# Ground and surface water interactions in karst terrains:

## Some observations from along the Cody Scarp

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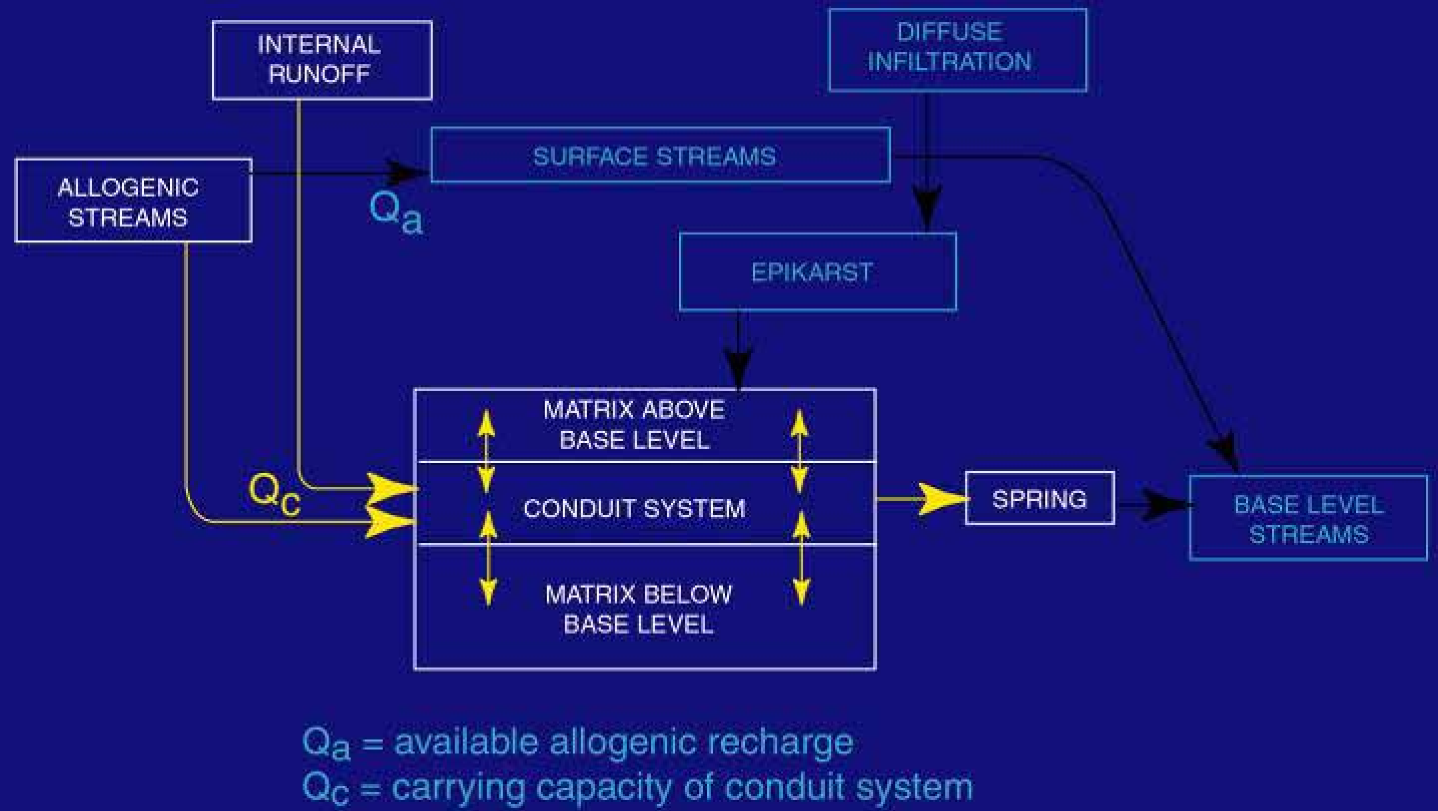
Liz Screaton, PJ Moore

Acknowledgements: NSF, DEP, SRWMD

O'Leno State Park, Ichetucknee State Park

Sheryl Gordon, Randy Dean, Brooke Sprouse, Jennifer Martin




Modified from White, 2002

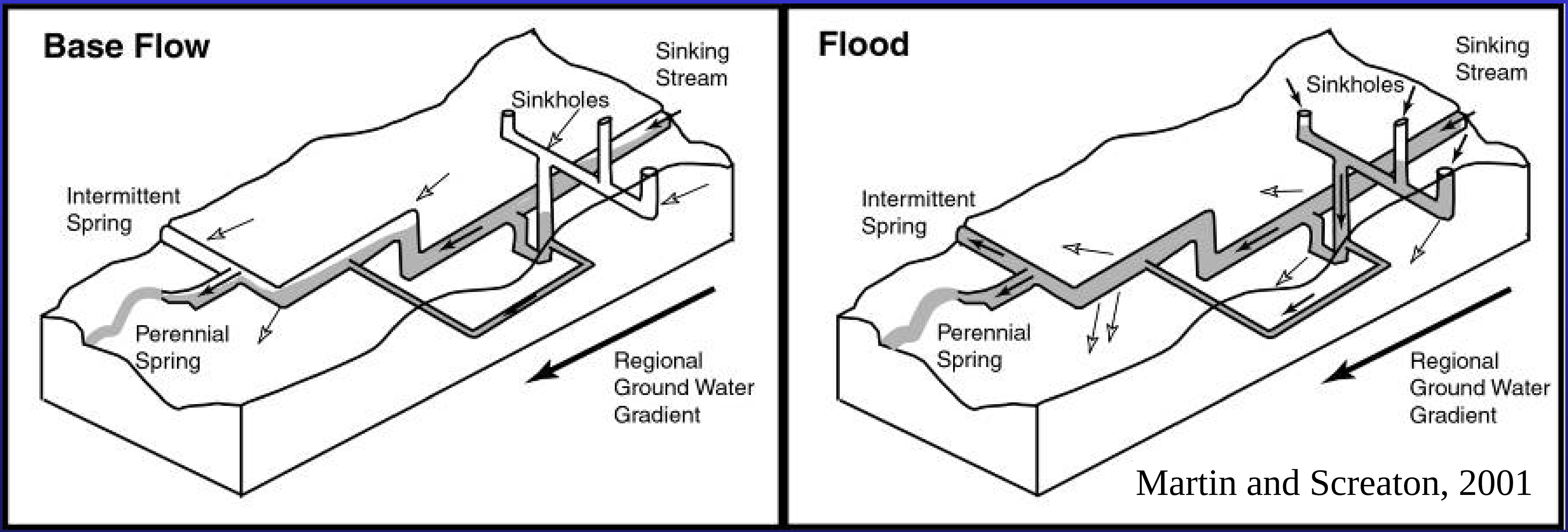
- How does flow in conduits and matrix interact?
- What can be learned from chemistry of spring discharge?

