Biomimetic Synthesis of the Non-Canonical PPAP Natural Products Yezo'otogirin C and Hypermogin D, and Studies Towards the Synthesis of Norascyronone A

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Lauren A. M. Murray, and Jonathan H. George*

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Supporting Information

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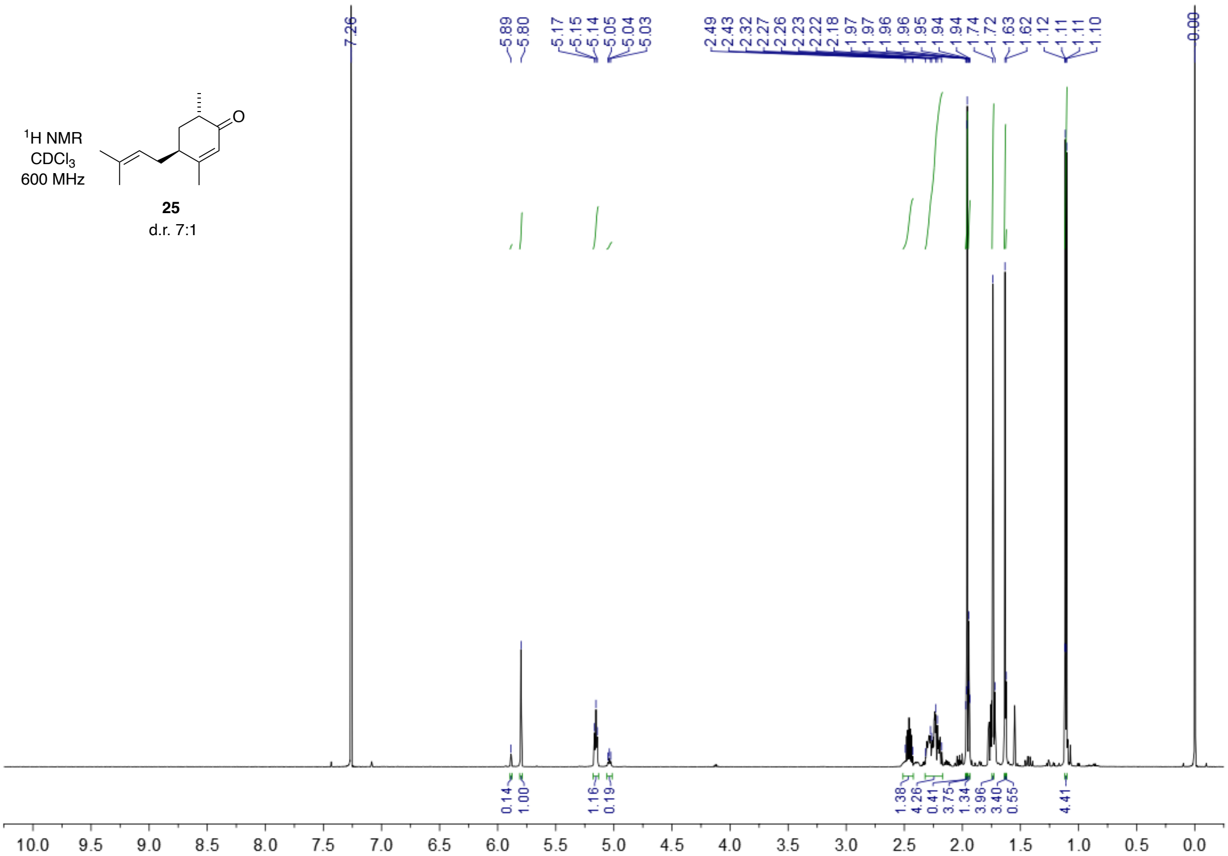
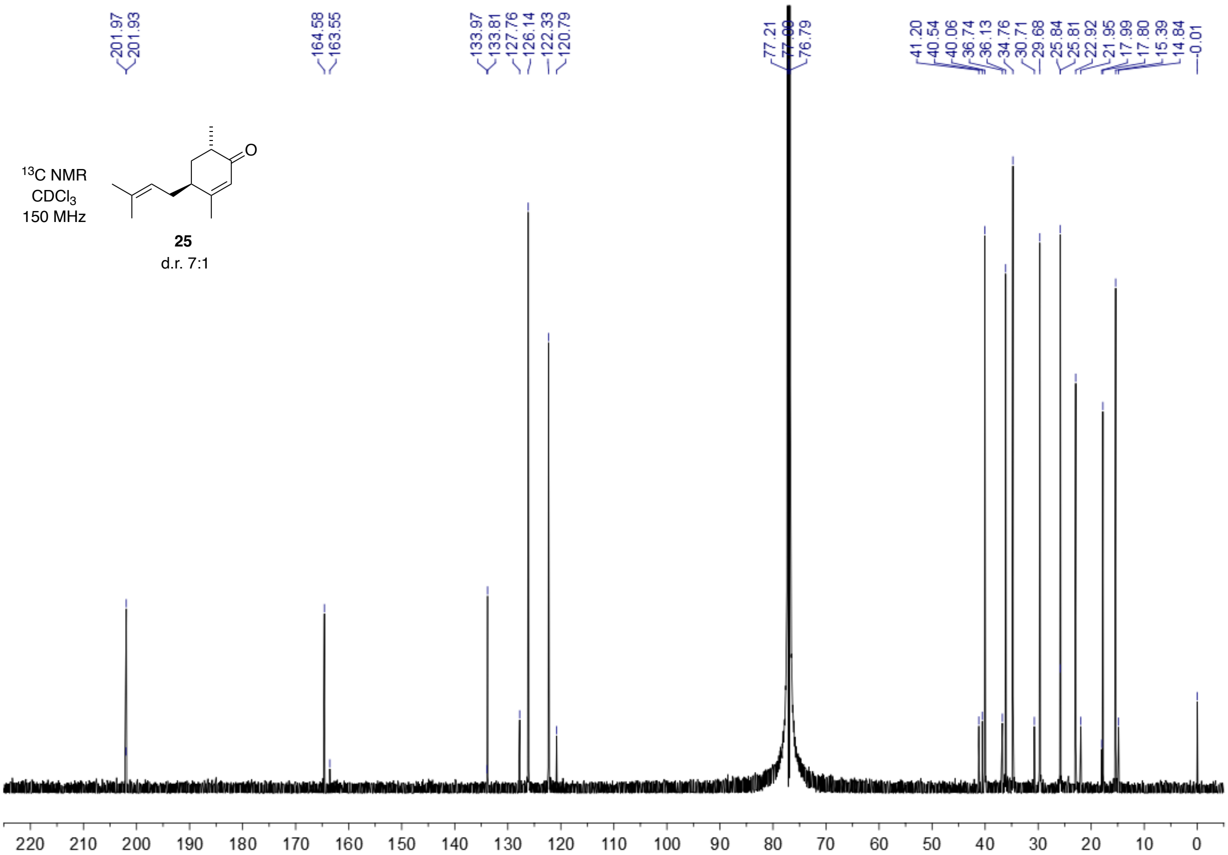
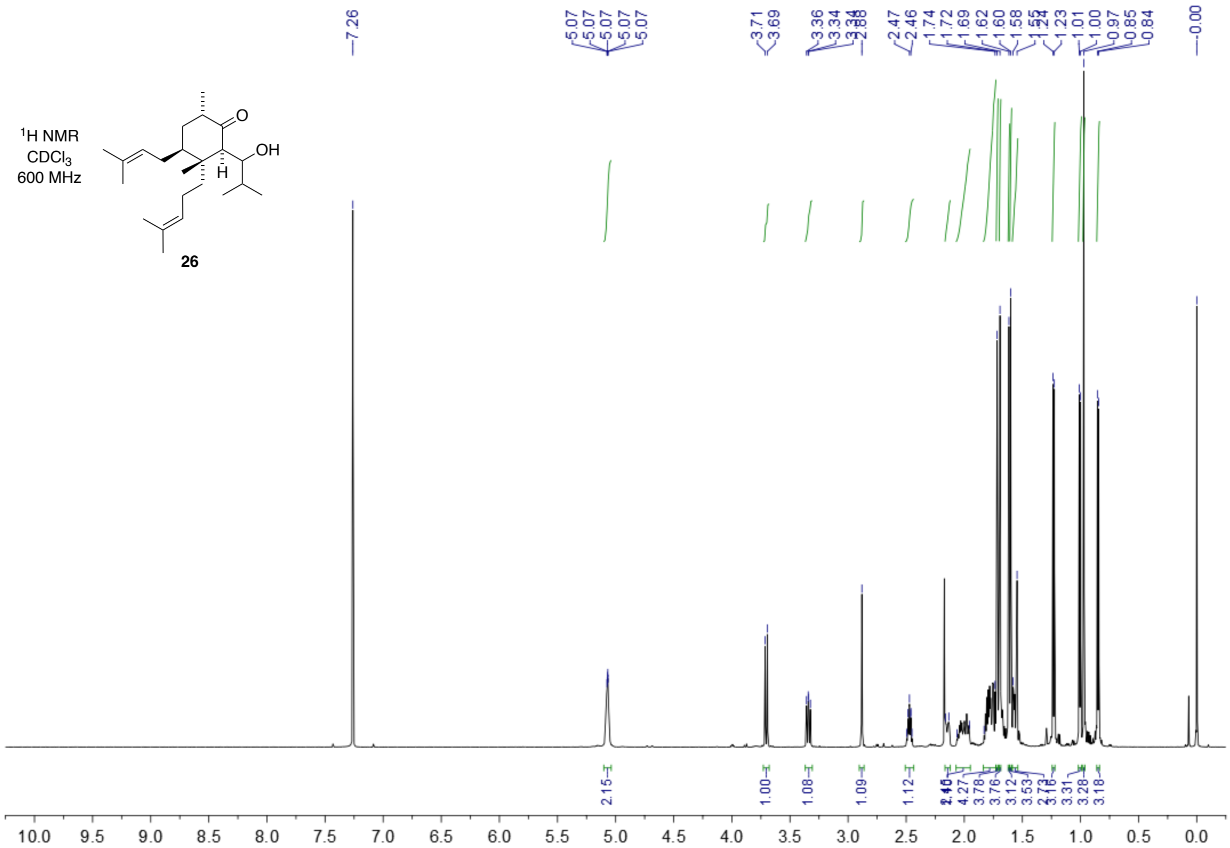
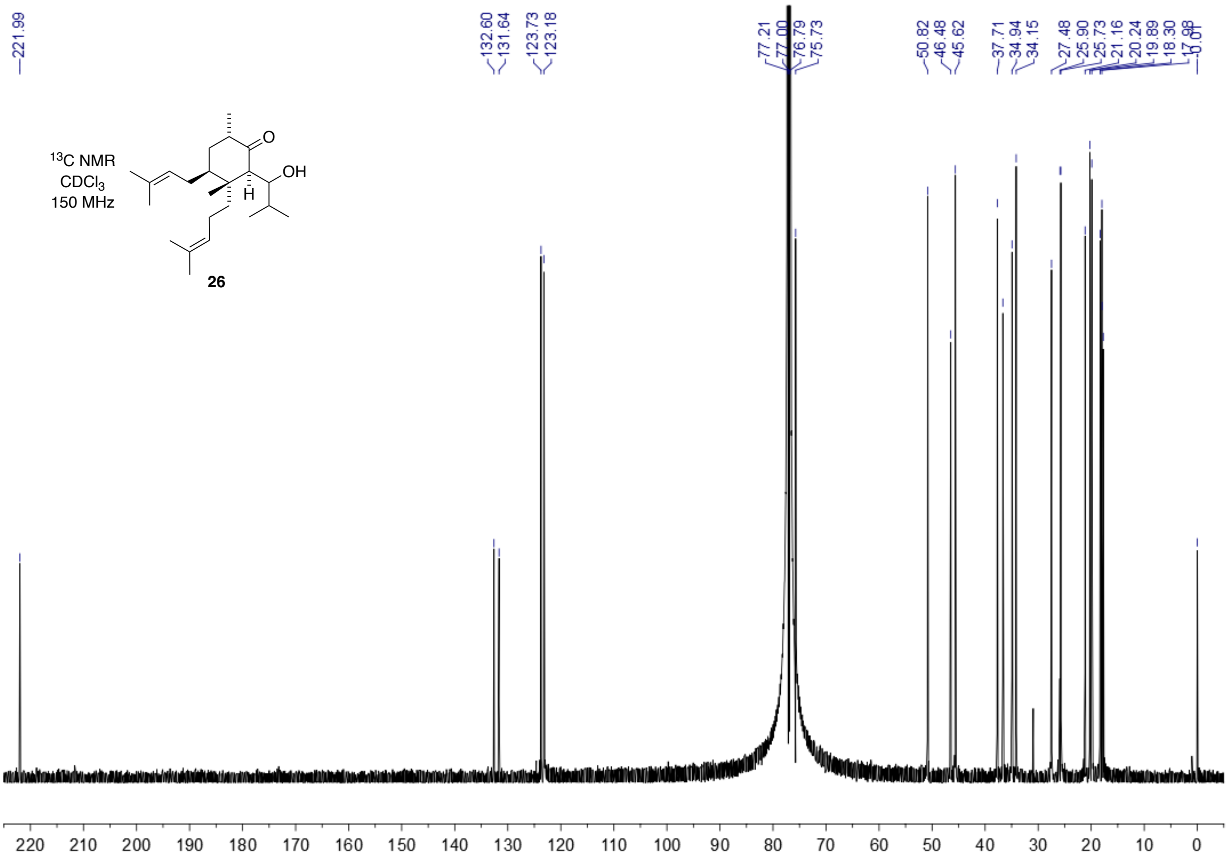
1. NMR spectra



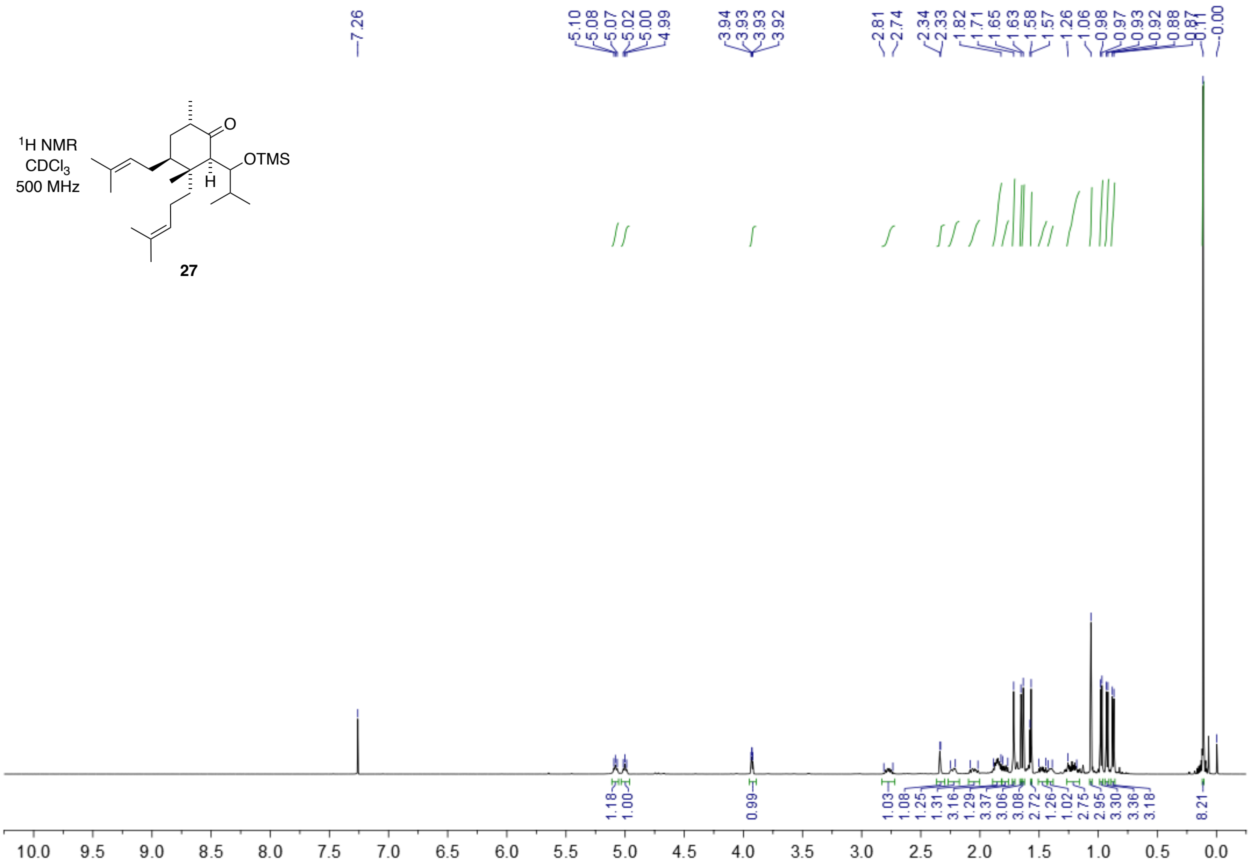




1H NMR
CDCl3
600 MHz
26



13C NMR
CDCl3
150 MHz
26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CDCl3
500 MHz
O
OTMS
H
27
7.26
5.10 5.08 5.07 5.02 5.00 4.99
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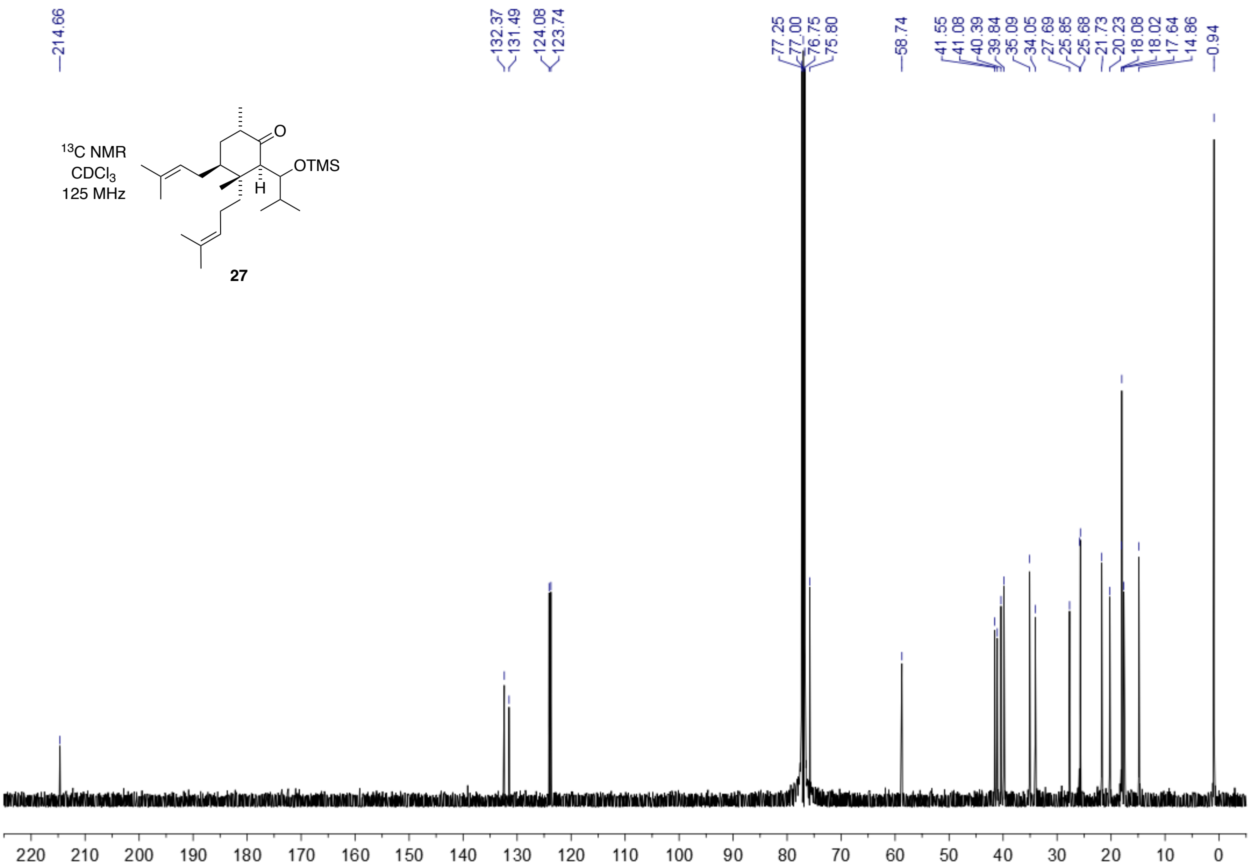
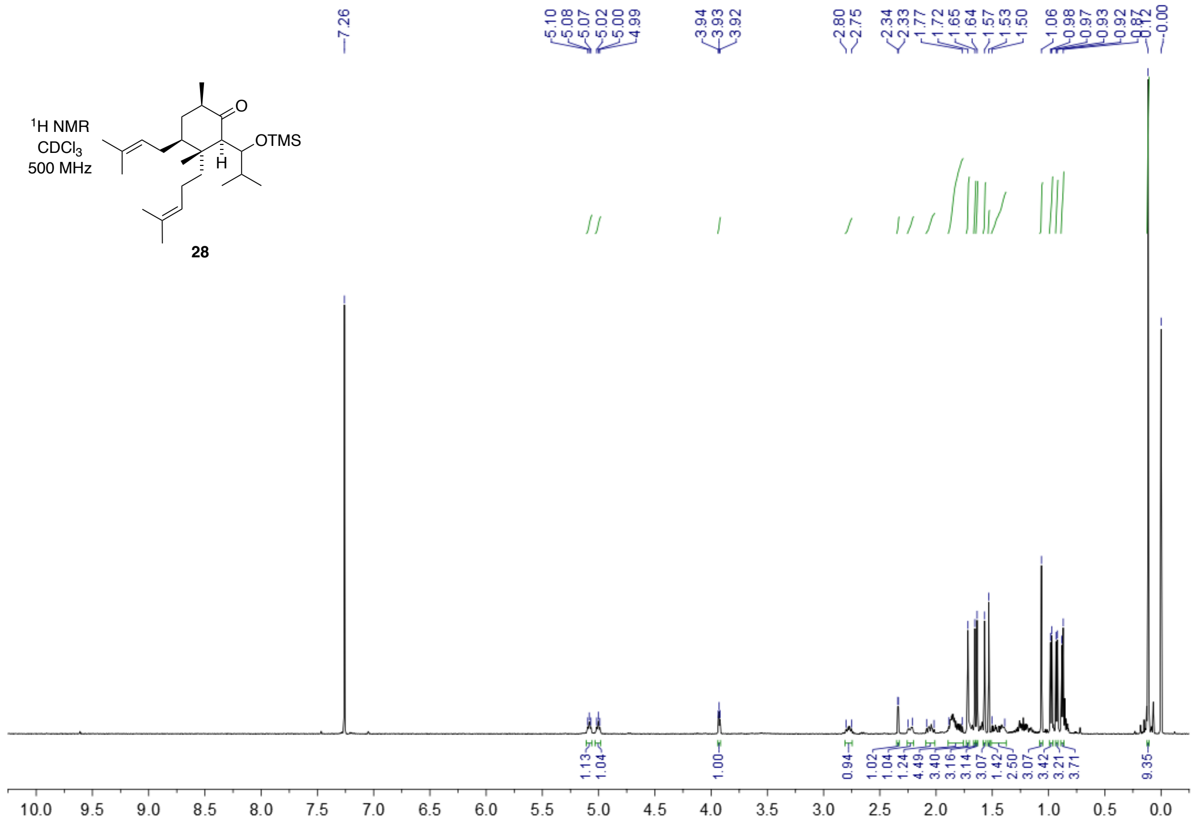
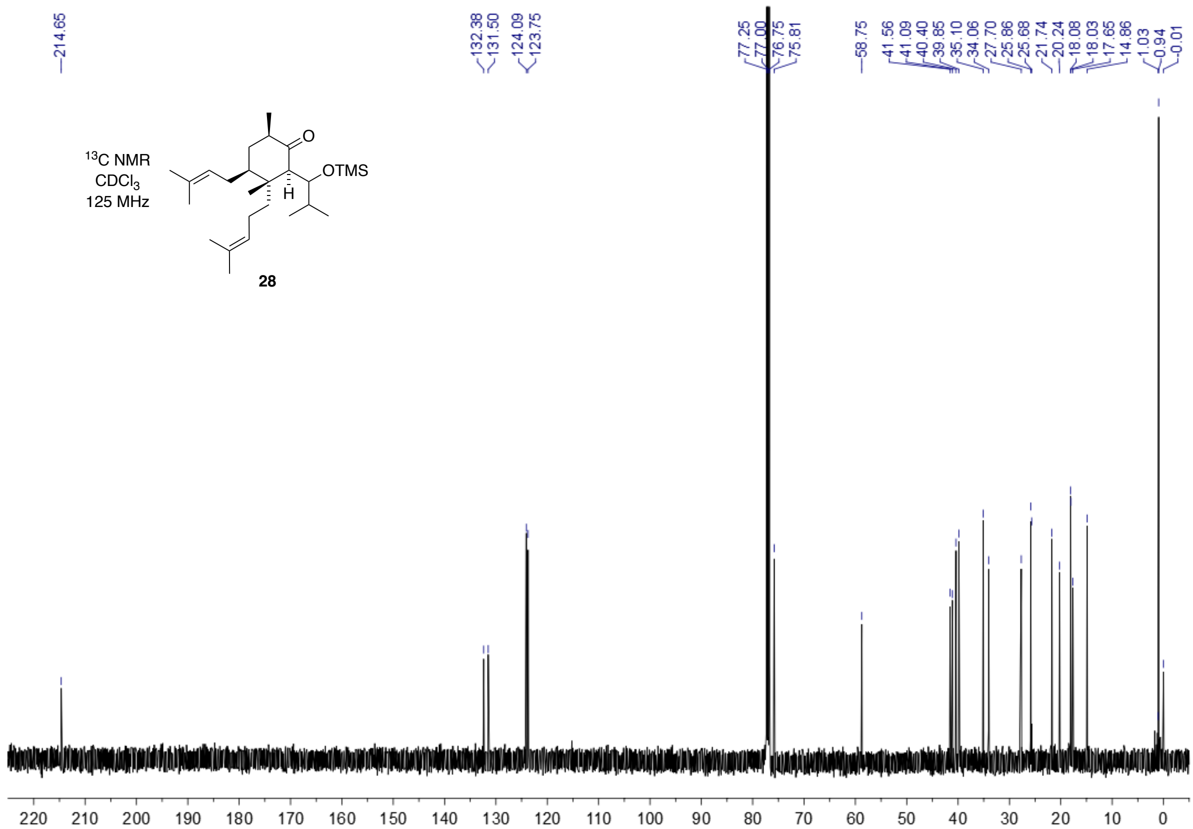
2.81 2.74 2.34 2.33 1.82 1.71 1.65 1.63 1.58 1.57 1.26 1.06 0.98 0.97 0.93 0.92 0.88 0.87 0.11 0.00
1.18 1.00 0.99 1.03 1.08 1.25 1.31 3.16 1.29 3.37 3.06 3.08 2.72 1.26 1.02 2.75 2.95 3.30 3.36 3.18 8.21
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0


