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Two regional metamorphic belts in assemblages of subduction-related orogens in Wales-England, U.K.

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Cryogenian-Devonian orogenic belt in the British Isles consists of accretionary complex, arc-related volcano-plutonic belt with regional metamorphic belt that have formed in relation to an oceanic-plate subduction in the Iapetus Ocean. This subduction-related orogeny plays an important role in understanding of the geotectonic history of the pre- Ordovician orogenic belt in Wales-England.

Wales-England consists of ca. 677-450 Ma calc-alkaline volcano-plutonic complexes and ca. 608-539 Ma accretionary complexes, suggesting that the subduction-related orogeny continued for ca. 200 My. Four metamorphic units related to this orogeny exist in northwest Wales. However, their metamorphic ages, except for one unit, have not been constrained yet. Therefore, we performed U-Pb dating on detrital zircon in psammitic schists and K-Ar dating on phengite in pelitic/mafic schists from the four metamorphic units in order to constrain their sedimentary and metamorphic ages, respectively.

The K-Ar analysis was carried out at Okayama University of Science, and the U-Pb ratio was determined with LA-ICP-MS at the Kyoto University. Three metamorphic units give K-Ar ages of 578-545 Ma, which overlaps the Ar-Ar age of 560-550 Ma reported by a previous work. During this metamorphic event, accretionary complex and calc-alkaline volcano-plutonic complexes also had been formed. On the other hands, one metamorphic unit, called as New Harbour Group, exhibits a younger K-Ar age of 474±9 Ma. The youngest U-Pb age of detrital zircons from the New Harbour Group is 520±31 Ma. These ages suggest that the New Harbour Group formed in the regional metamorphic event different from that of the above three units. Calc-alkaline igneous rocks of ca. 480-450 Ma exist in Wales-England, which coincide with the second metamorphic event. Therefore, we conclude that at least two regional metamorphic events occurred in the geotectonic history of Wales-England.

Keywords: British Isles, Subduction-related orogeny, Regional metamorphic belt, K-Ar phengite ages