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Evaluation of the geochemical activity of the Pusteria fault system (Eastern Alps, Italy) by Radon Activity Index

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Measurements of radon concentration in soil gas has been long applied to detect the presence of buried faults and evaluate their geochemical activity. The selected structural setting is the wide brittle-fracture zone between the Pusteria Line (*PL*, the eastern part of Periadriatic Lineament), and the Defferegggen-Anterselva-Valles (*DAV*) faults located in the Eastern Alps. This fractured zone may act as preferential pathway for radon transport and migration by carrier gases strongly contributing to its geogenic component. The relationship between radon concentration and the geochemical activity of the fractured zone has been studying and determine by the elaboration of Radon Activity Index (*RAI*). The *RAI* has been calculated as the ratio between the mean anomaly values of the radon statistical distribution >75% and the mean background values <75%. Soil gas radon concentration has been measured along three profiles crossing the fault zone at Terento (P1), Molini (P2) and Falzes (P3) areas, and along 21 profiles obtained by intersecting the estimated radon grid map. According to the classification by Seminsky and Demberel (2013), the *RAI* has been divided into 5 levels as follow: ultra-high *RAI* >10, high 10> *RAI* >5, increased 5> *RAI* >3, medium 3>*RAI*>2, low *RAI* <2. Most of the calculated *RAI* are classified as "increased" (5>*RAI*>3) identifying a fault having a geochemical activity or the existence of strong tectonic fractured zone. This is the case of the easternmost and the westernmost sector of the fault zone. These two sectors also display *RAI* values classified as "high" (10>*RAI*>5) which highlights that both, *PL* and *DAV* faults have clear activity expression corresponding to the highest measured anomaly values: 741 kBq/m^3 for P1 (W) and 253 kBq/m^3 for P3 (E). The central sector of the fractured zone shows the lowest *RAI* values identify as "medium" (3>*RAI*>2) pointing out the existence of a fractured zone combined with a not clear activity expression. *RAI* trend mainly displays a fractured zone associated with a clear geochemical activity which contributes to increase radon gas degassing in the study area with implications in increasing its geogenic radon potential at surface.