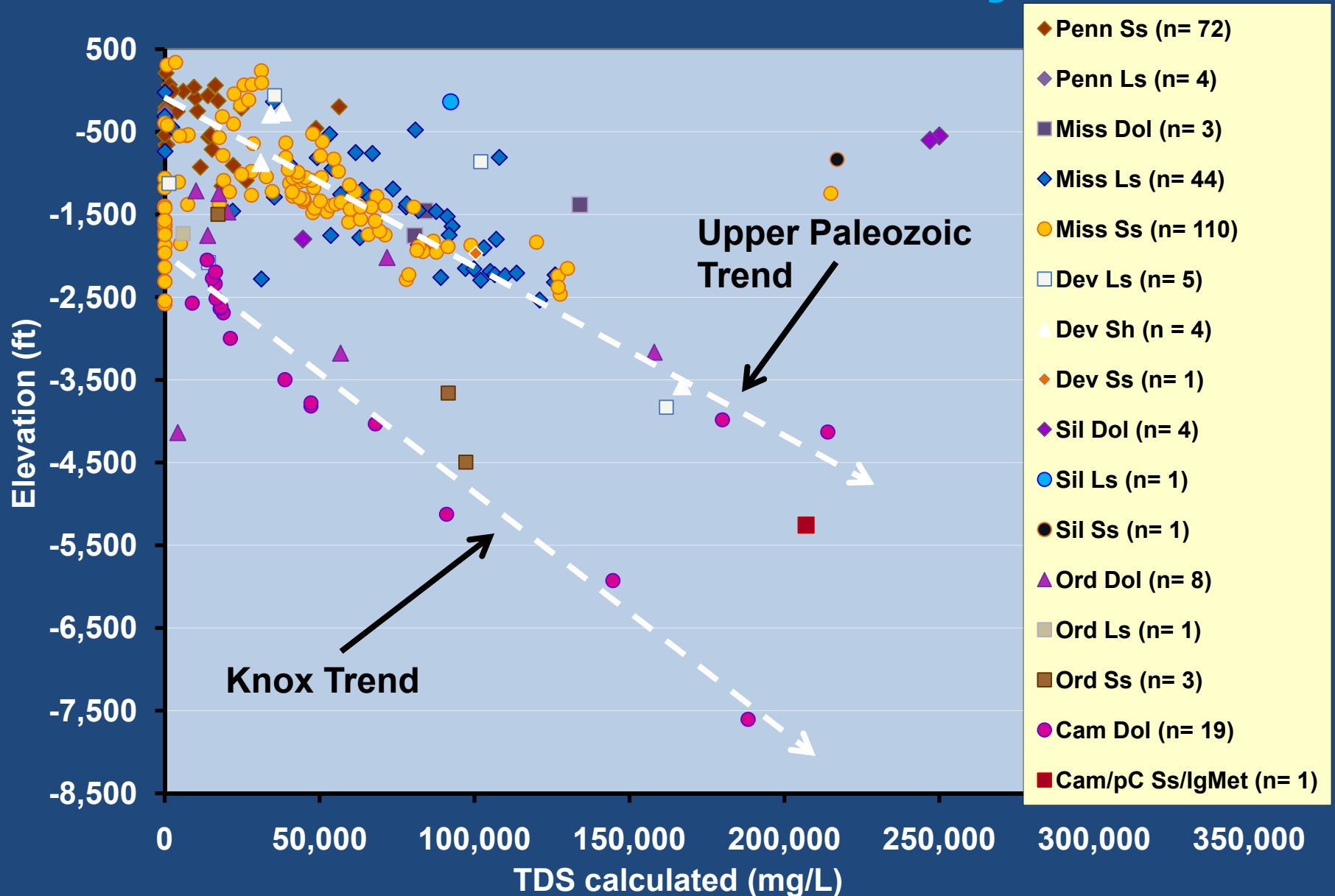


**Chemistry of
Knox Formation Waters Collected
from the
Blan #1,
Hancock County, Ky**

***Kathy Takacs, Steve Webb, and
Marty Parris
Kentucky Geological Survey***



Motivation for Study



Methods

- Collected samples during swabbing
- **Packer system—samples collected from restricted stratigraphic interval**
- Attempted to establish robust steady state flow from reservoir into wellbore—obtain representative samples w/ minimal contamination
- **Samples collected directly from flowline minimize contact to atmosphere and chilled**

