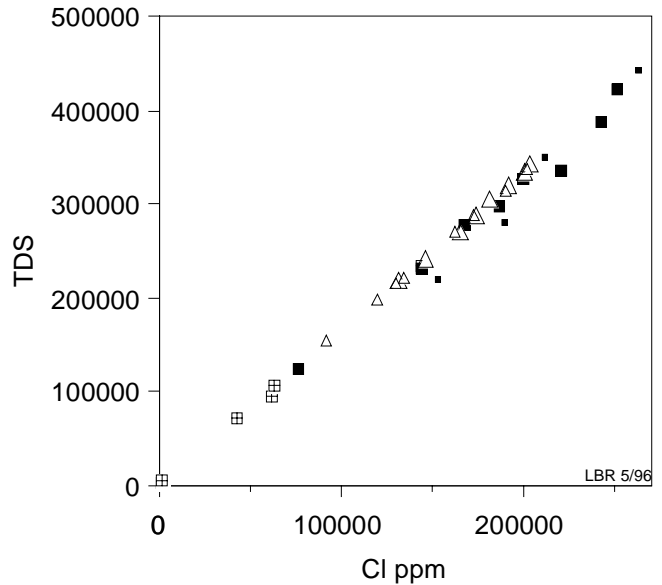
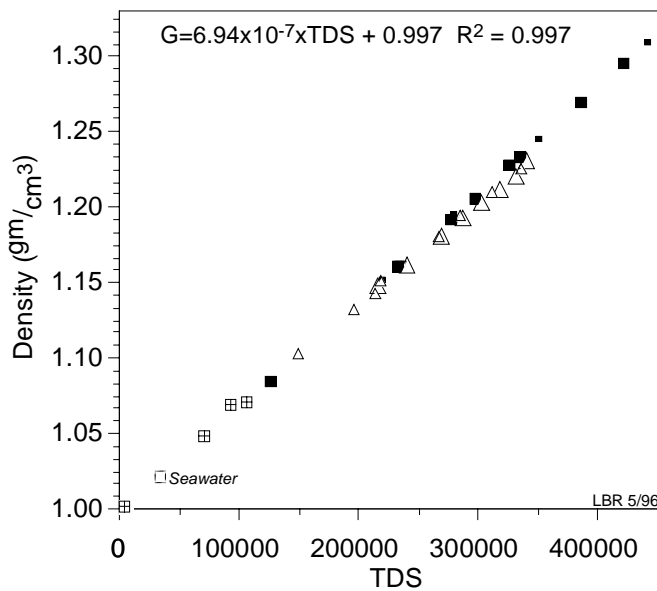


Deep-basin brines I: Density, TDS, and chloride

Groundwaters deep in sedimentary basins are commonly brines (highly saline aqueous solutions). These waters are known by a variety of terms: "deep-basin brines" because of the brines' geological settings, "oil-field brines" because they are generally sampled from oil wells; "formation waters" because the petroleum industry uses the term "formation" in referring to porous rocks from which petroleum may be recovered, and "connate waters" in the probably invalid sense that these might be the waters originally in the pores of the sediment when it was deposited and thus "born with" the host sediment.

Brines are commonly defined as waters with total dissolved solids (TDS) of more than 100,000 ppm (i.e., more than 10% by weight). Some deep-basin brines have TDS of more than 300,000 ppm. Their densities are thus considerably greater than the 1.00 gm/cm³ of pure water, as shown by the plot on the left.

Most of the anionic component of deep basin brines is chloride (Cl⁻). There is thus a nearly linearly relationship between Cl⁻ concentration and TDS, as is apparent from the plot on the right. One can thus use Cl⁻ content (an easy thing to measure) as a proxy for TDS (a harder parameter to measure).



— ⊠ —	Alberta Basin, W. Canada (Connolly & al., 1990)
— ⊠ —	Mesozoic Reservoirs, Norwegian shelf (Egeberg & Aagard, 1989)
— ■ —	Devonian Reservoirs, Michigan Basin (Wilson & Long, 1993a)
— ■ —	Silurian Reservoirs, Michigan Basin (Wilson & Long, 1993b)
— ● —	Carboniferous Reservoirs, Illinois Basin (Steuber et al., 1993)
— △ —	H ₂ S-rich Smackover Reservoirs, S. Arkansas (Moldovanyi & Walter, 1992)
— △ —	H ₂ S-poor Smackover Reservoirs, S. Arkansas (Moldovanyi & Walter, 1992)
— ○ —	Lower Cretaceous Carbonate, South-central Texas (Land & Prezbindowski, 1981)
— □ —	Oligocene Frio Formation, Gulf Coast, Texas (Land, 1995)