Carbon degassing through karst hydrosystems of Greece

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Estimation of CO_2 degassing from active tectonic structures and regional hydrothermal systems is essential for the quantification of present-day Earth degassing [Frondini et al., 2019 and references therein]. Due to the high solubility of CO_2 in water, great amounts of deep inorganic carbon can be dissolved, transported, and released from regional aquifers. By applying a mass-balance approach [Chiodini et al., 2000], different sources of the dissolved CO_2 can be discriminated. The main source of degassing in Greece is concentrated in hydrothermal and volcanic areas. However, deep CO_2 from active tectonic areas has not yet been quantified. A key point of this research is to investigate the possible deep CO_2 degassing through the big karst aquifers of Greece. From May 2016, 156 karst springs were sampled along the greatest part of the Hellenic region. To discriminate the different carbon sources, we analyzed the chemical and isotopic composition of total dissolved inorganic carbon (TDIC). Results yield TDIC values from 1.89 to 21.7 mmol/l and $\delta^{13}C_{TDIC}$ from -16.61 to -0.91 ‰. On this basis, karst springs are clustered into two groups: (a) low TDIC and $\delta^{13}C_{TDIC}$ values and (b) intermediate TDIC and $\delta^{13}C_{TDIC}$ values. The carbon of the first group derives from organic source and dissolution of carbonates; whilst the second group shows a possible carbon input from deep source. This geogenic carbon is mostly related to high heat flux areas, often near active or recent (Quaternary) volcanic systems.

References

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