Karst aquifers have two distinct ground water reservoirs:

(1) Conduits (> 1 cm$^2$)

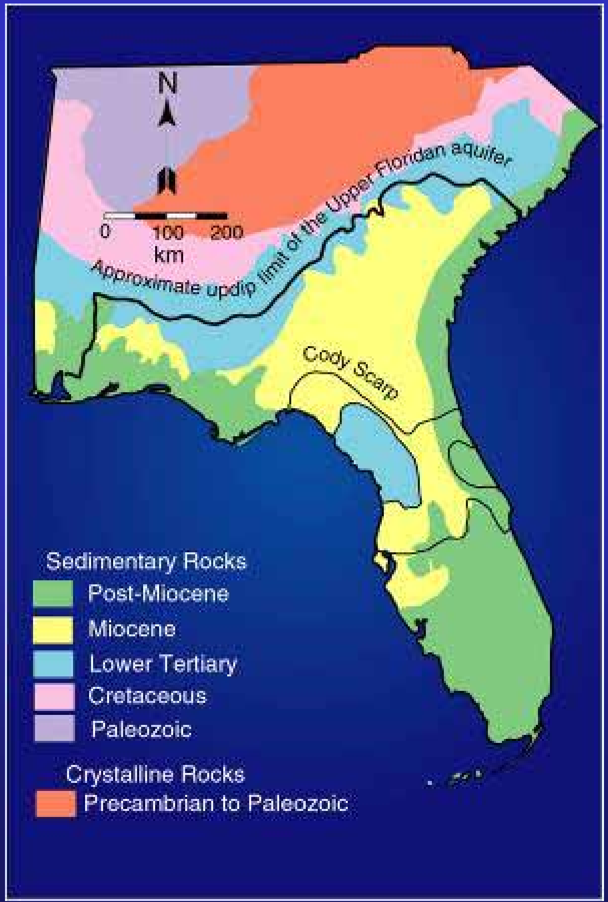
(2) Matrix (fracture and intergranular porosity)

- Flow unimportant in low porosity matrix, e.g. Paleozoic aquifers
- High porosity matrix important flow path and for storage, e.g. Floridan aquifer

