atmospheric deposition

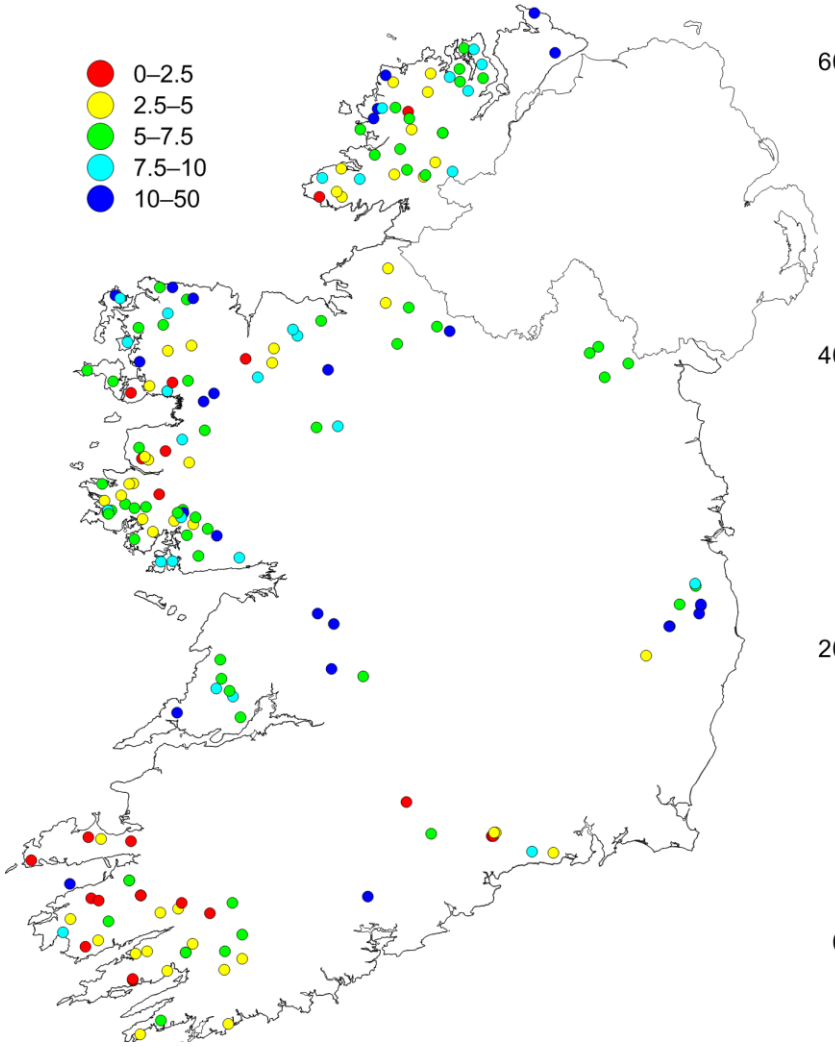
acidification and its role in dissolved organic carbon

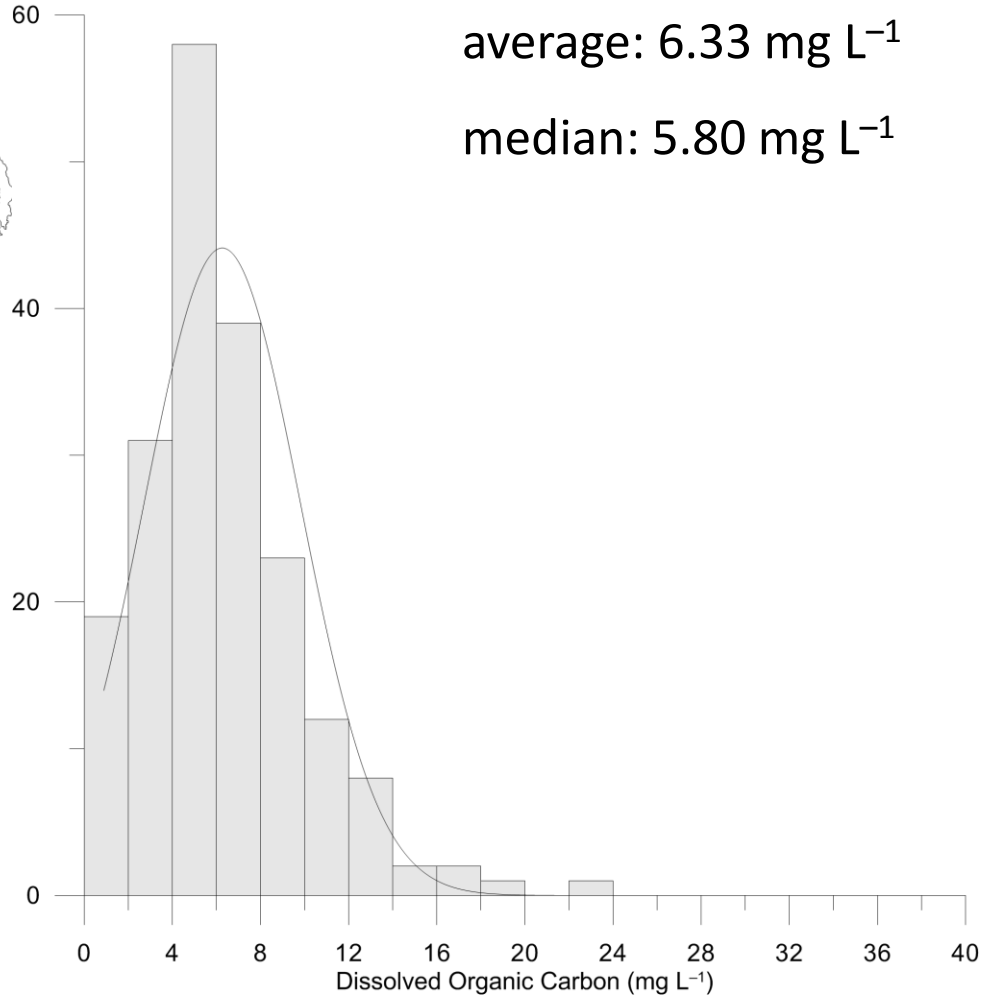
Irish Natural Organic Matter 2016
Galway [16 June 2016]

what is the concentration of DOC in Irish (surface) waters?
what are the sources of DOC in Irish surface waters?
what drives variability of DOC…?
what are the (long-term) trends in DOC…?

