North Sea Core Geochemical Data

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DATA • ANALYSIS • SOLUTIONS

Geochemical Data

- Combined ICP-OES (major trace element) and ICP-MS (other trace element) analysis of core samples from key North Sea lithologies
  - 3 samples from the Southern North Sea. including Carboniferous sandstones, and Permian sandstones
  - 9 samples from the Central North Sea, including Permian anhydrites, Triassic sandstones and the Jurassic Kimmeridge Clay Formation
  - 6 samples from the Northern North Sea, including the Brent deltaic formations

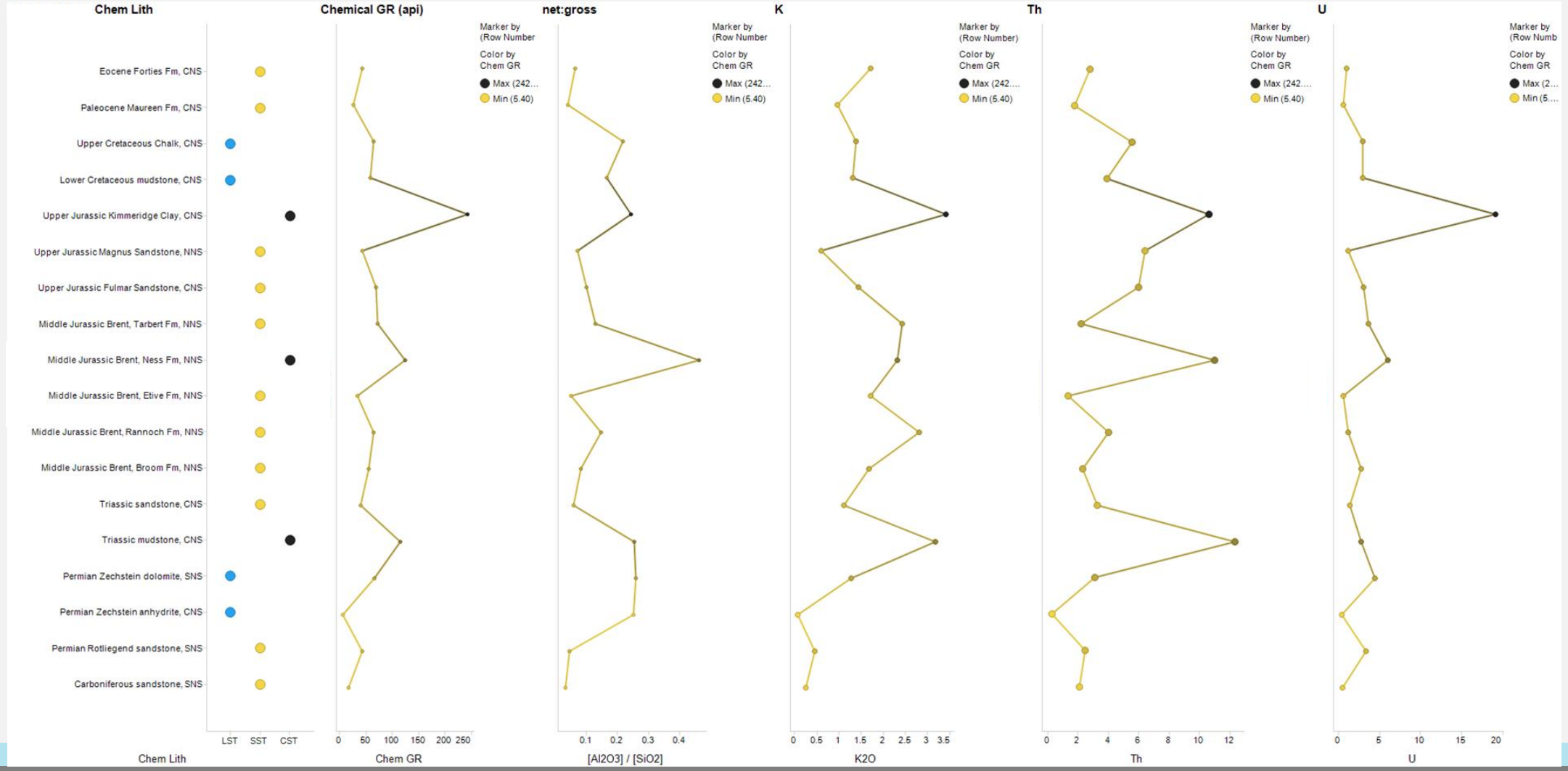
Well	Depth (ft)	Depth (m)	Geological Age and Formation	Basin
15/14a- 3	7136.00	2175.05	Triassic mudstone	Central North Sea
16/29a- A4	9231.00	2813.61	Upper Cretaceous Chalk	Central North Sea
16/29a- 2X	8712.00	2655.42	Paleocene Maureen Fm	Central North Sea
16/29a- 2X	9851.00	3002.58	Lower Cretaceous mudstone	Central North Sea
21/16- 3	7618.00	2321.97	Upper Jurassic Fulmar Sandstone	Central North Sea
21/20b- 3	7816.00	2382.32	Eocene Forties Fm	Central North Sea
21/20b- 3	Unknown	Unknown	Upper Jurassic Kimmeridge Clay	Central North Sea
44/23- 7	12114.00	3692.35	Carboniferous sandstone	Southern North Sea
47/15- 1X	9200.00	2804.16	Permian Zechstein dolomite	Southern North Sea
49/06a- 4	6160.00	1877.57	Triassic sandstone	Central North Sea
49/11a- 4	9619.00	2931.87	Permian Rotliegend sandstone	Southern North Sea
211/08c- 4Z	12676.00	3863.64	Upper Jurassic Magnus Sandstone	Northern North Sea
211/16- 4	7363.00	2244.24	Permian Zechstein anhydrite	Central North Sea
211/23- A18	12843.00	3914.55	Middle Jurassic Brent, Rannoch Fm	Northern North Sea
211/23- A38	9923.00	3024.53	Middle Jurassic Brent, Broom Fm	Northern North Sea
211/23- W1Z	9723.00	2963.57	Middle Jurassic Brent, Tarbert Fm	Northern North Sea
211/23b- 12	9779.00	2980.64	Middle Jurassic Brent, Ness Fm	Northern North Sea
211/23d- 18	10989.00	3349.45	Middle Jurassic Brent, Etive Fm	Northern North Sea

