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Uranium Groundwater Anomalies and Active Normal Faulting

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The ability to predict earthquakes is one of the greatest challenges for Earth Sciences. Radon has been suggested as one possible precursor, and its groundwater anomalies associated with earthquakes and water–rock interactions were proposed in several seismogenic areas worldwide as due to possible transport of radon through microfractures, or due to crustal gas fluxes along active faults. However, the use of radon as a possible earthquake's precursor is not clearly linked to crustal deformation.

The uranium groundwater anomalies, which were observed in cataclastic rocks crossing the underground Gran Sasso National Laboratory, can be used as a possible strain meter in domains where continental lithosphere is subducted. Measurements evidence clear, sharp anomalies from July, 2008 to the end of March, 2009, related to a preparation phase of the seismic swarm, which occurred near L'Aquila, Italy, from October, 2008 to April, 2009. On April 6th, 2009 an earthquake (Mw = 6.3) occurred at 01:33 UT in the same area, with normal faulting on a NW–SE oriented structure about 15 km long, dipping toward SW. In the framework of the geophysical and geochemical models of the area, these measurements indicate that uranium may be used as a possible strain meter in extensional tectonic settings similar to those where the L'Aquila earthquake occurred.