outline of presentation

Dissolved Organic Carbon (mg L^{-1})

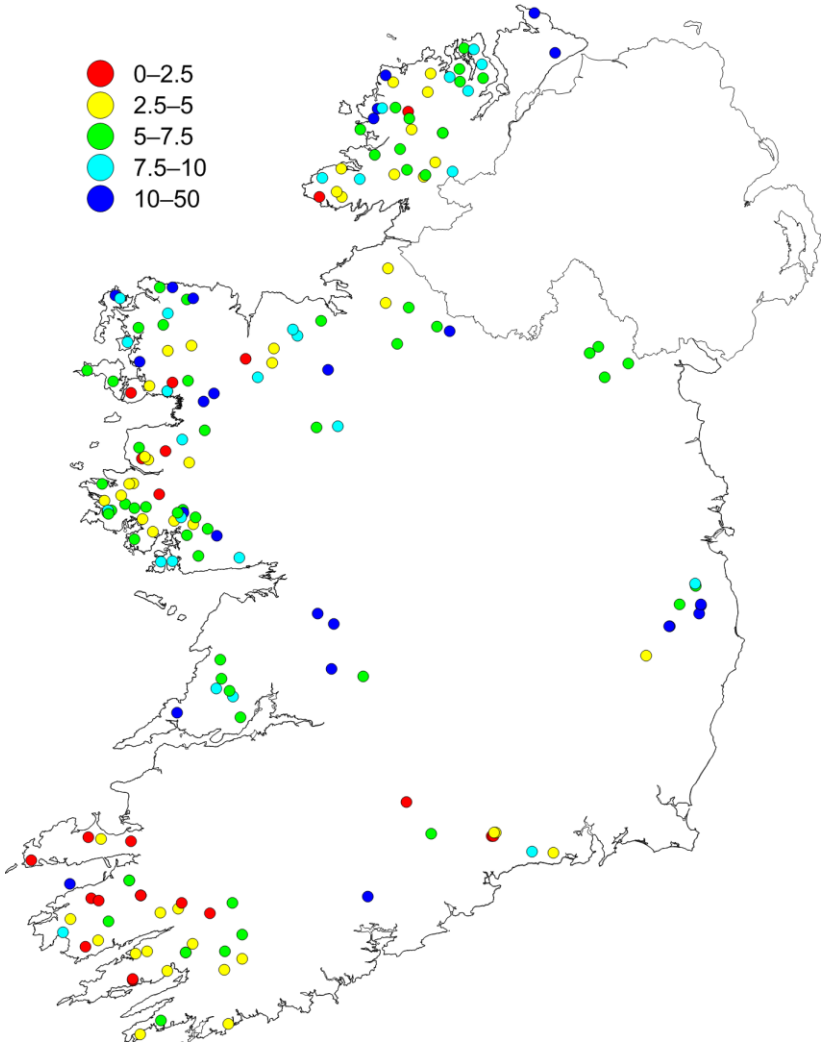


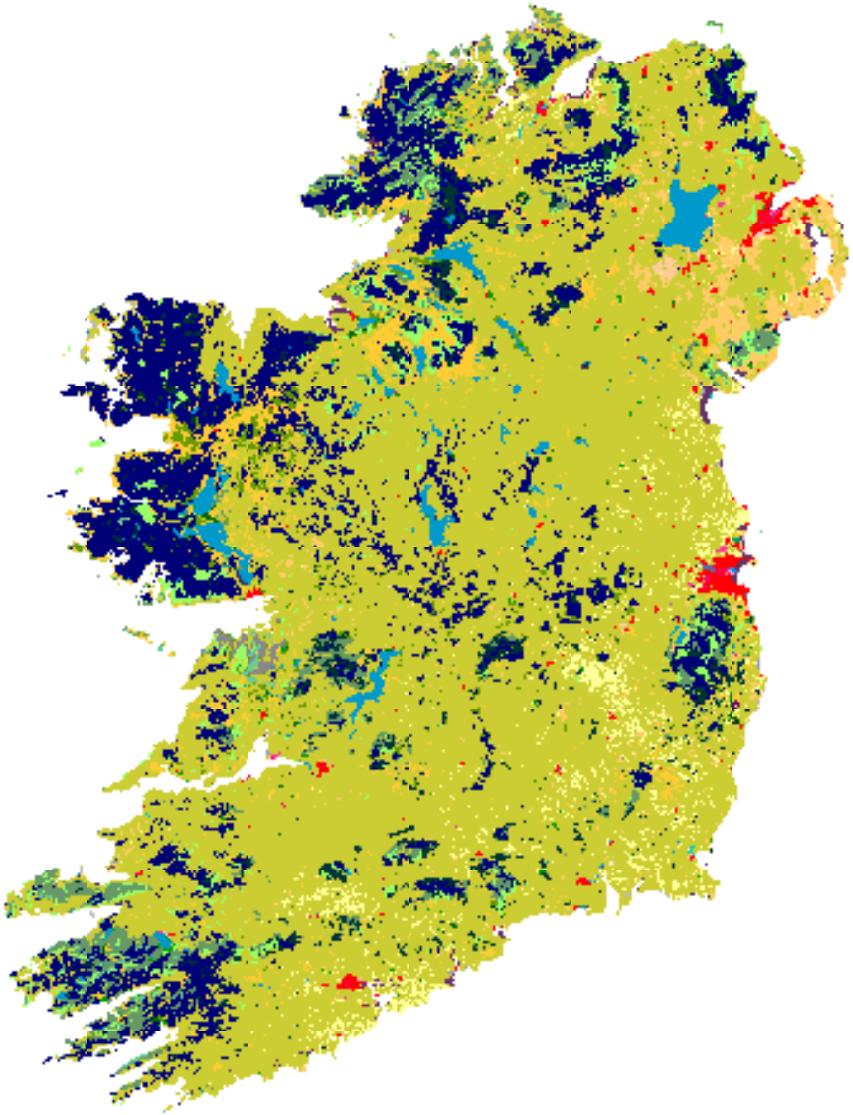


average: 6.33 mg L^{-1}

median: 5.80 mg L^{-1}

lakes (n = 175)


