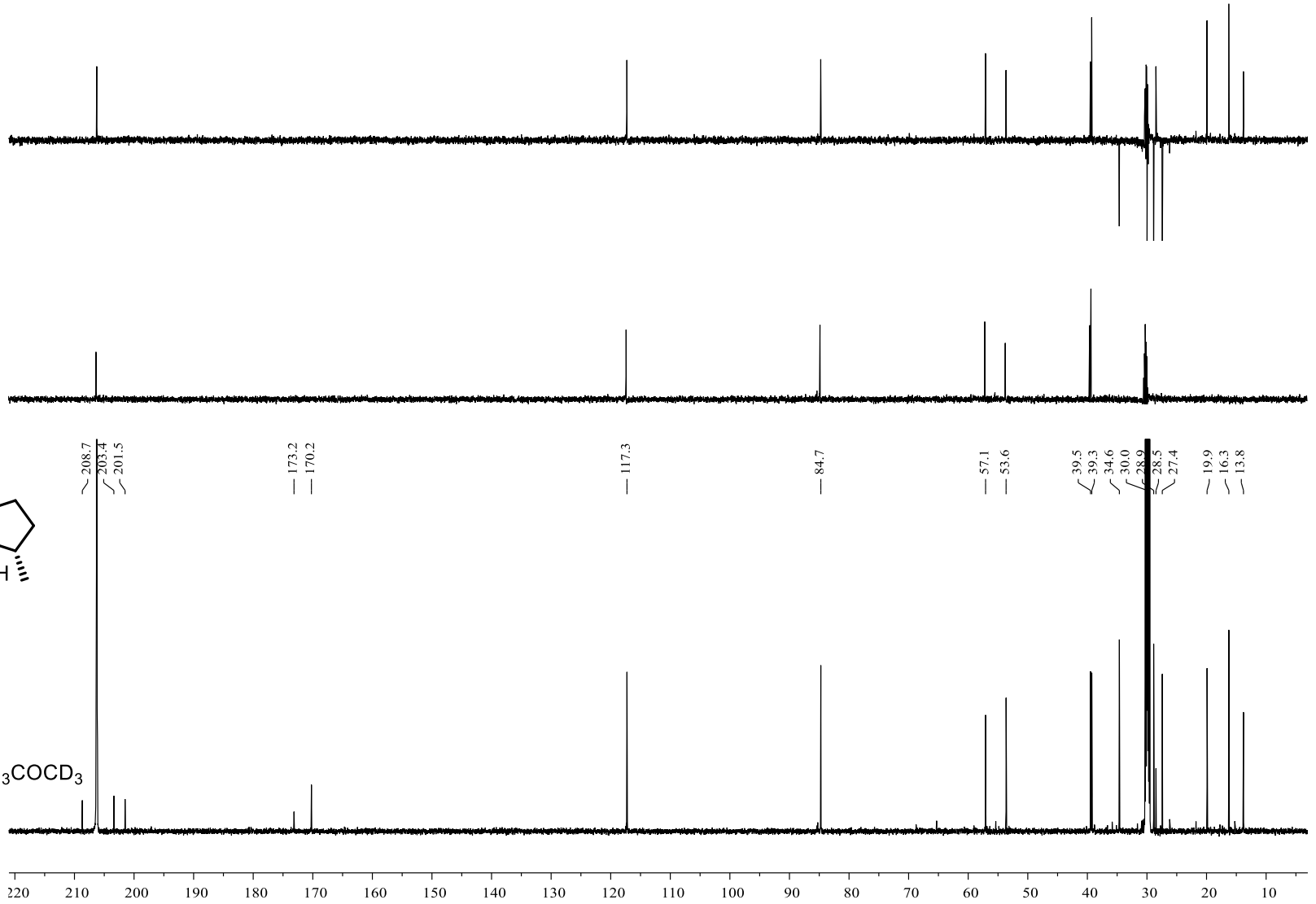
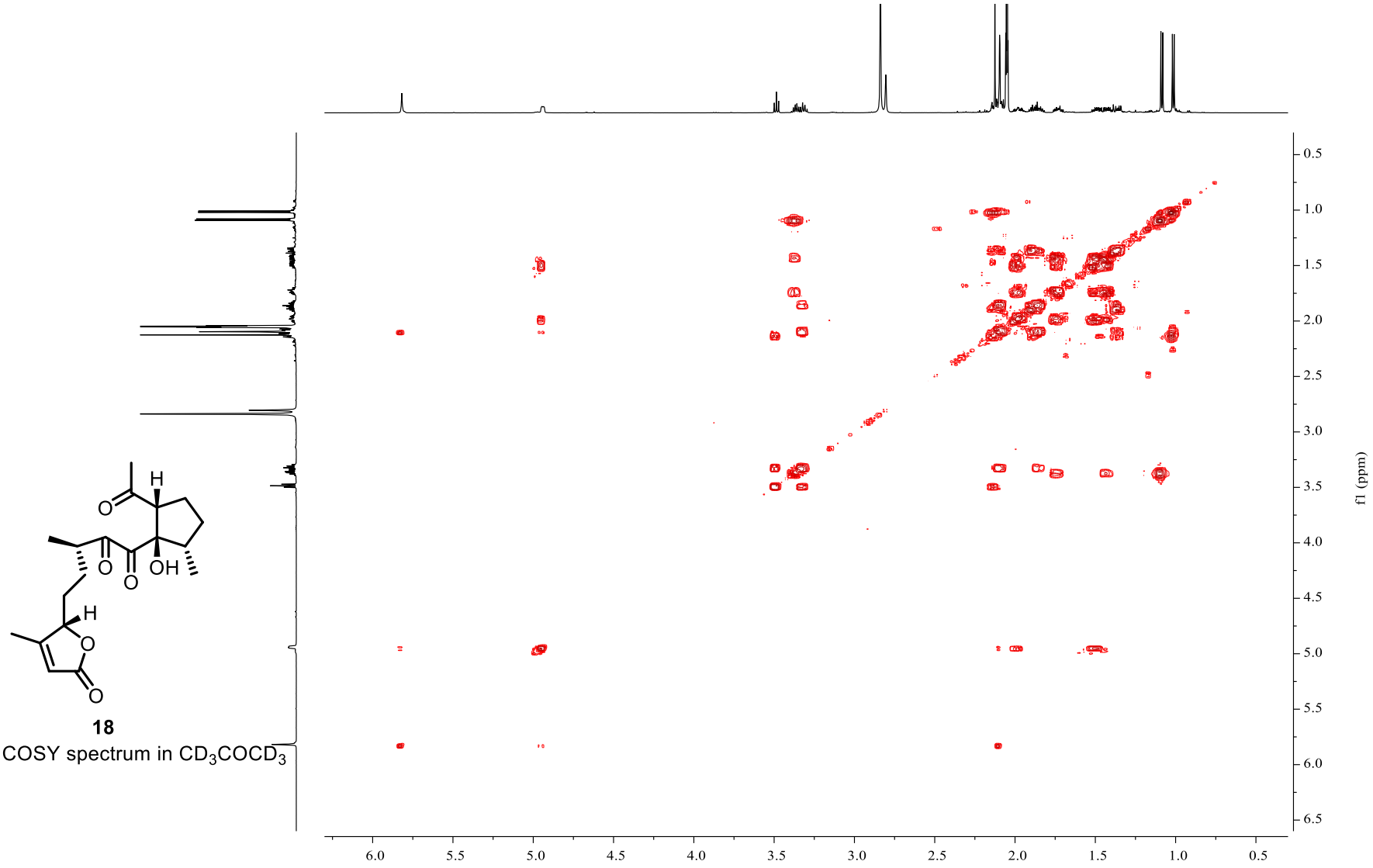
H
O
O
O
OH
H
O
O
18
1H NMR 600 MHz CD3COCD3
1.05 1.08 1.00 1.05 1.07 1.00 3.05 3.02 1.04 1.04 1.09 1.08 1.04 1.01 1.02 3.05 3.04
6.4 6.2 6.0 5.8 5.6 5.4 5.2 5.0 4.8 4.6 4.4 4.2 4.0 3.8 3.6 3.4 3.2 3.0 2.8 2.6 2.4 2.2 2.0 1.8 1.6 1.4 1.2 1.0 0.8 0.6 0.4



