

## Folding of Kitakami granite and exhumation associated with regional-scale flexural slip folding and ridge subduction

Soichi Osozawa<sup>1\*</sup>, Chin-Ho Tsai<sup>2</sup>, John Wakabayashi<sup>3</sup>

<sup>1</sup>Department of Earth Sciences, Graduate School of Science, Tohoku University, <sup>2</sup>Petrology and GeoMicroanalysis Lab, College of Environmental Studies, National Dong Hwa University, <sup>3</sup>Department of Earth and Environmental Sciences, California State University, Fresno, USA

The following abstract after Osozawa, Tsai, Wakabayashi, 2012, appeared in Journal of Asian Earth Sciences, 59, 85-98.

The early Cretaceous granitic plutons intrude the Kitakami zone, northeast Japan, whose southern and northern regions consist of forearc basin and accretionary complex rocks, respectively. All country rock of the Kitakami zone exhibit prominent pressure-solution cleavage and associated folds formed during shortening with a small component of sinistral shear, whereas most plutons show only igneous textures. The Kesengawa granite and some other plutons, however, have foliations that cut the pluton boundaries and are continuous with those observed in surrounding sedimentary rocks. We document a tectonic fold with axial planar foliation in part of the Kesengawa granite. The metamorphic minerals associated with the contact aureole and country rocks of the Kesengawa and other deformed plutons indicate an increase in metamorphic grade toward the pluton showing that deformation of the pluton and country rock took place as the plutons cooled. The Kesengawa pluton and country rocks of the southern Kitakami zone are deformed into regional scale upright folds with parasitic asymmetric folds that verge toward regional anticlinal axes whereas regional scale folds in the northern Kitakami zone are overturned and verge to the east. The Kitakami basement is not bounded by normal or reverse faults, so the style of regional exhumation does not resemble the upright or inclined extrusion noted in other regions, nor is the exhumation associated with extensional doming. Instead, the vergence of parasitic folds toward the regional fold hinges indicates flexural slip deformation at least in the late stages of exhumation and exhumation occurred in the cores of regional scale anticlines. The regional shortening of accretionary prism, forearc basin, and older forearc basement was associated with intrusion of adakitic plutons that thermally weakened the forearc basin and enhanced the deformation and exhumation. The adakitic magmatism and forearc shortening resulted from subduction of the buoyant Izanagi-Kula ridge, a regional event known as the Oshima orogeny.

Keywords: Kitakami granitic pluton, aplite marker, asymmetric fold, axial planar foliation, biotite, aureole, flexural slip anticline, tilted unconformity, extrusion, exhumation, adakitic magmatism, ridge subduction