0–2.5
2.5–5
5–7.5
7.5–10
10–50



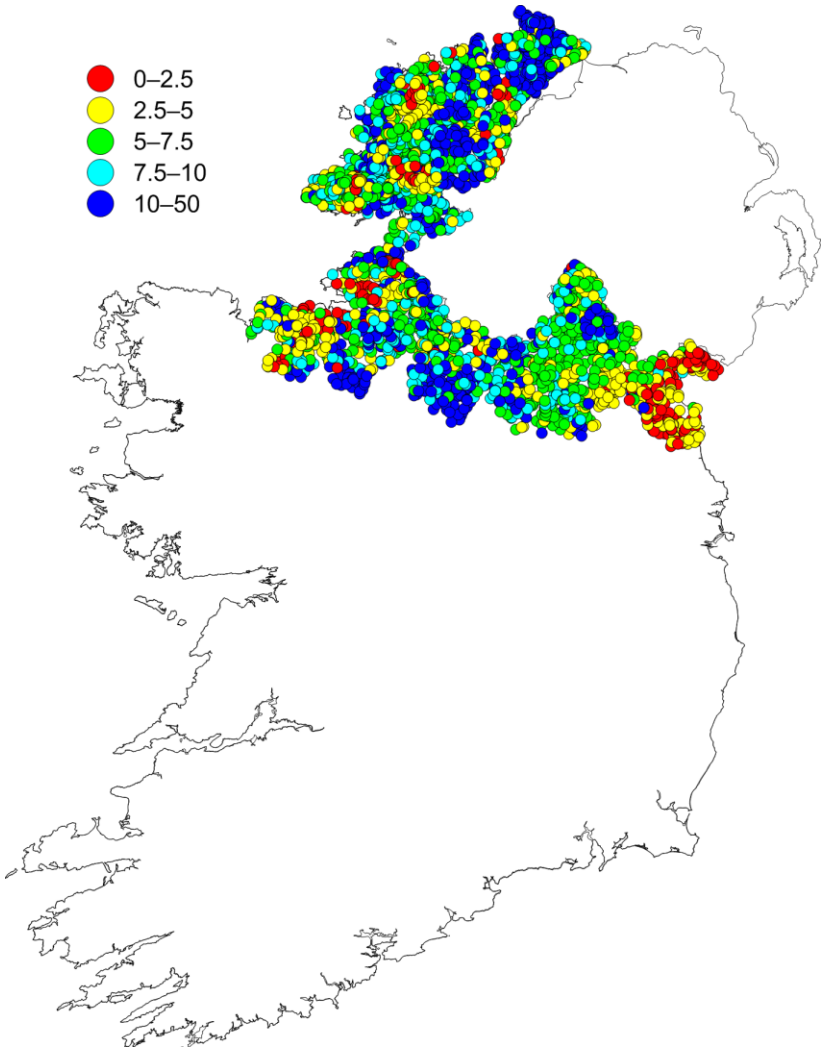
	%C	g cm^{-3} bulk density	kg m^2 C pool
Avoca	7.8	0.80	2861
Ballinastoe	12.5	1.19	6189
Brackloon	4.0	1.21	2199
Cloosh Valley	53.8	0.12	3412
Dromahaire	4.7	1.14	2248
Dungarvan-Coolroe	5.5	1.06	3273
Dungarvan-Old Parish	8.0	0.91	3137
Kilfinane	9.7	1.12	4476
ManorHamilton	5.9	0.74	1431
Mountrath	2.5	1.38	1476
Thomastown	11.0	0.88	4670
S0410	6.0	0.53	1403
S0705	35.3	0.12	1851
S0723	17.9	0.65	3099
S0808	1.4	1.25	827
S0826	30.0	0.16	2134
S1108	3.4	1.18	1013
S2211	10.3	0.62	1619
S2510	4.1	1.01	1305
S3121	28.4	0.13	1537

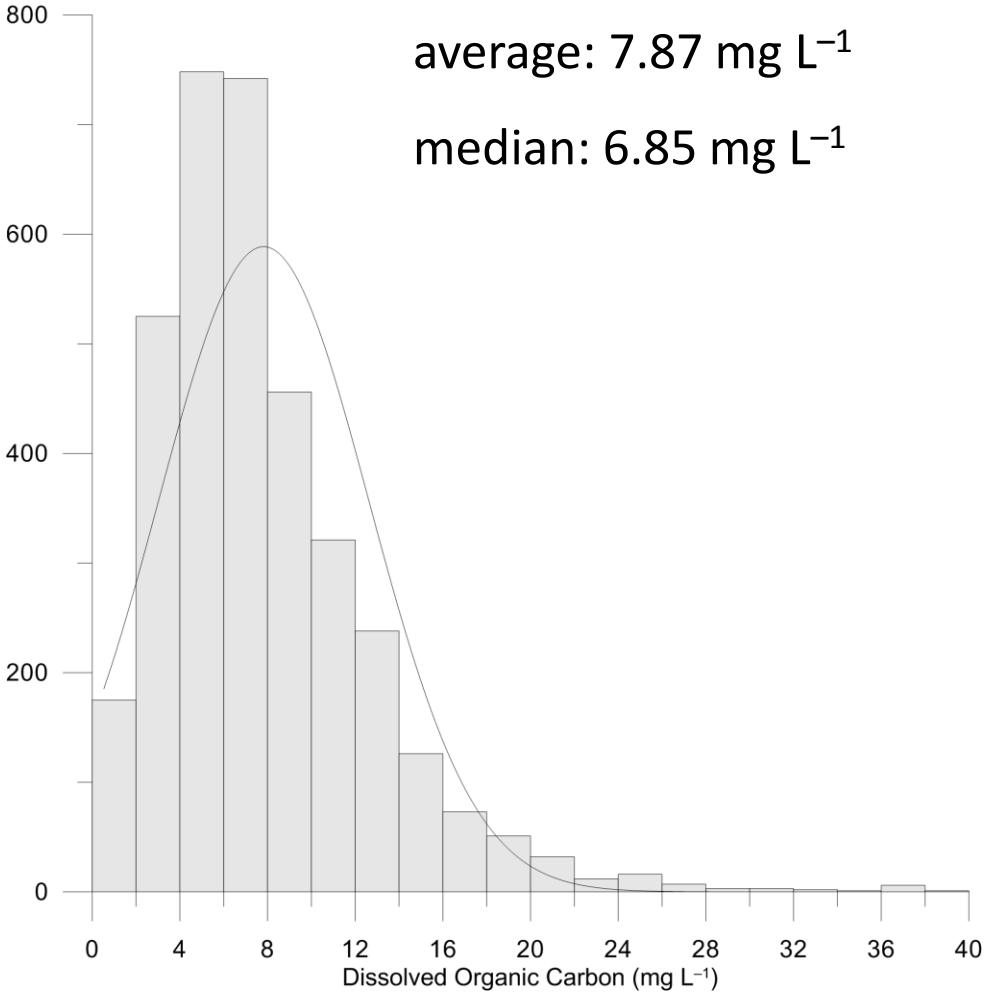
organic carbon pools in soils (top 50 cm)

