Evaluating the Hydrogeochemical Response of Semiarid Springs Using Phase-Plane Plots and Singular Spectrum Analysis

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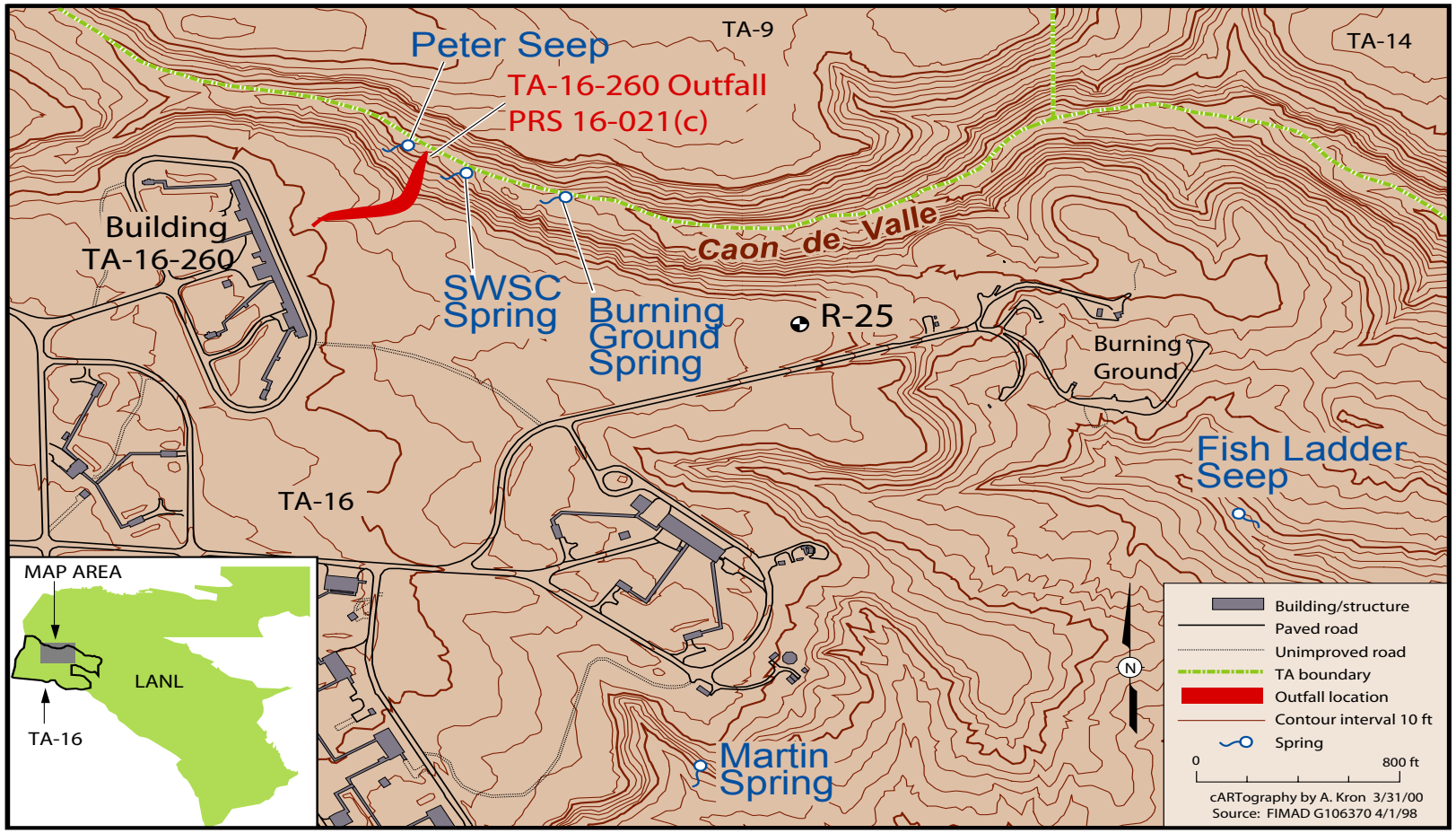