Geochemical Data

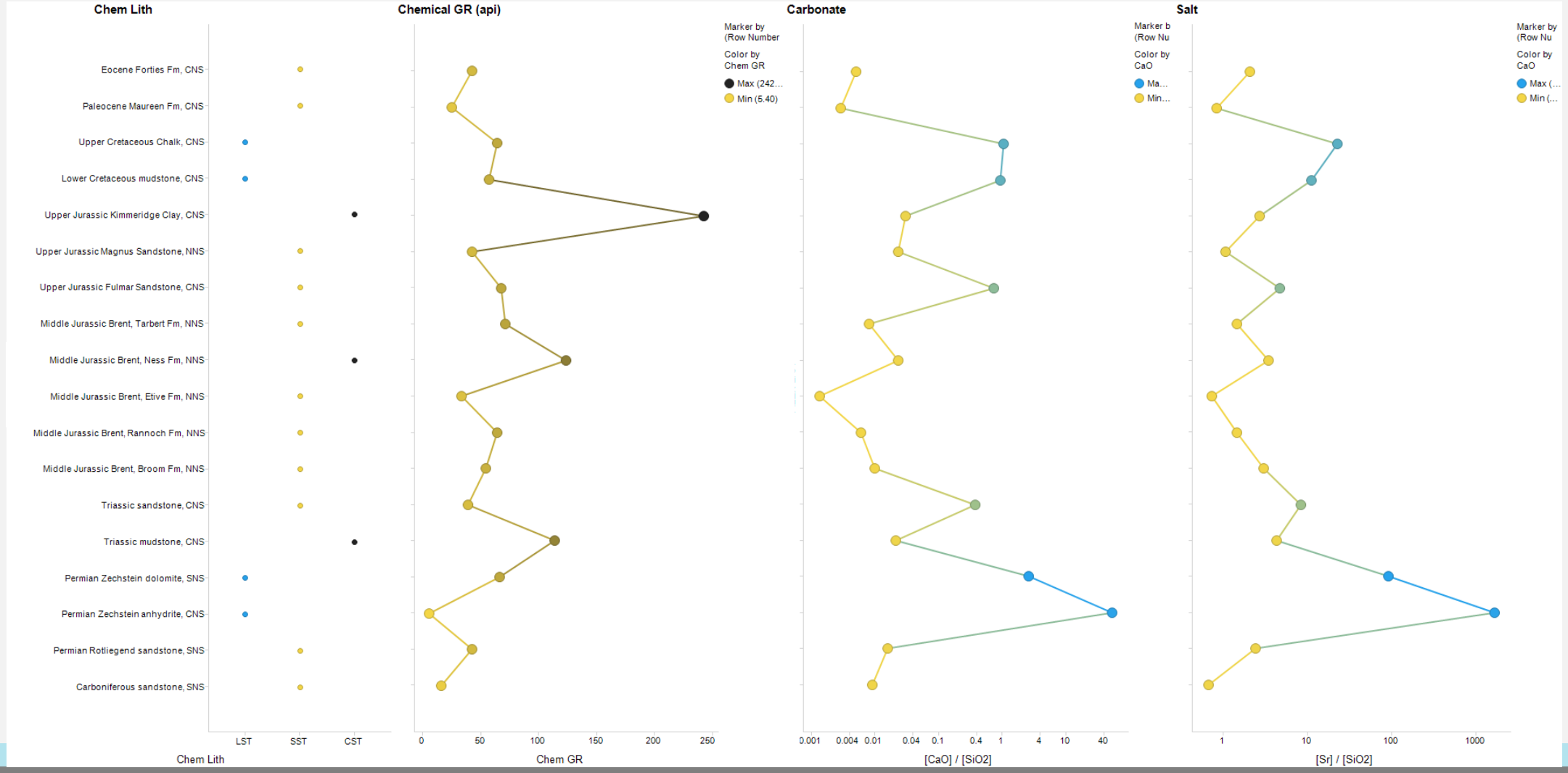
- Chemical compounds presented in Wt %
- Chemical elements presented in ppm
- Chemostrat charts present different lithostratigraphic types based on compound and elemental ratios (see table for examples of key element associations)
  - Sandstone vs Claystone
  - Carbonates
  - Salt and more…
- Analysis undertaken by Alex Finlay at Chemostrat Ltd