	%C	kg m^2 C pool	(range)
Forests	14.2	1050	(527–2787)
Oak woodlands	14.8	900	(207–1635)
Heathlands	28.1	702	(202–1404)

organic carbon pools in soils (top 10 cm)

Dissolved Organic Carbon (mg L^{-1})

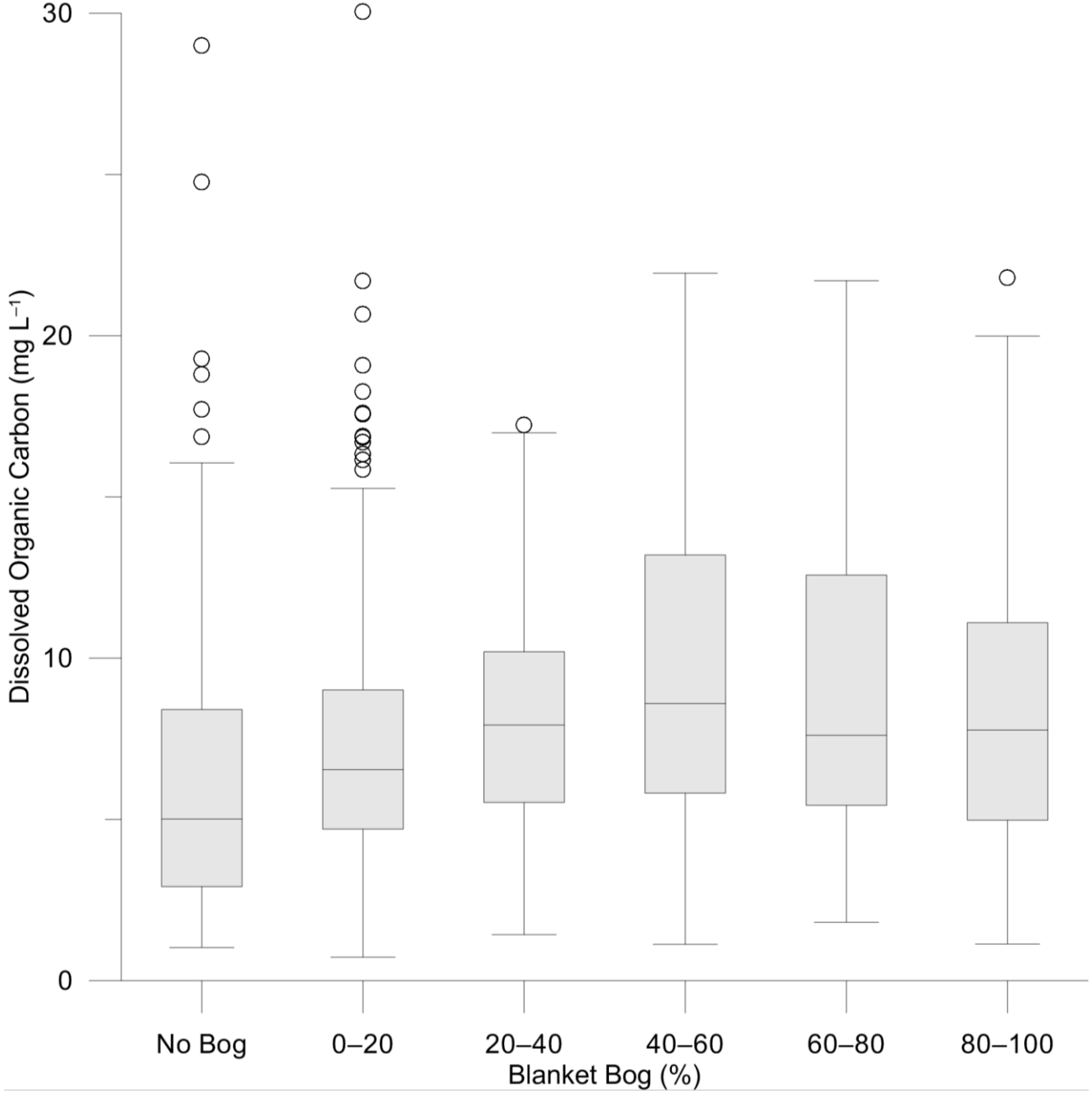




average: 7.87 mg L^{-1}

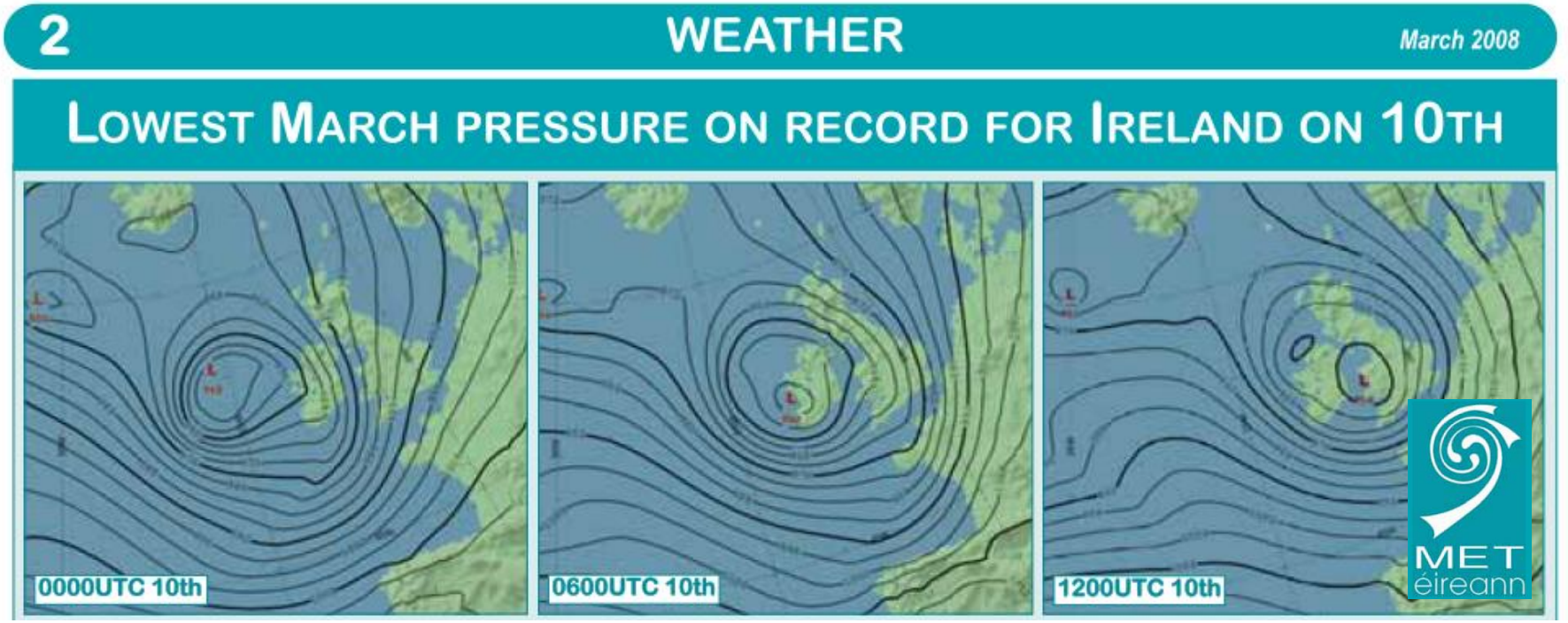
median: 6.85 mg L^{-1}

