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^{222}Rn behavior in waters from peatlands and eskers of the Amos region, Abitibi-Temiscamingue, Québec, Canada

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^{222}Rn is a short decay product of U. Being a noble gas not affected by chemical reactions ^{222}Rn can be a suitable tracer in subsurface hydrology, particularly for stream-groundwater interactions. We recently carried out a Quebec government-funded project for characterizing the hydrological cycle in peatlands located around fluvioglacial moraines and eskers in the Abitibi-Temiscamingue region of Québec, eastern Canada. The goal of this project was to trace water exchanges between the eskers and the surrounding peatlands using stable isotopes, major chemistry and noble gases (including ^{222}Rn). Samples were taken in summer 2012 from 46 wells tapping the Saint-Mathieu-de-Berry and Barraute eskers and the Harricana moraine. Sixteen samples were taken from deeper wells tapping the Archean fractured bedrock in the clay plain separating these eskers. And 40 samples were collected from piezometers installed at different depths from 0.70m to 4.8 m in four peatlands located along the flanks of the Saint-Mathieu-de-Berry esker and the Harricana moraine. ^{222}Rn activity was measured at UQAM using a liquid scintillation counter (SL-300 from HIDEX®). ^{222}Rn activities in peatland water range from 0.02 to 16.6 Bq/L. ^{222}Rn activities measured in groundwater flowing through the esker and moraine aquifers range from 2.8 to 34.9 Bq/L. These values are relatively low taking into account that the rock matrix derives from old Archean granitoids and volcanic rock likely rich in U and Th. However, ^{234}U/^{238}U analyses in the same waters showed that these hydrologic systems are extremely depleted in U-derived radionuclides. Interestingly, several peatlands show a good correlation between the Total Dissolved Salinity (TDS) and the ^{222}Rn activity and with HCO_3^-, SO_4^{2-}, Mg^{2+} and Ca^{2+}. Salinity in the eskers derives from the deeper fractured basement aquifer as indicated by a clear correlation between helium isotopes, TDS and the well depths. A similar relation is observed for the ^{222}Rn. This suggests that peatlands receives a contribution from deeper waters, either from their flanks (eskers) or possibly deeper. Using a simple mixing equation between saline and ^{222}Rn-rich deeper waters and less saline and ^{222}Rn-poor peatland water, we can estimate the maximum contribution of deeper water to be approximately 5% of the total amount of water found in peatlands. These are minimum values because we do not take into account the ^{222}Rn losses related to decay and evasion to the atmosphere.