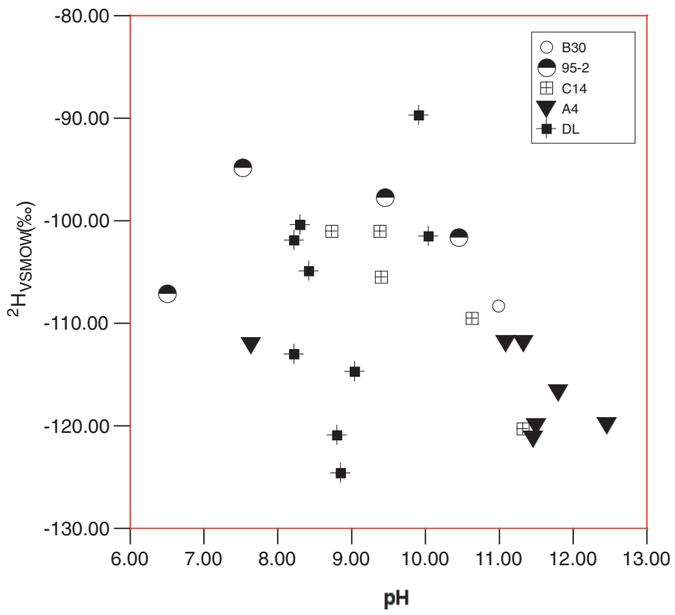
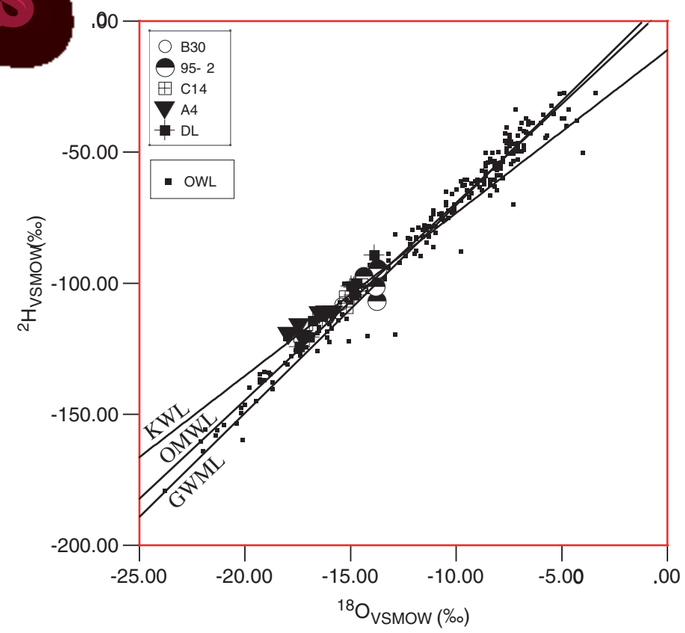
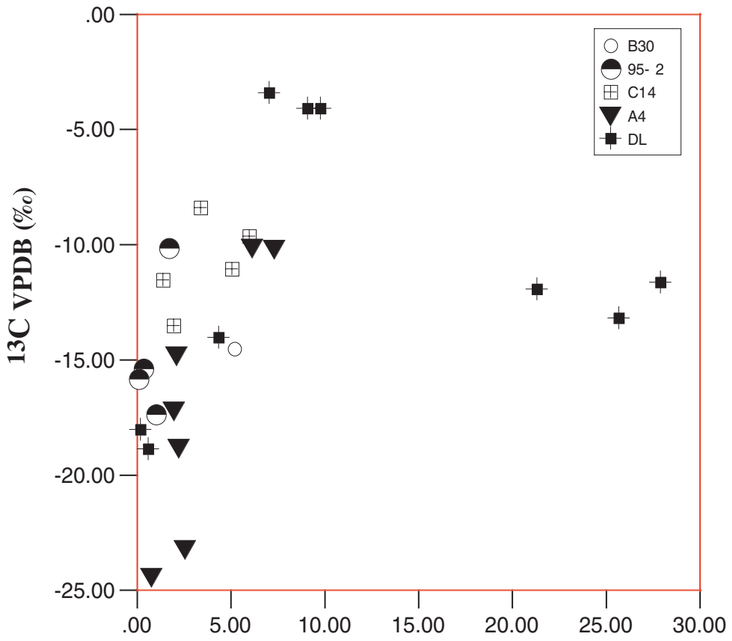
7. H, O and C stable isotopic analysis



Relationship between ^{2}H and pH.

One possibility to explain the shift in isotopic composition for A4 waters is the production of large amounts of OH^- in the waters is causing an enrichment of the delta^{2}H ratios. A4 is the only kimberlite that consistently plots farthest from the Ottawa meteoric water line. The support for this theory comes from the delta^{2}H vs. pH plot, which demonstrates for most samples, there is a correlation between pH and H (and O) isotopic composition.