Element	Symbol	Information
Chemical Lithology	Chem Lith	Calculated from elemental abundances of Silica, Aluminium and Calcium
Chemical Gamma	Chem GR	Calculated from elemental abundances of Potassium, Thorium and Uranium
Silica	Si	Mainly found in Quartz (although found in most aluminosilicates and chert)
Aluminium	Al	Mainly found in Clay (found in most aluminosilicates)
Potassium	K	Mainly found in Feldspars or Clays
Thorium	Th	Mainly found in Heavy Minerals (e.g. monazites and zircons)
Uranium	U	Mainly found in Organic Material or Heavy Minerals (e.g. zircons)
Calcium	Ca	Mainly found in Calcite or Salt (e.g. gypsum)
Strontium	Sr	Mainly found in Calcite or Salt (e.g. gypsum)
Sodium	Na	Mainly found in Salt (e.g. halite) or Feldspars and Clays
Sulphur	S	Mainly found in Salt (e.g. gypsum) or organic material
Copper	Cu	Can be a marker for the Kupferschiefer

Sandstone vs Claystone



Carbonates


Chem Lith
Chemical GR (api)
Carbonate
Salt
Eocene Forties Fm, CNS
Paleocene Maureen Fm, CNS
Upper Cretaceous Chalk, CNS
Lower Cretaceous mudstone, CNS
Upper Jurassic Kimmeridge Clay, CNS
Upper Jurassic Magnus Sandstone, NNS
Upper Jurassic Fulmar Sandstone, CNS
Middle Jurassic Brent, Tarbert Fm, NNS
Middle Jurassic Brent, Ness Fm, NNS
Middle Jurassic Brent, Etive Fm, NNS
Middle Jurassic Brent, Rannoch Fm, NNS
Middle Jurassic Brent, Broom Fm, NNS
Triassic sandstone, CNS
Triassic mudstone, CNS
Permian Zechstein dolomite, SNS
Permian Zechstein anhydrite, CNS
Permian Rotliegend sandstone, SNS
Carboniferous sandstone, SNS
LST
SST
CST
Chem Lith
Marker by (Row Number
Color by Chem GR
Max (242...
Min (5.40)
0
50
100
150
200
250
Chem GR
Marker b (Row Nu
Color by CaO
Ma...
Min...
0.001
0.004
0.01
0.04
0.1
0.4
1
4
10
40
[CaO] / [SiO2]
Marker by (Row Nu
Color by CaO
Max (...
Min (...
1
10
100
1000
[Sr] / [SiO2]

Salt and more…