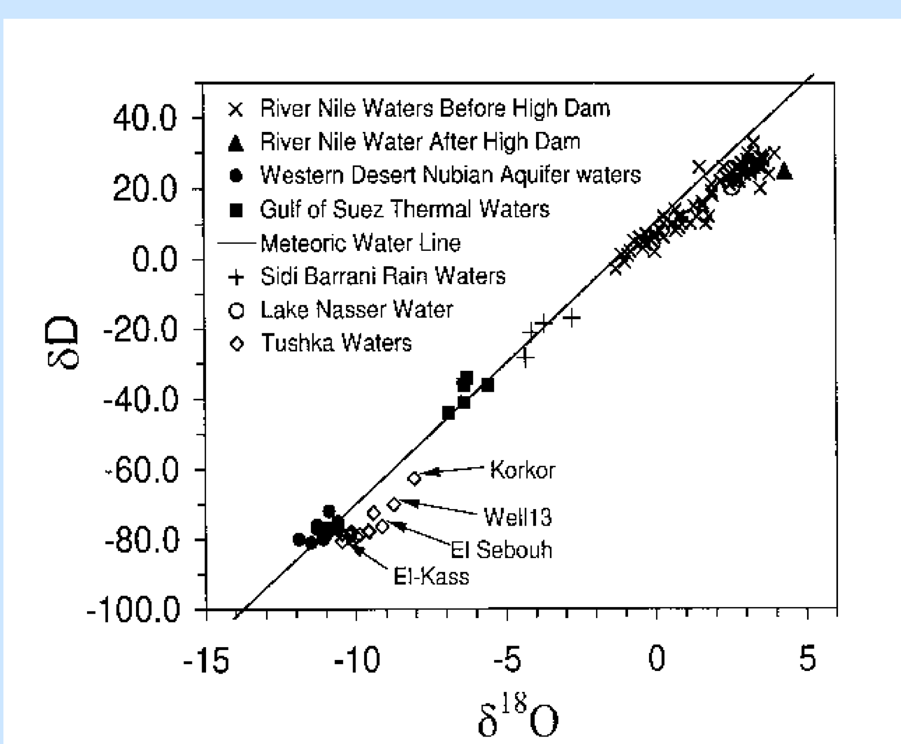
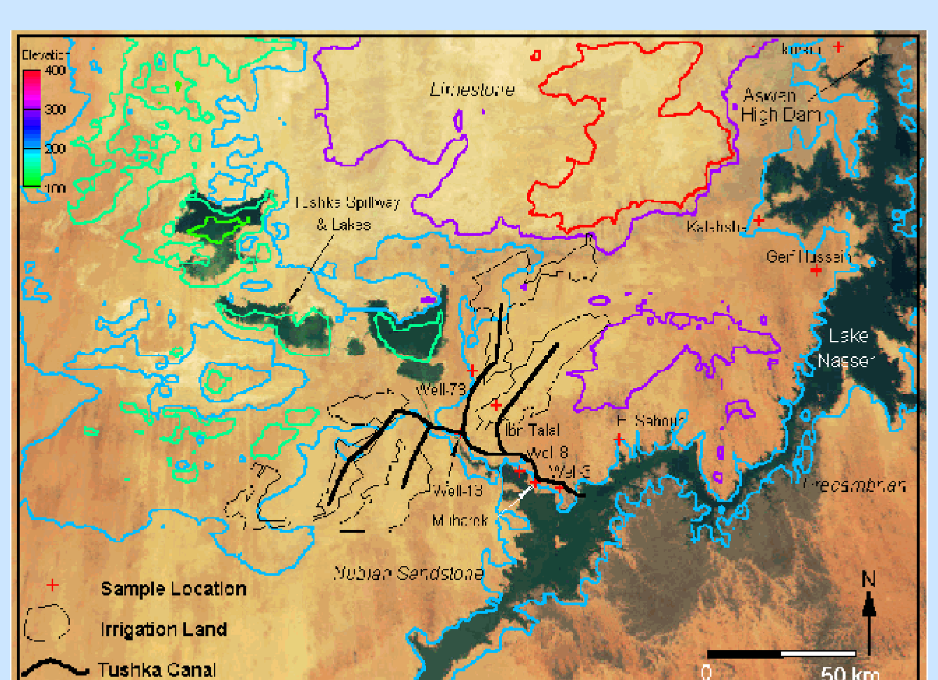
NEW FINDINGS (ISOTOPIC, GEOCHEMICAL) ON WATER & SOIL SAMPLES

FINDINGS

Groundwater samples from some productive wells in the immediate vicinity of the lake (e.g., Korkor, El Sebouh, and Kalabsha) or its tributaries (e.g., Well 13) indicate mixing between the Nubian aquifer fossil waters and lake waters. If the isotopic compositions of our samples from El Kass well and the lake represent the compositions of the Nubian aquifer and Lake Nasser end members, the El Sebouh groundwater sample, the least depleted of our samples, could be a mixture of 18% lake water and 82% Nubian aquifer water.