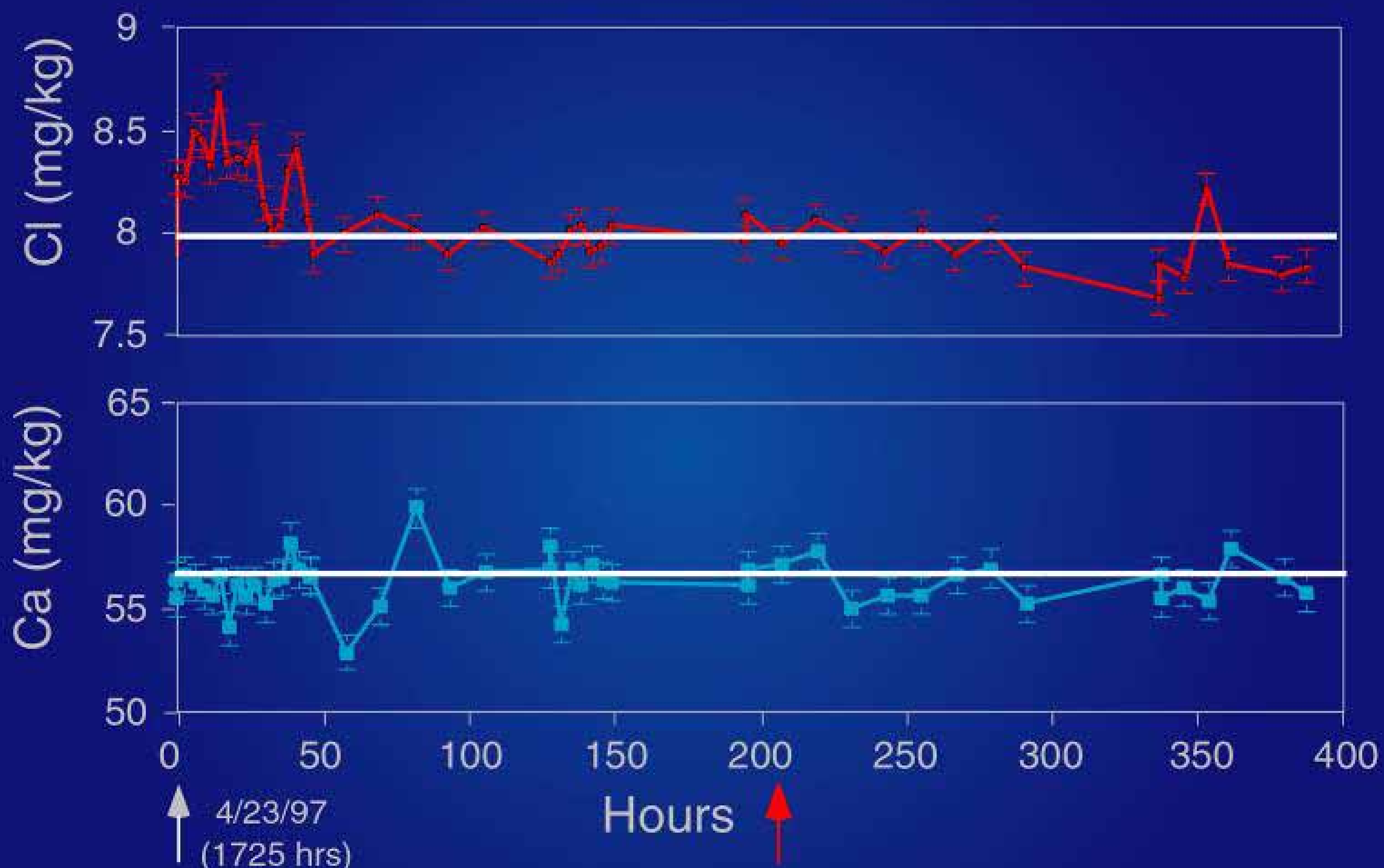



Martin and Screaton, 2001

# Study Area: Cody Scarp

# Mill Pond Spring, Ichetucknee River

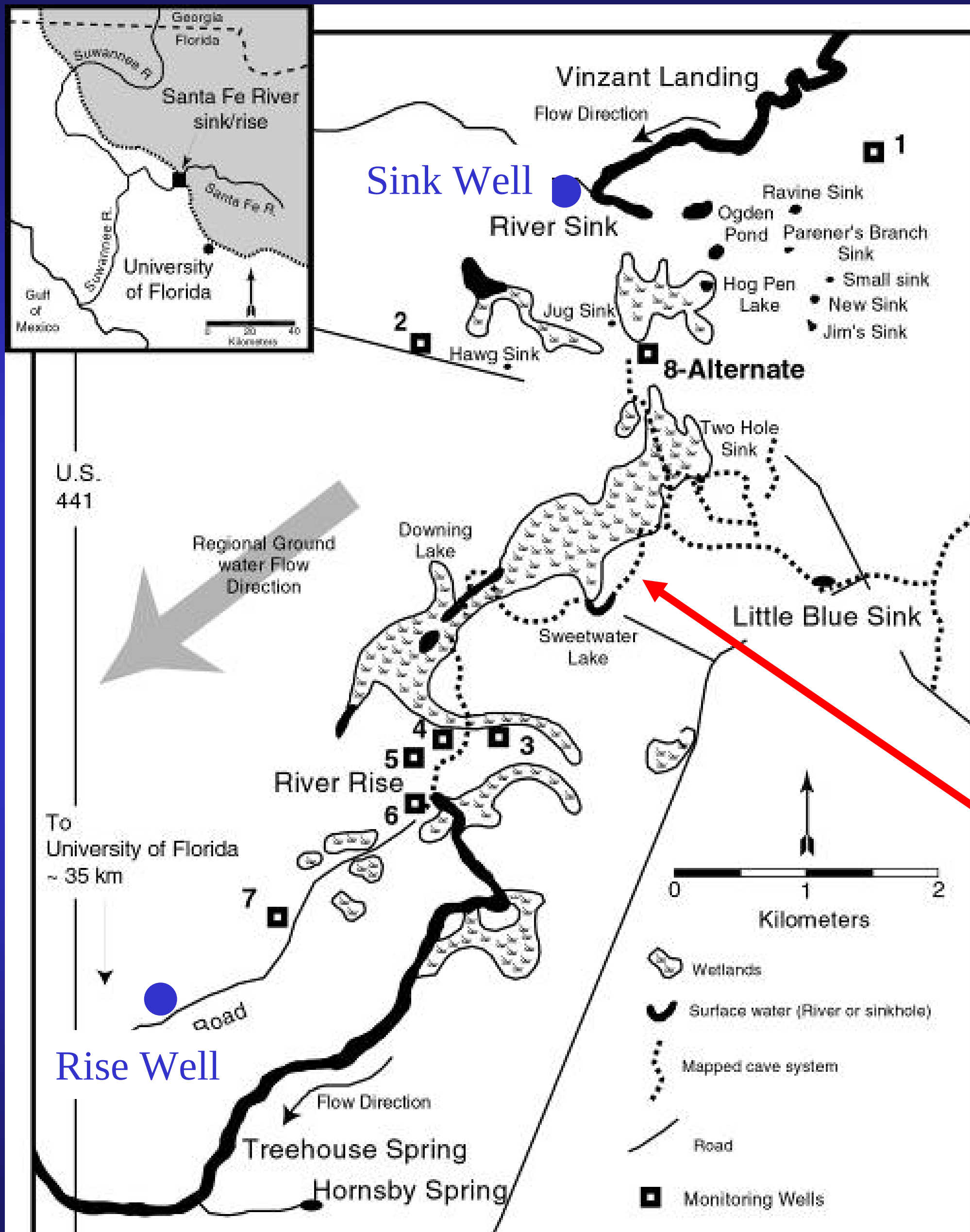