13C NMR
CDCl3
125 MHz
O
OTMS
H
27
214.66
132.37 131.49 124.08 123.74
77.25 77.00 76.75 75.80
58.74
41.55 41.08 40.39 39.84 35.09 34.05 27.69 25.85 25.68 21.73 20.23 18.08 18.02 17.64 14.86
0.94
220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0



1H NMR
CDCl3
500 MHz
O
OTMS
H
28
7.26
5.10 5.08 5.07 5.02 5.00 4.99
3.94 3.93 3.92
2.80 2.75
2.34 2.33 1.77 1.72 1.65 1.64 1.57 1.53 1.50
1.06 0.98 0.97 0.93 0.92 0.87 0.12 -0.00
1.13 1.04
1.00
0.94
1.02 1.04 1.24 4.49 3.40 3.16 3.14 3.07 1.42 2.50 3.07 3.42 3.21 3.71
9.35
10.0 9.5 9.0 8.5 8.0 7.5 7.0 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 0.0



13C NMR
CDCl3
125 MHz
O
OTMS
H
28
214.65
132.38 131.50 124.09 123.75
77.25 77.00 76.75 75.81
58.75
41.56 41.09 40.40 39.85 35.10 34.06 27.70 25.86 25.68 21.74 20.24 18.08 18.03 17.65 14.86 1.03 0.94 -0.01
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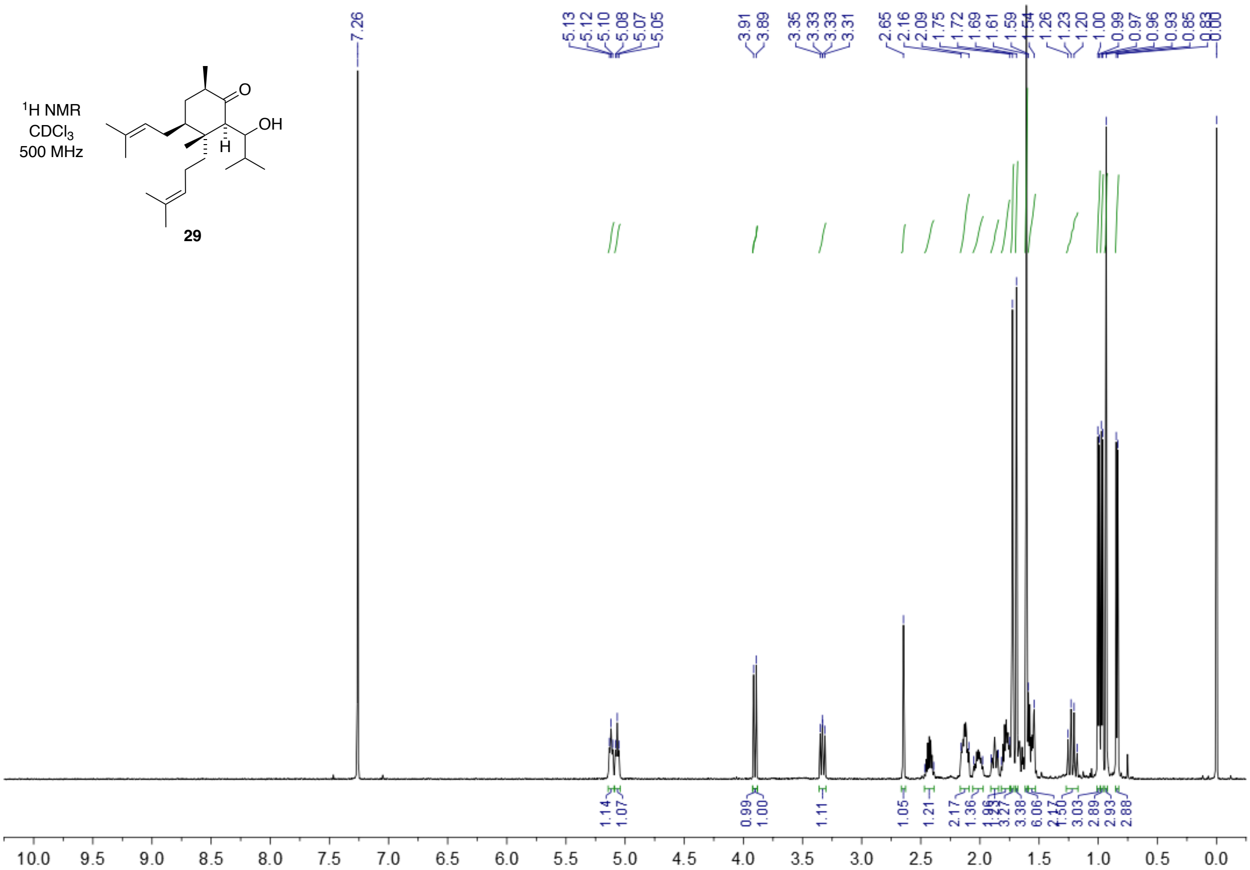
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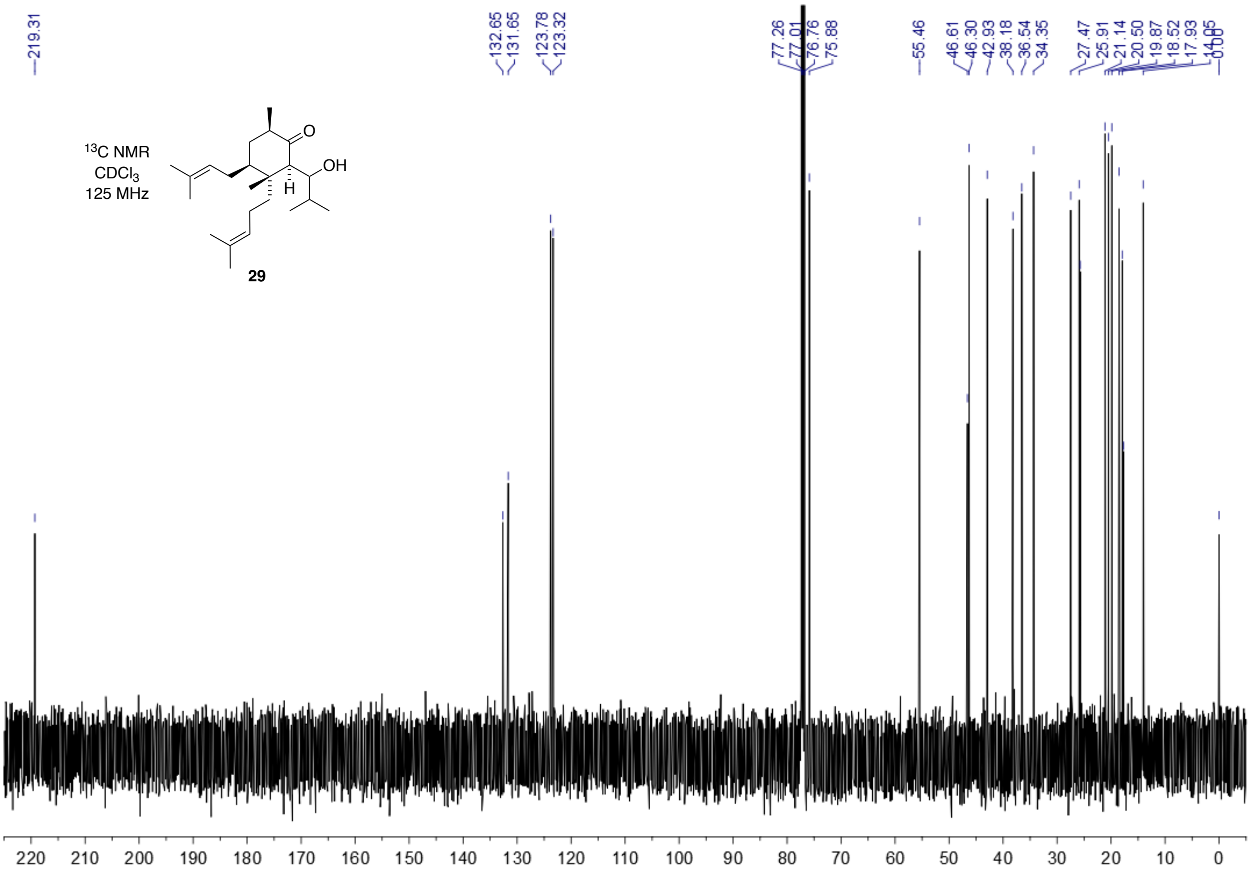
500 MHz
O
OH
H
29
7.26
5.13 5.12 5.10 5.08 5.07 5.05
3.91 3.89
3.35 3.33 3.33 3.31
2.65 2.16 2.09 1.75 1.72 1.69 1.61 1.59 1.54
1.26 1.23 1.20 1.00 0.99 0.97 0.96 0.93 0.85 0.83 0.00
1.14 1.07 0.99 1.00 1.11 1.05 1.21 2.17 1.36 1.98 3.38 6.06 2.17 1.50 3.03 2.89 2.93 2.88
10.0 9.5 9.0 8.5 8.0 7.5 7.0 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 0.0


13C NMR
CDCl3
125 MHz
O
OH
H
29
219.31
132.65 131.65 123.78 123.32
77.26 77.01 76.76 75.88
55.46 46.61 46.30 42.93 38.18 36.54 34.35
27.47 25.91 21.14 20.50 19.87 18.52 17.93 14.05 0.00
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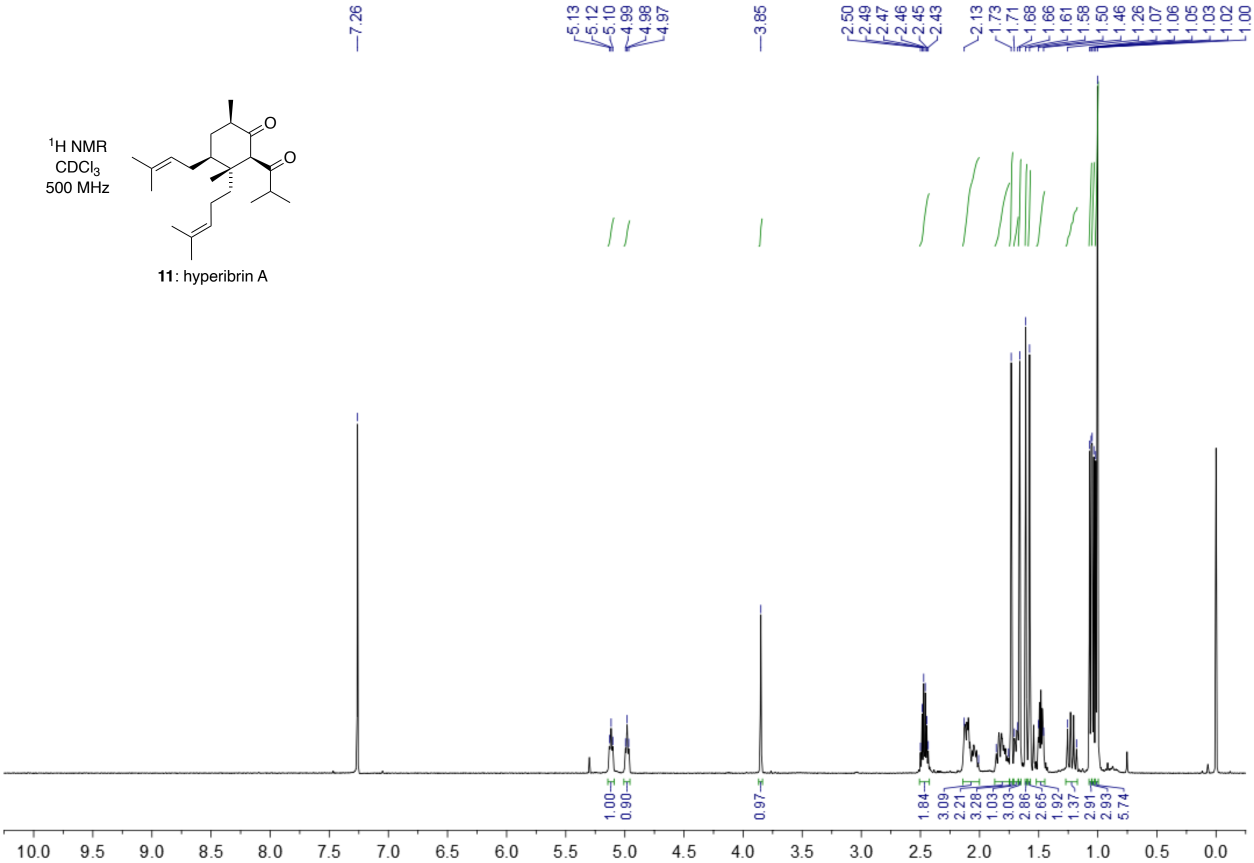
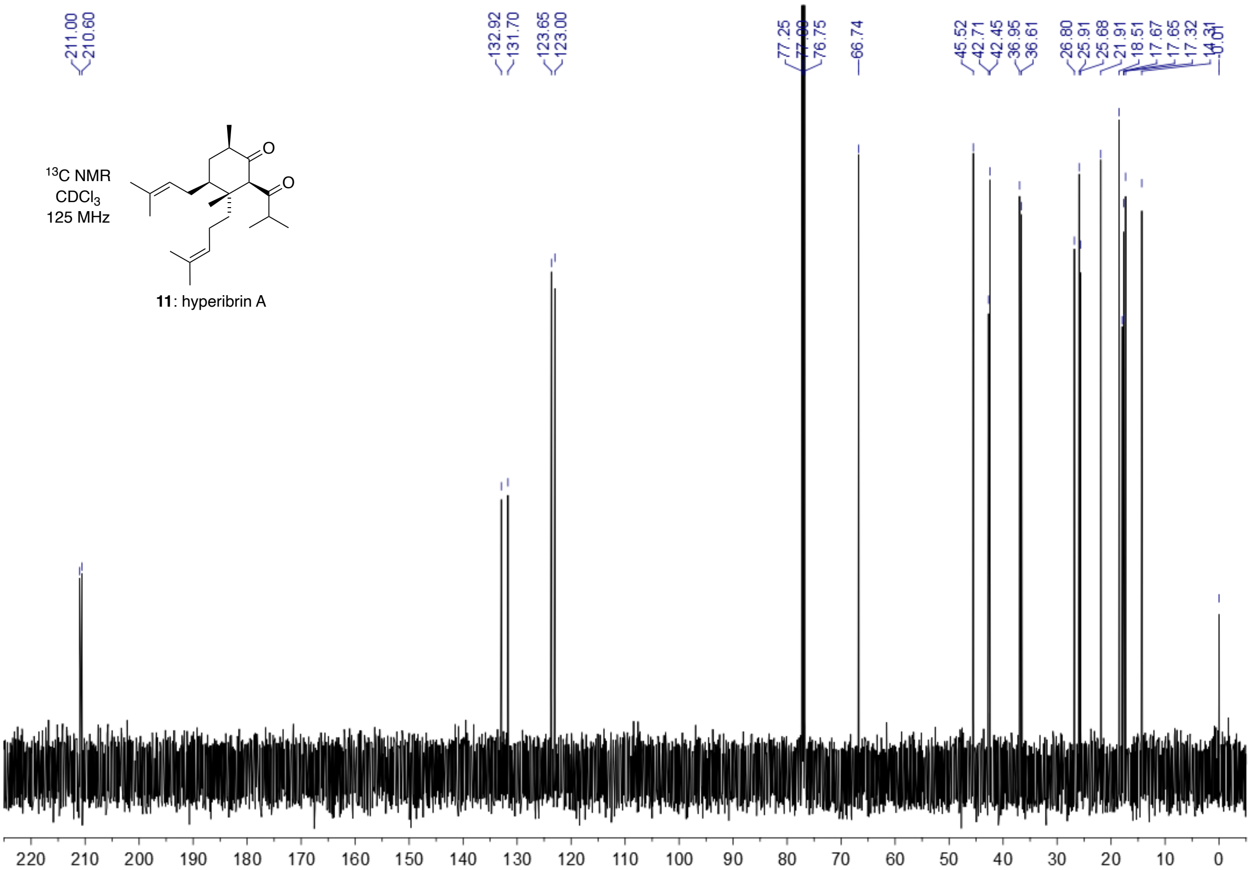


1H NMR
CDCl3
500 MHz
11: hyperibrin A
7.26
5.13 5.12 5.10 4.99 4.98 4.97
3.85
2.50 2.49 2.47 2.46 2.45 2.43
2.13 1.73 1.71 1.68 1.66 1.61 1.58 1.50 1.46 1.26 1.07 1.06 1.05 1.03 1.02 1.00
1.00 0.90 0.97 1.84 3.09 2.21 3.28 1.03 3.03 2.86 2.65 1.92 1.37 2.91 2.93 5.74
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0



13C NMR
CDCl3
125 MHz
11: hyperibrin A
211.00 210.60
132.92 131.70 123.65 123.00
77.25 77.00 76.75
66.74
45.52 42.71 42.45 36.95 36.61
26.80 25.91 25.68 21.91 18.51 17.67 17.65 17.32 14.31 0.01
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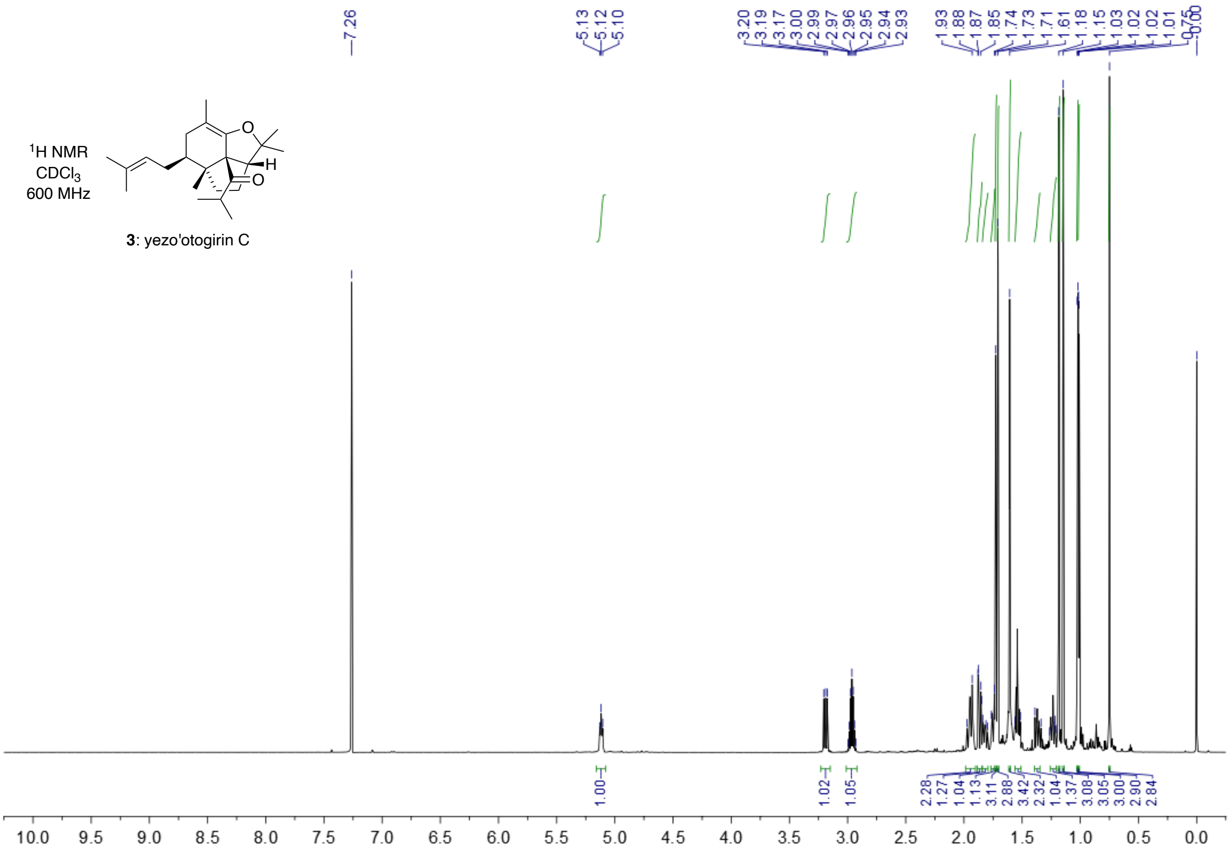
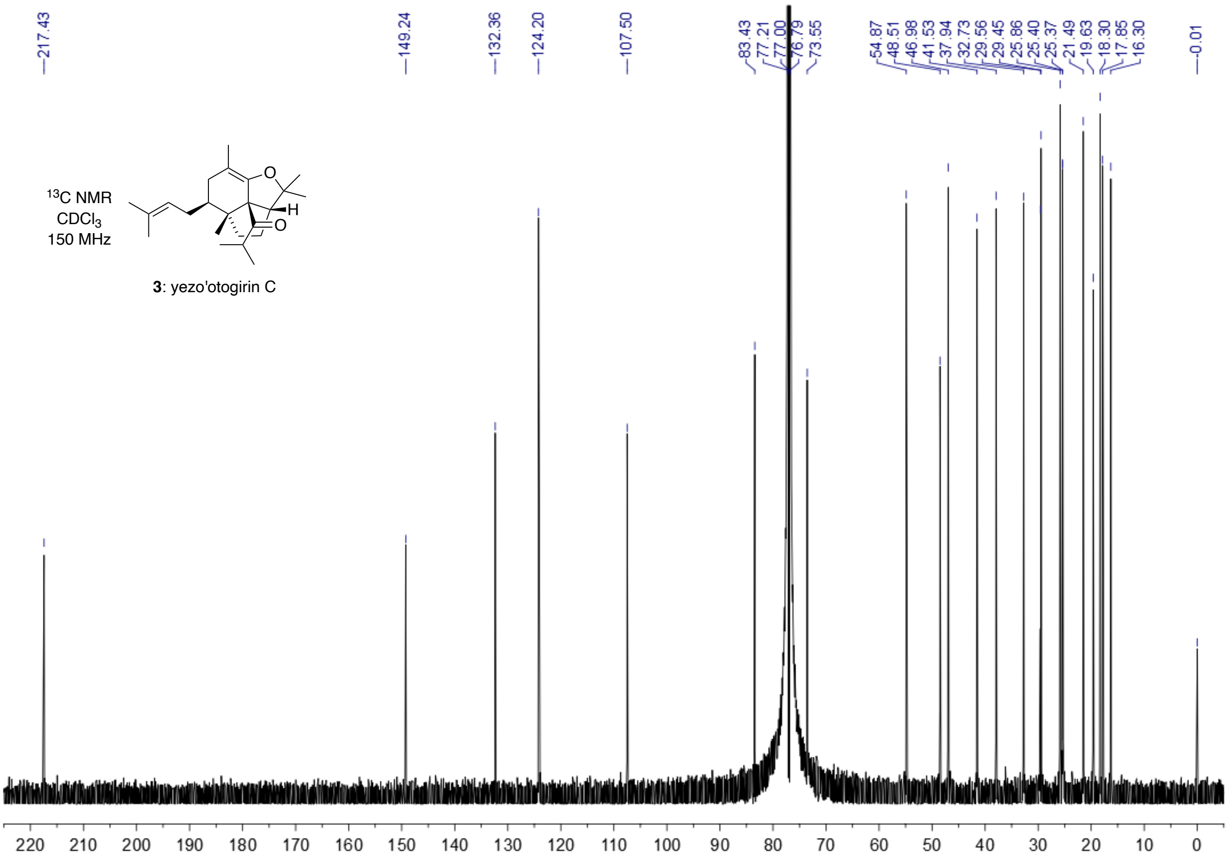
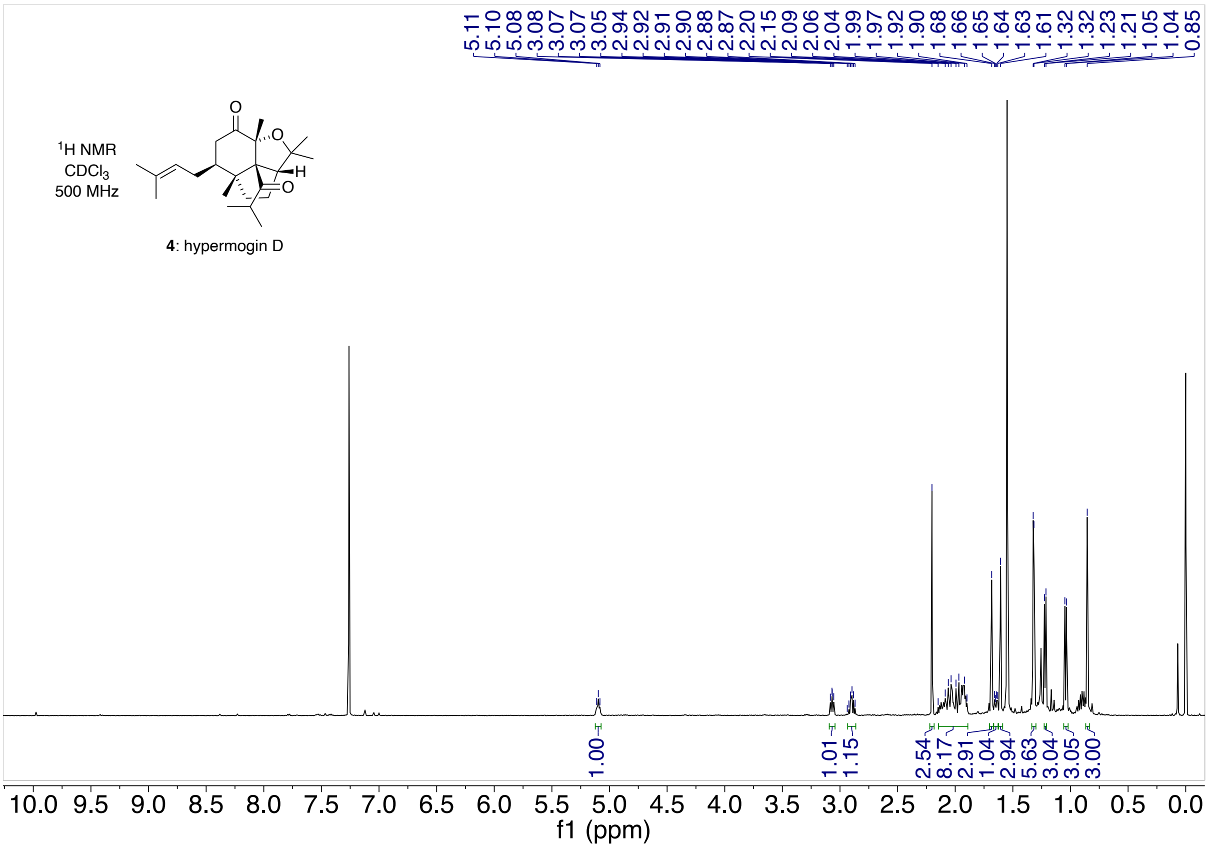