streams (n = 3540)


30
20
10
0
Dissolved Organic Carbon (mg L⁻¹)
No Bog
0–20
20–40
40–60
60–80
80–100
Blanket Bog (%)

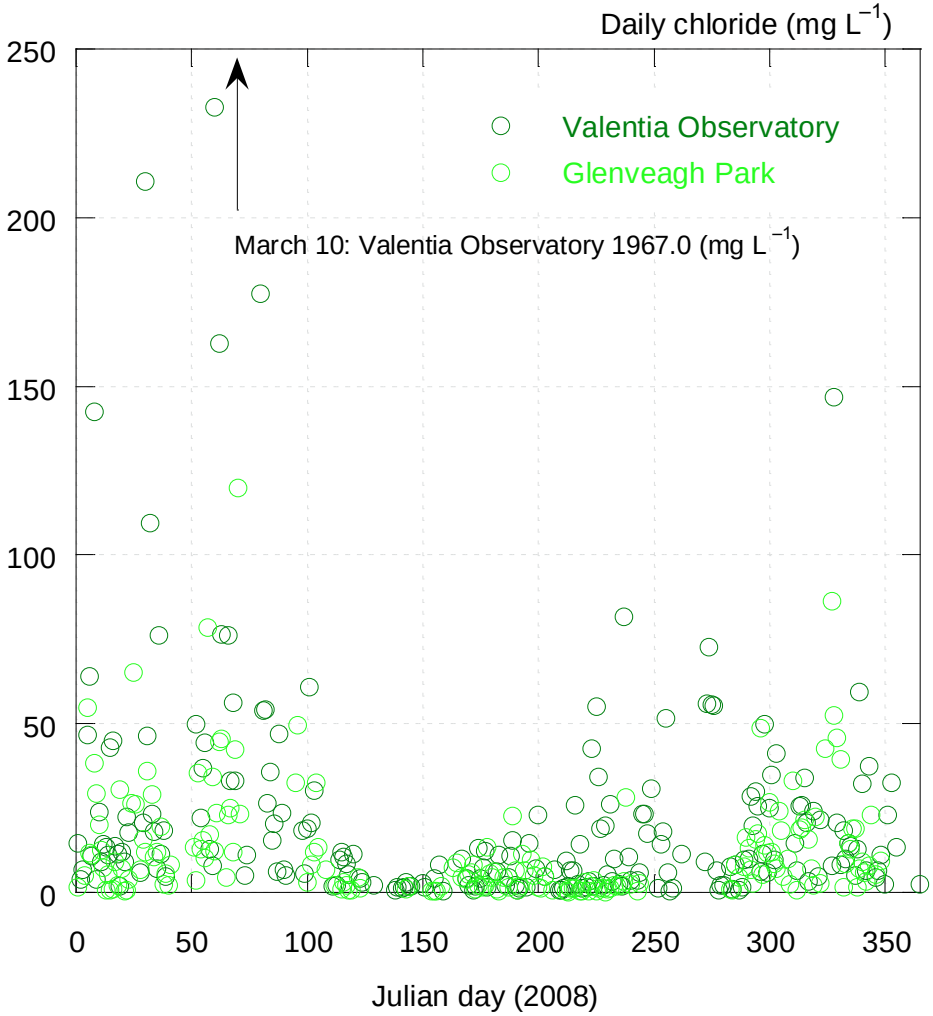
	mg L^{-1} DOC	L mg^{-1} m^{-1} $SUVA_{254}$
Rainwater	0.63	0.92
Upland lakes	4.77	1.63
Stemflow	32.16	0.73
Humus	57.54	1.23
Soil (25 cm)	49.06	1.01
Soil (50 cm)	13.43	0.44
Lakes	4.12	3.83