Peter Seep
TA-16-260 Outfall
PRS 16-021(c)
TA-9
TA-14
Building
TA-16-260
SWSC
Spring
Burning
Ground
Spring
Caon de Valle
R-25
Burning
Ground
Fish Ladder
Seep
TA-16
MAP AREA
LANL
TA-16
Martin
Spring
Building/structure
Paved road
Unimproved road
TA boundary
Outfall location
Contour interval 10 ft
Spring
0
800 ft
N
cARTography by A. Kron 3/31/00
Source: FIMAD G106370 4/1/98

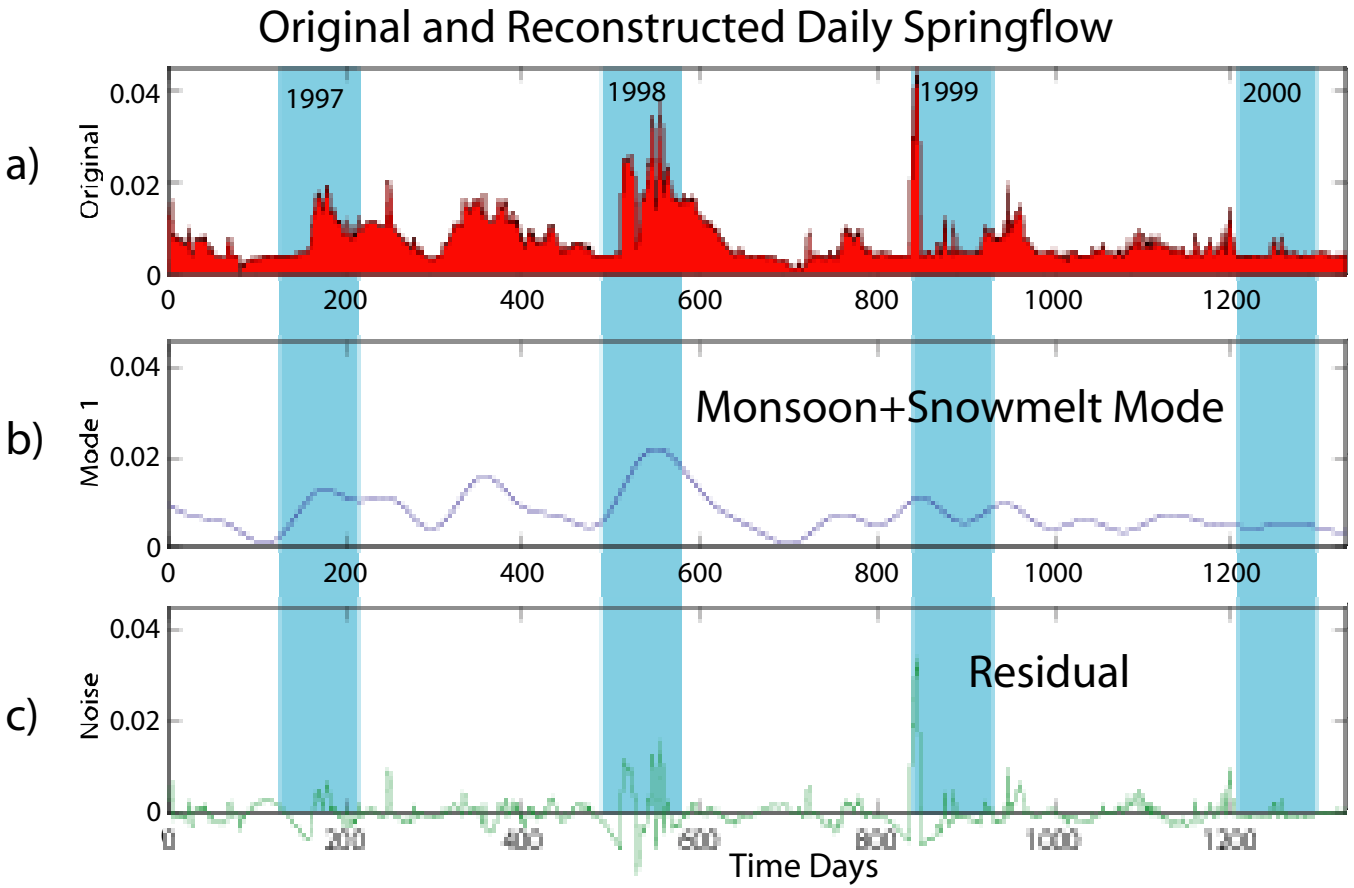


Figure 2. The SWSC spring discharge (upper) and the reconstructe monsoon and snowmelt springflow response. Note the weak snowr and weak monsoon in 1999-2000 reduced spring recharge and represents a major factor in the 1999-00 drought. The shaded blue area represents the March-May spring melt period.