^{1}H NMR
$CDCl_3$
600 MHz
3: yezo'otogirin C
7.26
5.13
5.12
5.10
3.20
3.19
3.17
3.00
2.99
2.97
2.96
2.95
2.94
2.93
1.93
1.88
1.87
1.85
1.74
1.73
1.71
1.61
1.18
1.15
1.03
1.02
1.02
1.01
0.75
0.00
1.00
1.02
1.05
2.28
1.27
1.04
1.13
3.11
2.88
3.42
2.32
1.04
1.37
3.08
3.05
3.00
2.90
2.84
10.0 9.5 9.0 8.5 8.0 7.5 7.0 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 0.0



^{13}C NMR
$CDCl_3$
150 MHz
3: yezo'otogirin C
217.43
149.24
132.36
124.20
107.50
83.43
77.21
77.00
76.79
73.55
54.87
48.51
46.98
41.53
37.94
32.73
29.56
29.45
25.86
25.40
25.37
21.49
19.63
18.30
17.85
16.30
-0.01
220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0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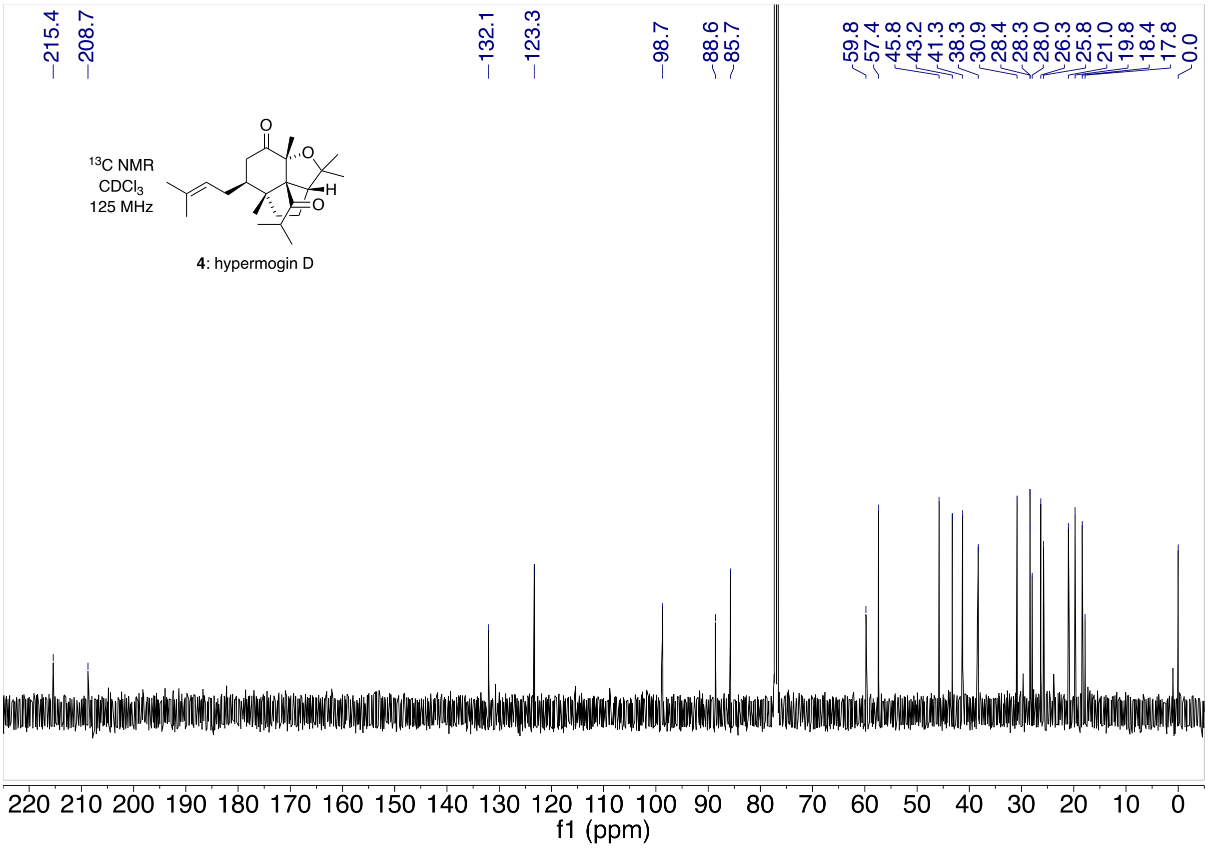
5.10
5.08
3.08
3.07
3.07
3.05
2.94
2.92
2.91
2.90
2.88
2.87
2.20
2.15
2.09
2.06
2.04
1.99
1.97
1.92
1.90
1.68
1.66
1.65
1.64
1.63
1.61
1.32
1.32
1.23
1.21
1.05
1.04
0.85
¹H NMR
CDCl3
500 MHz
4: hypermogin D
1.00
1.01
1.15
2.54
8.17
2.91
1.04
2.94
5.63
3.04
3.05
3.00
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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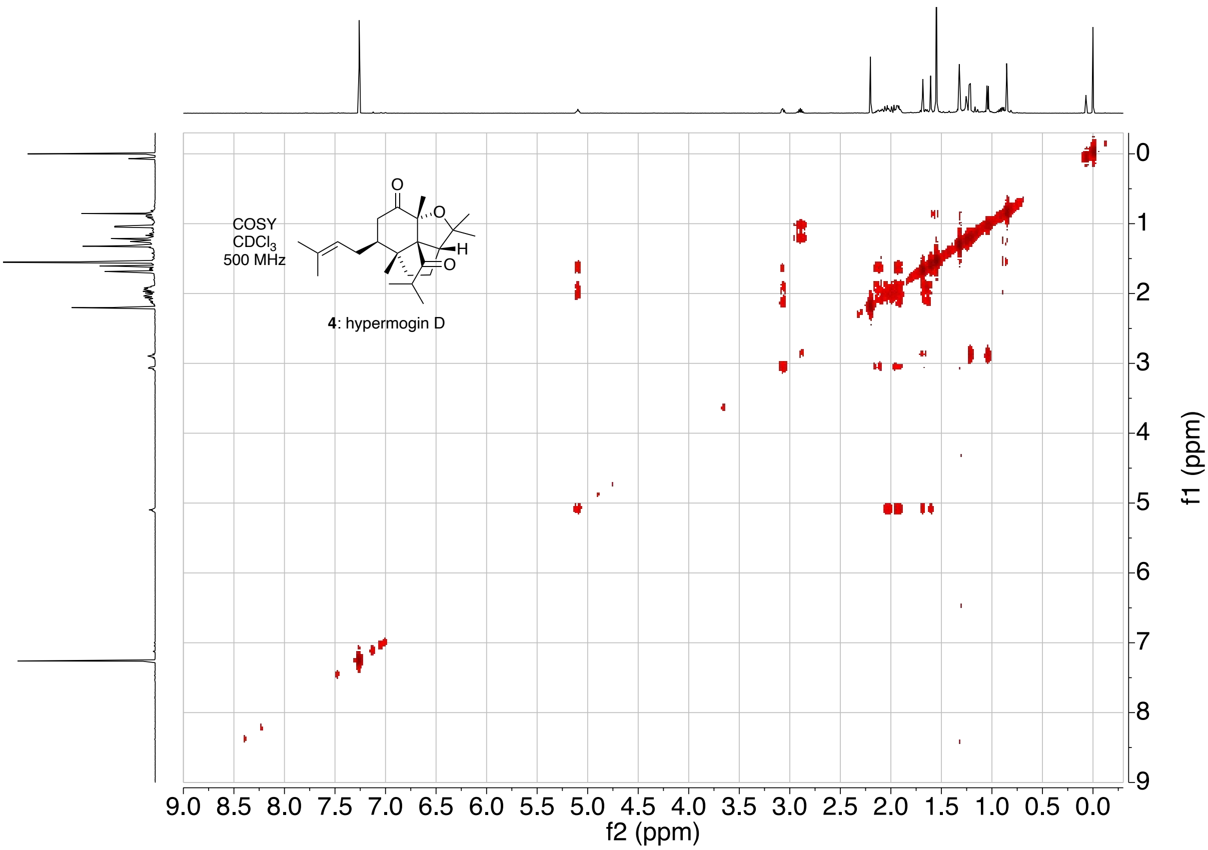
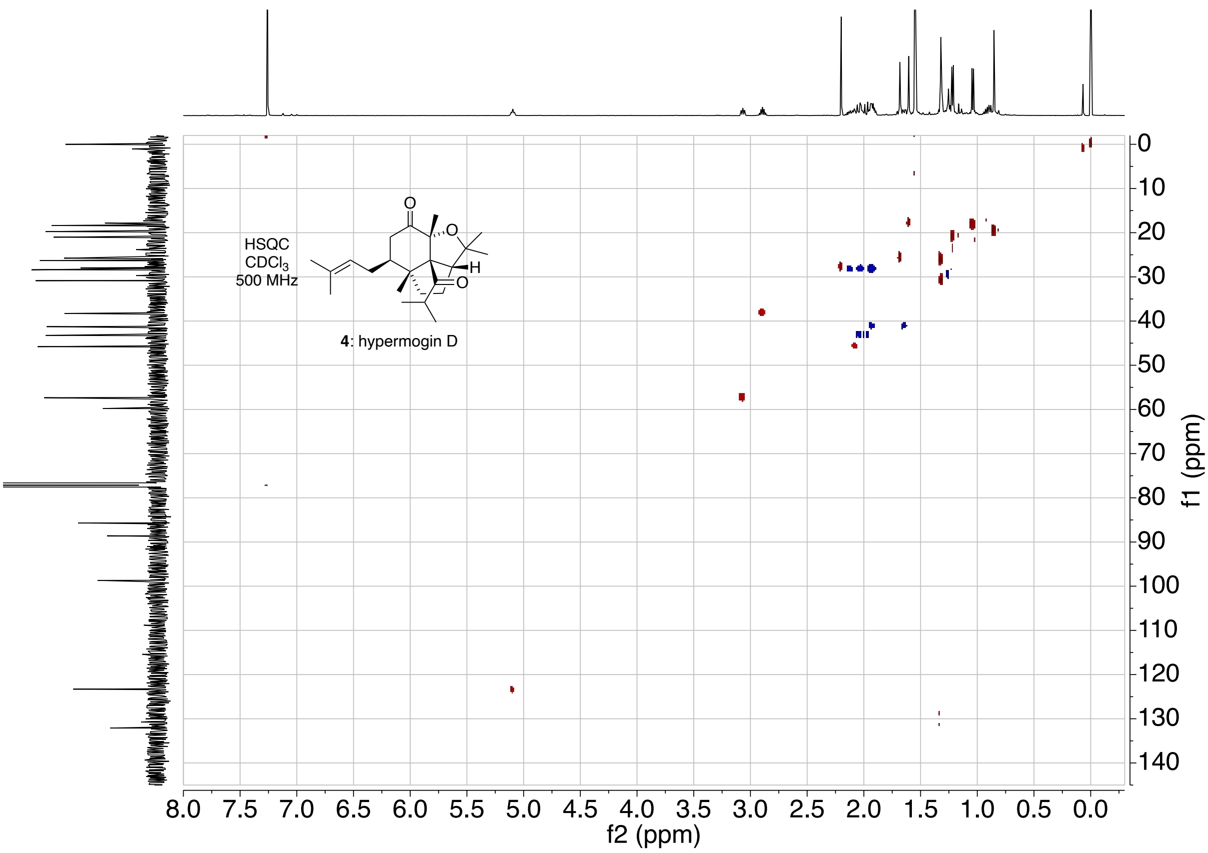
208.7
132.1
123.3
98.7
88.6
85.7
59.8
57.4
45.8
43.2
41.3
38.3
30.9
28.4
28.3
28.0
26.3
25.8
21.0
19.8
18.4
17.8
0.0
¹³C NMR
CDCl3
125 MHz
4: hypermogin D
220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)


