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Sunset Reservoir Wells Perchlorate Investigation Strontium Stable Isotope Analysis

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Presented to
United States Environmental Protection Agency
Jet Propulsion Laboratories, Pasadena

April 30, 2013

Strontium Stable Isotope Analysis

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"Native water in the area is generally heavier in its strontium isotope ratio than the Colorado River water. Groundwater collected from MW-24, located in the northern portion of the facility, has historically been categorized as Type 1, associated with run-off from the San Gabriel Mountains.

- Technical Memorandum (TM) Additional Investigation Results National Aeronautics and Space Administration, Jet Propulsion Laboratory, Pasadena, California pg. 20

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Strontium Stable Isotope Analysis

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^{86}Sr = 9.86 %

^{87}Sr = 7.00 % (Radiogenic)

^{88}Sr = 82.58 %

$^{87}Sr / ^{86}Sr$ = 0.7099

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Strontium Data

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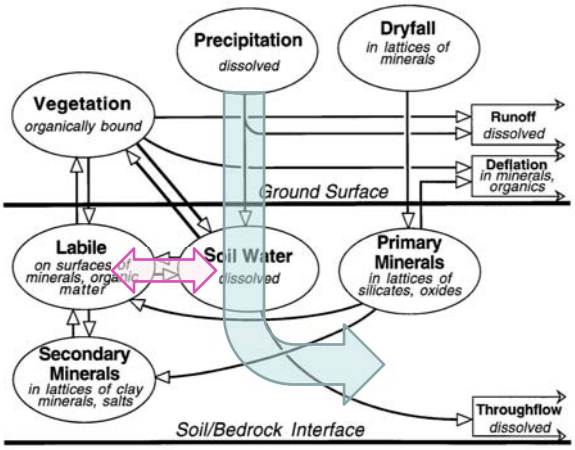

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Strontium Data

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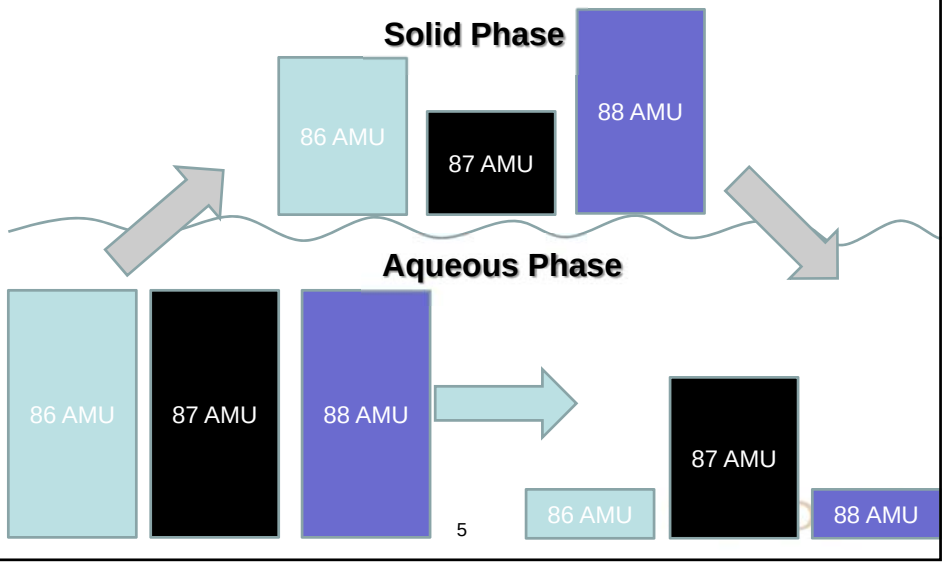

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Strontium Data

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1) Strontium in rainwater has different concentrations of strontium than groundwater, in this case more.
2) The strontium in rainwater has a smaller proportion of radiogenic strontium ($^{87}Sr/^{86}Sr$) than ground water (0.7090)
3) The concentration of strontium and the ratio of $^{87}Sr/^{86}Sr$ will change in an aquifer
4) The longer rainwater is in an aquifer, the more those two variables will change.

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Strontium Data

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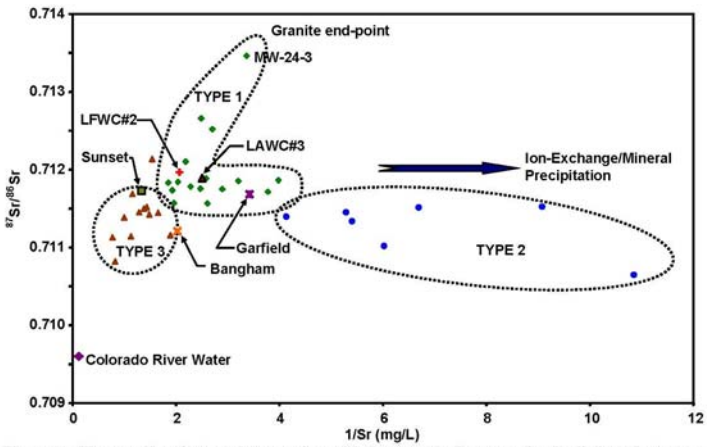

Figure 11. The strontium isotope data correlate with the water typing, grouping in distinct clusters on the above plot that can be explained by mixing and ion-exchange/mineral precipitation.