~21 cm of rain

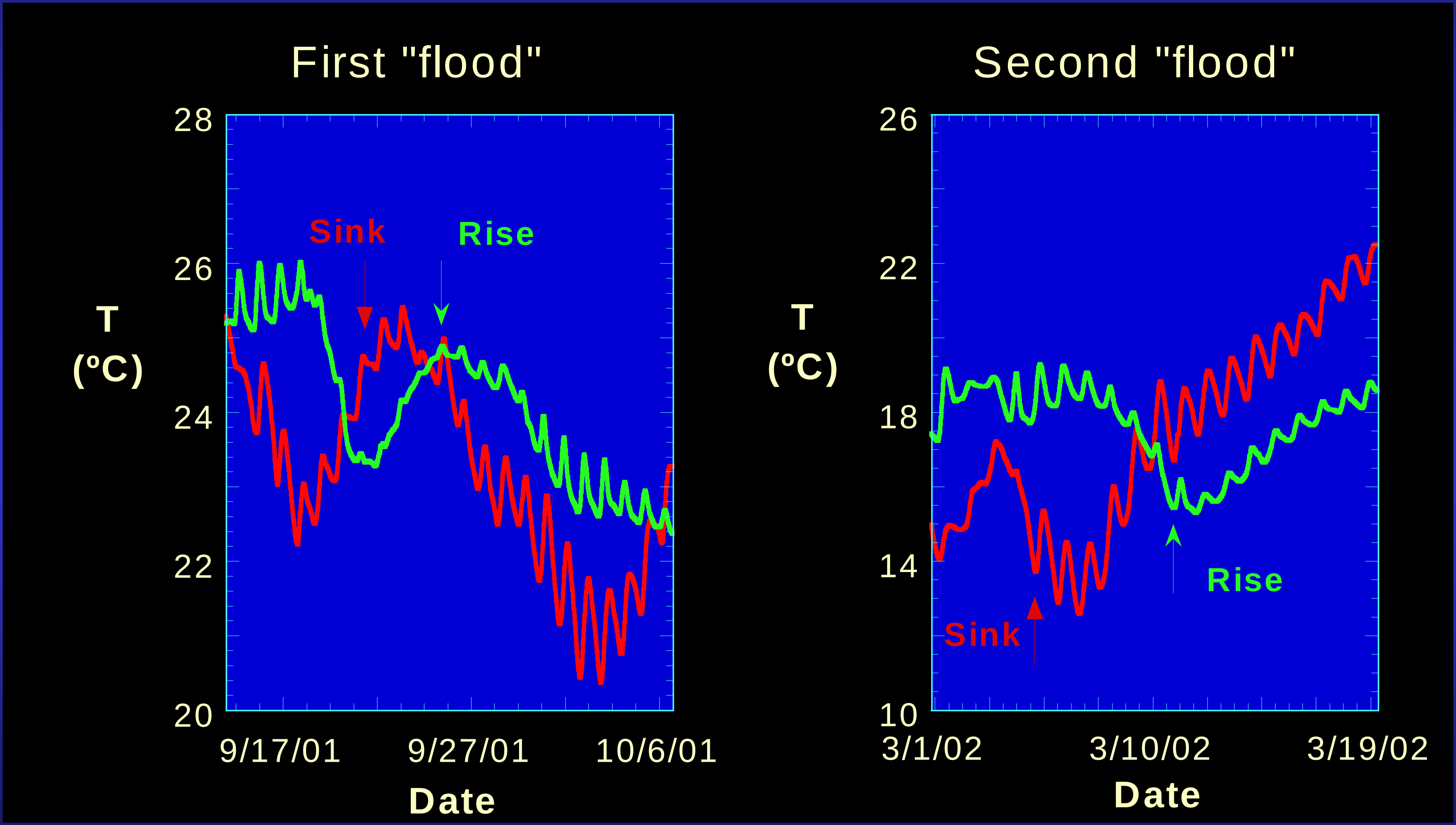
Dye return

Martin and Gordon, 1997

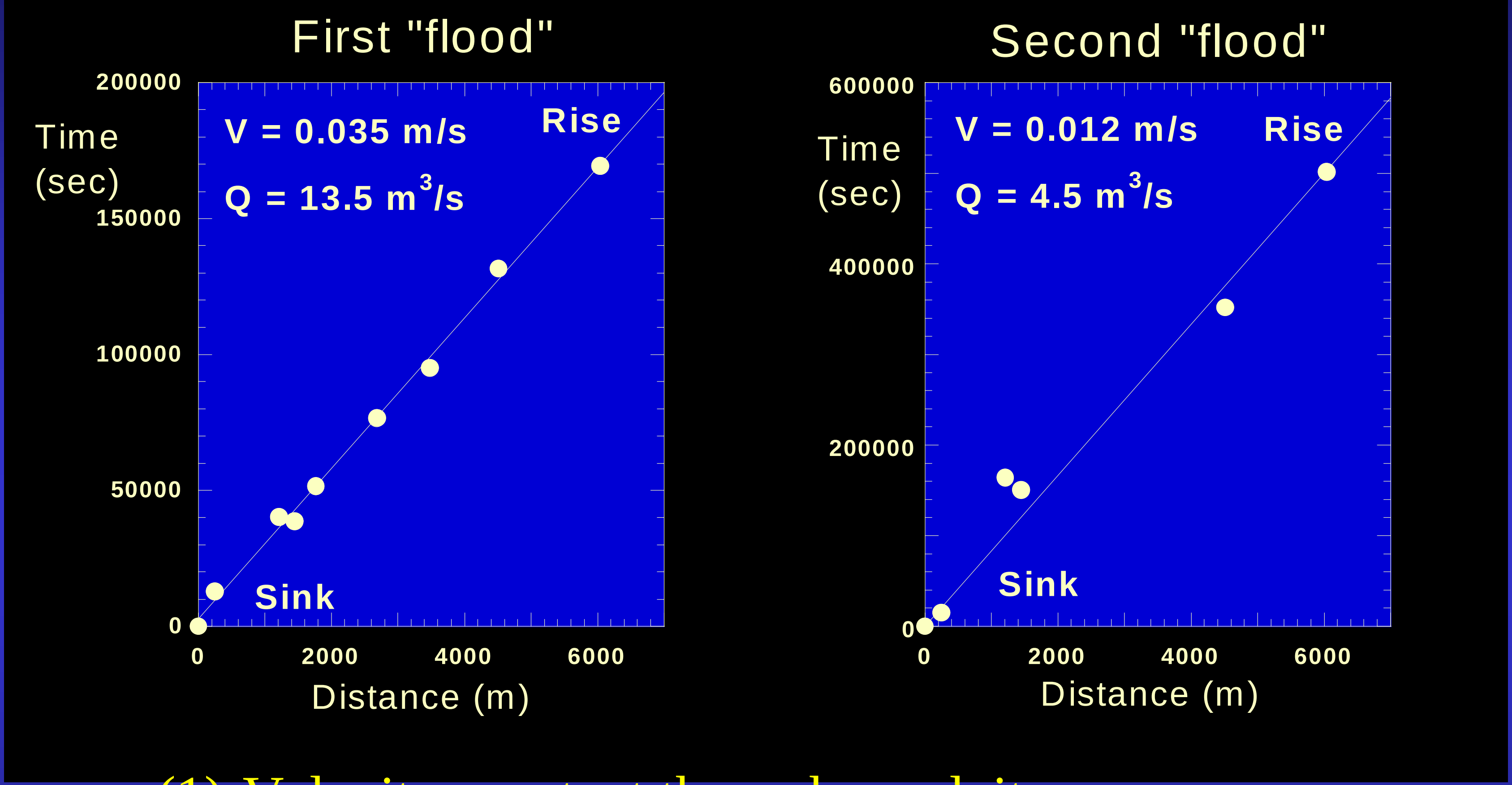
# Santa Fe River Sink/Rise area




# Travel