Samples Collected

Gunter Ss

5,120-5,140 ft

- Fluid at 2,100 ft after 26 swabs—robust inflow
- **Strong sulfur smell**
- pH= 6.4
- **Temp.= 25.7 C**
- TDS= 97,192 mg/L

Beekmantown

3,800-3,824 ft

- Fluid at 3,500 ft after 6 swabs—little inflow
- **No sulfur smell**
- pH= 6.6
- **Temp.= 25.3 C**
- TDS= 56,776 mg/L



Measurements

- Field: pH, temperature, conductivity, Eh, and dissolved oxygen—insure steady state
- Water properties, and cations and anions: KGS, Accutest, and archive
- Stable isotopes (Isotech): $\delta^{13}\text{C}$ -dissolved inorganic carbon, $\delta^{18}\text{O}$ and $\delta\text{D-H}_2\text{O}$
- Strontium isotopes (Geochron): $^{87}\text{Sr}/^{86}\text{Sr}$

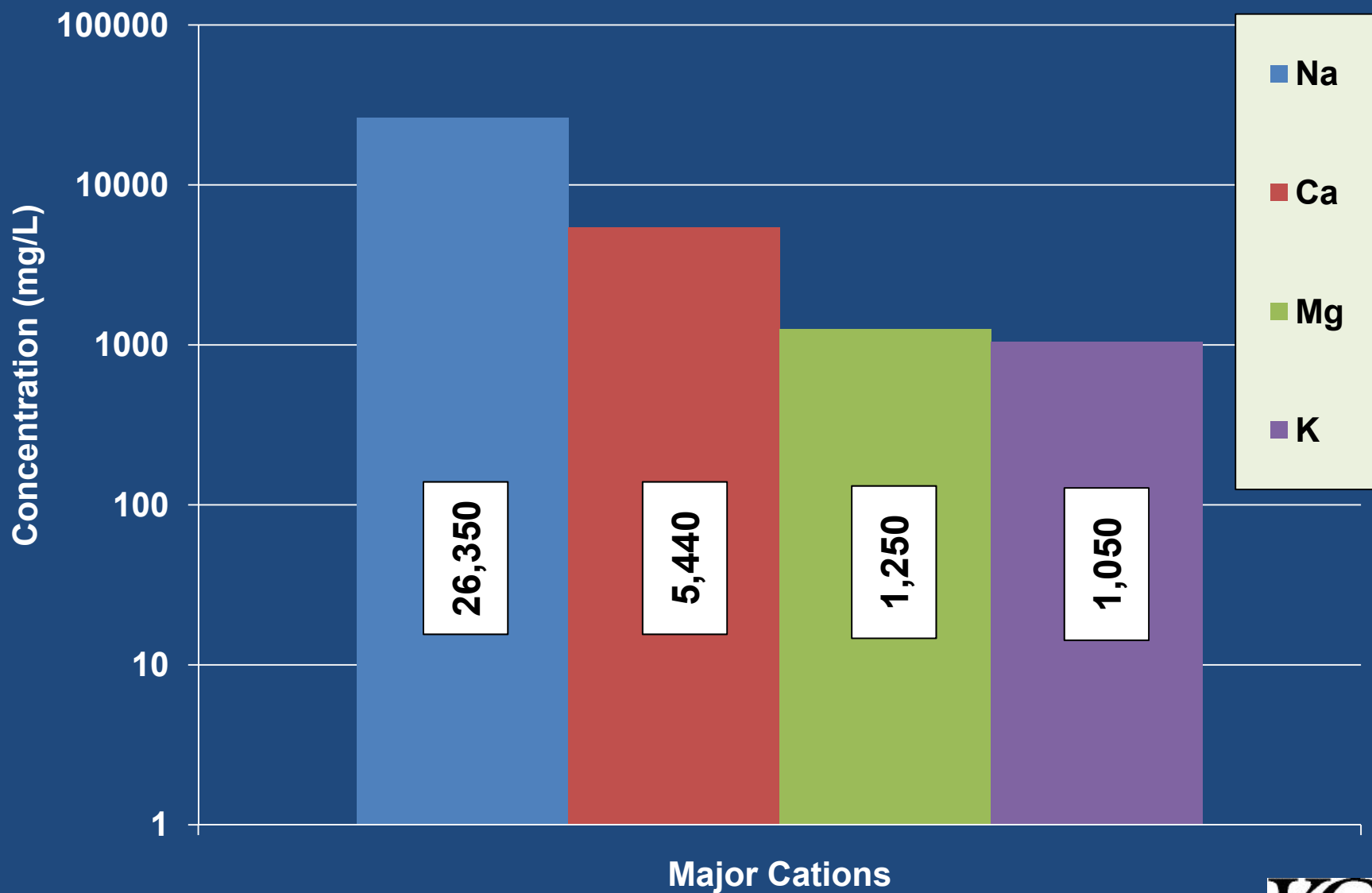
Field Sampling



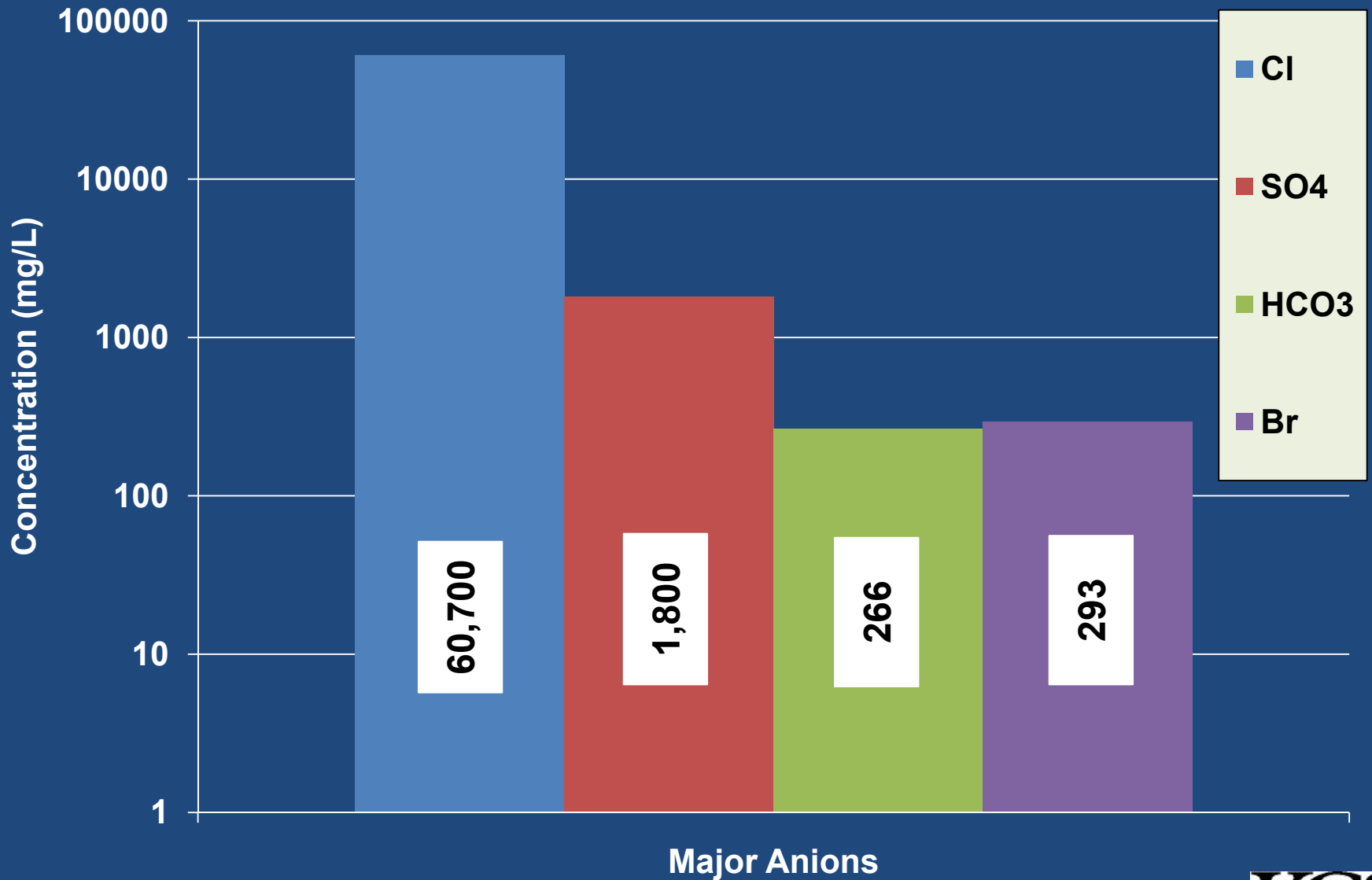
Field Sampling



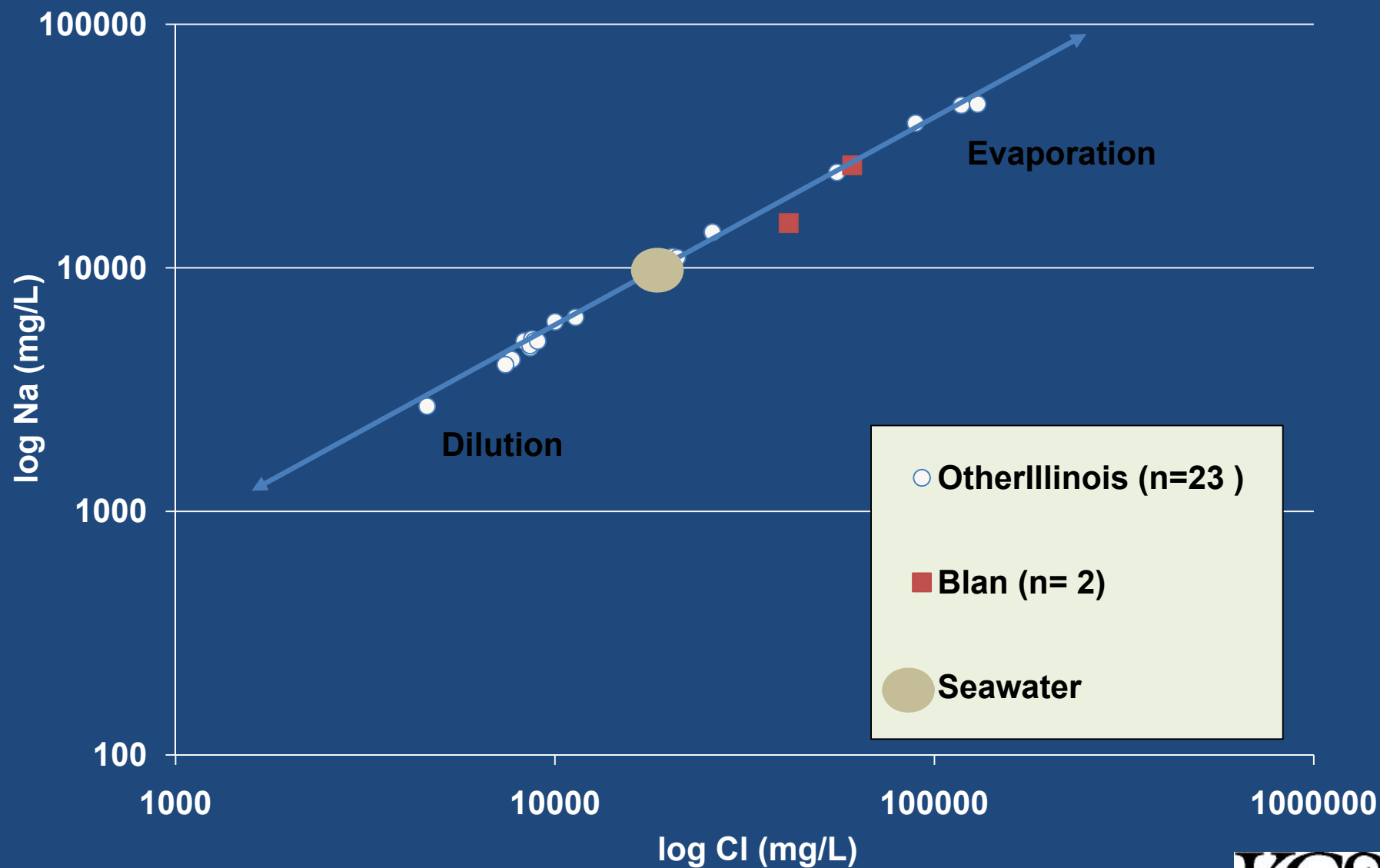
Gunter Ss Cations



Gunter Ss Anions



Fluid Origin



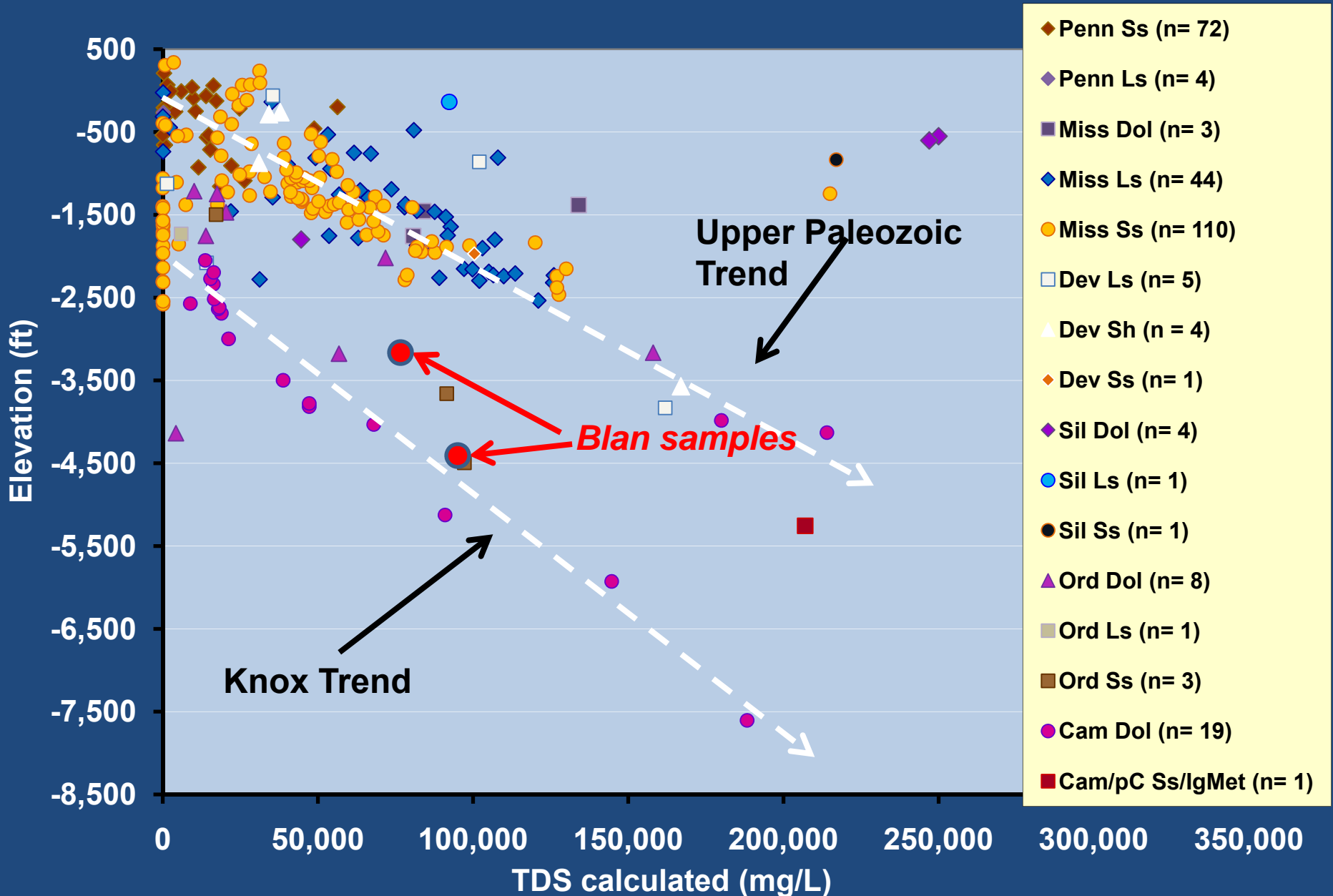
Isotope Measurements- Provisional Observations

- δD values similar between Gunter (-40.1 to -37.5‰) and Beekmantown (-41.5 to -40.0‰)
- $\delta^{18}O$ values similar between Gunter (-5.1 to -4.7) and Beekmantown (-5.5 to -5.7‰)
- Values are just right of meteoric water line suggesting that fluids are composite mixture of marine and meteoric waters

Isotope Measurements- Provisional Observations

- $^{87}\text{Sr}/^{86}\text{Sr}$ —similar between Gunter (0.709705) and Beekmantown (0.709727)
- **Values in upper part of range for marine water-possible continental influence?**
- Do not provide compelling case for reservoir compartmentalization
- **Caveat—Knox group rocks and fluids possibly isotopically homogeneous w/ respect to $^{87}\text{Sr}/^{86}\text{Sr}$ at time of deposition**

Blan Hypothesis Test



Summary

- Formation water analysis at Blan #1 appears to confirm observed fluid composition trends in which Knox Group formation waters are not as saline as predicted by trends in younger Paleozoic strata
- **Distinction in hydrologic characteristics suggests presence of broadly distributed seal in the Upper Ordovician strata**
- Lower expected salinities for Cambro-Ordovician strata—most of which are below 2500'—suggests greater potential for solubility trapping of CO₂