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Relation Between Sr vs. Ca vs. Depth

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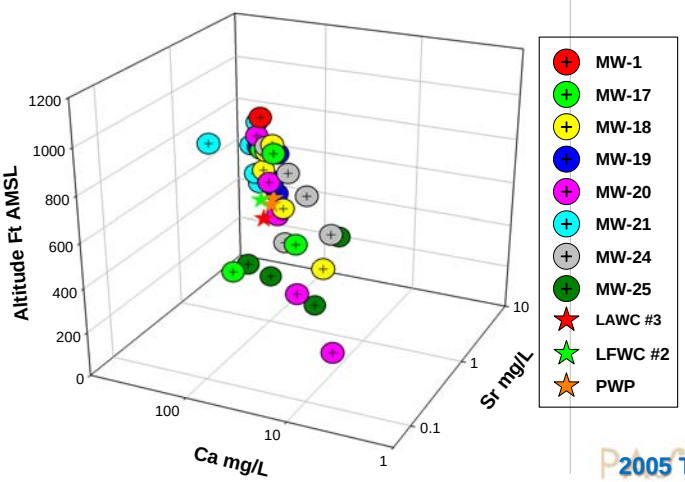

2005 TM Data

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Relation Between 1/[Sr] vs. $^{87}Sr/^{86}Sr$

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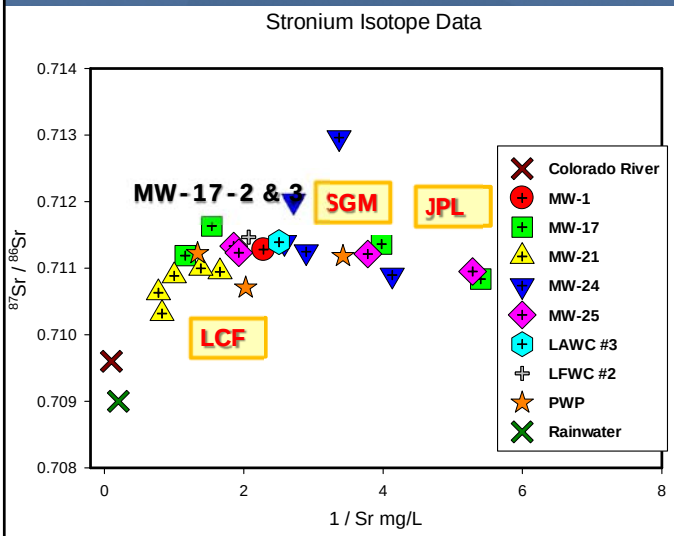

2005 TM Data

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Relation Between 1/[Sr] vs. $^{87}Sr/^{86}Sr$ & Water Type

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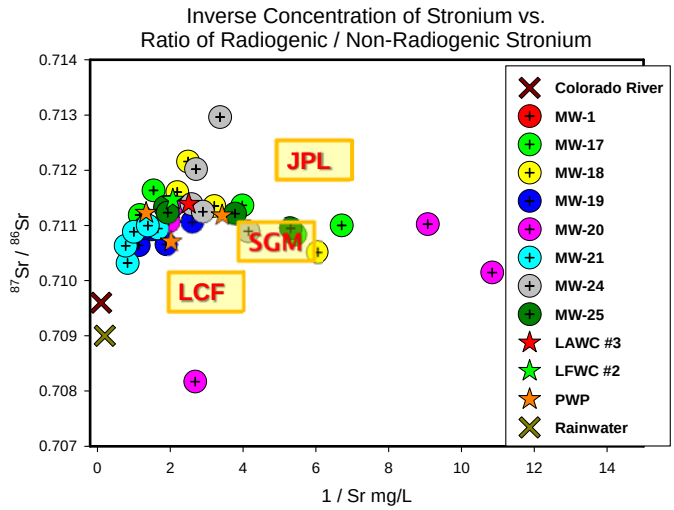

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Relation Between 1/[Sr] vs. $^{87}Sr/^{86}Sr$ & Water Type