time: Sink → Rise



# Flow velocity, two "floods"



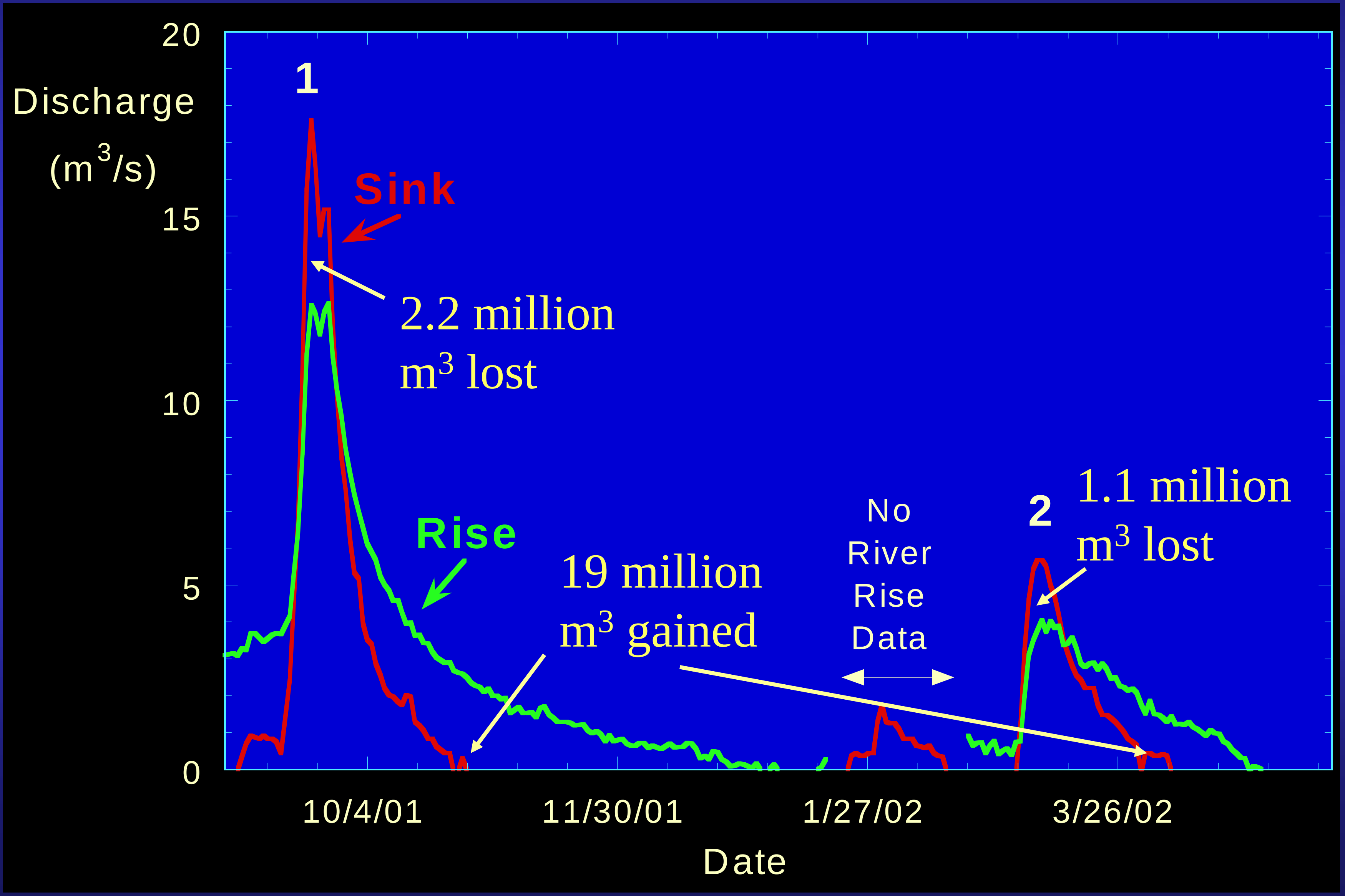

(1) Velocity constant through conduits

(2) Velocity depends on stage and discharge