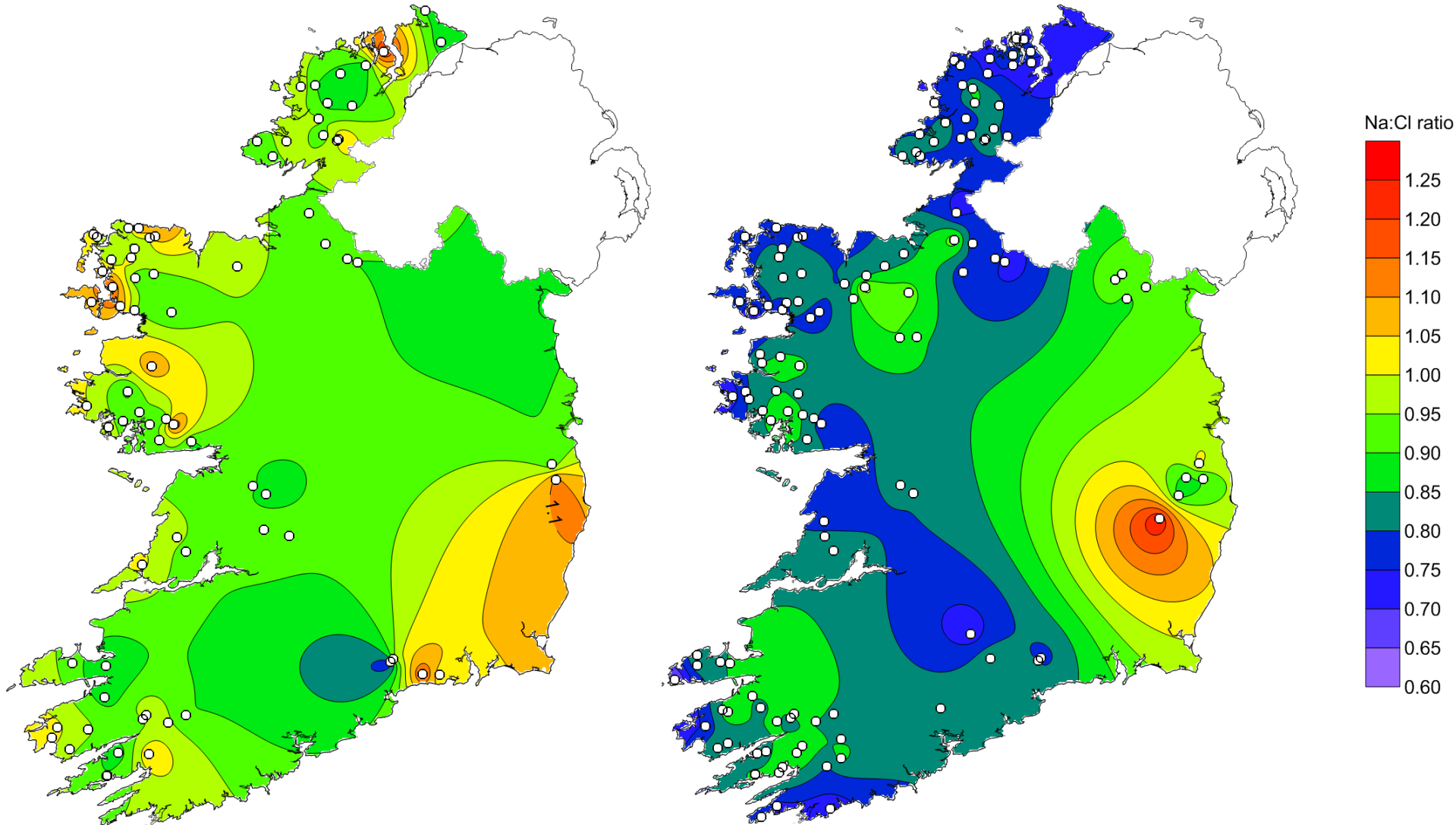
atmospheric deposition
influence of sea salts on water chemistry

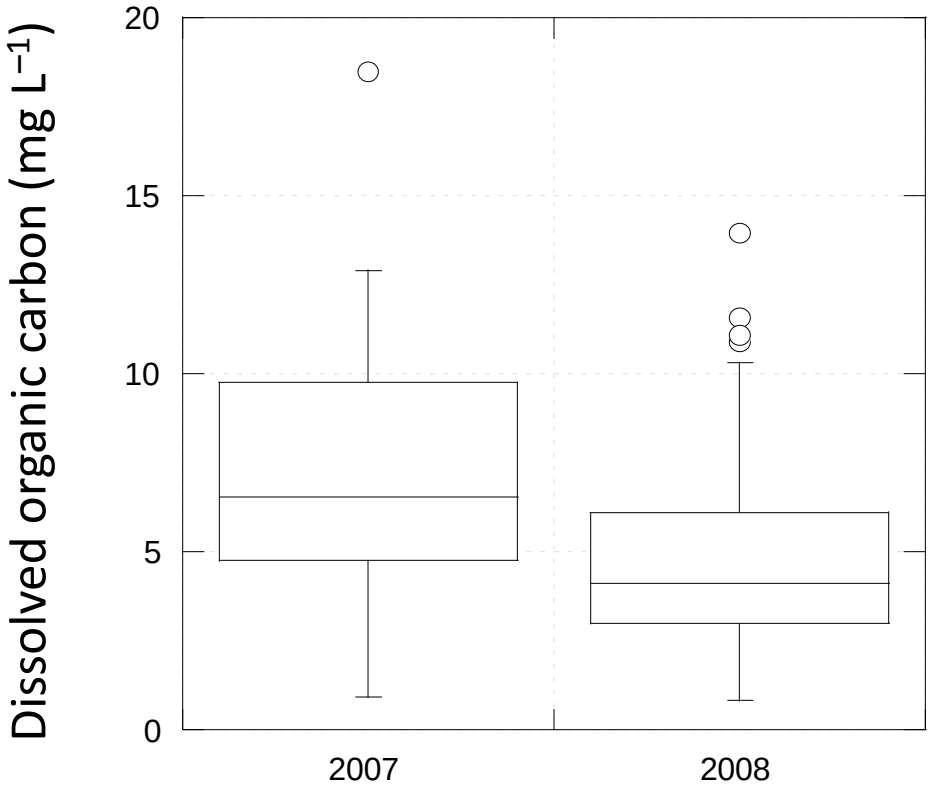


"*Lowest March pressure on record for Ireland on 10th*" Met Eireann, Monthly Weather Bulletin, March 2008.

"*Deep depressions passing close to or over Ireland brought very unsettled conditions, with strong winds and spells or rain or showers each day. All areas received heavy rain between the 9th and 11th… The same period produced very strong winds…*"

