

# Long-term evaluation of subduction zone earthquakes around the southern Kuril-Kamchatka Trench (3rd ed.)

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## Introduction

Japanese government established the Headquarters of Earthquake Research Promotion (HERP) in 1995 to promote research of earthquakes for preventing earthquake disasters. The Earthquake Research Committee (ERC) under HERP published long-term and probabilistic forecast of subduction zone earthquakes around Japan from 2000 to 2004. However, megathrust earthquakes, such as the 2011 off the Pacific coast of Tohoku Earthquake, were not taken into consideration in those evaluations. Therefore, ERC revised the long-term evaluations of subduction zone earthquakes around the Nankai Trough and the Sagami Trough were revised in 2013 and 2014, respectively. Successively, the long-term evaluation of subduction zone earthquakes around the southern part of Kuril-Kamchatka Trench (Chishima Trench) was revised in December 2017. Here we show the summary of the updated evaluation for the Chishima Trench.

## Key points of revision

The long-term evaluation of seismicity around the Chishima Trench was first published in 2003. The second edition was published in 2004, taking the occurrence of the 2003 Tokachi-oki earthquake (M8.0) opportunity. The third edition is the latest evaluation, which incorporated new insights obtained after 2004. We tried to describe the occurrence variety of large earthquakes regardless of the characteristic earthquake model. The key points of the revision are:

### 1) Evaluation of a megathrust earthquake

A megathrust earthquake, which involves a huge tsunami along the eastern shores of the main island of Hokkaido, is incorporated. Based on the paleoseismological studies at Kiritappu marsh and Mochirippu pond, the average recurrence interval and the probability of occurrence within the next 30 years are estimated to be 340 to 380 years, and 7-40%, respectively. Since the distribution of tsunami deposits in the Northern Territories has not been fully investigated, and too little has been known about earthquake disasters in Hokkaido before the modern era, the upper limit of its magnitude could not be determined. Already over 400 years have passed since the last megathrust earthquake in the 17th century; therefore, the occurrence of a megathrust earthquake may threaten. However, in fact, the recurrence interval estimated from each tsunami deposit varies. Various uncertainties would be included into both the evaluation of earthquake magnitudes and probabilities.

### 2) Evaluation of interplate large earthquakes in each region

The four regions in the previous edition were reconstituted into three regions: off Tokachi, off Nemuro, and off Shikotan and Etorofu Islands. Also evaluation for interplate earthquakes of M 8.0 or larger was also revised in each region.

## Future perspectives

We modified the evaluation of the megathrust earthquake as well as M8 interplate earthquakes around the Chishima Trench. Since only a few historical materials are available in Hokkaido, it is difficult to specify the focal region and the type of earthquakes even in the 19th century. A new probabilistic

calculation method that can reflect uncertainties are required to make more reliable evaluation. It is also required to challenge various approaches to comprehend seismic activities of this area, such as to reveal the spatial distribution of slip deficits and to find out the distribution of tsunami deposits at the Northern Territories.

Keywords: Subduction zone earthquakes, Long-term evaluation, Probability of earthquake occurrence, Kuril-Kamchatka Trench