

## Detrital zircon geochronology of Early Mesozoic evolution of a northeastern part of the Pangea Supercontinent

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**Introduction** In the Paleo-Mesozoic succession of the South Kitakami Belt in NE Japan, the detrital-zircon-age-distribution pattern on a probability density plot changed from multimodal type II (see below for pattern names; Silurian-Carboniferous) through unimodal (Permian-Lower Jurassic) to bimodal (Middle Jurassic-Lower Cretaceous). Okawa *et al.* (2013 *Mem. FPDM*) explained these transition by the Middle Jurassic collision of Gondwana-derived (multimodal) oceanic island arc (unimodal) with Asia (bimodal). This study reviews similar temporal transition in geologic belts of Japan and Mongolia and discusses Early Mesozoic assembly of a northeastern part of the Pangea Supercontinent.

**Method** We measured the LA-ICP-MS U-Pb age of detrital zircons at the Earthquake Research Institute of the University of Tokyo and the Graduate School of Environmental Studies of Nagoya University.

### Age-distribution patterns

The unimodal type consists of a single peak at the age of deposition, indicating an environment along the active margin of an oceanic island arc.

Multimodal type I consists of large peaks at the age of deposition, 500 Ma, and 900 Ma, indicating an environment along a margin of the **Khanka-Jiamusi Block**, which was likely a part of Gondwana and contains 500-Ma and 900-Ma igneous and metamorphic rocks.

Multimodal type II consists of a large peak at the age of deposition and small Neo- to Paleoproterozoic peaks, indicating an environment along a margin of Gondwana.

The bimodal type consists of large peaks at the age of deposition and Paleoproterozoic, indicating an environment along a margin of the **North China Block**.

### Temporal and special change of age-distribution patterns

**North-central Mongolia:** The pattern in a downward-younging accretionary complex (AC) changes from multimodal type I (Cambrian-Silurian) to unimodal (Devonian-Early Triassic; Ueda *et al.*, 2015 *JpGU*). North-central Mongolia has widely been cut by Triassic-Jurassic granitoids.

**Hida Gaien Belt:** The pattern changes from unimodal (Middle Permian-Lower Triassic) to multimodal type I (Middle Triassic; Kawagoe *et al.*, 2013 *Mem. FPDM*).

**Renge Belt:** The pattern changes from multimodal type II (Devonian: depositional age) to bimodal (Lower Jurassic cover).

**Akiyoshi Belt:** The pattern changes from unimodal (Permian AC) to bimodal or multimodal type I (Upper Triassic cover).

**Suo Belt:** The pattern of downward-younging metamorphic rocks changes from unimodal (Permian) to bimodal (Triassic-Jurassic; Obara *et al.*, 2012 *JpGU*).

**Ultra Tamba and Tamba belts:** The pattern of a downward-younging AC changes from mostly unimodal (Permian) to bimodal or multimodal type I (Triassic-Jurassic).

**Northern Chichibu Belt:** The pattern of a downward-younging AC changes from unimodal or multimodal type I (Permian) to bimodal (Jurassic; Morita *et al.*, 2012 *JpGU*; Yokogawa *et al.*, 2013 *JpGU*).

**Discussion** The above data set suggests that the Middle Paleozoic of Japan and Mongolia (Central Asian Orogenic Belt: CAOB) was mostly formed along a margin of Gondwana. The paleobiogeographic analysis of Williams *et al.* (2014 *Isl. Arc*) indicates close affinities between Ordovician-Devonian strata of Japan and CAOB. Because Late Paleozoic igneous activity in East Asia is only recorded in CAOB and Hainan Island-Malay Peninsula region (Ikeda *et al.*, 2015 *JpGU*), we suggest that the Late Paleozoic AC's of Japan and Mongolia formed oceanic island arc-trench systems together with some "island-arc terranes" in the CAOB. Triassic-Jurassic times are characterized by (1) introduction of Precambrian zircons to the sandstones in Japan and (2) wide occurrence of igneous rocks in the North and South China blocks (Ikeda *et al.*, 2015 *JpGU*). These facts suggest the successive collision of the above oceanic island arcs with supercontinent Pangea, including the North and South China blocks. Further study will clarify the timing of introduction of Precambrian zircons to each geologic belt and collision of each oceanic island arc.

Keywords: U-Pb age, detrital zircon, LA-ICP-MS, accretionary complex, Japan, CAOB