COSY
$CDCl_3$
500 MHz
4: hypermogin D
f2 (ppm)
f1 (ppm)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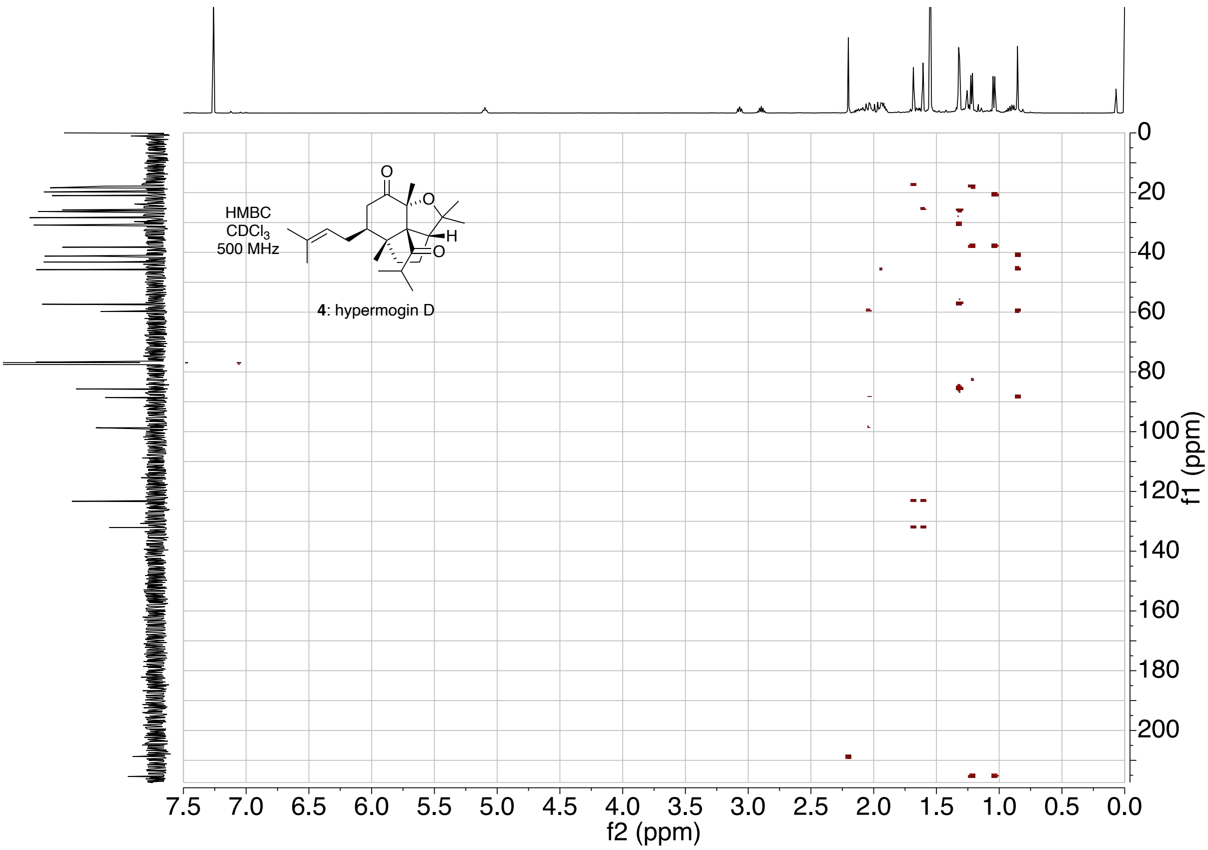
f2 (ppm)
f1 (ppm)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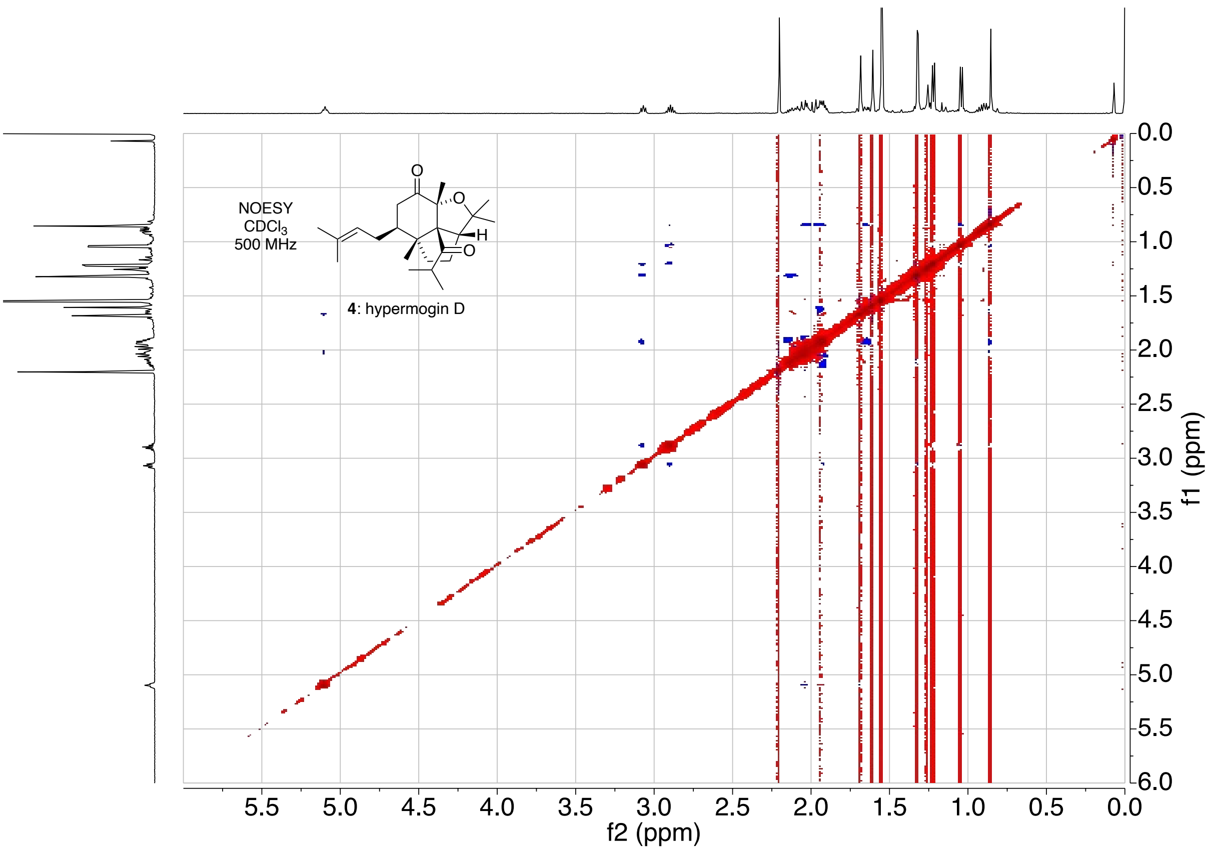
CDCl3
500 MHz
4: hypermogin D
f2 (ppm)
f1 (ppm)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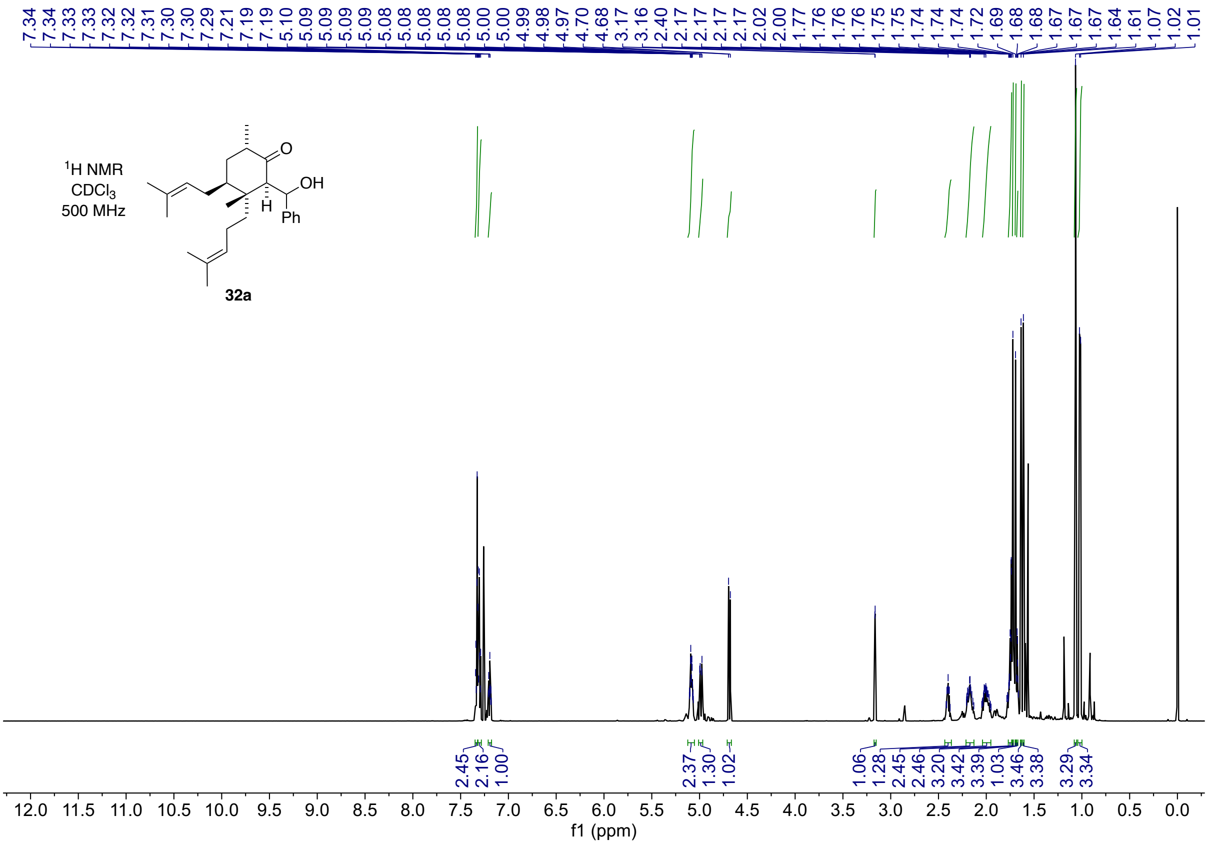
CDCl3
500 MHz
4: hypermogin D
f2 (ppm)
f1 (ppm)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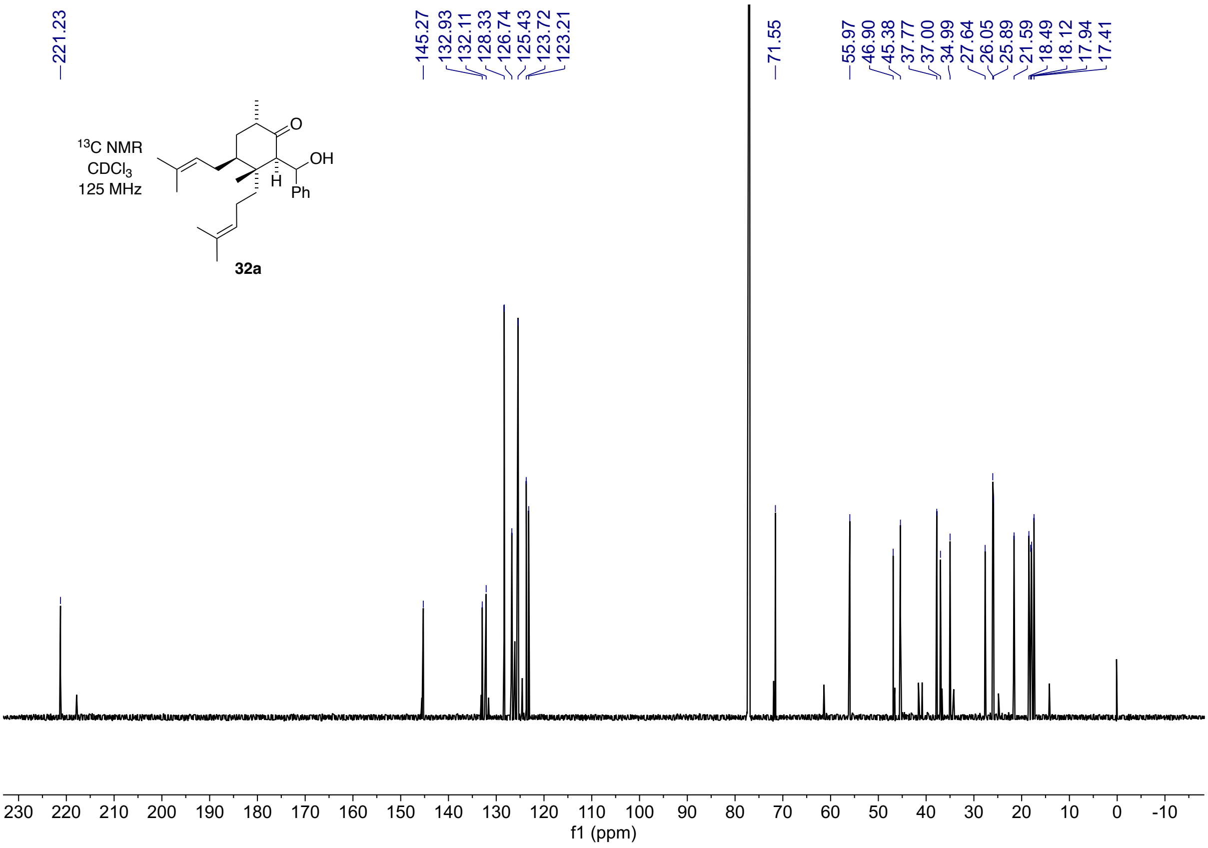
1H NMR
CDCl3
500 MHz
O
OH
H
Ph
32a
2.45 2.16 1.00 2.37 1.30 1.02 1.06 1.28 2.45 2.46 3.20 3.42 3.39 1.03 3.46 3.38 3.29 3.34
12.0 11.5 11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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145.27 132.93 132.11 128.33 126.74 125.43 123.72 123.21
71.55
55.97 46.90 45.38 37.77 37.00 34.99 27.64 26.05 25.89 21.59 18.49 18.12 17.94 17.41
13C NMR
CDCl3
125 MHz
O
OH
H
Ph
32a
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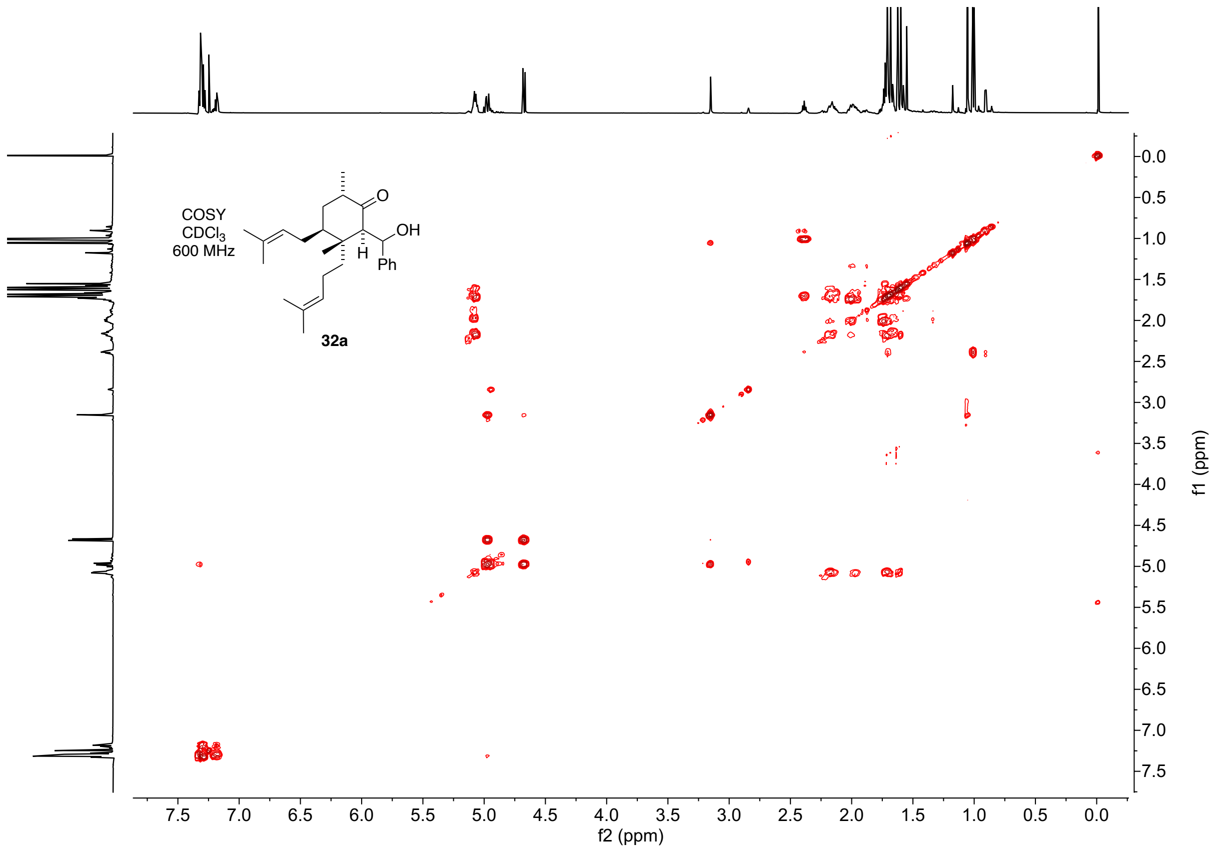
f1 (ppm)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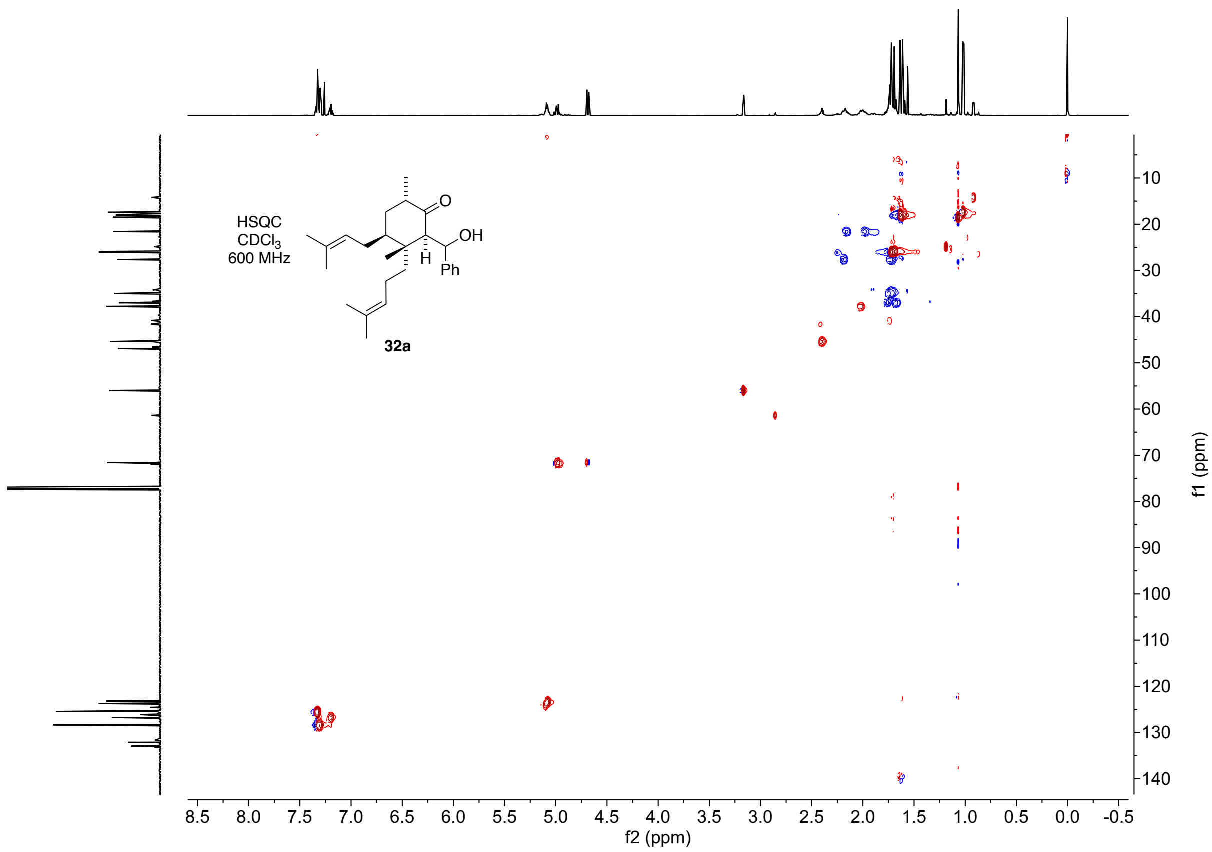
CDCl3
600 MHz
OH
O
H
Ph
32a
f2 (ppm)
f1 (ppm)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600 MHz
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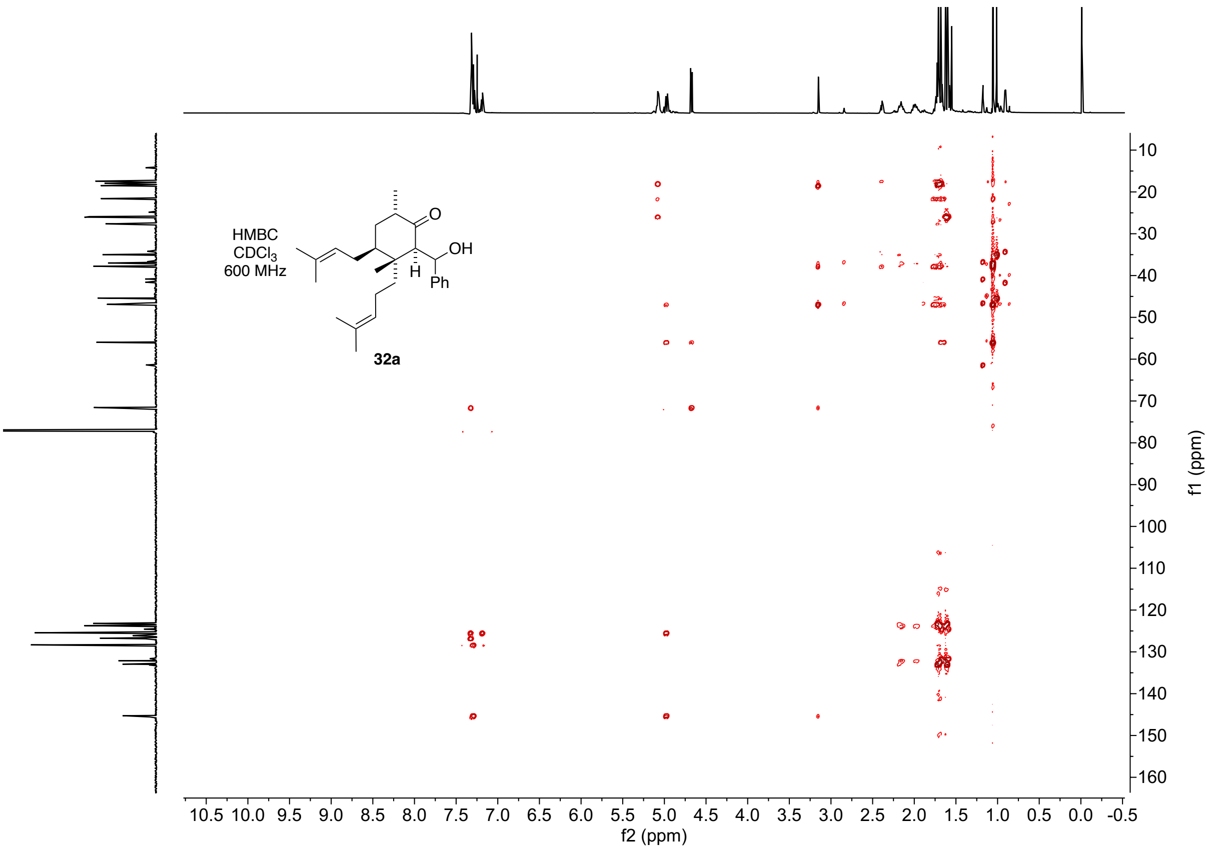
OH
H
Ph
32a
f2 (ppm)
f1 (ppm)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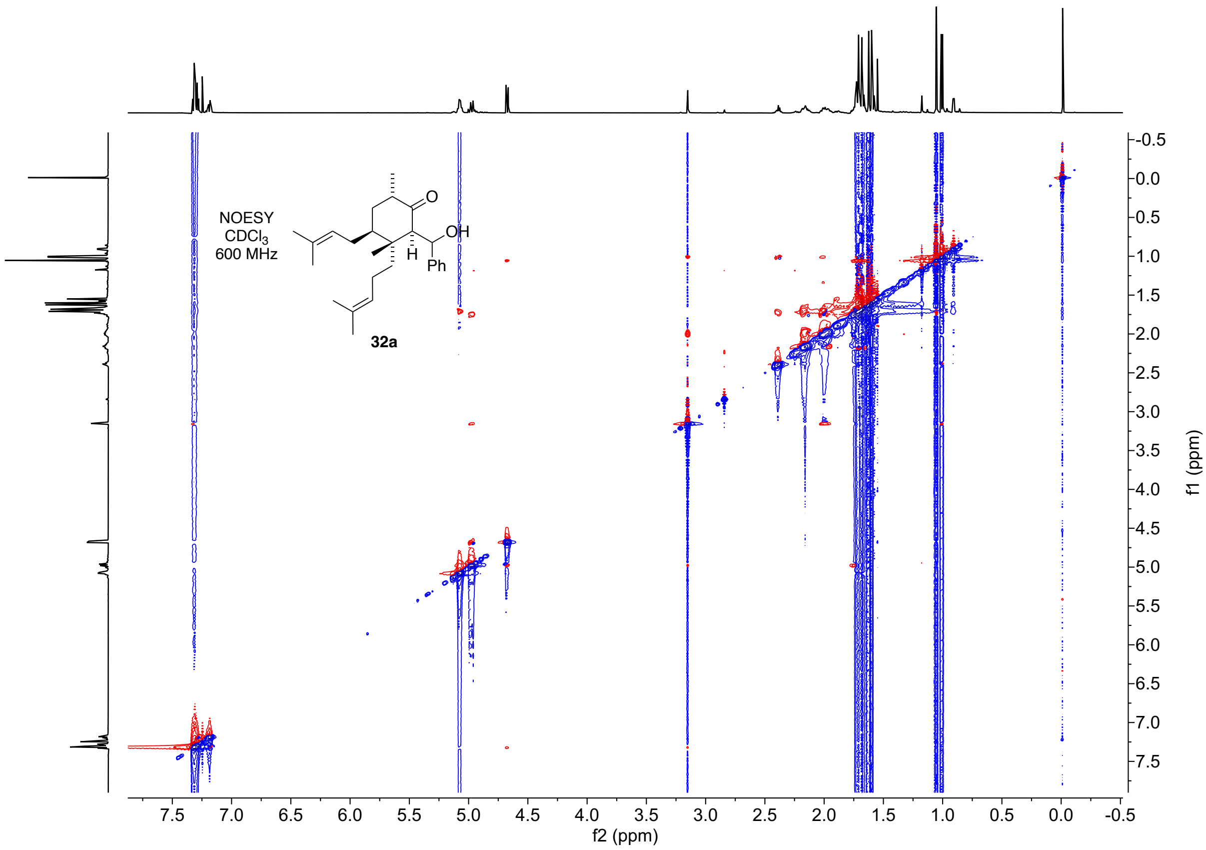
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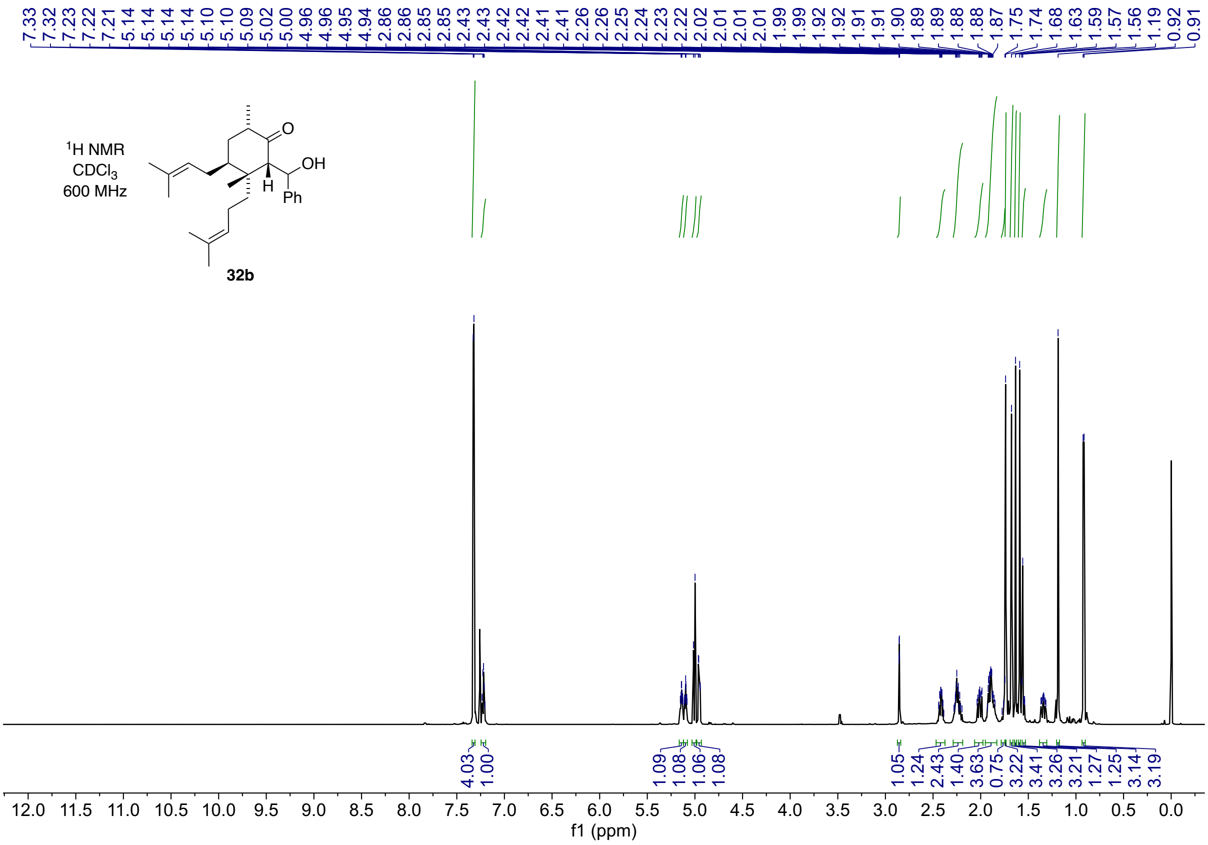
f2 (ppm)
f1 (ppm)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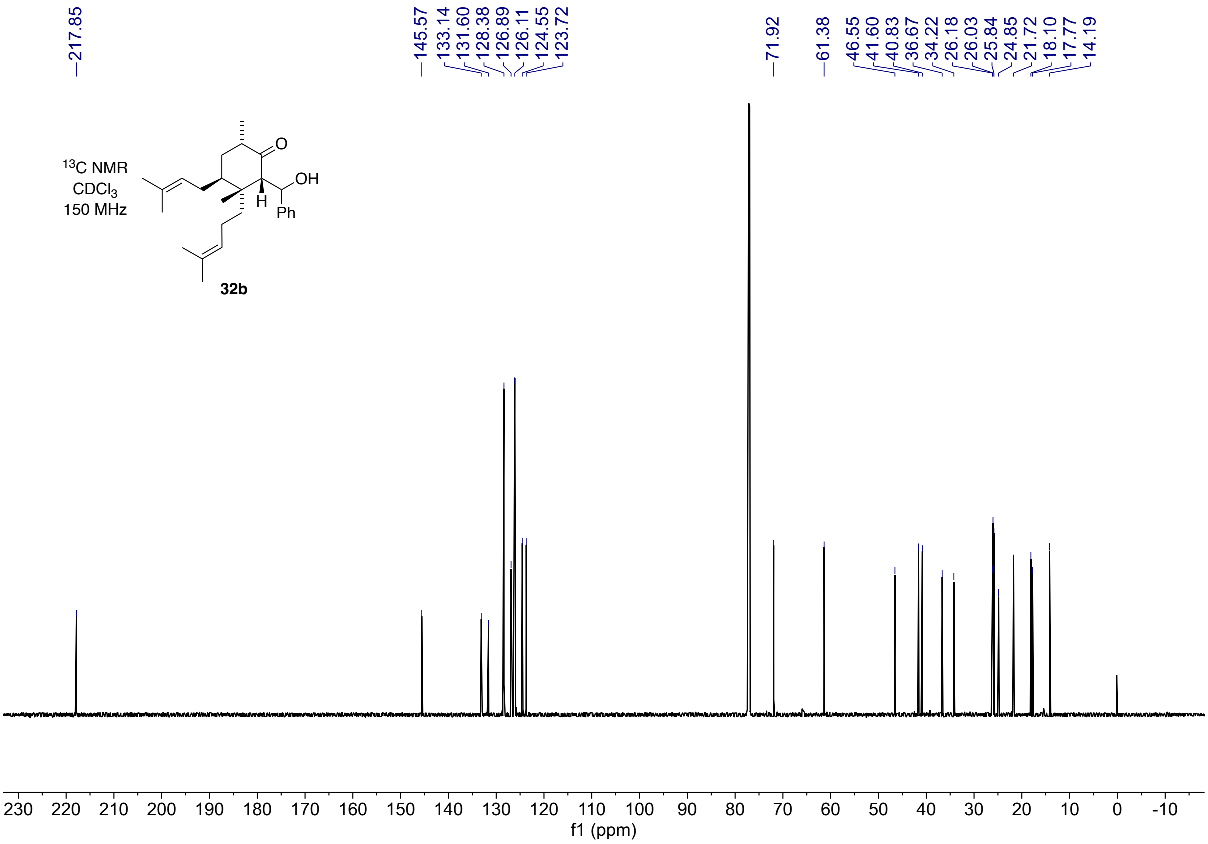
1H NMR
CDCl3
600 MHz
OH
O
H
Ph
32b
4.03 1.00 1.09 1.08 1.06 1.08 1.05 1.24 2.43 1.40 3.63 0.75 3.22 3.41 3.26 3.21 1.27 1.25 3.14 3.19
12.0 11.5 11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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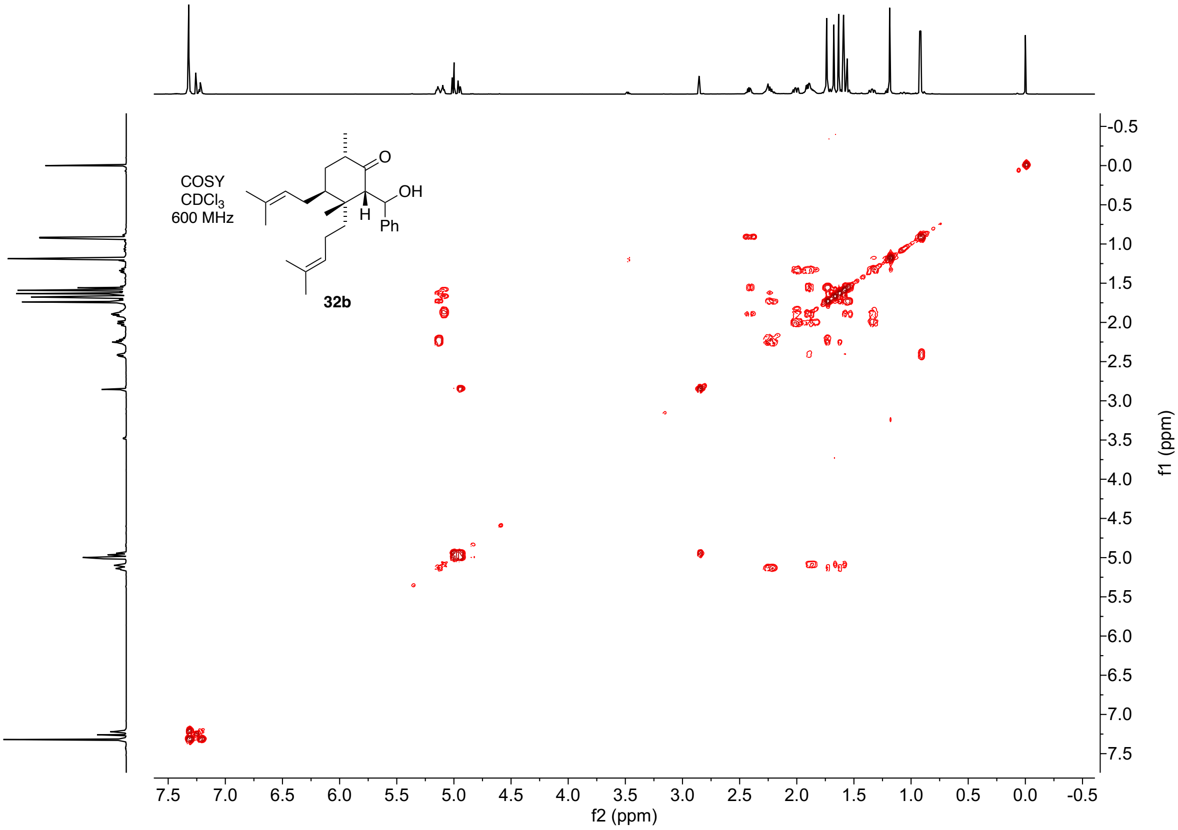
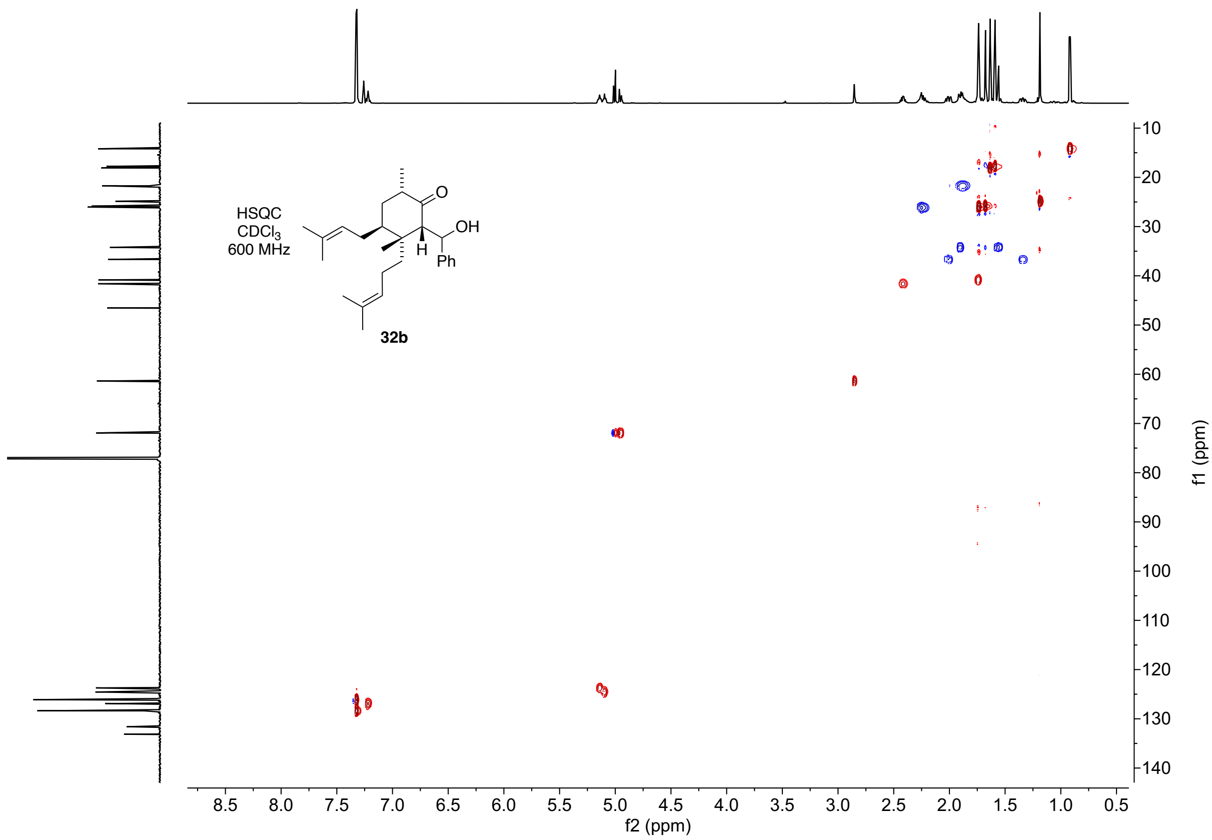
145.57 133.14 131.60 128.38 126.89 126.11 124.55 123.72
71.92
61.38 46.55 41.60 40.83 36.67 34.22 26.18 26.03 25.84 24.85 21.72 18.10 17.77 14.19
13C NMR
CDCl3
150 MHz
OH
O
H
Ph
32b
230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)