This result contrasts with the isotopic composition of the remaining samples from wells (W3, W8, Gerf Hussein, and Mubarek) that are proximal to the lake or its tributaries, yet show no evidence of substantial mixing. All other samples from wells at a distance from the lake (e.g., El Kass, Darb El Arbeen, South Baris, W73, Ibn Talal) have isotopic compositions that are quite similar to those of the Nubian aquifer, indicating no mixing with lake waters.

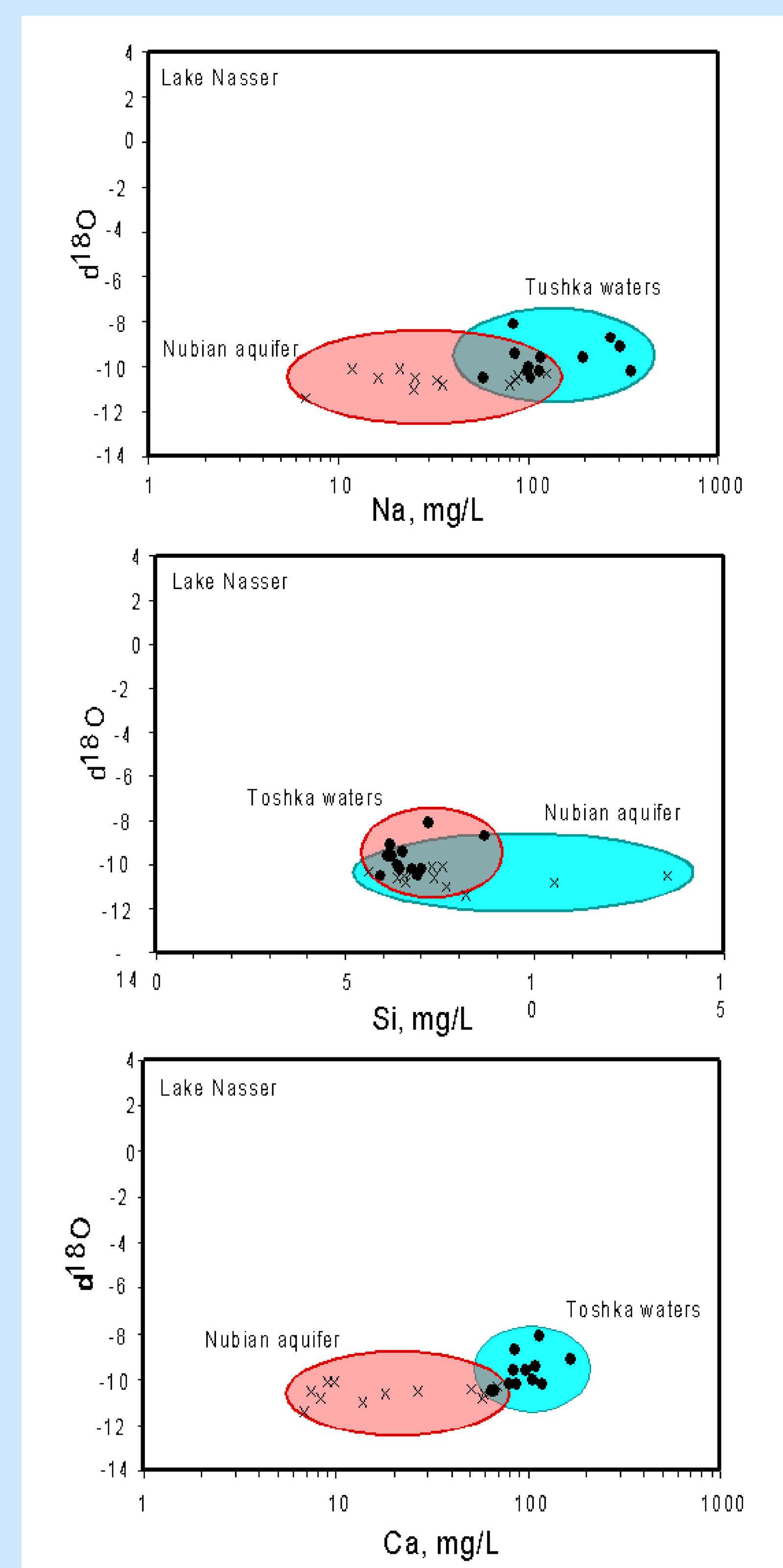




Key Unknowns

(1) Chemical effects of irrigation on the soils and underlying aquifer.
(2) Physical effects of irrigation on the soils and underlying aquifer
(3) Magnitude of aquifer recharge from lake Nasser.