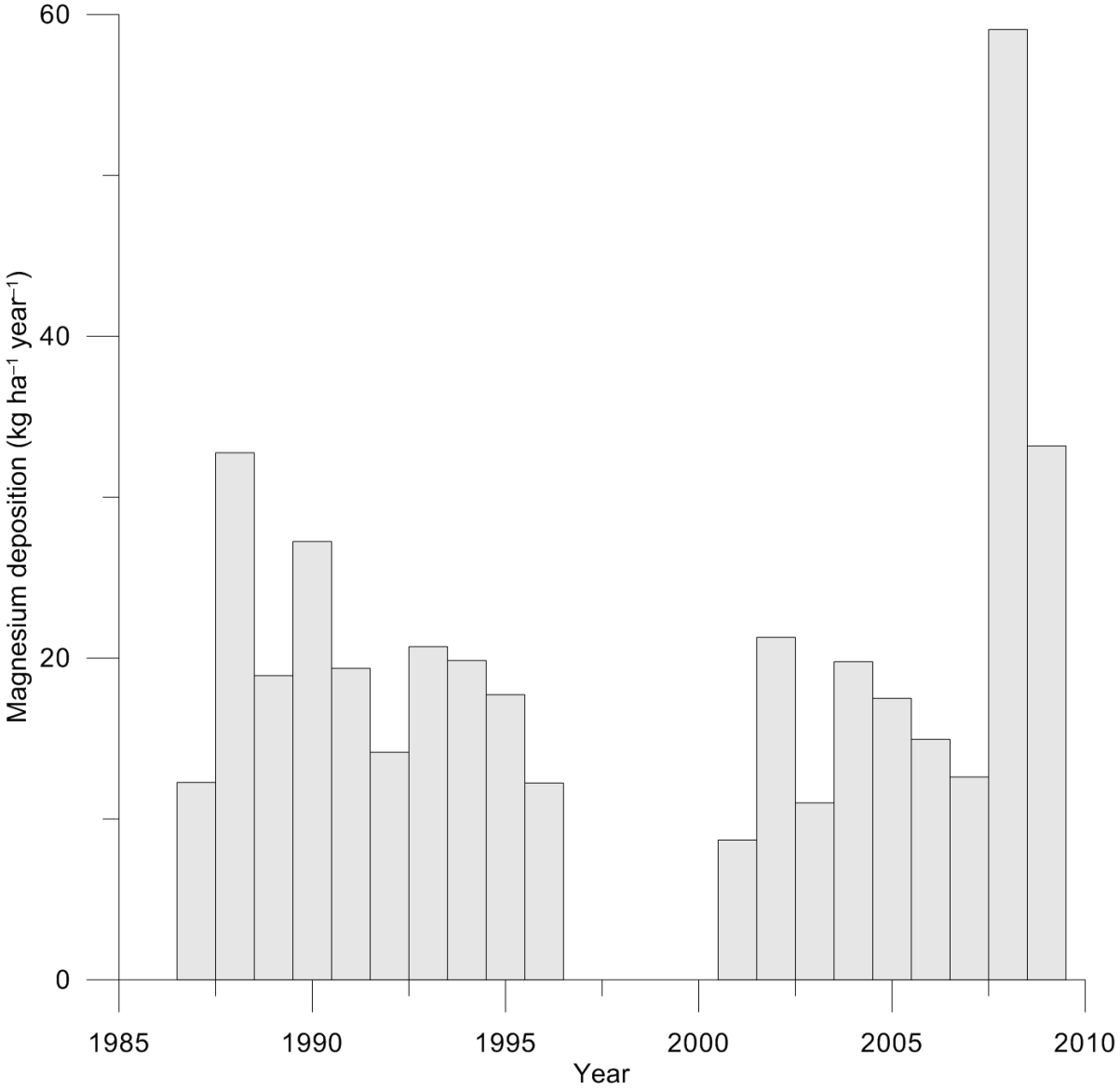


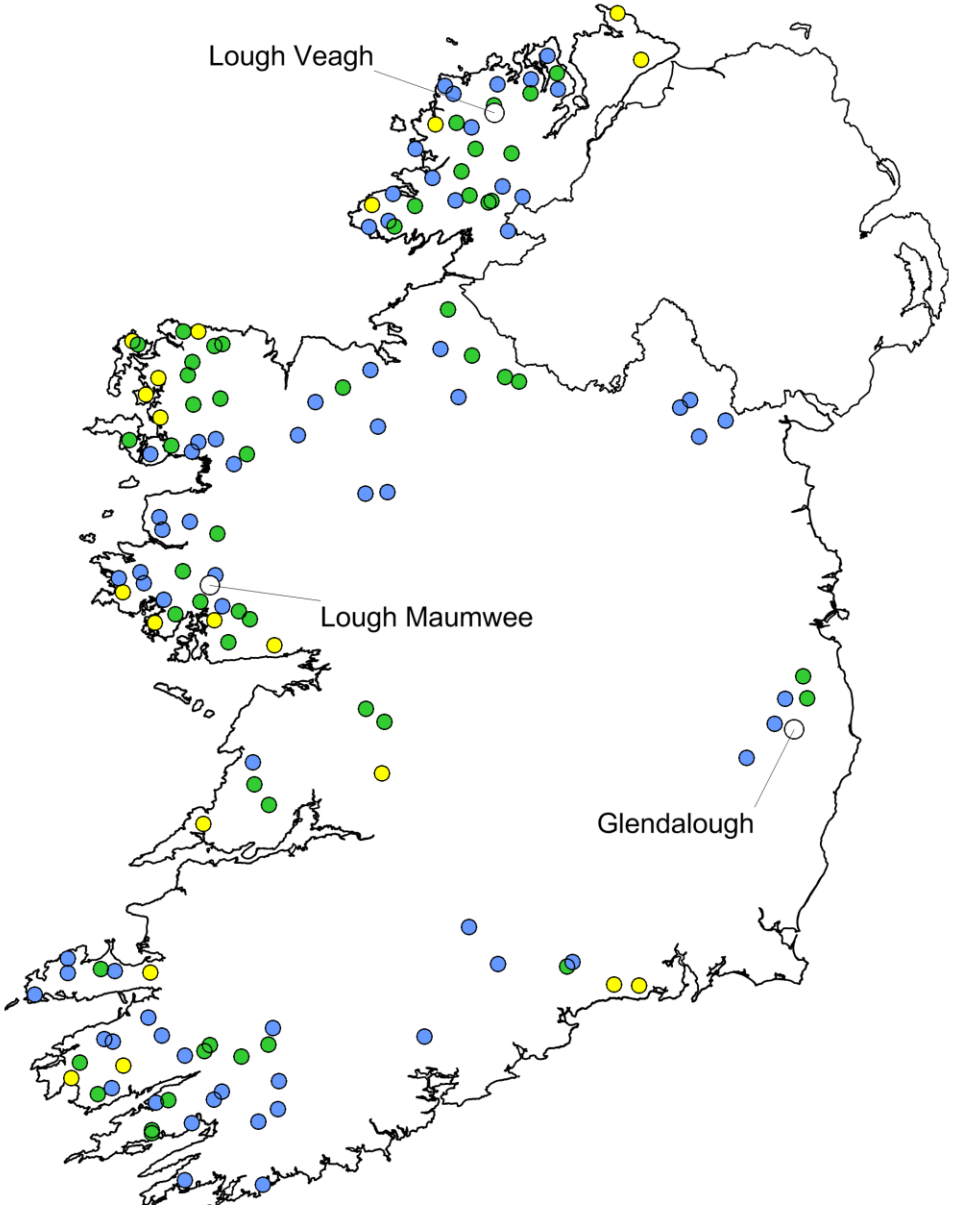

Na:Cl ratio
1.25
1.20
1.15
1.10
1.05
1.00
0.95
0.90
0.85
0.80
0.75
0.70
0.65
0.60
1.1



box-plot comparison of paired lake chemistry (n ~ 50) observations from the 2007 and 2008 surveys, before and after the 10 March 2008 sea-salt event.

