Preliminary study on geogenic degassing through the big karstic aquifers of Greece

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Non-volcanic degassing contributes to the C-cycle by providing on a global scale a significant amount of CO_2 emitted through diffuse earth degassing processes (Kerrick et al., 1995). Due to the elevated solubility of the CO_2 in water, in the areas where high CO_2 fluxes directly affect regional aquifers, most of it can be dissolved, transported and released by groundwaters. Therefore, quantification of this contribution to the atmosphere has a substantial implication for modeling the global carbon cycle. According to Chiodini et al. (2000), total dissolved inorganic carbon (TDIC) concentrations and $\delta^{13}C_{TDIC}$ values of groundwaters are useful tools to both quantify the geogenic degassing and distinguish the different carbon sources. This approach was proved to be valid for central Italy and can possibly work for continental Greece; due to similar geodynamic history. Greece is considered one of the most geodynamically active regions and is characterized by intense geogenic degassing. The main source of degassing in the Hellenic area is concentrated on hydrothermal and volcanic environments (Daskalopoulou et al., 2019), however, the impact of geogenic CO_2 released by tectonically active areas shouldn't be disregarded. Aim of this work is to quantify the CO_2degassing through aquifers hosted in the carbonate successions in the Hellenic region.

95 karst, thermal and cold waters were collected in the northern and central part of Greece with some of which being characterized by bubbling of CO_2-rich gases. Results show that karst waters have a typical Ca-HCO_3 composition. Thermal and cold waters show two different compositions: some samples are characterized by Ca-HCO_3 composition suggesting the presence of a carbonate basement, whilst others have a prevailing Na-HCO_3 composition. On the basis of TDIC concentrations and $\delta^{13}C_{TDIC}$ values, the springs are divided into two groups. The first group includes karst waters and some of thermal waters and is characterized by low TDIC concentrations and negative $\delta^{13}C_{TDIC}$ values. This group shows no evidence of deep CO_2 contributions, whereas the carbon of these waters derives from dissolution of carbonate minerals by organic derived CO_2. Remaining samples belong to the second group and present intermediate to high TDIC concentrations and $\delta^{13}C_{TDIC}$ values, indicating a possible input of inorganic CO_2. Some of these springs are characterized by gas bubbling at discharge, suggesting an extensive degassing.

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