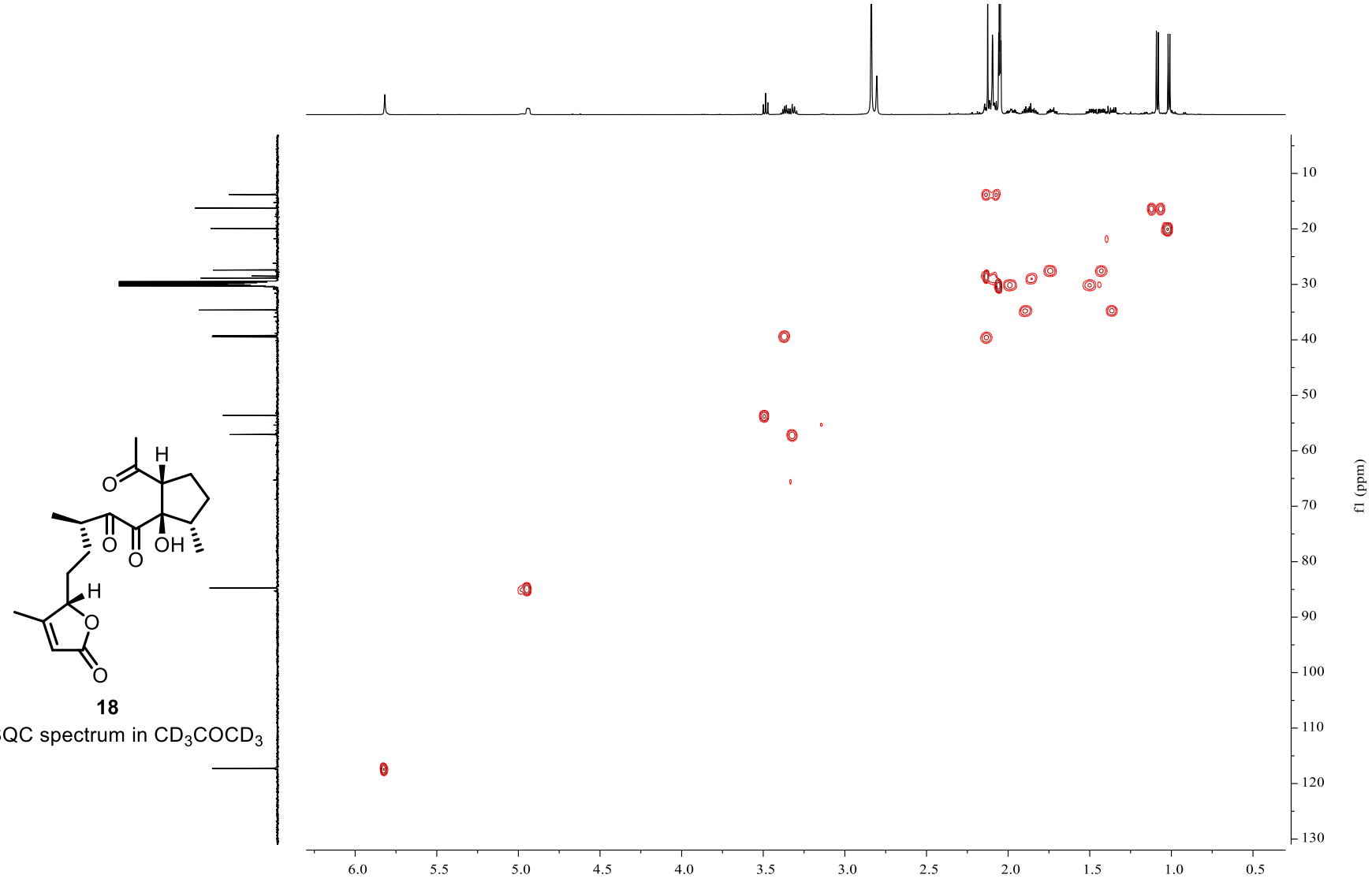
18

^{13}C NMR 151 MHz CD_3COCD_3



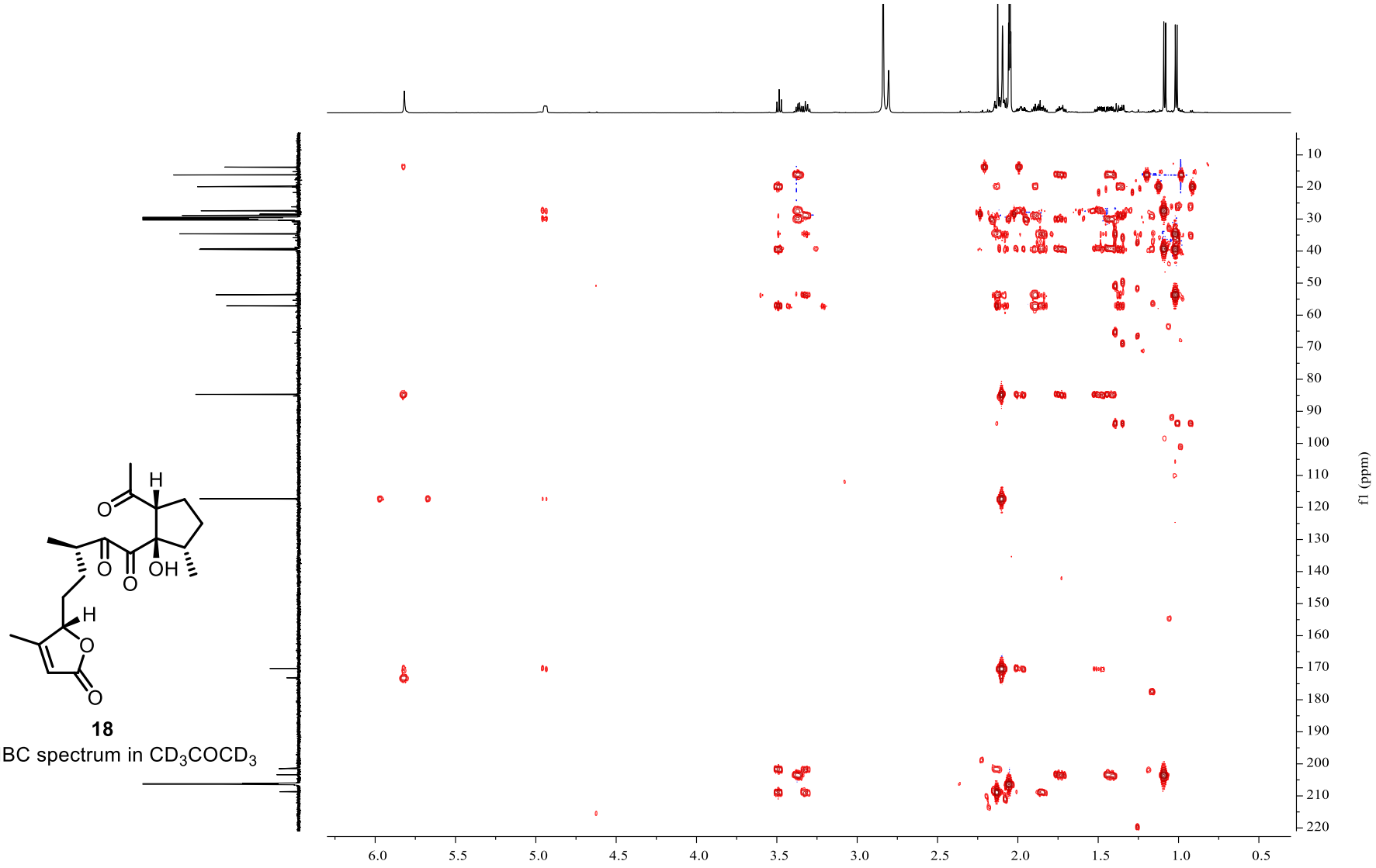