Long term sea salt deposition at Valentia, Kerry





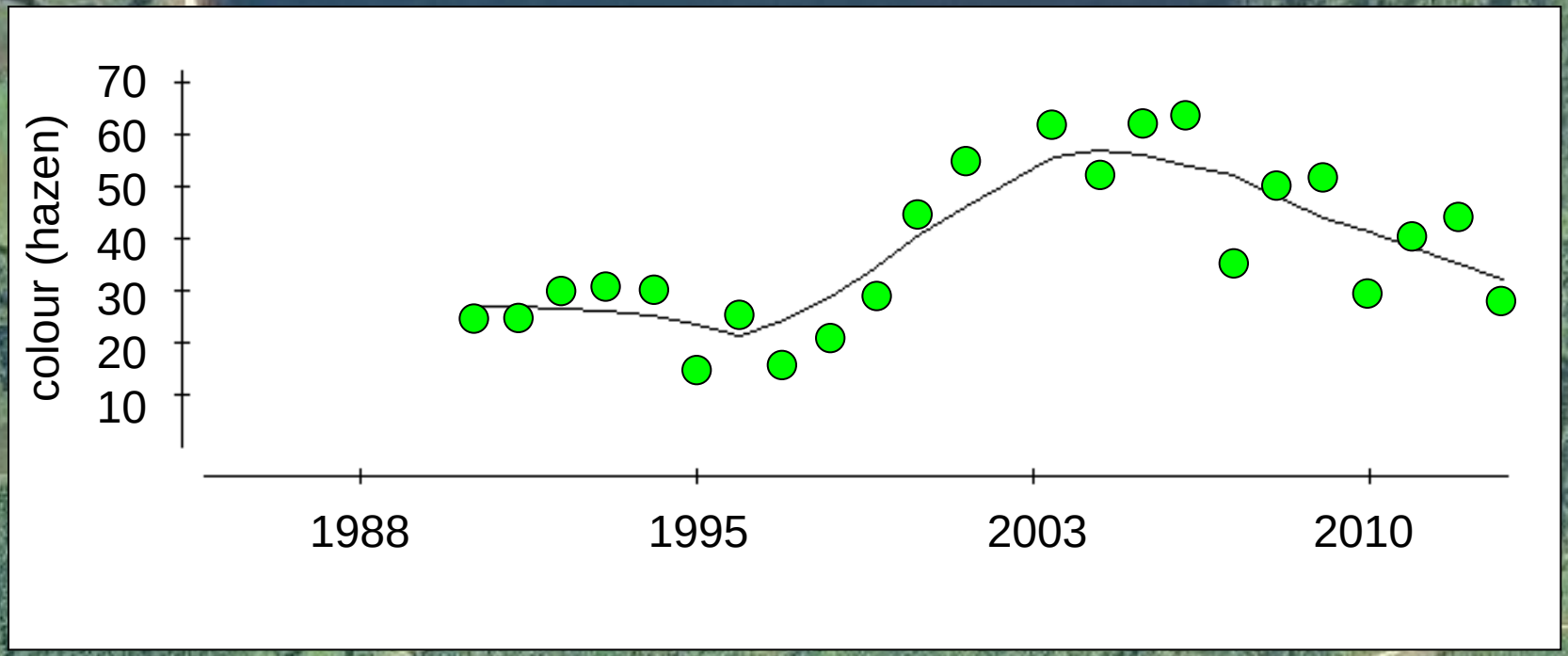
does sea salt drive the inter-annual variability in water chemistry?

multiple linear regression analysis for study lakes: (a) Glendalough, (b) Lough Maumwee, and (c) Lough Veagh for winter-spring (WS) and summer-autumn (SA) seasons. (Adj R^2) Only models significant at $p < 0.05$ are shown.

Season	Dependent	R^2	n	p	Variable	Coefficient	p
Glendalough							
SA	pH	0.86	7	0.001	Constant	134.55	0.031
					Air pressure	–0.13	0.035
					Mg^{2+}	0.15	0.008
	Colour	0.72	7	0.034	Constant	–267.12	0.040
					Wind speed	37.07	0.018
					Mg^{2+}	–7.40	0.046
	Aluminium	0.90	5	0.013	Constant	2.37	0.485
					$nmSO_4^{2-}$	0.76	0.013
WS	Aluminium	0.62	9	0.012	Constant	9.60	0.001
					$nmSO_4^{2-}$	0.26	0.012
Lough Maumwee							
SA	Alkalinity	0.32	13	0.045	Constant	702.18	0.021
					Wind speed	–50.06	0.045
	pH	0.55	12	0.006	Constant	6.70	<0.0001
					Mg^{2+}	–0.02	0.006
WS	pH	0.32	14	0.035	Constant	6.23	<0.0001
					NAOI	–0.48	0.035
	Colour	0.35	12	0.043	Constant	63.75	0.006
					Wind speed	–2.99	0.043
	Aluminium	0.57	10	0.012	Constant	3.96	<0.0001
					NAOI	3.65	0.012
Lough Veagh							
SA	Alkalinity	0.59	12	0.003	Constant	–17114.31	0.004
					Air pressure	17.00	0.003
	pH	0.60	12	0.006	Constant	12.20	<0.0001
					Wind speed	–0.45	0.002
					Mg^{2+}	0.04	0.041
	Colour	0.53	11	0.011	Constant	76.06	<0.0001
					$nmSO_4^{2-}$	–9.94	0.011

Long-term trends in colour (slope [hazen])

Glendalough	1.97*
Lough Maumwee	0.62
Lough Veagh	1.88*



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what are the (long-term) trends in DOC…?

end of presentation


epa
Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil


Department of
Agriculture,
Food and the Marine
An Roinn
Talmhaíochta,
Bia agus Mara


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