T234-004 **Room: Ocean B** **Time: May 19 10:10-10:30**

Thermal structure on the Nankai subduction fault inferred from a 3-D thermal convection model and large interplate earthquakes

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1. Introduction

The Nankai trough is a convergent plate boundary where the oceanic Philippine Sea (PHS) plate is subducting beneath the continental plate in southwest Japan. Large megathrust earthquakes have occurred repeatedly along the Nankai trough with a recurrence time of about 90 to 150 years. In this region, Hyndman et al.(1995) estimated temperature distribution on the upper surface of the PHS plate, by interpolating two investigated sections, and regarded a region whose temperature ranges from 100-150 degree C to 350-450 degree C as a seismogenic zone. However, in the following studies, detailed shape of the PHS plate and relative plate motion have been revealed, and large number of heat flow data has been accumulated. This enables us to estimate high-resolution temperature distribution on the plate interface.

From these viewpoints, we would like to propose a new temperature distribution on the Nankai subduction fault through numerical simulation, using 3-D box models. We compare the temperature distribution with coseismic slip distributions of large interplate earthquakes in the Nankai subduction zone. We also discuss the difference in maximum magnitude of interplate earthquakes between off Shikoku (about M8) and the adjacent Hyuganada region (less than M7.5).

2. Data and model

Using heat flow data obtained by BSR, heat probe, and borehole, we compared them with those calculated from temperature distribution obtained by numerical simulation. In this study we carried out calculation of temperature distribution associated with subduction of the PHS plate, by improving 'stag3d' (Tackley and Xie, 2002) . We incorporated spatio-temporal changes of past relative plate motion and formation process of the Shikoku basin inferred from anomaly of magnetic lineation into our model. Similar model is applied to the Hyuganada region. We attributed observed very low heat flow values in the southern part of the region to subduction of the Kyushu-Palau ridge, which is presumably older than the adjacent Shikoku basin.

3. Results and discussion

From the results off Shikoku and Kii Peninsula, we found that the spatial variation of temperature on the plate interface in the margin-parallel direction is explainable by spatio-temporal changes associated with cooling process of the oceanic plate. The downdip limit of the seismogenic-locked zone is determined by temperature. Maximum coseismic slipped regions associated with the 1944 Tonankai and the 1946 Nankai earthquakes are located in the thermally estimated seismogenic-locked zone on the plate interface. The seismogenic-locked zone is the narrowest off Kii Peninsula where hypocenters of the two earthquakes were located. The narrow seismogenic zone may determine the rupture initiation points for the Tonankai and the Nankai earthquakes, as was demonstrated by numerical simulation of the earthquake cycle.

From the results in the Hyuganada region, we found that the Hyuganada earthquakes may take place in a newly-proposed 'Hyuganada triangle', which is bounded by a southeastern isotherm of about 200 ºC on the plate interface, a northwestern boundary line between the upper surface of the subducting PHS plate and the continental Moho discontinuity, and a northeastern margin-normal zone with a possible barrier and/or large friction parameter L. The occurrence of interplate earthquakes in such limited area may cause earthquakes with at most M7.5 in the Hyuganada region. We also found that the seismic gap in the seaward of the Hyuganada region may be due to stable sliding arising from low temperature. The seismic gap in the southwest of off south Kyushu along the Ryukyu trench may be due to overlapping of two stable sliding regimes on the plate interface: low temperature at shallower depths and serpentinized mantle wedge at deeper depths.

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