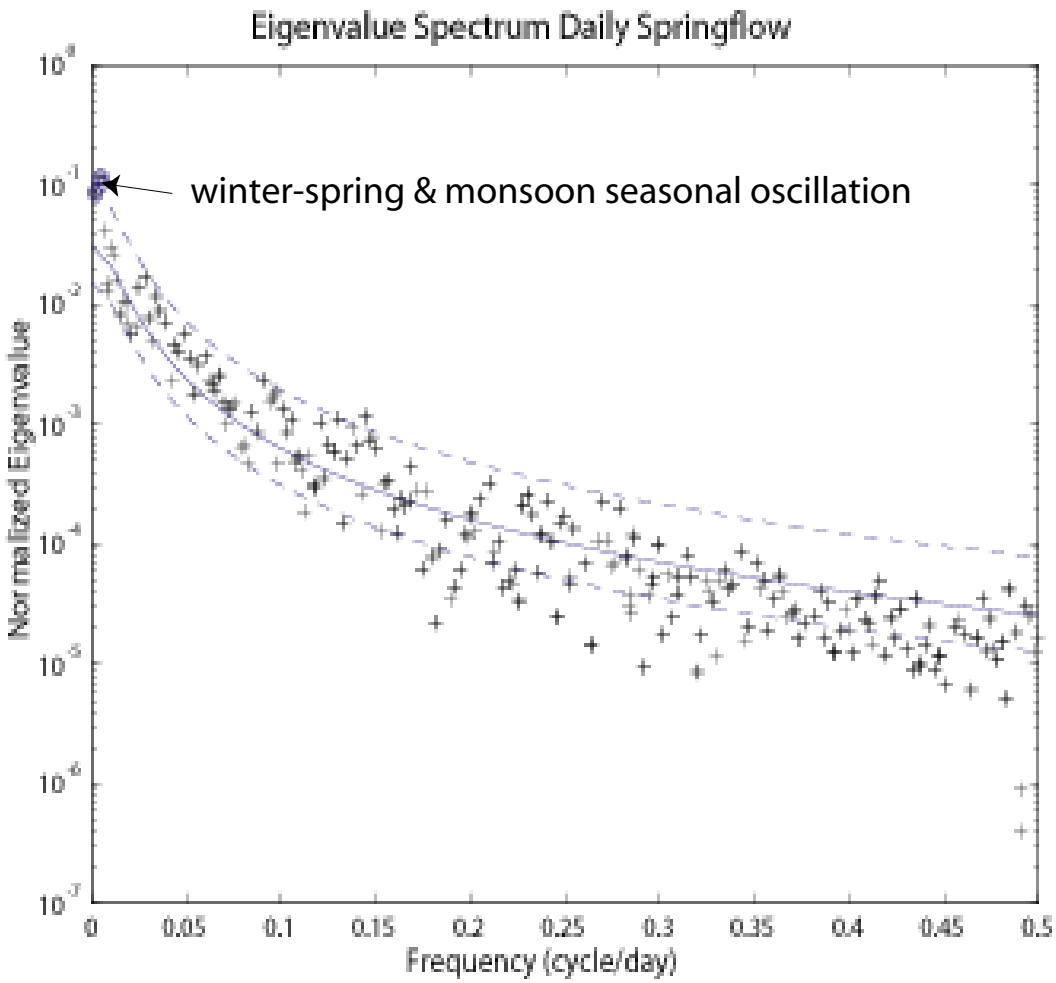