COSY
CDCl3
600 MHz
32b
f2 (ppm)
f1 (ppm)


HSQC
CDCl3
600 MHz
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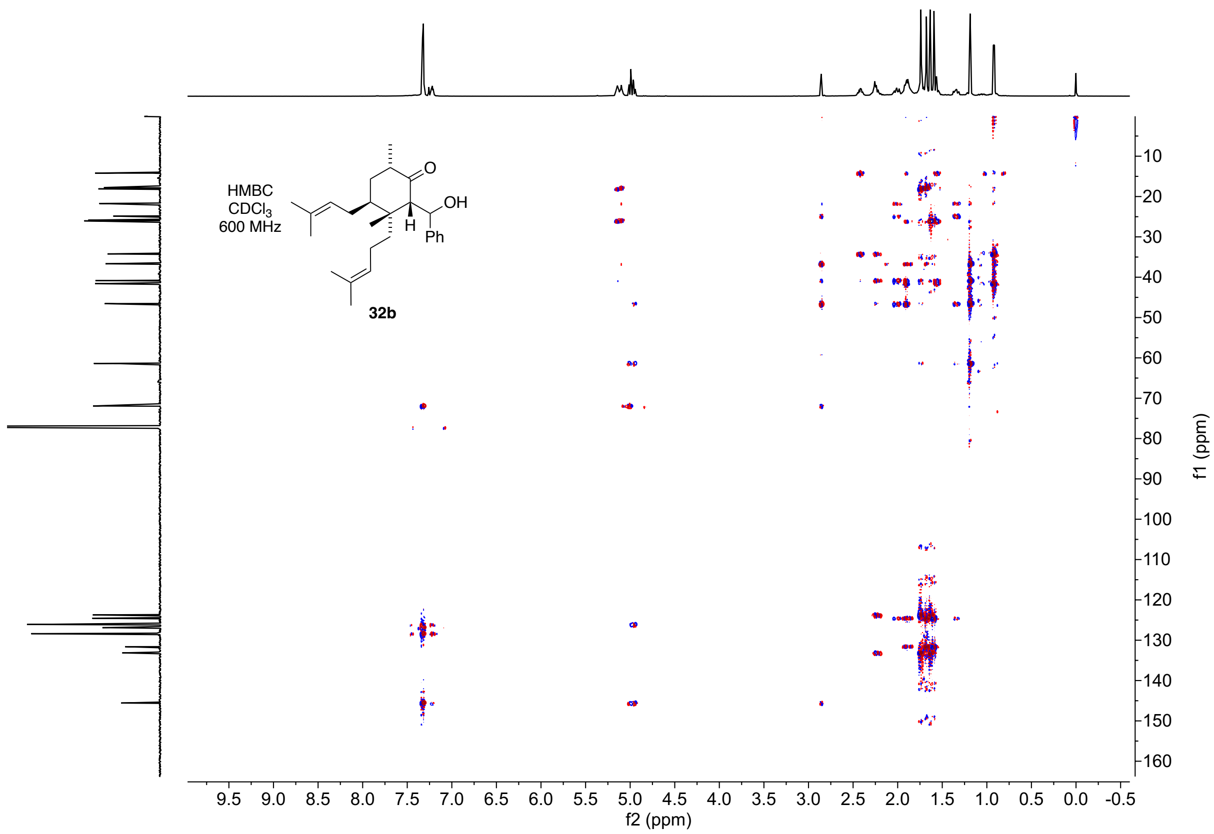
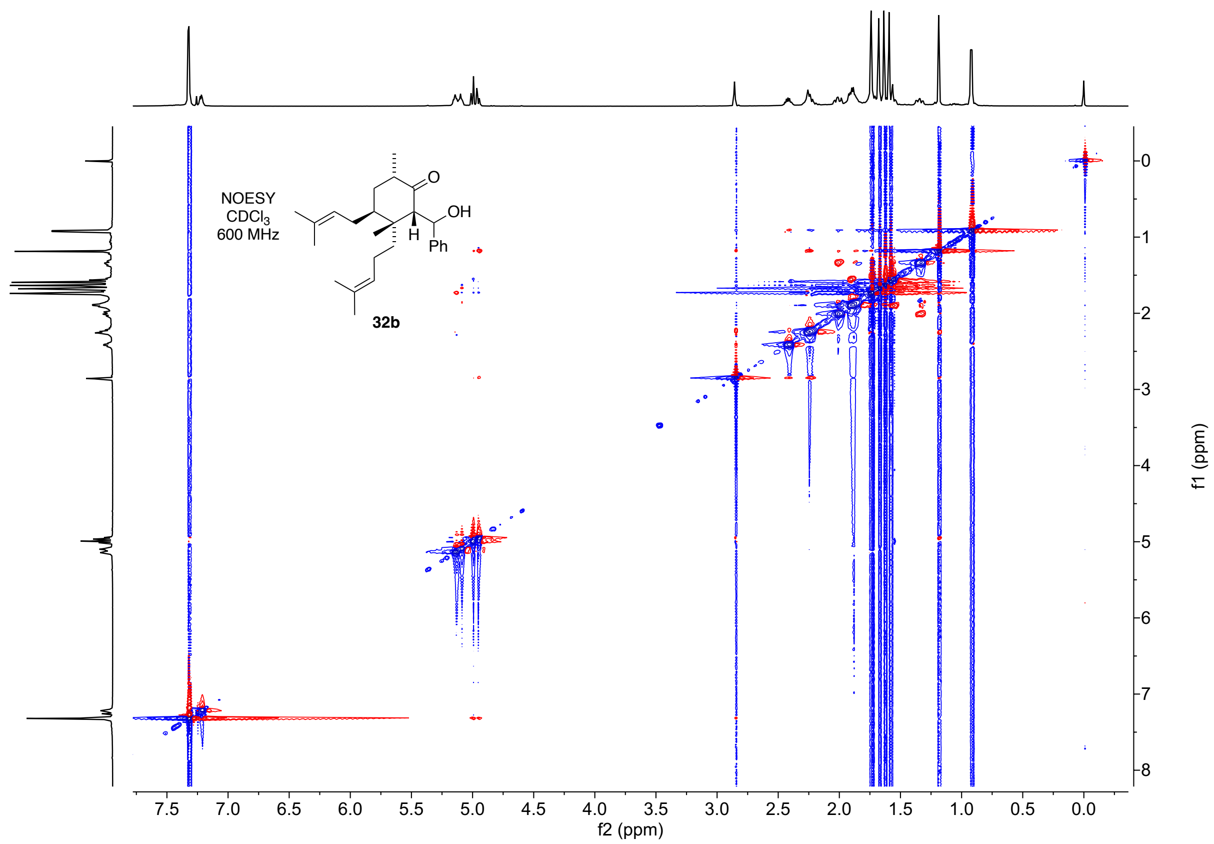
f2 (ppm)
f1 (ppm)


HMBC
$CDCl_3$
600 MHz
O
OH
H
Ph
32b
f2 (ppm)
f1 (ppm)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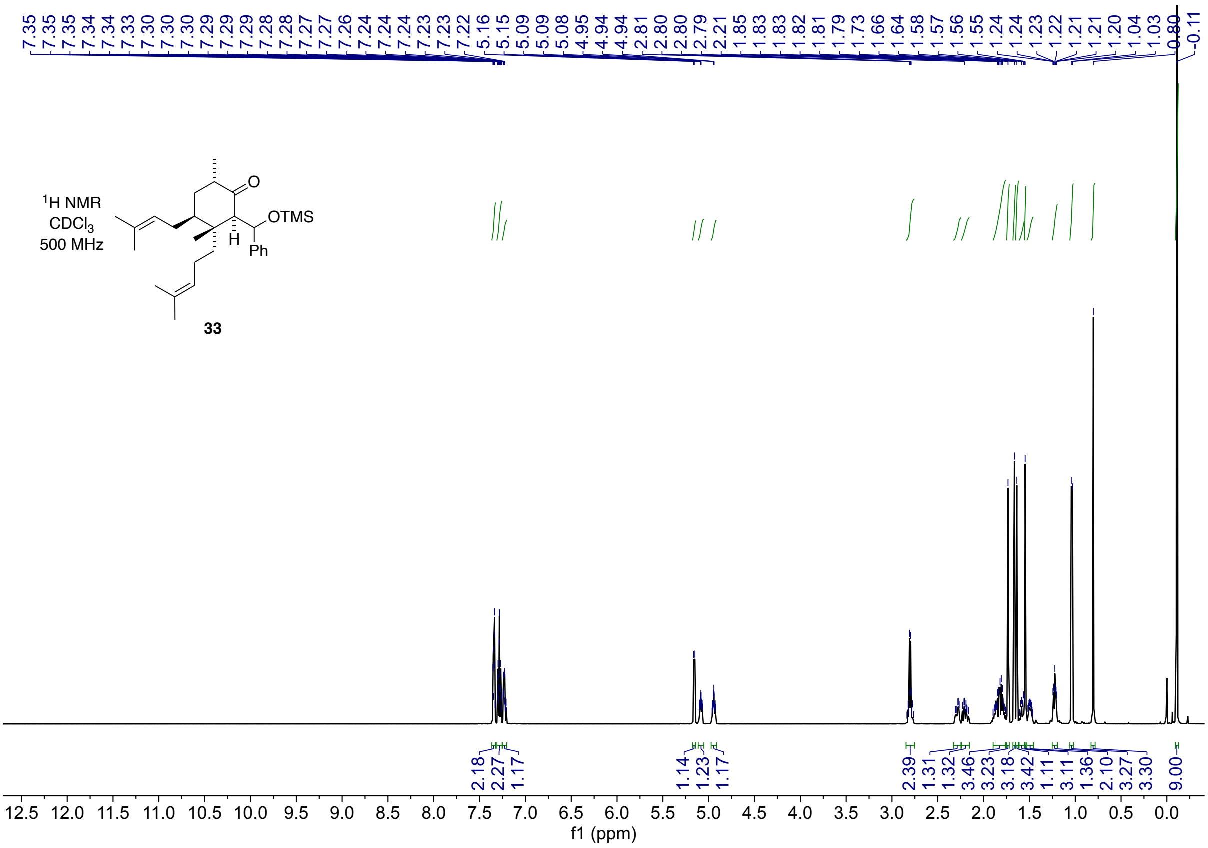
f1 (ppm)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7.24
7.23
7.23
7.22
5.16
5.15
5.09
5.09
5.08
4.95
4.94
4.94
2.81
2.80
2.80
2.79
2.21
1.85
1.83
1.83
1.82
1.81
1.79
1.73
1.66
1.64
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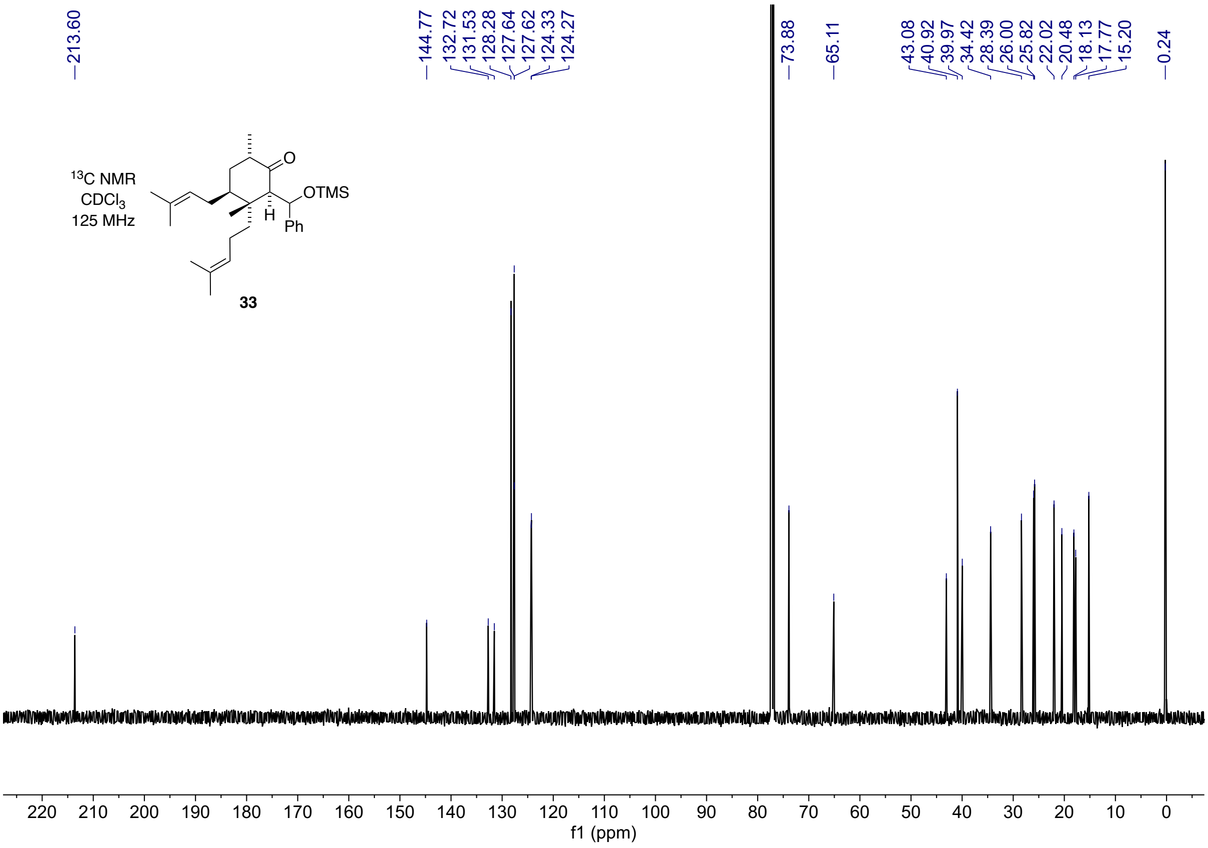
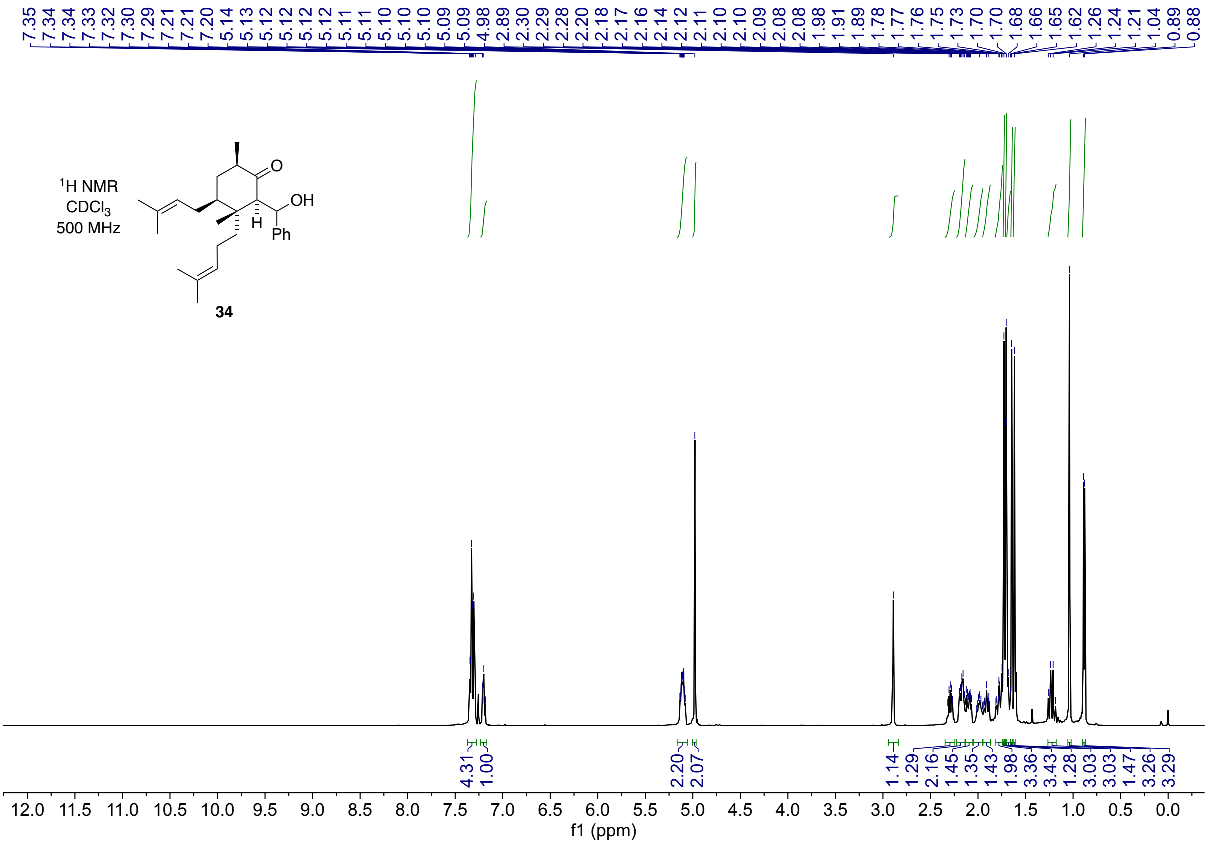
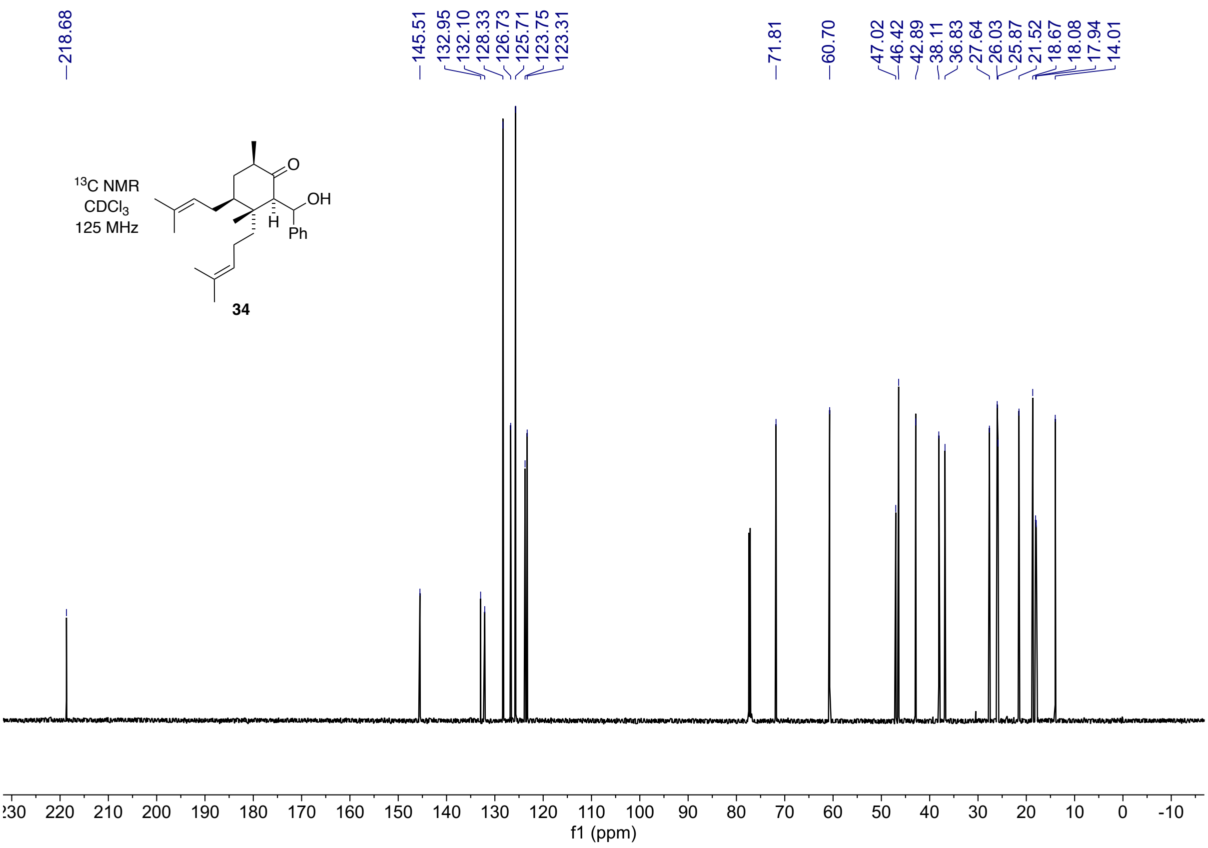
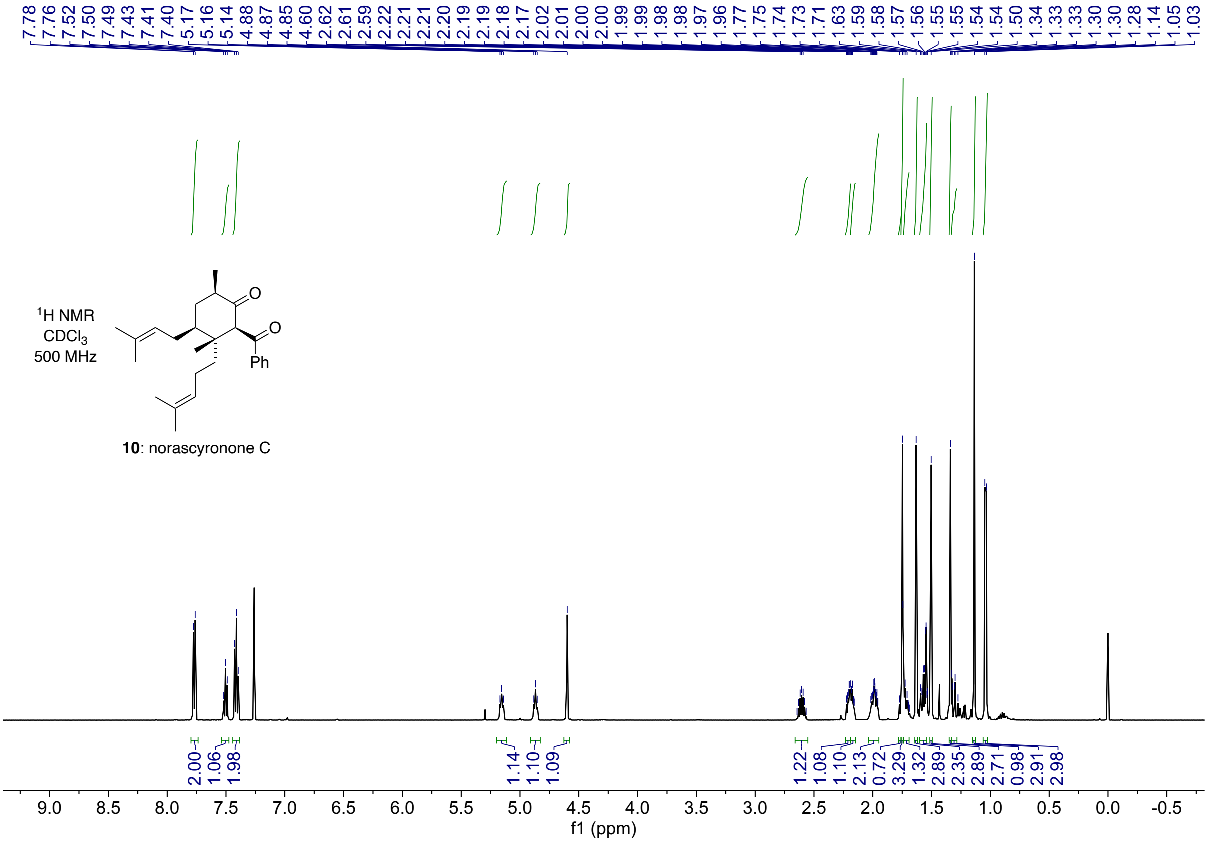
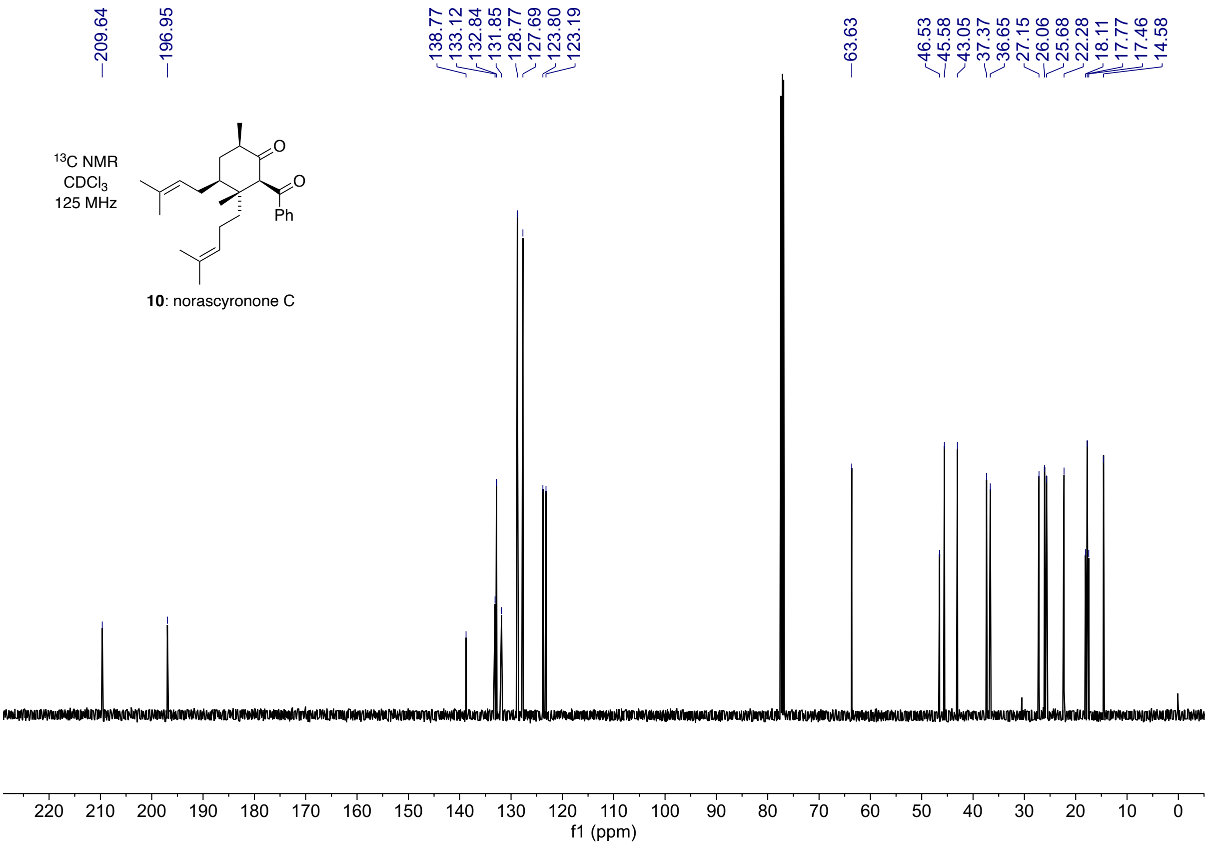
1.57
1.56
1.55
1.24
1.24
1.23
1.22
1.21
1.21
1.20
1.04
1.03
0.80
-0.11
1H NMR
CDCl3
500 MHz
OTMS
H
Ph
33
2.18
2.27
1.17
1.14
1.23
1.17
2.39
1.31
1.32
3.46
3.23
3.18
3.42
1.11
3.11
1.36
2.10
3.27
3.30
9.00
12.5 12.0 11.5 11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