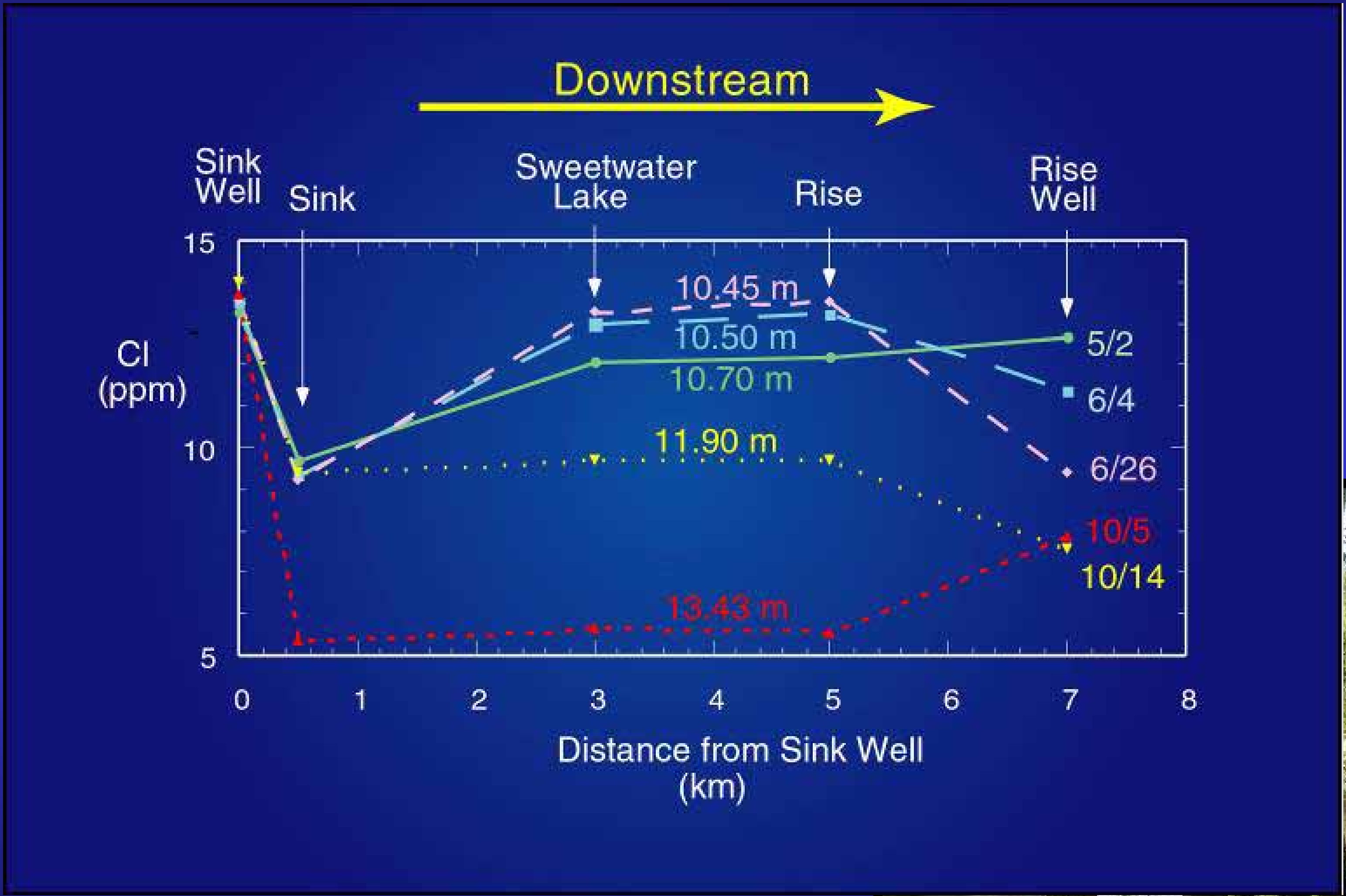
(3) Discharge can be used to determine conduit size

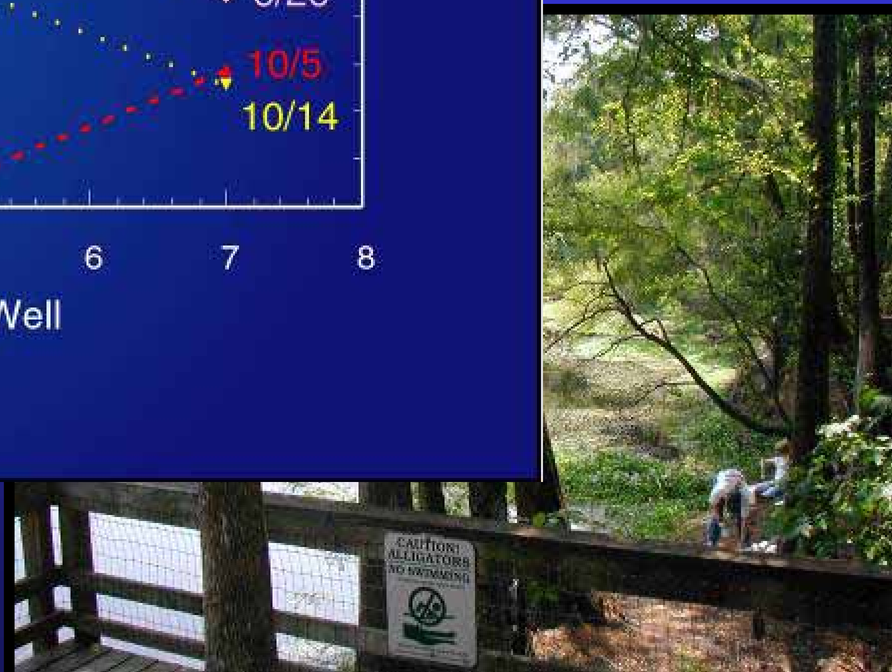
(4) Determine residence time – chemical sampling