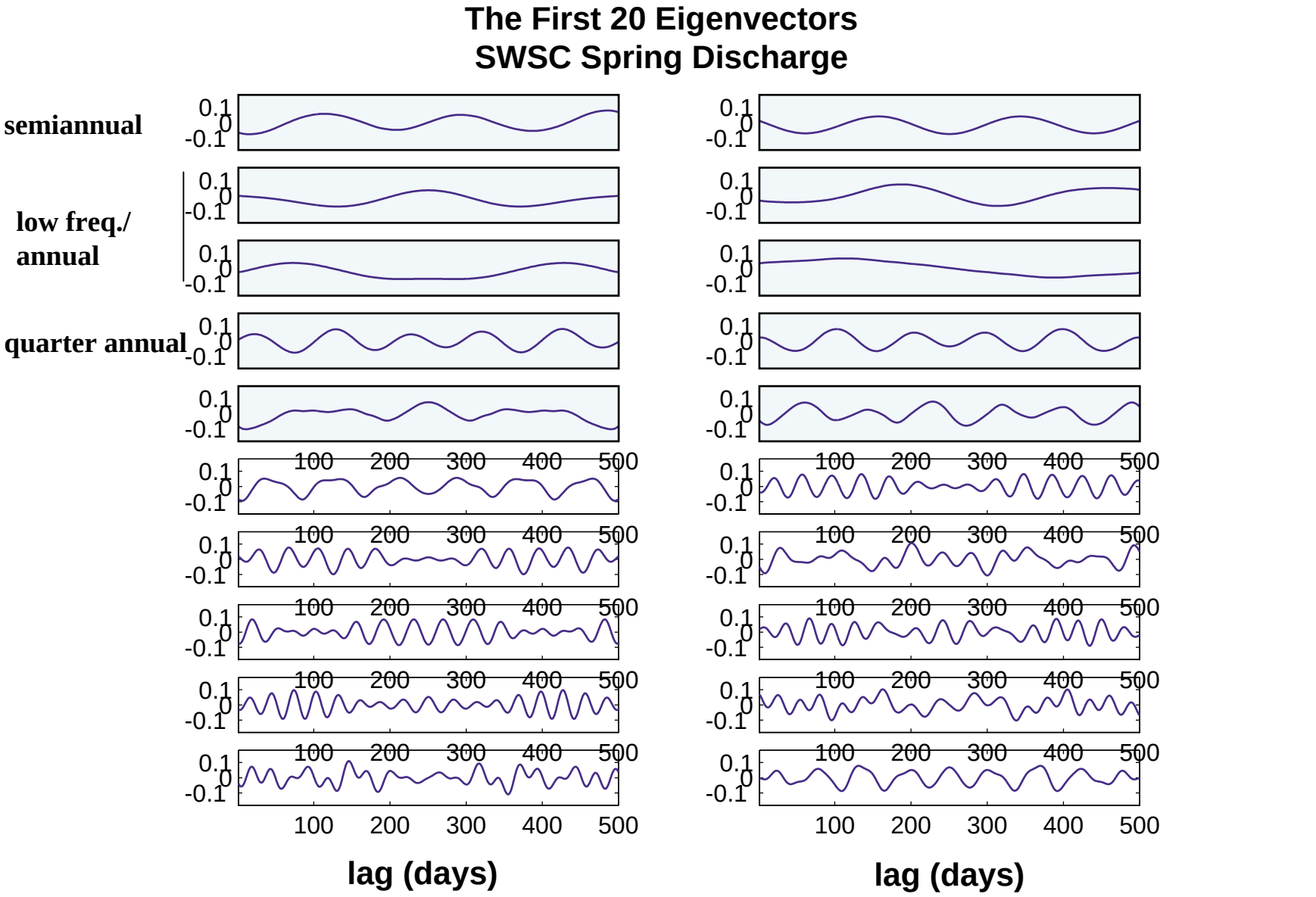


