# Chemosteering Using elemental Chemostratigraphy

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## Abstract

Elemental chemostratigraphy incorporates the characterization of sedimentary units based on their inorganic geochemical compositions. Variations in the inorganic geochemical compositions and characteristics of sedimentary rock successions enable the chemostratigrapher to divide them into geochemically distinct intervals and zones Specific elements and element ratios are identified and developed for each play, formation and/or area leading to the characterization of stratigraphic units, but also of diagenetic alteration, mineralogy and reservoir properties. The geochemical characteristics usually displayed as logs against depth can then be correlated on various scales leading to a well to well and eventually field-wide chemostratigraphic correlation framework, which in turn can be utilized for advanced chemostratigraphic applications, such as geo-/chemosteering.

Chemosteering is a well-placement technique that utilizes the above mentioned chemostratigraphic characteristics of the sedimentary rocks. These are determined in near real-time, for geo-/chemosteering wells. Depending on the stratigraphic resolution and characteristics, wells can be geo-/chemosteered in two ways; reactive (correction of the well trajectory when geochemical data indicate the exit of a particular unit) and proactive (trajectory corrections based on distinct trend within a particular chemostratigraphic unit).

Wellsite chemostratrigraphy and subsequently chemosteering have been widely applied in different reservoirs of various lithologies worldwide and have been proven successful techniques for well placement reducing uncertainties whether used as a standalone application or in conjunction with other techniques, such as biostratigraphy and/or M/LWD tools.

Biostratigraphy is utilizing (micro) fossils to define biostratigraphic zones , subzones and facies that can be used to recognize a particular interval and for biosteering within it by tracing a particular fossils or fossil assemblages within the zone(s) of interest.

Biosteering and chemosteering usually complement each other in the oil and gas well drilling. However, in particular stratigraphic sequences of both, clastic and carbonate sediments, the strata are barren of fossils, non-diagnostic or do not provide the required biostratigraphic resolution, e.g. the clastic sections of the Unayzah A or the carbonates of the Khuff B (B1) Formations. Chemostratigraphy often works in these types of sedimentary deposits, such as the aforesaid formations and has been demonstrated its capabilities for chemosteering.