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Present-day chaotic formations around the Japanese trenches: Comparison to the on land examples from the Shimanto and Miura-Boso, and from the Franciscan, Mineoka and Ankara

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Four different types of chaotic formations were recognized by the submersible observation around the Japanese trenches, including the Nankai and Sagami troughs, Boso triple junction, Japan trench, and Izu-Bonin arc, and each type is summarized and discussed in view of comparison to the on land examples, such as from the Franciscan, Shimanto and Miura-Boso belts in the circum Pacifc margins, and the Ankara. The submarine geologies are present actual examples to give us a critical key to understanding the formation processes and emplacement mechanisms for the so-called mélange bodies, either sedimentary, tectonic or diapiric.

Some are made of alternated beds of sandstone and mudstone that show broken or block-in-matrix fashion, in most cases in muddy matrix. These are commonly developed on the trench landward slope toe of the Nankai and Sagami troughs and Boso triple junction area as well as the Japan trench slope. One type is from the landward slope, but another type is from the oceanward slopes. The former type is in places calcareous cemented, probably caused by hydraulic fracturing by high pore pressure along the thrust fault and oxidized methane-made carbonate precipitation. They are seen on the feet of the thrust-dominated slope and to be compared to the so-called sedimentary mélanges due to the gravitational sliding, which occur because of tectonically induced steep slopes. Most of such thrusts are related to large subduction type earthquakes, and await for further critical consideration on to the relation to the asperity problem. Some of large scale gravitational collapses may be related to the seamount or ridge subduction to the trench, both in case of accretionary and non-accretionary type margins, the former is for the examples from the Nankai and Sagami troughs and the Boso triple junction, latter for the Japan trench. In all cases on land and under the sea in the trench landward slope, some calcareous breccias are associated with methane-fluid supported animals within injection or diapiric intrusion. On the other hand, in the Nankai prism and the on land Miura-Boso Peninsulas, many examples of sandy matrix supported mudstone breccia are a result of liquefaction and injection of such coarse-grained clastic fragments during the earthquake shake and subsequent landsliding. Those deposits are faulted, folded and injected in various stages, some before accretionary prism incorporation, some after. Some are of sedimentary origin by gravitational process, others tectonic or diapiric, but in most cases thrust duplexes and complex folds are common.

The third and fourth are mélanges including igneous, metamorphic and/or ophiolitic rock blocks. They look similar to the on land examples in the Franciscan, Mineoka (Boso, central Japan) and the Ankara, and used to be attributable to the diapiric origin, as those that have been already known as serpenitine mud volcanoes with metamorphic block at the foot of the Izu-Bonin-Mariana forearc. However, such analogue need careful consideration how the rock association would form to the final emplacement. As the fourth new type, we found an example of deep (1.5 to 2 GPa) metamorphic rock blocks of eclogitic conditions from the fault line in the schistose serpentinite (antigorite-dominated) in the middle part of the Izu arc near the Ohmachi seamount. This implies for the incorporation and exhumation of igneous and metamorphic rocks in the island arc setting, and may give an adequate analogue to the specific mélange formation of the Franciscan, Mineoka and Ankara.