# Discharge at sink and rise: evidence for conduit-matrix exchange

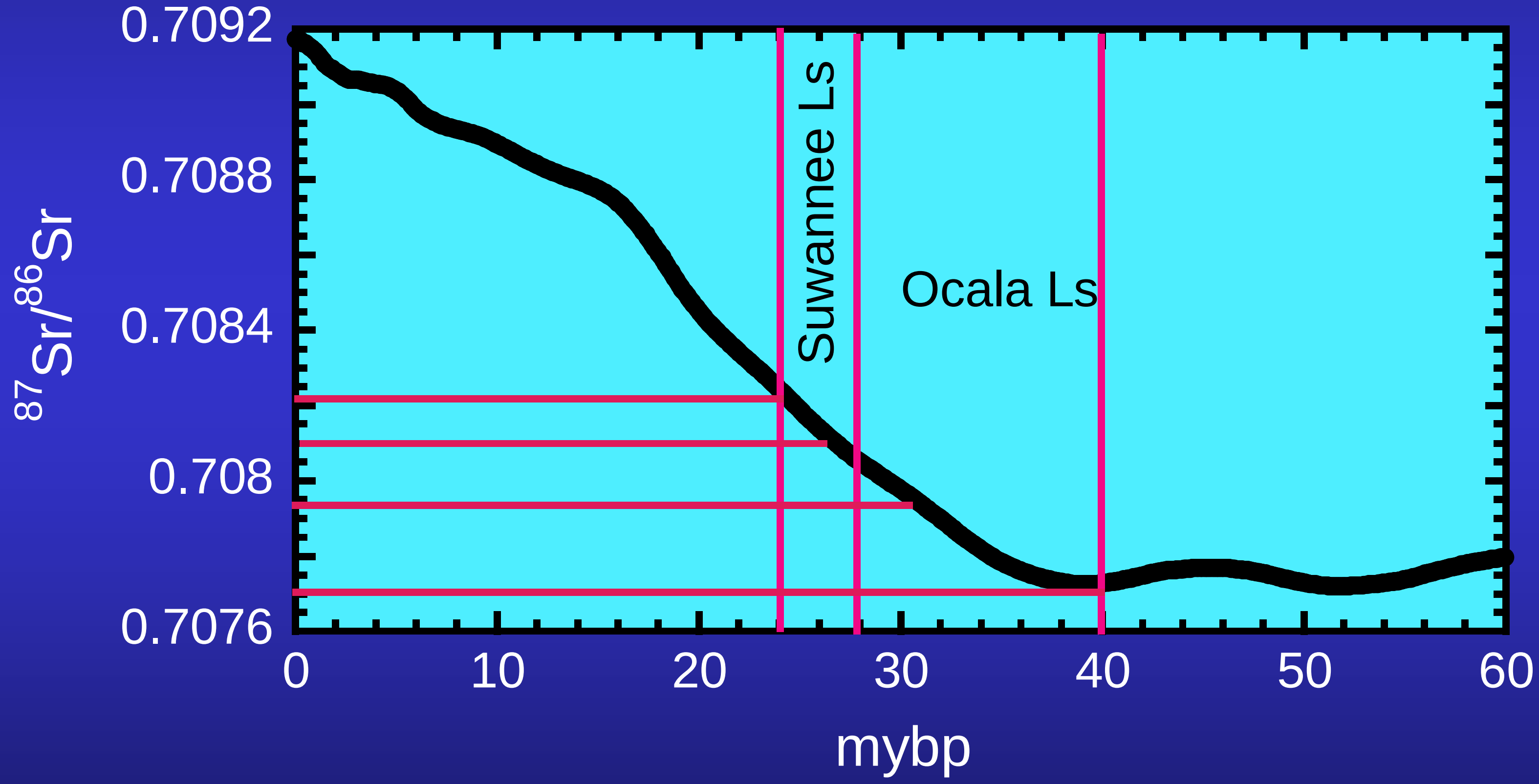


# $Cl^-$ concentrations vs. distance and through time following 1998 El Nino floods



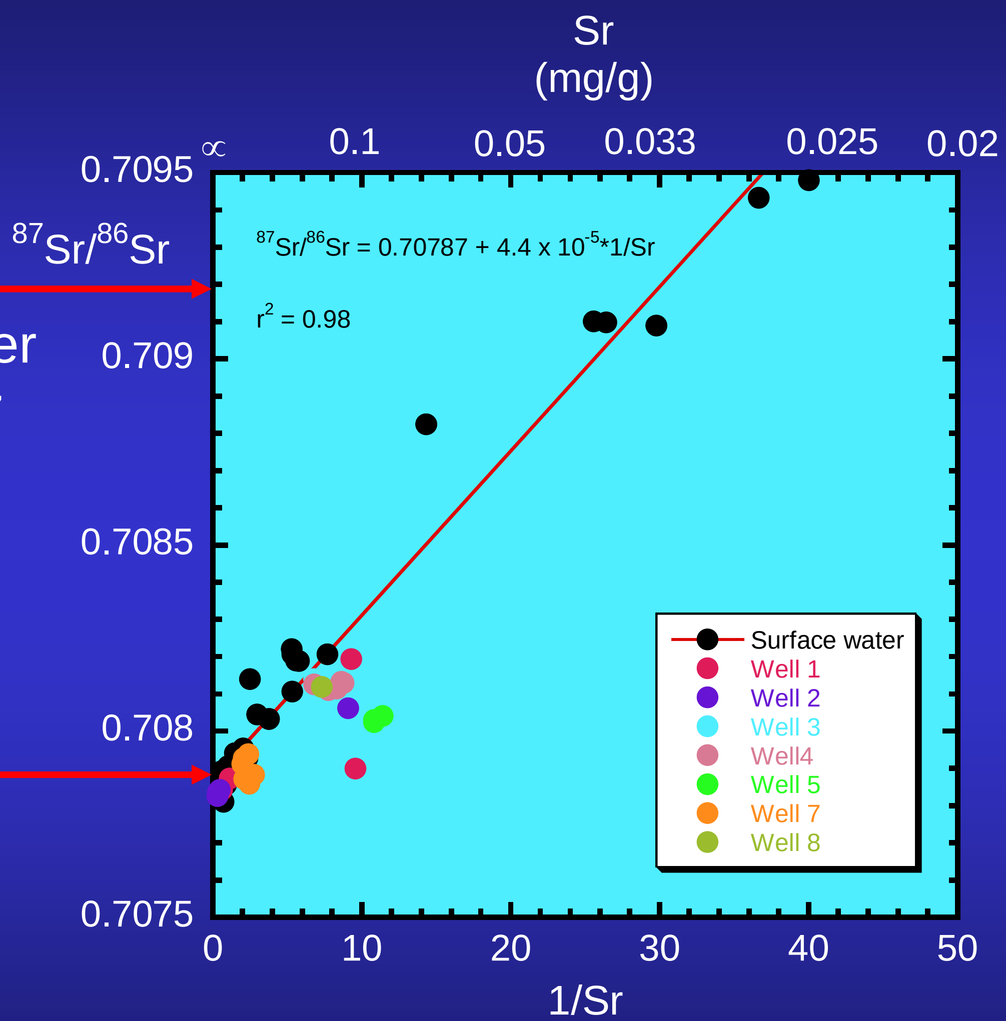



# Seawater Sr Isotopes Through Time



Modern Seawater 0.70917

0.7079 Upper Ocala




Mixing: Ocala Ls and seawater + radiogenic Sr?

Some wells have more Ocala Sr than others

Radiogenic Sr from Hawthorn Gp?

# $^{222}$Rn Geochemistry

$^{222}$Rn derived from decay of $^{238}$U

$^{226}$Ra

Alkaline earth element; easily fits in clay and carbonate mineral structures.

$t_{1/2}$ = ~1600 yrs

$\Rightarrow$ Source of $^{222}$Rn to ground water.