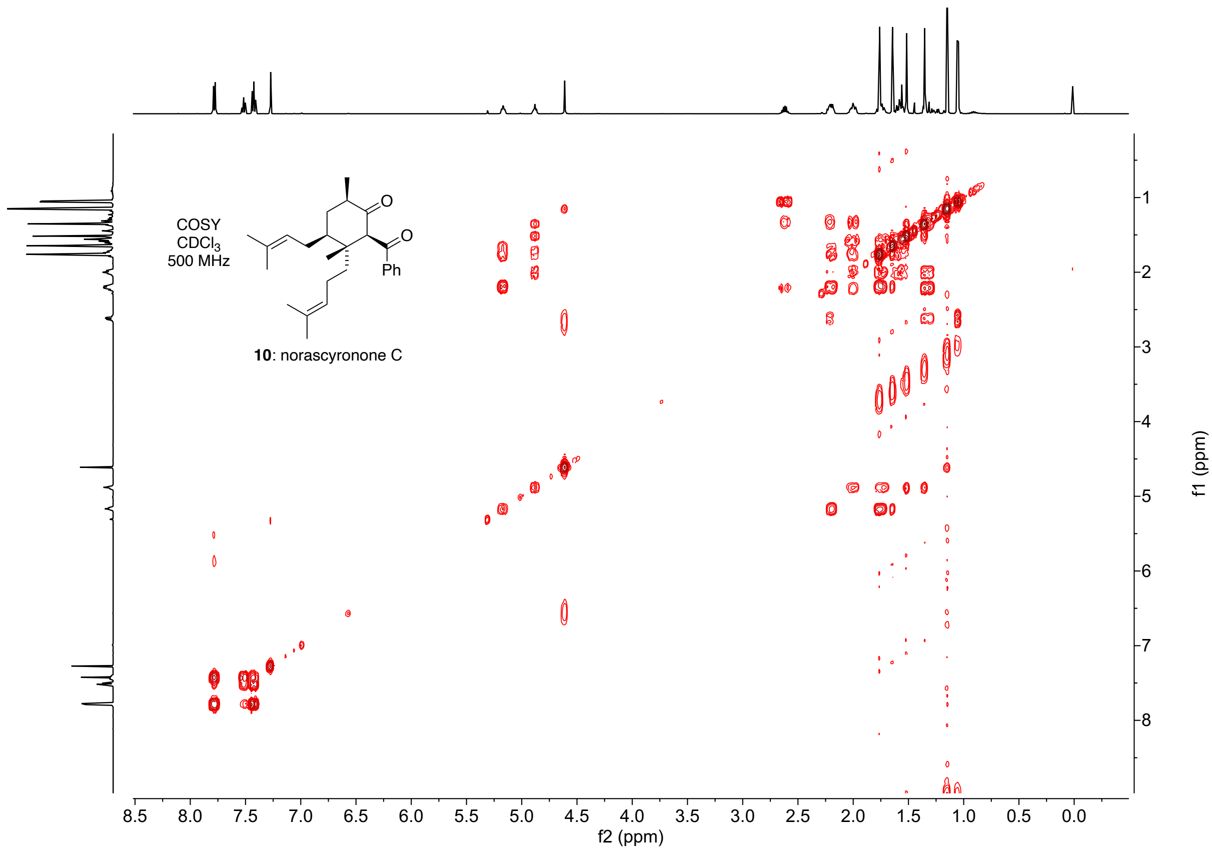

213.60
144.77
132.72
131.53
128.28
127.64
127.62
124.33
124.27
73.88
65.11
43.08
40.92
39.97
34.42
28.39
26.00
25.82
22.02
20.48
18.13
17.77
15.20
0.24
13C NMR
CDCl3
125 MHz
OTMS
H
Ph
33
220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

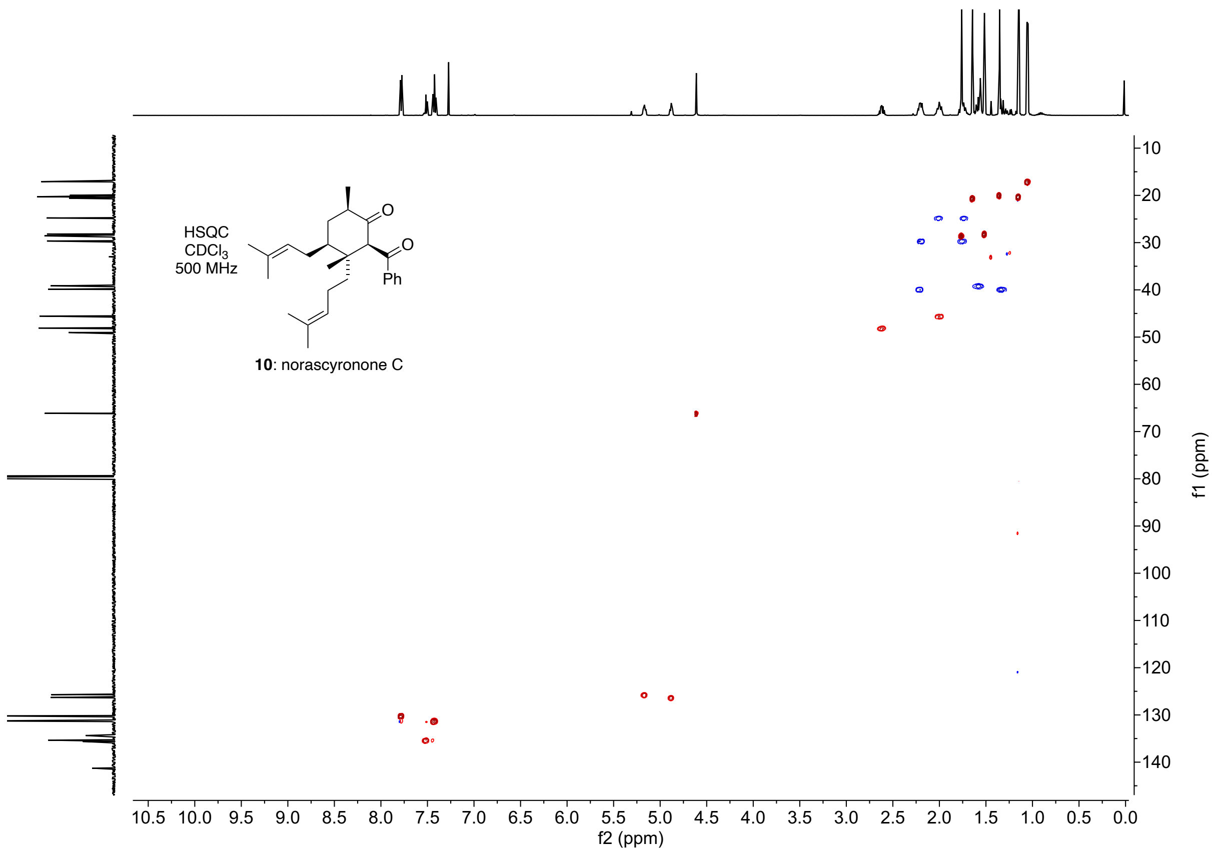

7.35 7.34 7.34 7.33 7.32 7.30 7.29 7.21 7.21 7.20 5.14 5.13 5.12 5.12 5.12 5.11 5.11 5.10 5.10 5.10 5.09 4.98 2.89 2.30 2.29 2.28 2.20 2.18 2.17 2.16 2.14 2.12 2.11 2.10 2.10 2.09 2.08 2.08 1.98 1.91 1.89 1.78 1.77 1.76 1.75 1.73 1.70 1.70 1.68 1.66 1.65 1.62 1.26 1.24 1.21 1.04 0.89 0.88
^{1}H NMR
$CDCl_3$
500 MHz
OH
H
Ph
34
4.31 1.00 2.20 2.07 1.14 1.29 2.16 1.45 1.35 1.43 1.98 3.36 3.43 1.28 3.03 3.03 1.47 3.26 3.29
12.0 11.5 11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 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 0.0
f1 (ppm)

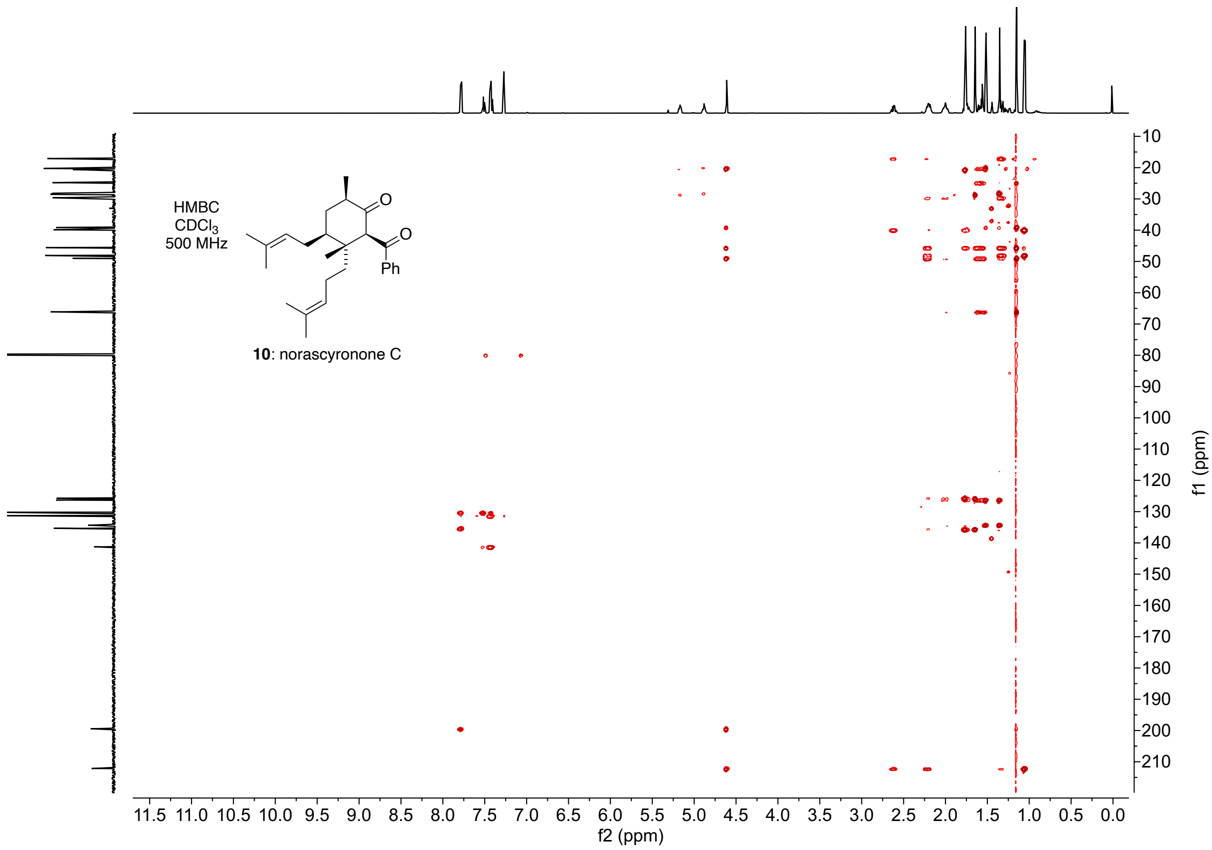

218.68
145.51 132.95 132.10 128.33 126.73 125.71 123.75 123.31
71.81
60.70
47.02 46.42 42.89 38.11 36.83 27.64 26.03 25.87 21.52 18.67 18.08 17.94 14.01
^{13}C NMR
$CDCl_3$
125 MHz
OH
H
Ph
34
230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

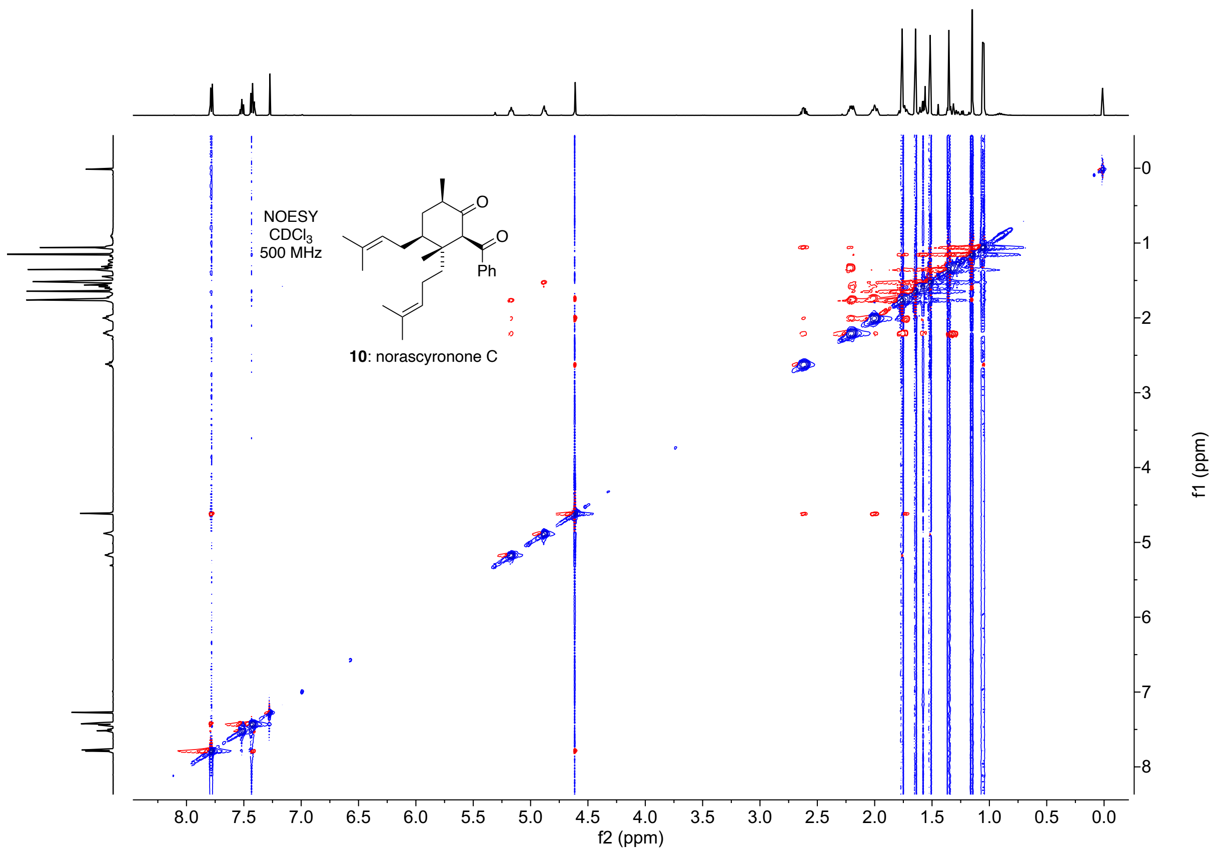

7.78 7.76 7.52 7.50 7.49 7.43 7.41 7.40 5.17 5.16 5.14 4.88 4.87 4.85 4.60 2.62 2.61 2.59 2.22 2.21 2.21 2.20 2.19 2.19 2.18 2.17 2.02 2.01 2.00 2.00 1.99 1.99 1.98 1.98 1.97 1.96 1.77 1.75 1.74 1.73 1.71 1.63 1.59 1.58 1.57 1.56 1.55 1.55 1.54 1.54 1.50 1.34 1.33 1.33 1.30 1.30 1.28 1.14 1.05 1.03
1H NMR
CDCl3
500 MHz
O
O
Ph
10: norascyronone C
2.00 1.06 1.98 1.14 1.10 1.09 1.22 1.08 1.10 2.13 0.72 3.29 1.32 2.89 2.35 2.89 2.71 0.98 2.91 2.98
9.0 8.5 8.0 7.5 7.0 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 0.0 -0.5
f1 (ppm)

