Very slightly anomalous leakage of $\text{CO}_2$, $\text{CH}_4$, and radon along the main activated faults of the strong L’Aquila earthquake (Magnitude 6.3, Italy).

Implications for risk assessment monitoring tools & public acceptance of $\text{CO}_2$ and $\text{CH}_4$ underground storage.

### Abstract

The 2008-2010 L’Aquila seismic sequence is still slightly occurring along the central Apenninic Belt (August 2010), spanning more than one year period. After the main-shock (Mw 6.3), occurred on April 6th at 1:32 (UTC), INGV geochronal group started to survey the seismically activated area. We sampled above 1000 soil gas points and flux measurements and around 80 groundwater points (springs and wells), to understand geometry and behaviour of the activated fault segments. In addition, we sampled groundwaters in Colli-Camerata area (30 km NW from the seismically activated area) where a deep natural $\text{CO}_2$ reservoir is present (mesothermal $\text{CO}_2$ from carbonate diapirism), to study leakage pattern and fluids (CO$_2$, $\text{CH}_4$, Radon and other geos as He, N$_2$, H$_2$, O$_2$ etc...).

Results of this work highlighted that geophysical measurements on sites are very powerful to discriminate the activated seismogenic segments on surface, their jointing belt, as well as co-seismic depo-center of deformation. Our geophysical method consisted to be strategic also in presence of earthquakes of magnitude around 6.0 and we wish to use these methods in $\text{CO}_2$ analogues/$\text{CO}_2$ reservoir studies abroad. Moreover, geochemical anomalies were not caused by catastrophic human faults. Investigating these $\text{CO}_2$ gases can be widely utilized industrially (160 km deep) without dangerous leakage. Therefore, these results can be very useful for the $\text{CO}_2$-CH$_4$ -periodic carbon storage public acceptance, if necessary (towards, or not) taking geos data strictly from underground stored activated faults.

### Results

1. **Geochemical data of $\text{CO}_2$ and $\text{CH}_4$ flux and soil gas measurements have been collected and discussed with respect to: a) geochemical characteristics of soils b) tectonics of the area...**

2. **The used experimental methods could be exploited along other dangerous "silent" faults, "$\text{CO}_2$ analogues" or "$\text{CO}_2$ injection test sites", adding information where geo-structural expressions of active faults at surface are hidden.**

3. **The main-shock (Mw 6.3) occurred on April 6th at 1:32 (UTC), causing about 300 historical buildings and 1500 injured people.**

4. **Table 1 shows the maximum and minimum values of fluxes and concentrations of geogas species measured in...**

5. **The results of this work highlighted that geochemical measurements are very powerful to discriminate the activated seismogenic segments on surface, their jointing belt, as well as co-seismic depo-center of deformation.**

6. **Geochemical methods have been demonstrated to be strategic also in presence of earthquakes of magnitude around 6.0 and we wish to use these methods in $\text{CO}_2$ analogues/$\text{CO}_2$ reservoir studies abroad. Moreover, geochemical anomalies were not caused by catastrophic human...**

### Discussion and conclusions

Geochemical data of $\text{CO}_2$, $\text{CH}_4$, and radon along the main activated faults of the strong L’Aquila earthquake (Magnitude 6.3, Italy).

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### Reference
