

U–Pb zircon geochronology on high-grade metamorphic rocks from the Higo metamorphic Belt in central Kyushu, Japan

*Vuong Thi Sinh Bui¹, Yasuhito Osanai², Nobuhiko Nakano², Tatsuro Adachi²

1. Graduate school of Integrated Sciences for Global Society, Kyushu University, 2. Division of Earth Sciences, Faculty of Social and Cultural Studies, Kyushu University

The Higo metamorphic Belt in west-central Kyushu, southwest Japan is an imbricated crustal section in which a sequence of metamorphic rocks with increasing metamorphic grade from northern (greenschist-facies) to southern part (granulite-facies) is exposed (Osanai et al., 1998). Five metamorphic zones have been defined by mineral assemblages of metapelites in this belt: zone A by Chl+Ms, zone B by Bt+Ms+And, zone C by Kfs+Sil+Bt, zone D by Grt+Crd+Bt, zone E by Opx (Obata et al., 1994). Additionally, Osanai et al. (2006) proposed the new zone as zone F on the basis of the presence of Spr granulite. This study reports the U-Pb zircon geochronological characteristics of high-grade rocks in the Higo metamorphic Belt to access the metamorphic conditions as well as tectonic correlations to other terranes in Japan. Most of pelitic gneisses and associated granitoids in this study were collected from zone D. The metapelites are mainly composed of plagioclase, quartz, biotite, garnet, cordierite, and accessory amount of sillimanite, spinel, zircon, monazite, apatite, graphite and opaque mineral. The mineral assemblage under the peak metamorphism is represented by garnet+cordierite+biotite+plagioclase+quartz. The garnet porphyroblasts show the resorption texture that replaced by secondary biotite and/or cordierite. Cordierite also occurs as anhedral porphyroblasts with or without inclusions of biotite, plagioclase, spinel, sillimanite, quartz, apatite. Sillimanite is included in cordierite, garnet and quartz. Dark-green spinel is subhedral in shape and occurs only as inclusions associated with sillimanite in cordierite porphyroblast. The distribution and textural features of late-forming biotite, cordierite and prehnite indicate that these pelitic gneisses are highly affected by later hydration.

Zircons exhibit internal structures of bright oscillatory or sector zoning cores with dark faint to unzoned rims, and dark faint or patchy zoned cores with bright homogenous rims. U-Pb zircon dating by laser ablation-inductively coupled plasma-mass spectrometry provided *ca.* 105-125 Ma with low Th/U ratios from overgrowth rims and other older age dates of 182-284, 350-450, 900-1000, 1800 and 2000 Ma with various Th/U ratios from the relic cores. The internal textures and Th/U ratios indicate the former as the metamorphic ages and the latter as detrital ages. The associated igneous rocks cutting the foliation yielded the zircon U-Pb ages of *ca.* 105-110 Ma. It suggests these igneous rocks intruded into host metamorphic rocks after peak metamorphism at *ca.* 105-110 Ma. The maximum depositional age of protolith sediments was deduced at *ca.* 150 Ma on the basis of the youngest detrital zircon date. The detrital age distributions possibly indicated that the zircon provenance for Higo metamorphic rocks might be derived from the North China craton (Suga et al., 2017) or South China craton (Isozaki et al., 2010; Fujisaki et al., 2014). The similarities, including the Cretaceous age high-temperature with low to medium pressure metamorphism and the presence of the Proterozoic to Triassic provenance of sediments from zircon dates, suppose that the Higo metamorphic Belt may correlate with Ryoke Belt further to the east (Dunkley et al., 2008; Herzig et al., 1998) as well as the Abukuma Belt to the north (Dunkley et al., 2008; Hiroi et al., 1998) and South Kitakami Belt (Dunkley et al., 2008; Sakashima et al., 2003). In addition, the detrital zircon ages of 235-250, 282, 350-450 and 1844 Ma are consistent with those from psammitic schists in the Sangun Belt (Chizu belt, Suga et al., 2017; Suo belt, Tsutsumi et al., 2003), suggesting that the protolith of the Higo high-T metamorphic rocks is possibly equivalent to that of the Sangun high-P metamorphic rocks.

Keywords: Zircon, Detrital zircon ages, Higo metamorphic Belts