

CHAPTER VII

CONCLUSION AND RECOMMENDATION

7.1 Conclusion

1. Devonian and Carboniferous sandstones in the Southern Kitakami area are composed of litharenite, feldspathic litharenite, and lithic arkose whereas arkose is the dominant sandstone in Permian to Cretaceous Periods.

2. Detrital chromian spinels from Southern Kitakami area were discovered in sandstones and siltstones of Devonian Nakazato Formation, Carboniferous Hikoroichi and Odaira Formations, and Triassic Osawa Formation.

3. Chromian spinels were also detected in basalt of Carboniferous Karosawa Formation.

4. Petrography and geochemistry of these (detrital) chromian spinels indicate both mafic (basalt) and ultramafic (peridotite) provenances.

5. $Cr/(Cr+Al)$ of (detrital) chromian spinels in the study area are more similar to those of fore-arc setting than those of Japan arc (back-arc) one.

6. Plots of spinels from clastic rocks in diagrams between $Cr/(Cr+Al)$ and TiO_2 , and between $Fe^{3+}/(Cr+Al+Fe^{3+})$ and TiO_2 indicate the island arc basalt for the provenance of detrital minerals.

7. Plots of spinels from basalt in $\text{Cr}/(\text{Cr}+\text{Al})$ vs. TiO_2 , and $\text{Fe}^{3+}/(\text{Cr}+\text{Al}+\text{Fe}^{3+})$ vs. TiO_2 diagrams also give the island arc setting of the rock.

8. Fe^{3+} -Cr-Al triangular diagram and diagram between $\text{Cr}/(\text{Cr}+\text{Al})$ and $\text{Mg}/(\text{Mg}+\text{Fe}^{2+})$ suggest the Alpine-type peridotites for the host rocks of detrital chromian spinels from the Devonian and Carboniferous clastic rocks in the study area.

9. Detrital chromian spinel plots of this study in diagram between $\text{Cr}/(\text{Cr}+\text{Al})$ and $\text{Mg}/(\text{Mg}+\text{Fe}^{2+})$ fit well with the model of Haggerty (1991) and also the model of Cookenboo (1997) indicating the island arc provenance.

10. Miyamori and Hayachine ultramafic complexes may be the provenances of detrital chromian spinels in Devonian and Carboniferous clastic rocks of the Southern Kitakami area.

11. Southern Kitakami area was a segment of Yangtze plate drifting from Australia. It may have been formed as multiple subduction since at least Silurian before colliding with Sino-Korea during Triassic.

7.2 Recommendation

As a key mineral for tectonics, detrital chromian spinel should be investigated further in detail from Permian and Triassic clastic rocks within the Southern Kitakami area. Chemistry of the chromian spinels from these two periods is recommended to study. Results of the study will help the interpretation of tectonic setting of the area more precisely.