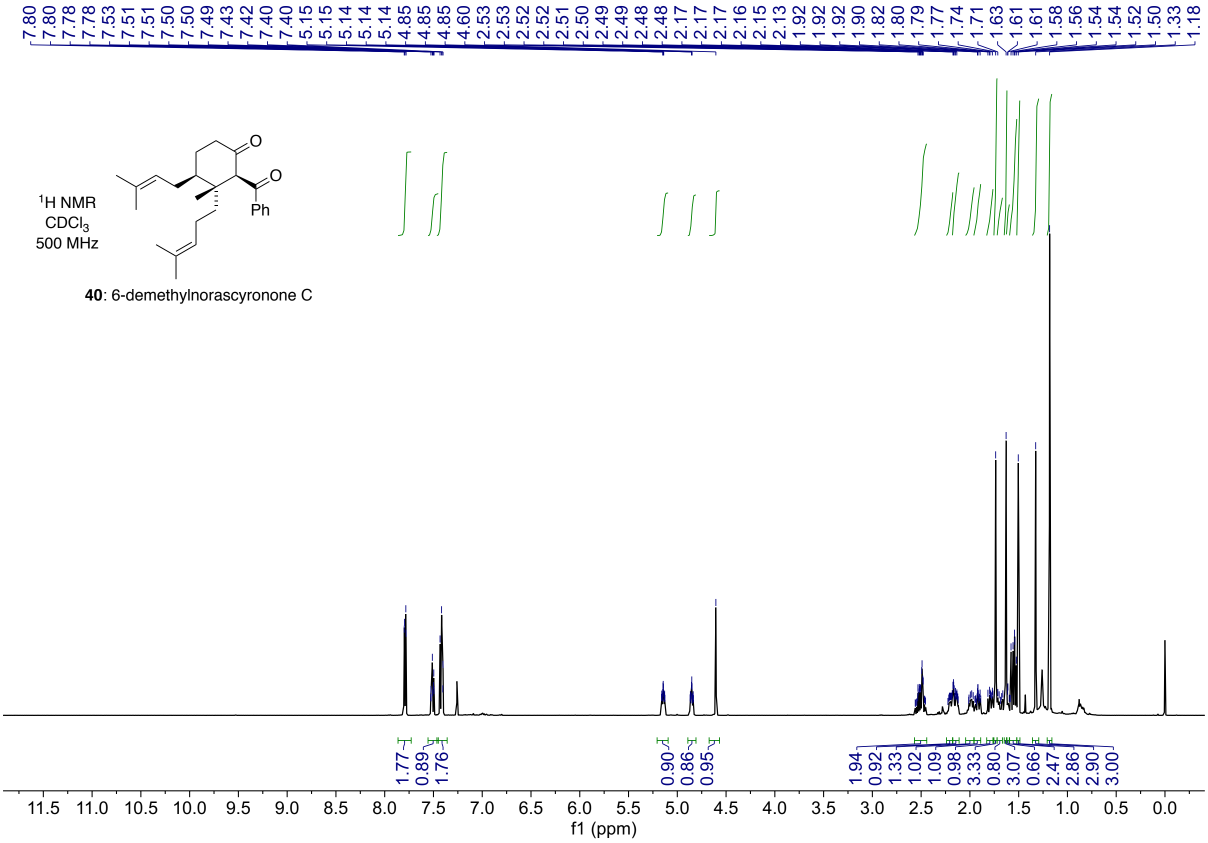

209.64
196.95
138.77 133.12 132.84 131.85 128.77 127.69 123.80 123.19
63.63
46.53 45.58 43.05 37.37 36.65 27.15 26.06 25.68 22.28 18.11 17.77 17.46 14.58
13C NMR
CDCl3
125 MHz
O
O
Ph
10: norascyronone C
220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

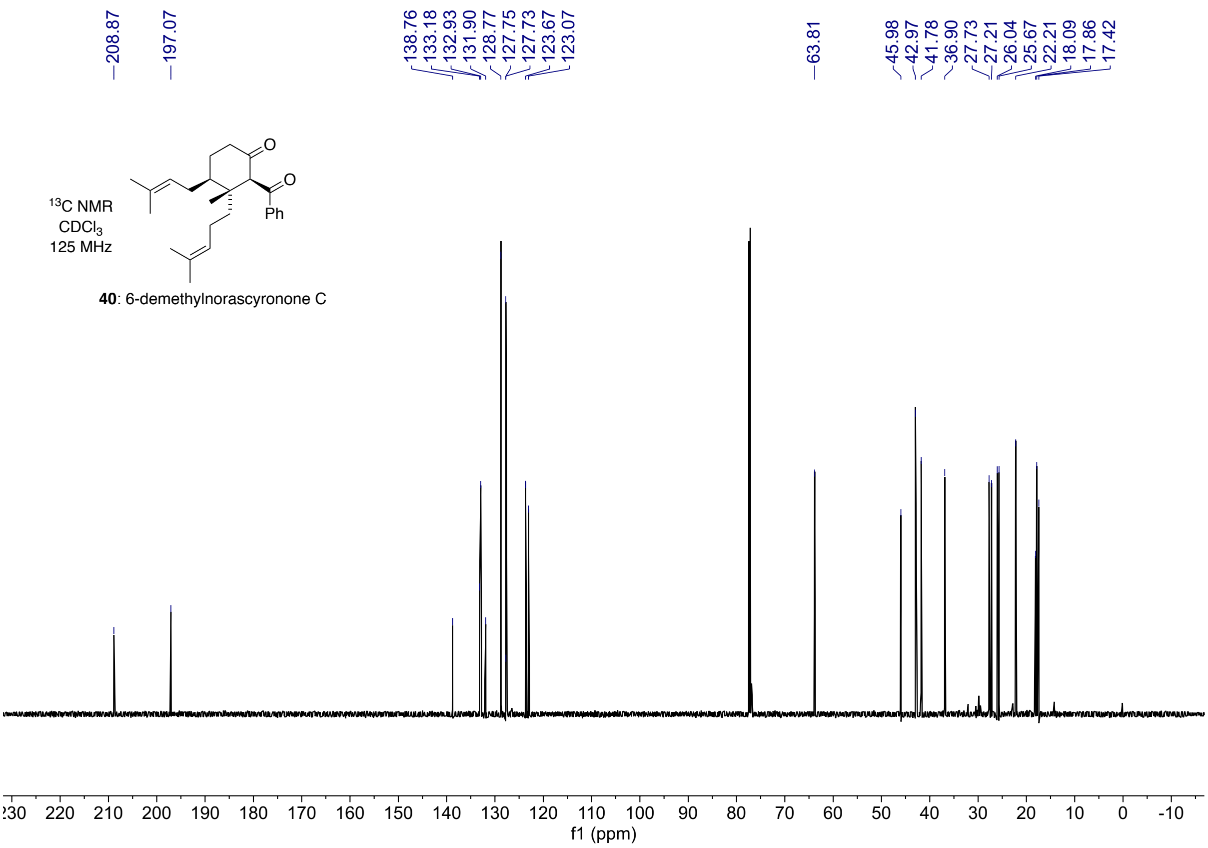

COSY
CDCl3
500 MHz
10: norascyronone C
f2 (ppm)
f1 (ppm)

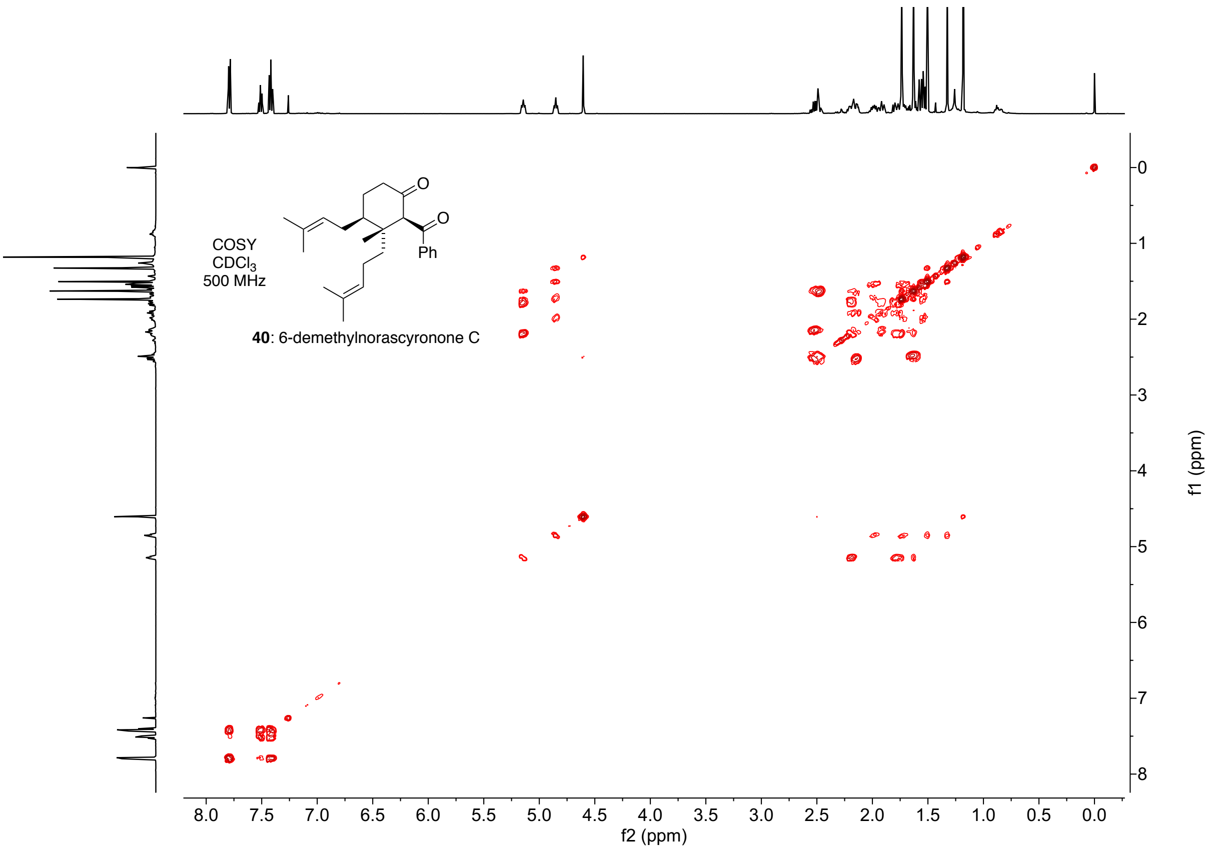

HSQC
CDCl3
500 MHz
10: norascyronone C
f2 (ppm)
f1 (ppm)

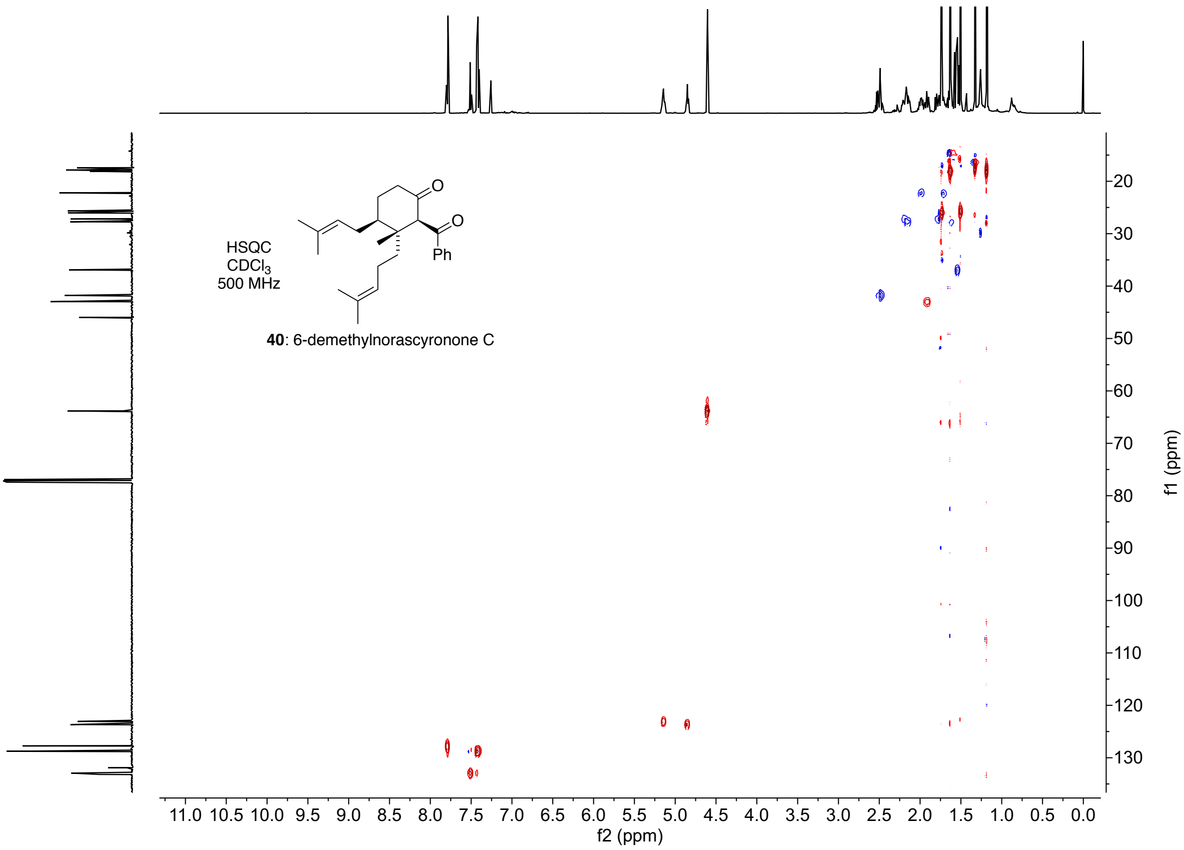

HMBC
CDCl3
500 MHz
O
O
Ph
10: norascyronone C
f2 (ppm)
f1 (ppm)

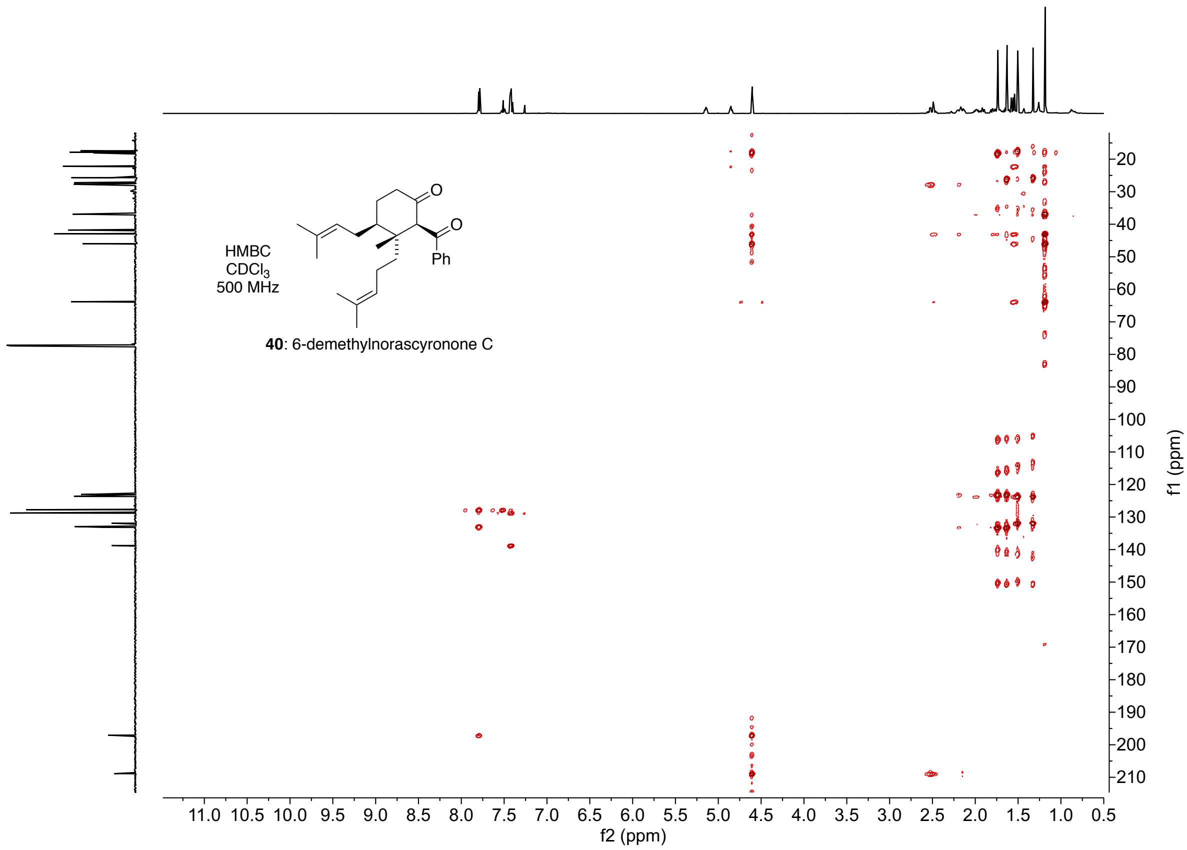

NOESY
CDCl3
500 MHz
O
O
Ph
10: norascyronone C
f2 (ppm)
f1 (ppm)

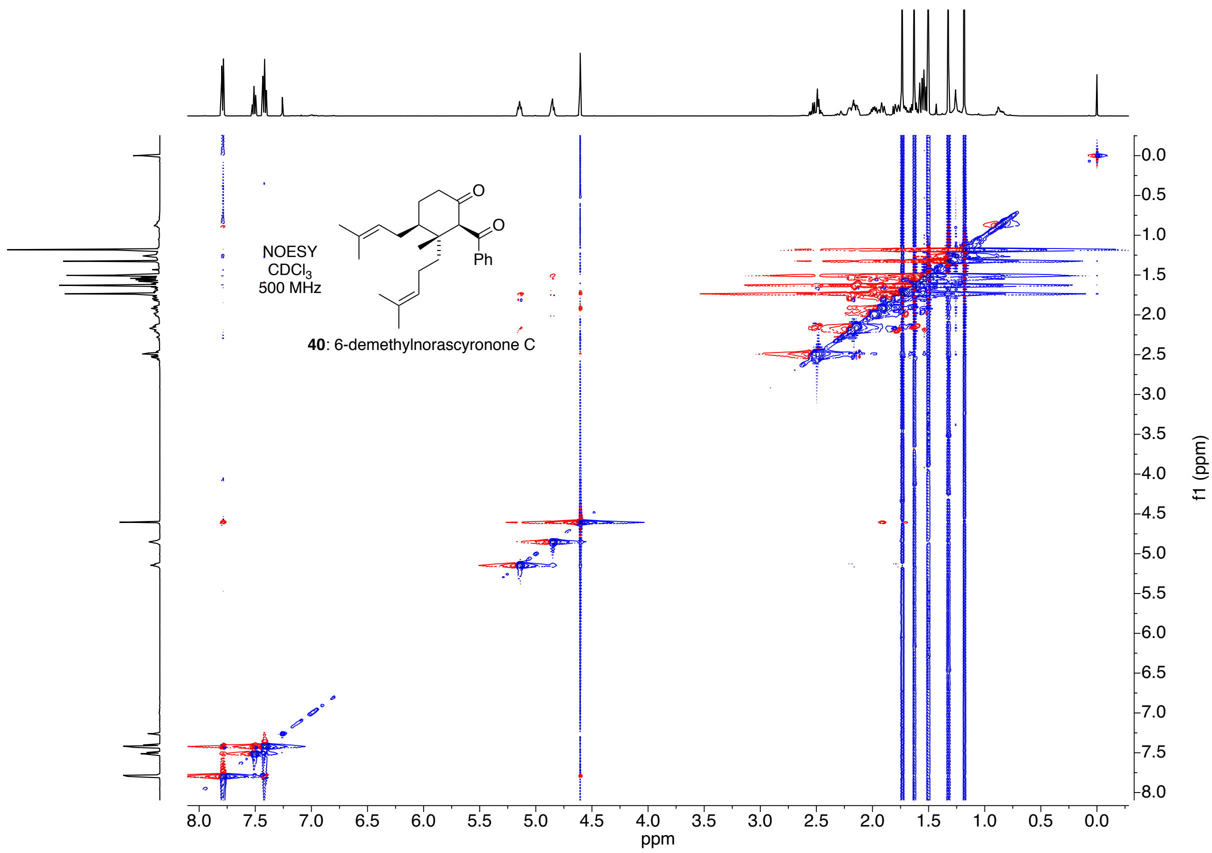

7.80 7.80 7.78 7.78 7.53 7.51 7.51 7.50 7.50 7.49 7.43 7.42 7.40 7.40 5.15 5.15 5.14 5.14 5.14 4.85 4.85 4.85 4.60 2.53 2.53 2.52 2.52 2.51 2.50 2.49 2.49 2.48 2.48 2.17 2.17 2.17 2.16 2.15 2.13 1.92 1.92 1.90 1.82 1.80 1.79 1.77 1.74 1.71 1.63 1.61 1.61 1.58 1.56 1.54 1.52 1.50 1.33 1.18
^{1}H NMR
$CDCl_3$
500 MHz
O
O
Ph
40: 6-demethylnorascyronone C
1.77 0.89 1.76 0.90 0.86 0.95 1.94 0.92 1.33 1.02 1.09 0.98 3.33 0.80 3.07 0.66 2.47 2.86 2.90 3.00
11.5 11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 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 0.0
f1 (ppm)

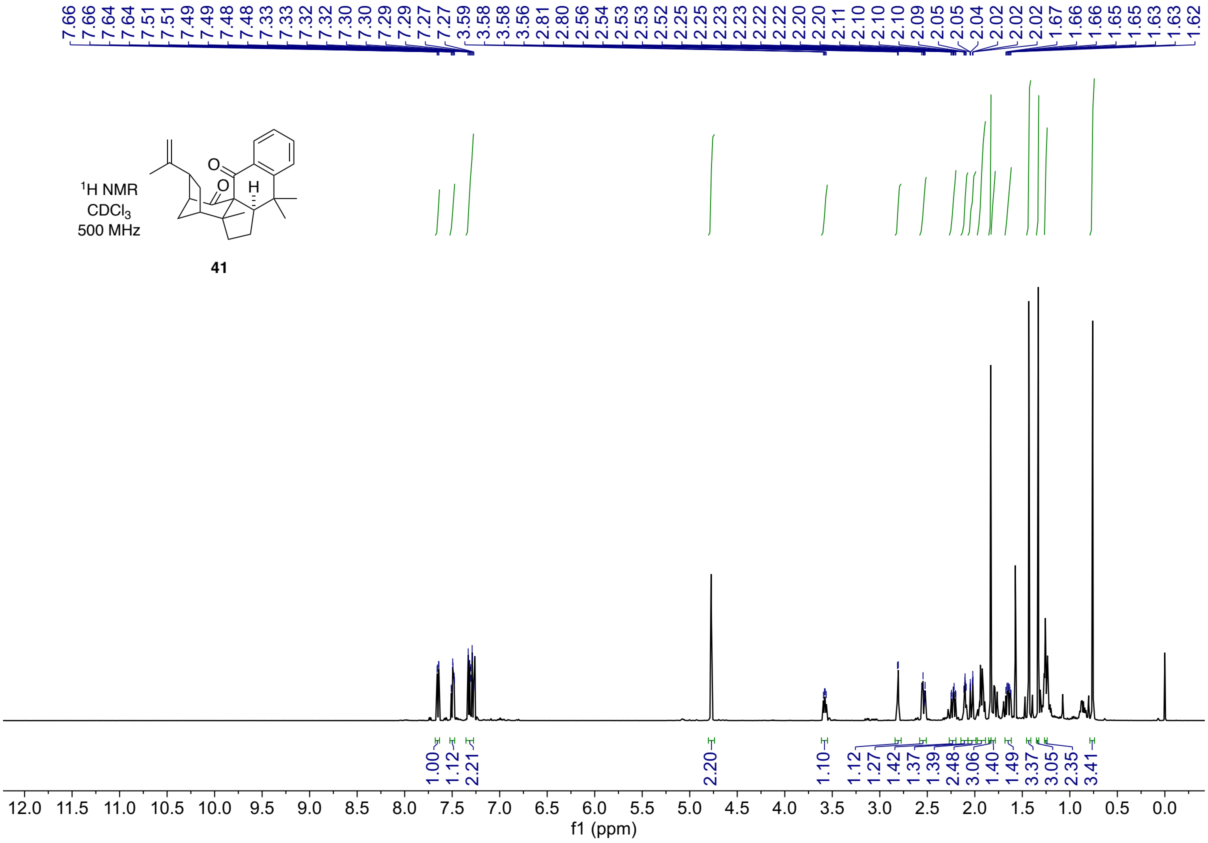

208.87 197.07 138.76 133.18 132.93 131.90 128.77 127.75 127.73 123.67 123.07 63.81 45.98 42.97 41.78 36.90 27.73 27.21 26.04 25.67 22.21 18.09 17.86 17.42
^{13}C NMR
$CDCl_3$
125 MHz
O
O
Ph
40: 6-demethylnorascyronone C
230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)


COSY
CDCl3
500 MHz
40: 6-demethylnorascyronone C
f2 (ppm)
f1 (ppm)