18

^{1}H-^{1}H COSY spectrum in CD_3COCD_3



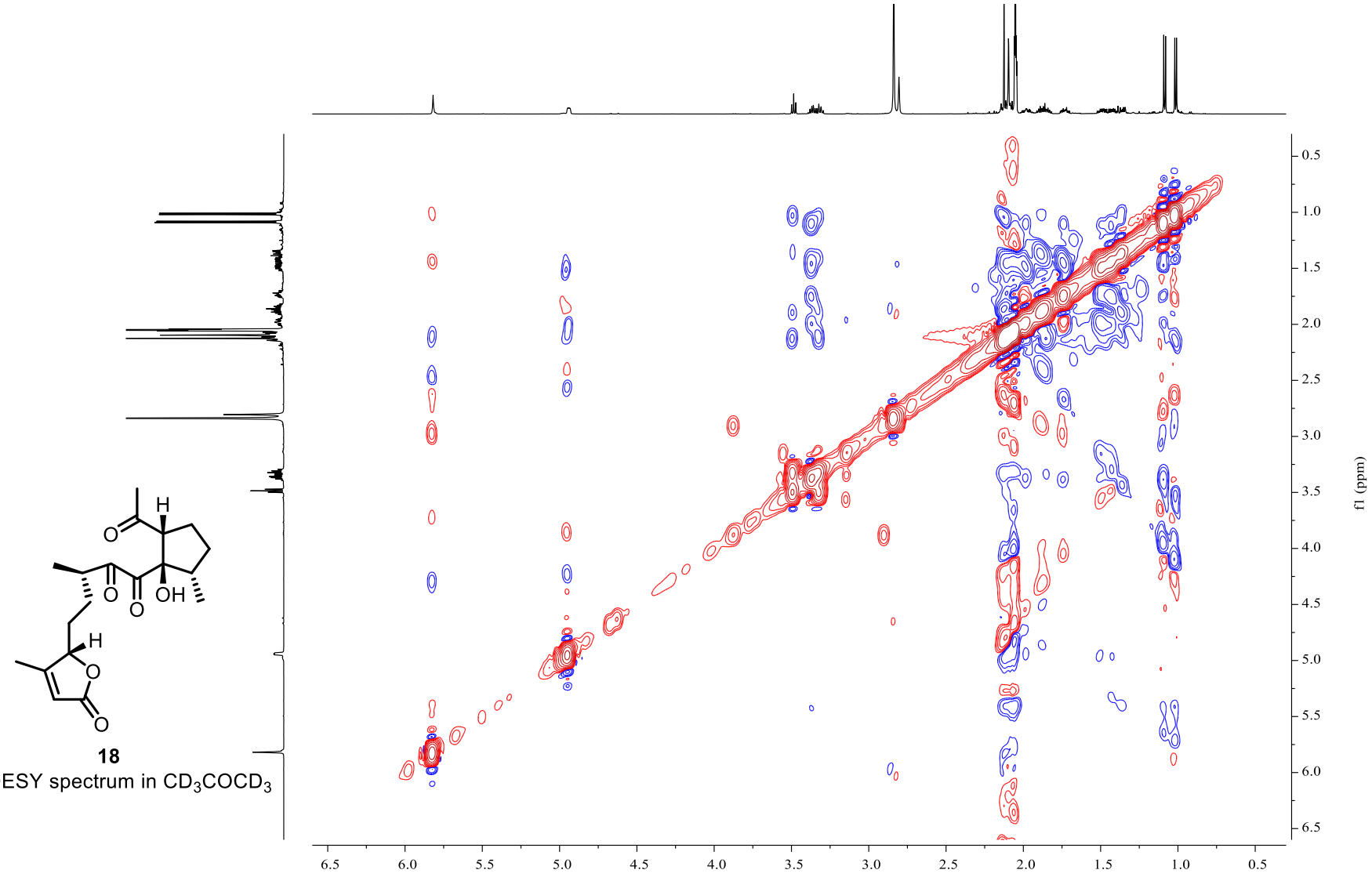
18

HSQC spectrum in CD_3COCD_3



18

HMBC spectrum in CD_3COCD_3



18

ROESY spectrum in CD_3COCD_3