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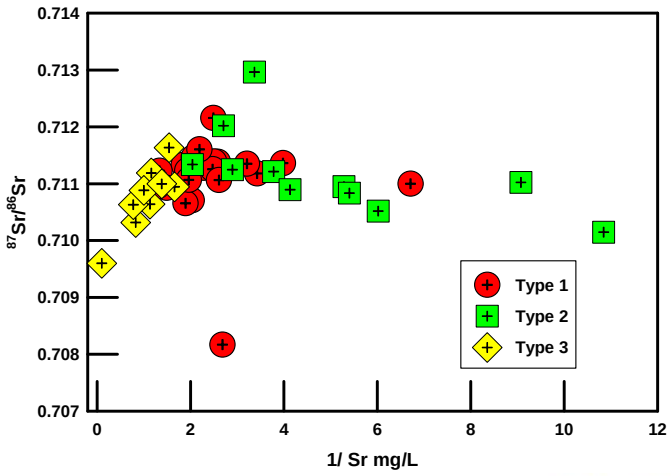

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Relation Between 1/[Sr] vs. $^{87}Sr/^{86}Sr$ & ClO_4

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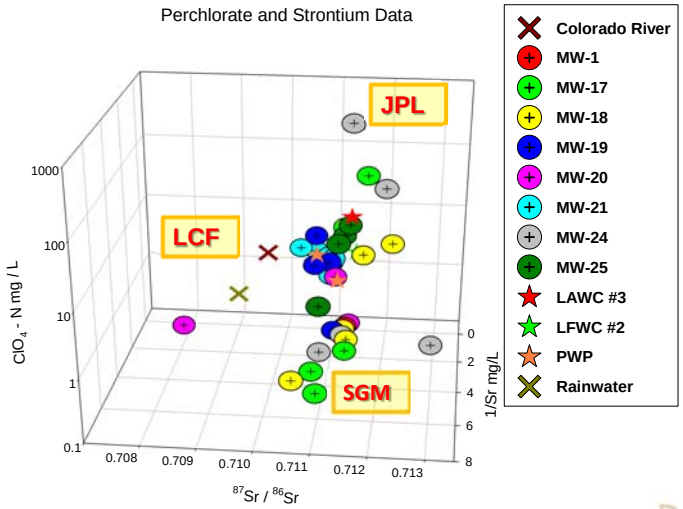

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Relation Between 1/[Sr] vs. $^{87}Sr/^{86}Sr$ & Sulfate

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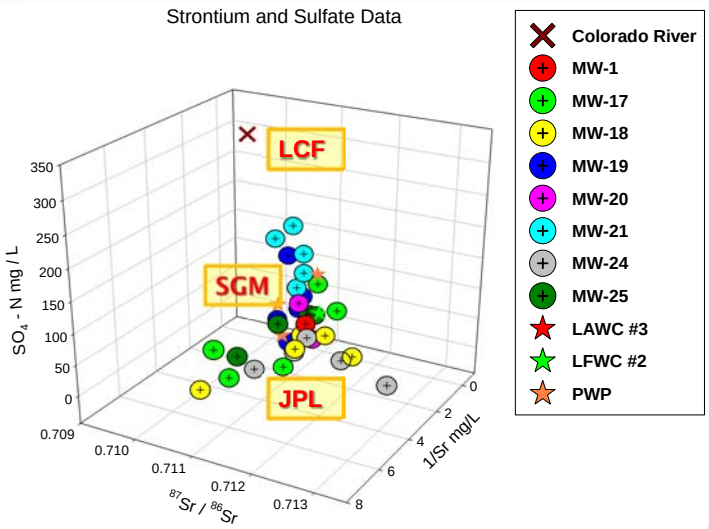

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Relation Between 1/[Sr] vs. $^{87}Sr/^{86}Sr$ vs NO_3

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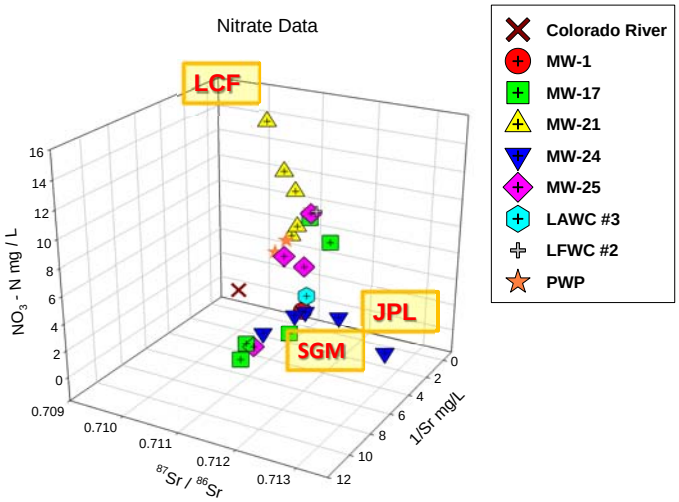

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