Abstract Although it is often said that typical ophiolites show a definite pseudostratigraphic sequence of rocks and occur in ancient subduction zones, most ophiolites showing a typical sequence occur outside subduction zones, and most ophiolites in subduction zones do not show a regular sequence. So, in this paper, large-scale mafic and ultramafic rock associations in subduction zones and other parts of orogenic belts are called ophiolites, regardless of the presence or absence of a regular sequence. Ophiolites in this sense occur not only in ancient subduction zones but also in ancient island arcs.

Subduction-zone ophiolites and island-arc ophiolites occur in two parallel belts in Hokkaido and are associated with the Kamuikotan high-pressure and the Hidaka low-pressure metamorphic belt, respectively. They were emplaced originally in the subduction zone and the island arc, respectively, formed along an early Tertiary plate boundary.

Three belts of ophiolites occur in northern Greece. Two of them may be regarded as representing subduction-zone and island-arc ophiolites that were originally emplaced along a Mesozoic plate boundary.
Island-arc ophiolites form in immature arcs as well as in arcs transitional between the immature and mature stages but do not form in typical mature arcs. Not only in subduction-zone ophiolites but also in island-arc ophiolites, a majority of peridotites may be fragments of the upper mantle pushed up in the solid state. Mafic rocks in subduction-zone ophiolites differ in chemical composition from those in island-arc ophiolites.

The ophiolites in subduction zones, in obduction zones and in island arcs represent three major classes in a classification of ophiolites according to the mode and place of their emplacement. Each of the three probably includes rocks originally created in two or more different tectonic settings.

1 INTRODUCTION

Many authors have claimed recently that the ophiolites are fragments of oceanic crust created in midoceanic ridges (e.g., Dietz, 1963; Moores and Vine, 1971; Gass and Smewing, 1973). This view was opposed by Miyashiro (1973c; 1975a, b), who claimed that ophiolites are created not only in midoceanic ridges but also in some other tectonic settings including island arcs in particular, and that ophiolites of different origins show different chemical characteristics. On the basis of chemical evidence the present author suggests that the Troodos complex in Cyprus and the Vourinos complex in Greece are island-arc ophiolites. Unfortunately, however, geologic relations of the Cypriote and Greek ophiolites are ambiguous. Therefore, it is important that a belt of island-arc ophiolites whose geologic relations are clear, occur in Hokkaido, Japan. The origin of island-arc ophiolites is closely related to the evolution of island arcs. Low-pressure regional metamorphism commonly occurs in island-arc zones. The island-arc ophiolites in Hokkaido are associated with a low-pressure metamorphic belt.

Convergent plate boundaries usually have an island arc on one side and a subduction zone on the other. It is well known that ophiolites, irrespective of their origin, occur in subduction zones such as the Franciscan terrane in California and the Sanbagawa belt in Japan. As high-pressure (glaucophanitic) metamorphism commonly takes place in subduction zones, ophiolites in such zones are commonly associated with high-pressure metamorphic belts. This is the case with Hokkaido.

It appears to me that the subduction-zone ophiolites and the island-arc ophiolites together with obducted ophiolites represent three major categories of ophiolites on earth. The nature of ophiolite belts in Greece and the problem of the chemical characteristics of ophiolites will be discussed from this viewpoint.