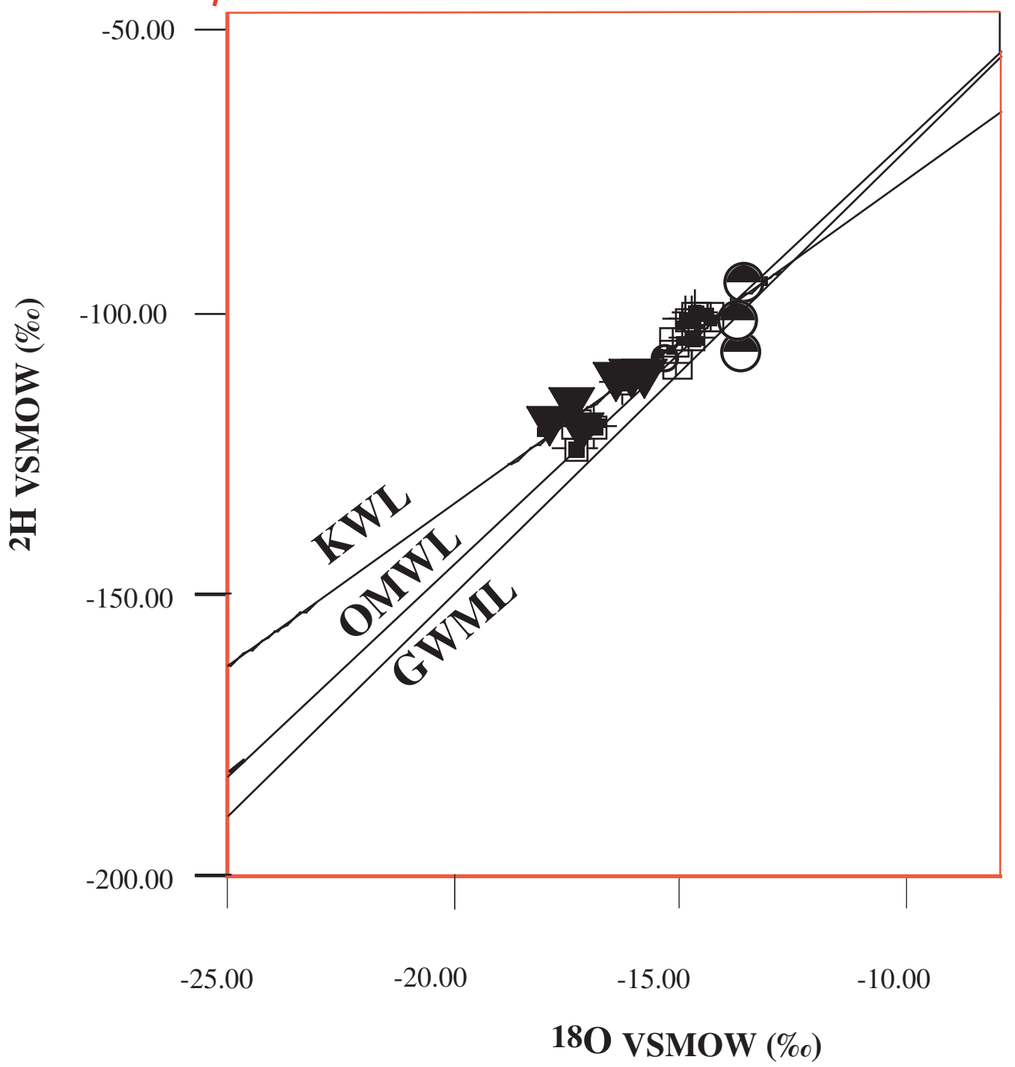


Comparison of the dissolved inorganic carbon and the ^{13}C isotopic ratios.

There is an interesting correlation between DIC and delta^{13}C. Initial interpretation suggests that the increasing delta^{13}C with DIC may be a result of the dissolution of carbonate minerals as some points are approaching the delta^{13}C ratio for Paleozoic marine carbonate. The most DIC-rich samples show relatively low delta^{13}C, suggesting an additional source of organic acid.

The delta$^{18}O_{VSMOW}$(‰) and delta$^{2}H_{VSMOW}$(‰) data reveals that many of the points fall along the Ottawa meteoric water line (the closest collection station) indicating they are meteroric waters. The Ottawa meteoric water line (OMWL) was calculated from data obtained from the International Atomic energy Agency (IAEA) Isotope Hydrology Section database (http://isohis.iaea.org). However, many of the waters from A4 (the site with the highest pH values) do not fall along this line. This deviation from the OMWL suggests that some of these waters are not from meteoric recharge and are possibly paleowaters. The longer period that the waters have had to react with the rock would also help to explain why the waters demonstrate elevated pH, Eh and gas concentrations with respect to the other kimberlites.

KWL= Kimberlitic water line
GWML= Global meteoric water line
OMWL= Ottawa meteoric water line



Comparison of kimberlite mean water line (KWL), Ottawa mean water line (OWL) and the Global mean water line (GWML).