Figure 3. Eigenvalue spectrum of the SWSC springflow. The seasonal modes for the winter snowmelt and summer monsoon are indicated. The fitted line and 95% confidence interval assume a "red noise" spectrum.


The First 20 Eigenvectors
SWSC Spring Discharge
semiannual
low freq./
annual
quarter annual
0.1
0
-0.1
100
200
300
400
500
lag (days)
lag (days)

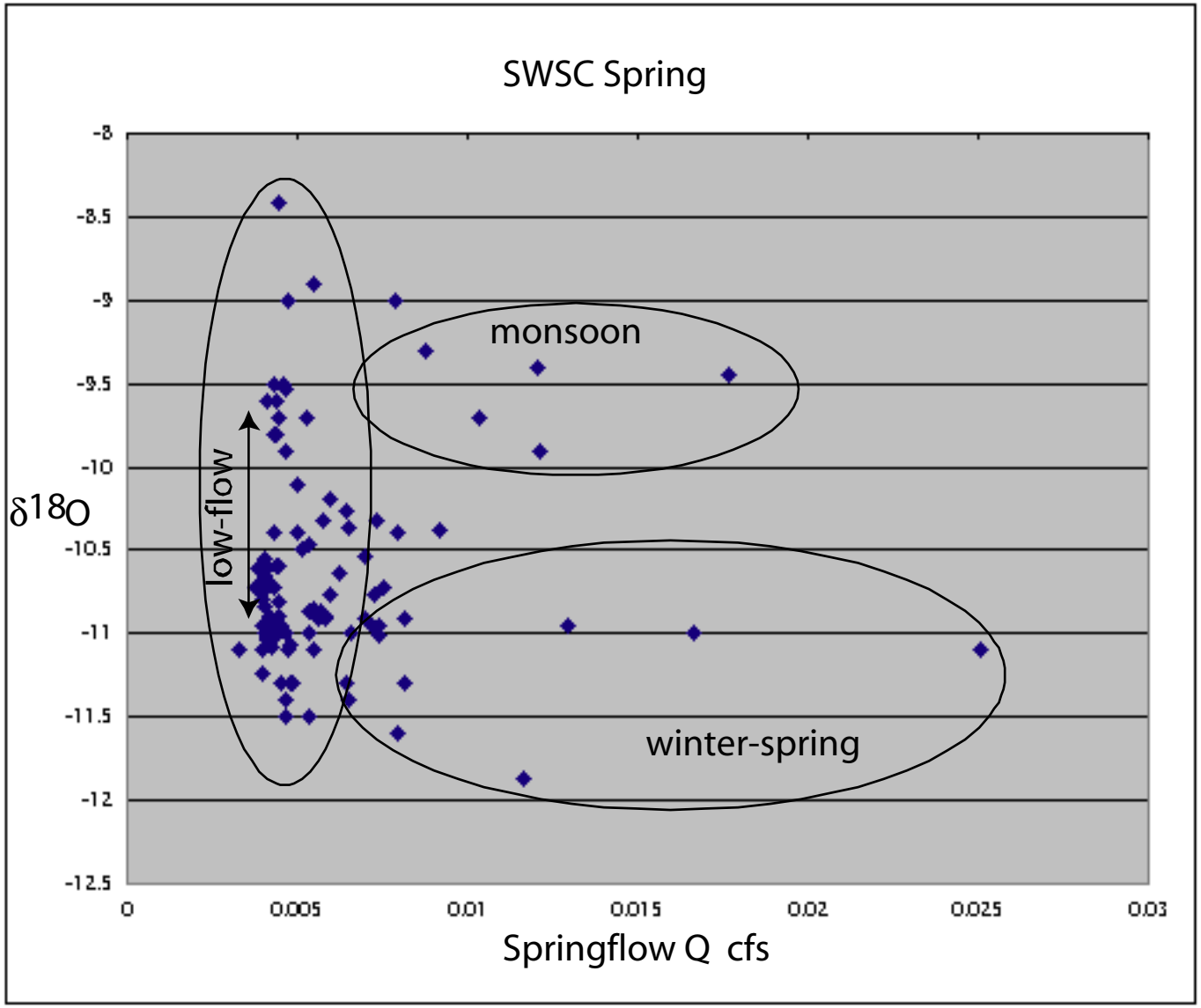
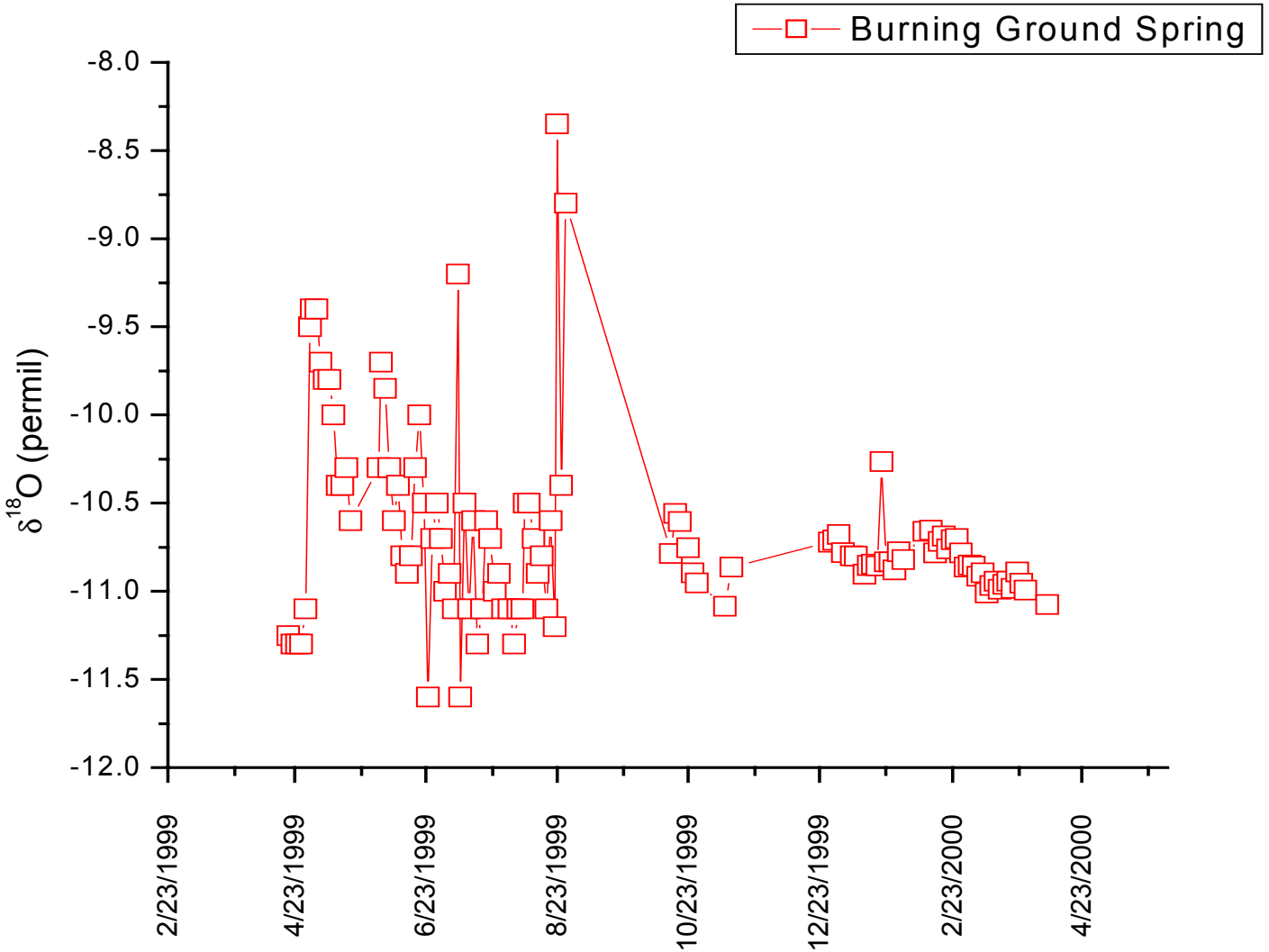


Figure 4. The $\delta^{18}O$ - Q phase-plane response for SWSC spring demonstrating the seasonal mixing of low-flow $\delta^{18}O$ and the characteristic response of the monsoon and the snow-melt $\delta^{18}O$ - Q relationship.

Burning Ground $\delta^{18}O$ Time Series



Recharge Elevations Using Stable Isotopes

- Elevation (m) = -314 ($\delta^{18}O$) - 1161
  - r = -0.97
  - Vuataz and Goff, 1986 (JGR)

- The maximum recharge elevation can be bounded by using the lowest isotopic value

- Using a value of –11.3 ‰ (Burning Ground sp.) yields a maximum recharge elevation of 7878 ft (2387 m)

- Result suggests that spring recharge occurs no more than about 2 km west of the springs
  - Just west of Hwy 502 along the Pajarito Fault
  - Other isotope values give elevations on the TA-16 mesa