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Gas Geochemistry of Ground Water in the Ilan Plain, Northeast Taiwan

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Abstract

Ilan Plain is located at the northeast Taiwan and has been tectonically spreading due to the westward back-arc rifting of the Okinawa Trough. In previous studies, geological survey, geophysical research, and stratigraphic correlation were conducted to rebuild the aquifer systems in the Ilan Plain. However, few gas geochemical data of ground water are available. In this study, it is first time to systematically analyze the gas geochemistry of ground water from 37 wells to recognize the gas sources/components in the Ilan Plain. Water samples can be classified as three main groups, most samples are classified as sulfate and bicarbonate groups, few samples belong to chloride group due to the contamination of sea water. Based on the major dissolved gases compositions, the ground water samples can be divided into two groups, i.e. CH4-enriched group and N2 enriched group. Ten out of total 37 wells show CH4-enriched affinities with CH4 proportions of 30-50%, in which three wells exhibit very high CH4 contents, up to 70-90%. Two of the CH4-enriched wells are located in the northwest, and the remains are in the southeast of Ilan Plain. The dissolved radon concentrations are in the range of 800-10000 Bq/m3 in the studied area. It is interesting to note that the radon actives are higher in the west mountain areas and gradually decreasing toward the east coast areas. Meanwhile, the oxidation-reduction potential and dissolved oxygen data show positive correlations with the radon actives. It implies that the recharge of the ground water in the Ilan Plain may be from the Hsuehshan Range in west. Furthermore, elevated helium isotopic results suggest that mantle component may play an important role for the gas sources in the southeast and center of the Ilan Plain, where may be corresponding to the extensional structure or the suspected faults in the Ilan Plain.

Keyword: ground water, dissolved gases, radon actives, helium isotopes, Ilan Plain