

Paper No. 99-1

Presentation Time: 9:00 AM-6:00 PM

HOLOCENE NOBLE GAS PALEOTHERMOMETRY FROM SPRINGS IN THE OLYMPIC MOUNTAINS, WASHINGTON

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Noble gas temperature proxies are examined from 52 springs in the Olympic Mountains, Washington. Groundwater flows from seeps to pooled springs at $<0.1 \text{ L s}^{-1}$ - 2.5 L s^{-1} in the Elwha watershed ($\approx 692 \text{ km}^2$). About 85% of sampled springs issue from confined fracture reservoirs preserving noble gas temperatures (NGT) from recharge areas. Closed system equilibration modeling exceeds goodness of fit testing ($\chi^2 = 37.8$; $p > 0.010$) among other treatment methods for trapped excess air during groundwater infiltration. Calculated mean recharge air temperatures (MRAT) range from $3.9 \pm 1.0^\circ\text{C}$ to $12.4 \pm 0.6^\circ\text{C}$. About 17% of the NGT's indicate some past air temperatures to be warmer during the Holocene than present climate trends in the region. Apparent ages of recharge events that equilibrated with these surface air temperatures were calculated from cosmogenic ^{39}Ar , ^{14}C , and fissionogenic ^{85}Kr , ^3H , and its progeny ^3H - ^3He . The multi-tracer ages of these springs record recharge events from $5 \pm 3 \text{ yr BP}$ (^{85}Kr) to $8510 \pm 420 \text{ yr BP}$ (^{14}C). Fourier transform time-series modeling supports at least two pronounced regional warming trends with significant centennial-scale variability during the Holocene. Where decadal variability can be discerned among the NGT proxies, its past millennium variability exceeds that observed from the most recent half-century of weather instrument records within subalpine areas of the Olympic Peninsula.

[2009 Portland GSA Annual Meeting \(18-21 October 2009\)](#)

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