Cation analyses, when plotted against oxygen isotope ratios of the waters, indicate that the Tushka well waters are generally more saline than the Nubian aquifer waters (by up to a factor of five). This salinity most likely arises from dissolution of clay minerals within the aquifer host rocks, as well as perhaps residual salts retained within soils and the unsaturated zone that are introduced to the aquifer during recharge events. Other chemical and isotopic analyses (in progress) will provide insight into the frequency of recharge events, the sources of solutes, and a baseline for changes induced by increased irrigation in the Tushka project area.



APPROACH

(1) Expand the O-H isotopic and geochemical (anion, cation) analyses to cover area "A".
(2) Plot chemical and isotopic profiles of soil-pore water and underlying aquifer.
(3) Evaluate rate of water transport through unsaturated zone by using natural isotopic tracers (e.g., tritium, carbon-14, chlorine-36)

FINDINGS

Preliminary analyses of total soil organic C (carbonate free) for sites representing a range of times in irrigated agriculture in the Kharga area suggest that organic C can accumulate in fine-textured, irrigated desert soils over time.

KEY QUESTIONS

(1) What portion of total soil organic C has entered pools that are protected from rapid decomposition and, thus, have long er residence times?

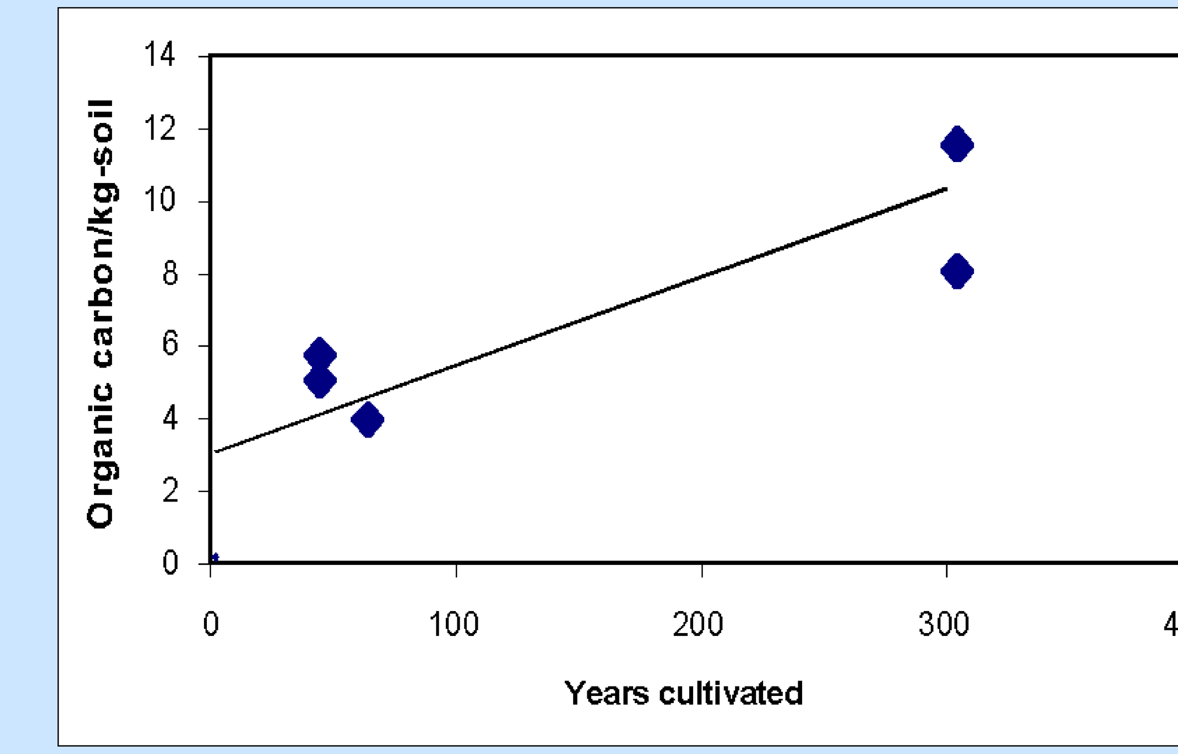
(2) Do the increased inputs of organic matter to soils under irrigated agriculture promote the formation and stabilization of soil?

(3) Does the development of stable microaggregate structures in irrigated soils increase the size of protected C pools?

(4) How do different land uses, management practices, and soil types influence the for mation of protected C pools and the accu mulation of total soil organic C?

APPROACH

To answer these questions, we will use a process/mechanistic-based soil fractionation scheme to quantify the development of microaggregate structure and of protected C pools in a variety of soils with differing lengths of time in irrigated agriculture. Key variables of interest are the amounts of particulate organic matter (POM) C that are physically protected by incorporation into microaggregates and the amounts of mineral (silt and clay) associated C that become chemically protected (resistant to acid hydrolysis).



SOIL FORMATION SCHEME