$^{222}$Rn

Noble gas; non-reactive in inorganic or organic reactions.

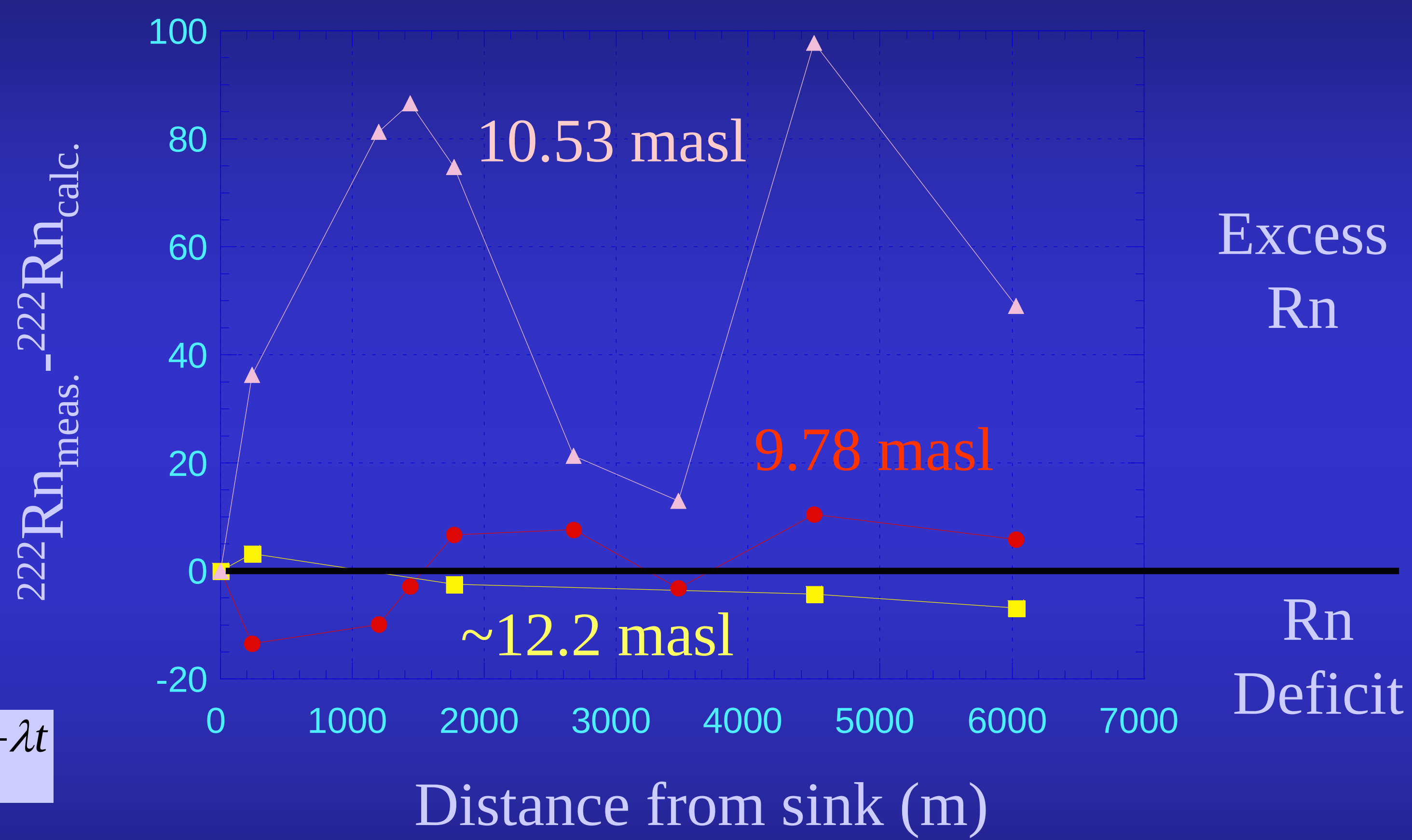
$t_{1/2}$ = 3.8 days

$\Rightarrow$ Loss from evasion to atmosphere.

$\Rightarrow$ Loss from radioactive decay.

$^{218}$Po

# Rn input and decay




$$N = N_0 e^{-\lambda t}$$

N = $^{222}$Rn activity

$N_0$ =initial $^{222}$Rn activity

$\lambda$ = decay constant

t = time

# Conclusions and Questions

- Water exchanges between conduits and matrix (T, physical models, Cl concentrations)

- Several sources of recharged water from confined region (Sr and Rn isotopes)

- What roles do diffuse recharge and epikarst have in flow in conduits and matrix?