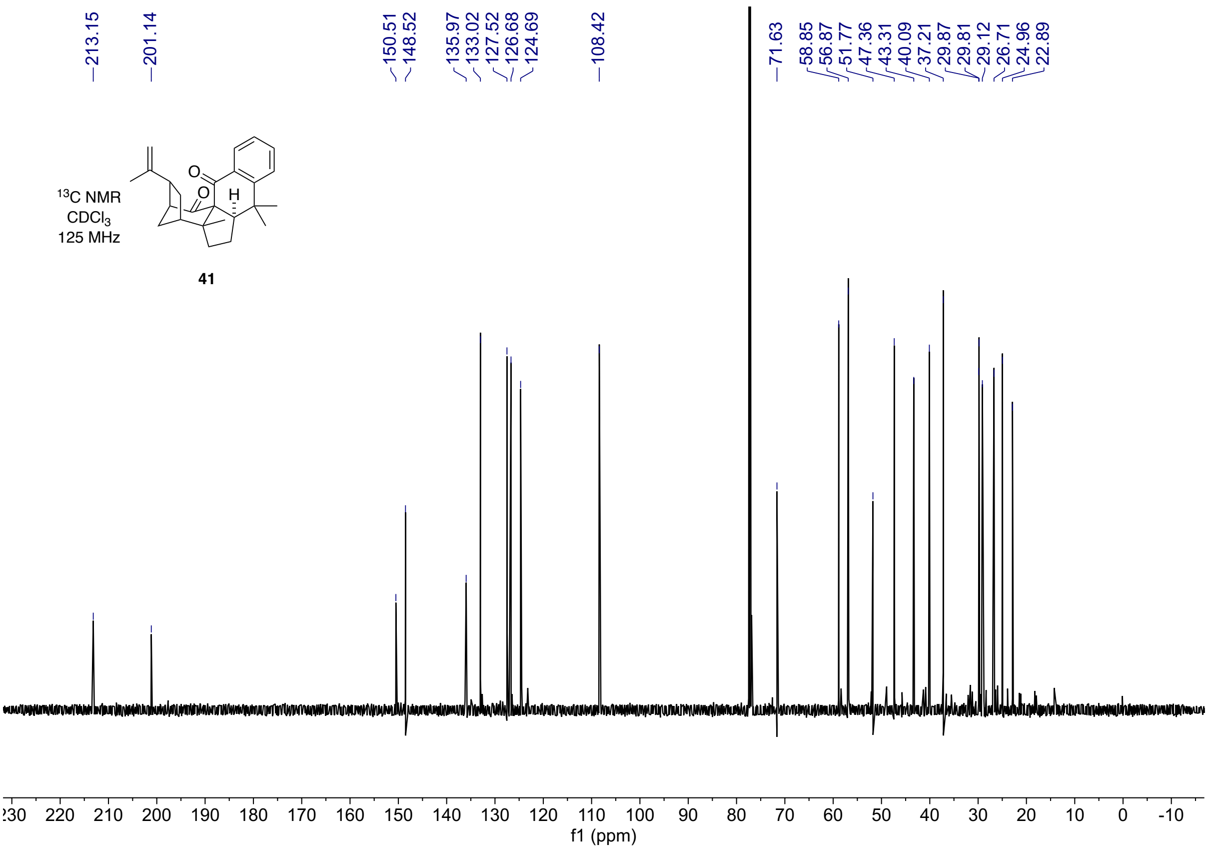

HSQC
CDCl3
500 MHz
40: 6-demethylnorascyronone C
f2 (ppm)
f1 (ppm)


HMBC
CDCl3
500 MHz
40: 6-demethylnorascyronone C
O
O
Ph
f2 (ppm)
f1 (ppm)

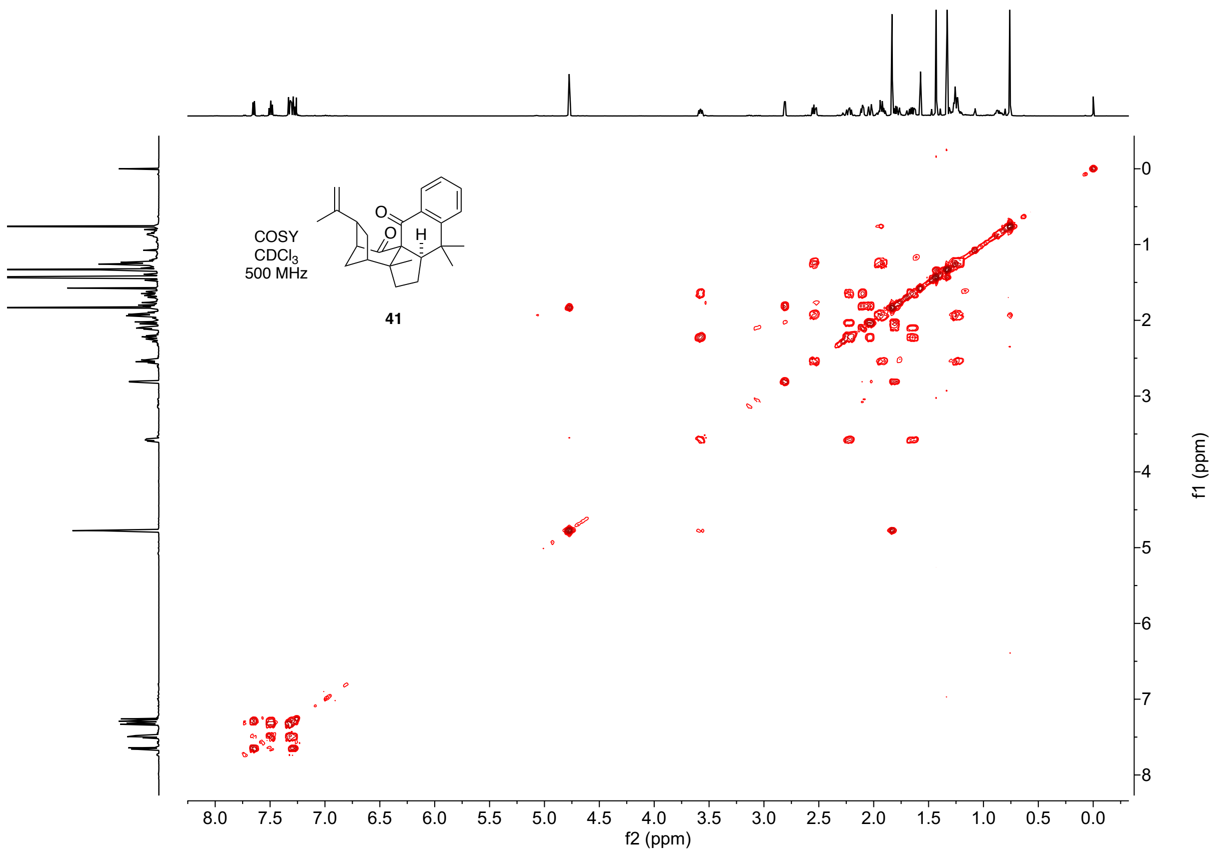

NOESY
CDCl3
500 MHz
40: 6-demethylnorascyronone C
O
O
Ph
ppm
f1 (ppm)

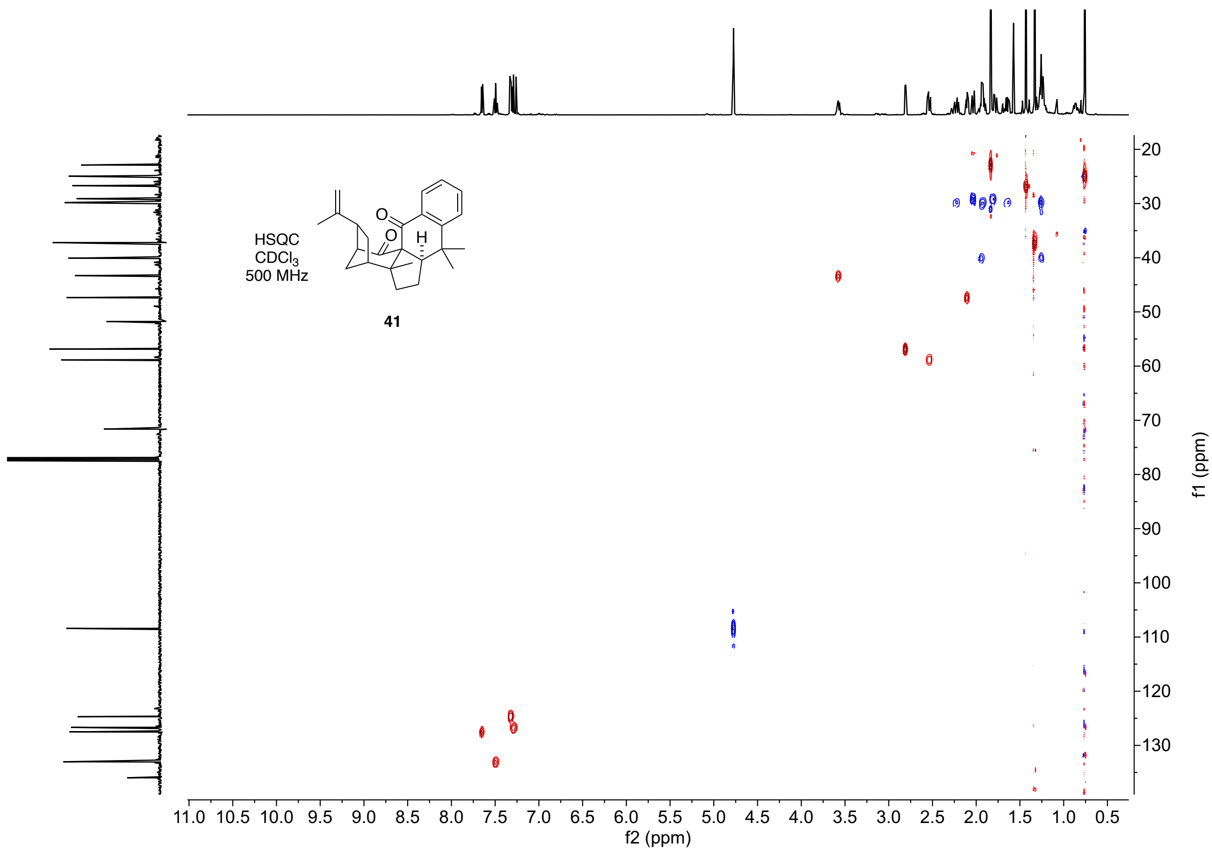


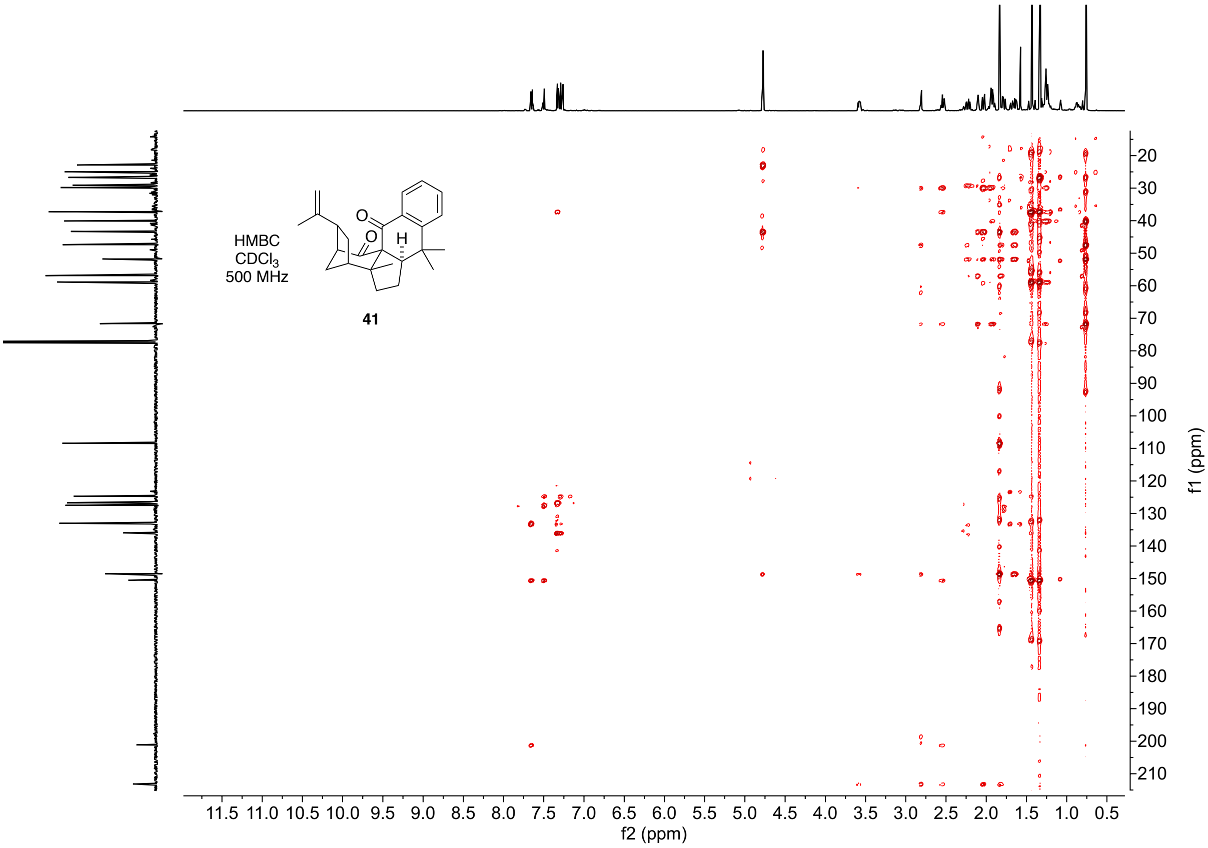
7.66 7.66 7.64 7.64 7.51 7.51 7.49 7.49 7.48 7.48 7.33 7.33 7.32 7.32 7.30 7.30 7.29 7.29 7.27 7.27 3.59 3.58 3.58 3.56 2.81 2.80 2.56 2.54 2.53 2.53 2.52 2.25 2.25 2.23 2.23 2.22 2.22 2.20 2.20 2.11 2.10 2.10 2.10 2.09 2.05 2.05 2.04 2.02 2.02 2.02 1.67 1.66 1.66 1.65 1.65 1.63 1.63 1.62
^{1}H NMR
$CDCl_3$
500 MHz
41
1.00 1.12 2.21 2.20 1.10 1.12 1.27 1.42 1.37 1.39 2.48 3.06 1.40 1.49 3.37 3.05 2.35 3.41
12.0 11.5 11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 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 0.0
f1 (ppm)



213.15 201.14 150.51 148.52 135.97 133.02 127.52 126.68 124.69 108.42 71.63 58.85 56.87 51.77 47.36 43.31 40.09 37.21 29.87 29.81 29.12 26.71 24.96 22.89
^{13}C NMR
$CDCl_3$
125 MHz
41
230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

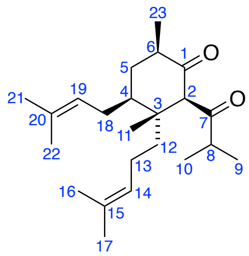

COSY
CDCl3
500 MHz
41
f2 (ppm)
f1 (ppm)


HSQC
CDCl3
500 MHz
41
f2 (ppm)
f1 (ppm)


HMBC
CDCl3
500 MHz
41
f2 (ppm)
f1 (ppm)

2. Tables of NMR data for natural products

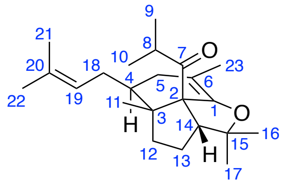
Comparison of the ^{1}H and ^{13}C NMR spectra of natural[1] and synthetic hyperibrin A (**11**).



11: hyperibrin A

Assignment	Natural ^{1}H NMR CDCl$_3$, 400 MHz	Synthetic ^{1}H NMR CDCl$_3$, 500 MHz	Natural ^{13}C NMR CDCl$_3$, 125 MHz	Synthetic ^{13}C NMR CDCl$_3$, 125 MHz
1			210.6	210.6
2	3.85 (s)	3.85 (s)	66.7	66.7
3			45.5	45.5
4	1.84 (m)	1.86 – 1.75 (m)	42.4	42.5
5	2.13 (m) 1.68 (m)	2.13 – 2.01 (m) 1.71 – 1.68 (m)	36.9	37.0
6	2.45 (m)	2.50 – 2.43 (m)	42.7	42.7
7			211.0	211.0
8	2.47 (m)	2.50 – 2.43 (m)	45.5	
9	1.06 (d, J = 8.4)	1.04 (d, J = 8.0 Hz)	18.5	18.5
10	1.08 (d, J = 8.4)	1.06 (d, J = 8.0 Hz)	17.9	18.0
11	1.00 (s)	1.00 (s)	17.3	17.3
12	1.50 (m) 1.25 (m)	1.50 – 1.46 (m) 1.26 – 1.18 (m)	36.6	36.6
13	2.07 (m) 1.49 (m)	2.13 – 2.01 (m) 1.50 – 1.46 (m)	21.9	21.9
14	4.98 (t, J = 5.6)	4.98 (t, J = 6.7 Hz)	123.6	123.7
15			131.6	131.7
16	1.66 (s)	1.66 (s)	17.6	17.7
17	1.58 (s)	1.58 (s)	25.6	25.7
18	2.12 (m) 1.71 (m)	2.13 – 2.01 (m) 1.71 – 1.68 (m)	26.8	26.8
19	5.12 (t, J = 5.6)	5.12 (t, J = 7.0 Hz)	122.9	123.0
20			132.9	132.9
21	1.61 (s)	1.61 (s)	25.9	25.9
22	1.74 (s)	1.73 (s)	14.3	14.3
23	1.01 (d, J = 5.2)	1.01 (d, J = 8.0 Hz)	17.6	17.7

Comparison of the ^{1}H and ^{13}C NMR spectra of natural[2] and synthetic yezo'otogirin C (**3**).

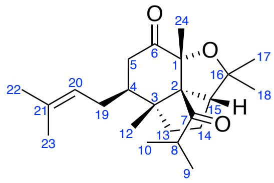


3: yezo'otogirin C

Assignment	Natural ^{1}H NMR CDCl$_3$*	Synthetic ^{1}H NMR CDCl$_3$, 600 MHz	Natural ^{13}C NMR CDCl$_3$*	Synthetic ^{13}C NMR CDCl$_3$, 150 MHz
1			149.3	149.2
2			73.6	73.6
3			48.5	48.5
4	1.22 (m)	1.23 (tt, *J* = 11.4, 3.0 Hz)	47.0	47.0
5	1.98 (dd, *J* = 15.3, 11.4 Hz) 1.86 (dd, *J* = 15.3, 3.0 Hz)	1.96 (dd, *J* = 14.8, 11.6 Hz) 1.86 (dd, *J* = 15.5, 3.3 Hz)	32.8	32.7
6			107.5	107.5
7			217.4	217.4
8	2.96 (hept, *J* = 6.6 Hz)	2.96 (hept, *J* = 6.6 Hz)	37.9	37.9
9	1.01 (d, *J* = 6.6 Hz)	1.02 (d, *J* = 6.6 Hz)	18.3	18.3
10	1.01 (d, *J* = 6.6 Hz)	1.01 (d, *J* = 6.6 Hz)	21.5	21.5
11	0.75 (s)	0.75 (s)	19.6	19.6
12	1.75 (m) 1.46 (m)	1.76 – 1.74 (m) 1.56 – 1.52 (m)	41.5	41.5
13	1.54 (m)	1.56 – 1.52 (m)	25.4	25.4
14	3.18 (t, *J* = 9.6 Hz)	3.19 (dd, *J* = 10.2, 9.0 Hz)	54.9	54.9
15			83.4	83.4
16	1.14 (s)	1.15 (s)	29.4	29.5
17	1.18 (s)	1.18 (s)	25.4	25.4
18	1.93 (m) 1.81 (m)	1.94 (dd, *J* = 11.1, 1.0 Hz) 1.84 – 1.80 (m)	29.6	29.6
19	5.11 (t, *J* = 6.9 Hz)	5.13 – 5.10 (m)	124.2	124.2
20			132.3	132.4
21	1.72 (s)	1.73 (s)	25.8	25.9
22	1.60 (s)	1.61 (s)	17.8	17.9
23	1.70 (s)	1.71 (s)	16.3	16.3

*The operation frequency is not specified in the isolation paper.

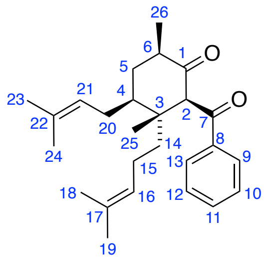
Comparison of the ^{1}H and ^{13}C NMR spectra of natural[3] and synthetic hypermogin D (**4**)



hypermogin D (**4**)

Assignment	Natural ^{1}H NMR $CDCl_3$, 600 MHz	Synthetic ^{1}H NMR $CDCl_3$, 500 MHz	Natural ^{13}C NMR $CDCl_3$, 150 MHz	Synthetic ^{13}C NMR $CDCl_3$, 125 MHz
1			98.7	98.7
2			85.7	85.7
3			59.8	59.8
4	2.10 (m)	2.13 – 2.06 (m)	45.8	45.8
5	1.93 (m) 1.66 (m)	2.17 – 1.89 (m)	43.2	43.2
6			208.7	208.7
7			215.4	215.4
8	2.91 (m)	2.94 – 2.85 (m)	38.3	38.3
9	1.06 (d, *J* = 6.5)	1.04 (d, *J* = 6.6 Hz)	18.4	18.4
10	1.24 (d, *J* = 6.5)	1.22 (d, *J* = 6.6 Hz)	21.1	21.0
11				
12	0.87 (s)	0.85 (s)	19.7	19.8
13	2.13 (m)	2.17 – 1.89 (m) 1.66 – 1.63 (m)	41.2	41.3
14	2.05 (m) 1.94 (m)	2.17 – 1.89 (m)	28.4	28.4
15	3.09 (dd, *J* = 8.2, 6.2)	3.07 (dd, *J* = 8.3, 6.4 Hz)	57.3	57.4
16			88.6	88.6
17	1.34 (s)	1.32 (s)	25.8	25.8
18	1.33 (s)	1.32 (s)	30.9	30.9
19	2.05 (m) 1.99 (m)	2.17 – 1.89 (m)	28.3	28.3
20	5.11 (t, *J* = 6.5)	5.10 (t, *J* = 7.1 Hz)	123.3	123.3
21			132.1	132.1
22	1.70 (s)	1.68 (s)	17.8	17.8
23	1.62 (s)	1.61 (s)	26.3	26.3
24	2.22 (s)	2.20 (s)	28.0	28.0

Comparison of the ^{1}H and ^{13}C NMR spectra of natural[4] and synthetic norascyronone C (**10**)



norascyronone C (**10**)

Assignment	Natural ^{1}H NMR $CDCl_3$, 600 MHz	Synthetic ^{1}H NMR $CDCl_3$, 500 MHz	Natural ^{13}C NMR $CDCl_3$, 150 MHz	Synthetic ^{13}C NMR $CDCl_3$, 125 MHz
1	-	-	209.6	209.6
2	4.55 (s)	4.60 (s)	63.7	63.6
3	-	-	46.3	46.5
4	1.94 (m)	2.03 – 1.95 (m)	42.8	43.1
5	2.13, m 1.25 (q, *J* = 12.3 Hz)	2.23 – 2.19 (m) 1.33 – 1.28 (m)	37.1	37.4
6	2.55 (m)	2.60 (dp, *J* = 12.8, 6.6 Hz)	45.4	45.6
7	-	-	196.8	197.0
8	-	-	138.5	138.8
9	7.71 (d, *J* = 7.8 Hz)	7.77 (d, *J* = 7.3 Hz)	127.5	127.7
10	7.35 (t, *J* = 7.8 Hz)	7.41 (t, *J* = 7.7 Hz)	128.6	128.8
11	7.44 (t, *J* = 7.8 Hz)	7.50 (t, *J* = 7.4 Hz)	132.7	132.8
12	7.35 (t, *J* = 7.8 Hz)	7.41 (t, *J* = 7.7 Hz)	128.6	128.8
13	7.71 (d, *J* = 7.8 Hz)	7.77 (d, *J* = 7.3 Hz)	127.5	127.7
14	1.50 (m)	1.60 – 1.54 (m)	36.4	36.7
15	1.91 (overlap) 1.65 (m)	2.03 – 1.95 (m) 1.74 – 1.69 (m)	22.0	22.3
16	4.80 (t, *J* = 7.0 Hz)	4.87 (t, *J* = 7.1 Hz)	123.6	123.8
17	-	-	131.7	131.9
18	1.44 (s)	1.50 (s)	25.5	25.7
19	1.27 (s)	1.34 (s)	17.3	17.5
20	2.11 (m) 1.70 (overlap)	2.19 – 2.15 (m) 1.78 – 1.75 (m)	26.9	27.2
21	5.09 (t, *J* = 7.2 Hz)	5.16 (t, *J* = 7.2 Hz)	123.0	123.2
22	-	-	132.9	133.1
23	1.56 (s)	1.63 (s)	17.9	18.1
24	1.68 (s)	1.75 (s)	25.9	26.1
25	1.07 (s)	1.14 (s)	17.6	17.8
26	0.98 (d, *J* = 6.6 Hz)	1.04 (d, *J* = 6.4 Hz)	14.4	14.6

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