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**Measurement and modeling of dissolved radon as a tracer of ground water flow in a well** VINCENTE GUISEPPE, University of Maine, C.T. HESS, University of Maine — $^{222}$Rn, a naturally occurring radioactive gas produced in the $^{238}$U decay series, can build-up in rock and dissolve in ground water. Although $^{238}$U and $^{226}$Ra dictate the presence of radon in the rock, the dynamics of ground water systems control dissolved radon in a well. We have measured variation of radon concentrations (up to a factor of 5) while drawing water from a well over 2 hours. We have measured the vertical distributions of radon in nine wells and identified the sources of dissolved radon. We designed and built a discrete interval thief sampler, lowered it desired depths and collected a volume of water to be later analyzed for radon using liquid scintillation. Using borehole geophysical instruments, we determined the location of fractures and the flow in the well as a function of depth. We observed higher radon values at both the locations of fractures as well as where flow is high. The core fragments removed during well-drilling were counted using gamma spectroscopy to determine the concentrations of radionuclides in the $^{238}$U decay series surrounding the well. A mathematical model of the water mixing and flow out of the well predicts the variation of radon measured over time using the measured vertical radon profiles.

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