intervals for major tectonic events of 400–1300 years over the past 5000 years and an average uplift rate of 10–11 mm/yr.

GEOCHEMICAL MODELING AND RADIOCARBON DATING OF GROUNDWATER: RECENT SOFTWARE DEVELOPMENTS AND FIELD EXAMPLES

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Geochemical reaction models are usually required for radiocarbon dating of groundwater. The adjustment of $^{14}$C data for geochemical reactions by the inverse modeling approach has been generalized and put into the interactive FORTRAN 77 code, NETPATH. NETPATH solves net chemical and isotope mass balance and isotope evolution in a groundwater system using observed chemical and isotopic data. The processes of dissolution, precipitation, oxidation/reduction, incongruent reaction, gas exchange, mixing, evaporation, dilution, isotope fractionation and isotope exchange can be considered. Given a set of chemical and isotopic constraints, and a set of plausible reactant and/or product phases for the system, NETPATH computes every possible geochemical mass balance reaction for an observed initial and final water composition along a flow path. Rayleigh distillation calculations are applied to each geochemical reaction model to predict carbon, sulfur and strontium isotopic compositions at the endpoint, including the reaction-adjusted $^{14}$C content. Reaction identification and assignment of adjusted $^{14}$C ages is usually non-unique because of a lack of sufficient mineralogic and kinetic data for the system, and a lack of definition of the initial $^{14}$C content. Examples of the application of NETPATH to $^{14}$C dating of groundwater in the Floridian aquifer of Georgia and Florida, USA are presented.

$^{14}$C GAS COUNTING: IS THERE STILL A FUTURE?

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Reviewed here are developments in low background proportional counters and chambers used for low-level internal gas counting of $^{14}$C and other soft beta emitters. I have studied the influence of counter geometry and the nature of the gas filling on counter characteristics and describe in detail operational characteristics of multi-element proportional chambers. Further detector developments for ultra-low-level gas counting based on cryogenic liquids and time projection chambers are discussed. My observations show that proportional and drift chambers together with multichannel electronics operating on-line with a computer open up new possibilities in ultra-low-level gas counting.