

BREIF ILLUSTRATION ON THE SEISMIC ZONING OF THE SEA AREA OF CHINA AND ITS VICINITY

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In 1986, the book of "countermeasure of earthquake" was published. In this book, it was pointed out that the countermeasure of earthquake in sea area have not been studied and need to study this problem in future. For studying the countermeasure in sea area, we have to compile a seismic intensity zoning of the sea area of China and its vicinity. We compiled this kind of map on the basis of earthquake activity, seismotectonics, topography and geophysical prospecting in sea area. The theoretical foundations of the compilation are described as follows.

1. In sea area, where the crust belongs to oceanic type, strong earthquakes do not occur. Because it has a thin granitic layer and sea water penetrate into the layer. In the other hand, in this area moderate earthquakes may occur, which are responsible for the seismic intensity of 6—7 degree in epicenter. The center part of the South China Sea belongs to this type.

2. In the Yellow Sea there is a steep contour line having strike of N-S from the extreme of the Shandong peninsula to the mouth of the Chang-jang river. Around this line and in the west of it many of strong earthquakes with magnitudes of 6 and more occurred. We determined this Sea area as that of seismic intensity of 7—8 degree.

3. In the north part of the South China Sea, there is a seismic zone, which round the latitude of 20 degrees. The earthquakes having magnitudes of 6 and more are limited within the latitude belt and in the north from it. Therefore we identify this region with that of seismic intensity of 7—8 degree.

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4. The Sea area, where earthquakes are very strong and frequent in earlier history and the earthquake activities in the past ten and twenty years are lower than before, may be regarded as that one where the strong earthquakes having seismic intensities of 9 and more will occur in the future 50 years, such as the Sea area off the east coast of Taiwan island of China, Bashi strait, the part of the South China Sea closely neighbouring to Philippines and so on.

5. In Bohai area, seismo-tectonics and earthquake activity are the same as that in continent, this area should be identified with the seismic intensity of 8 degree.

6. In the northern Yellow Sea area, there are seismo-tectonic lines and earthquake migration lines with the strike of NE-WS, and in the Korea peninsula there only are moderate earthquake activities. We put the connecting line from the 1944 Dandong earthquake to the 1948 Weihai earthquake and its western sea area into area of seismic intensity of 7 - 8 degree.

7. According to the stereographic (stereoscopic) cross model, the intersection area of earthquake migration line with active fault is regarded as that of occurring strong earthquake for the future 50 years. Two regions in Bohai Sea and three regions in South China Sea are determined as this sort of areas on the basis of the stereographic cross model.

The stereographic cross model is divided into two cases, the first is the perpendicular stereographic cross model, the second is the parallel stereographic cross model. The latter is that a shear creep fault in the lower lithosphere pass through beneath the fault forming earthquake in the upper lithosphere and their strikes are the same. The perpendicular stereographic cross model mainly make the fault in upper lithosphere to be locked and to accumulate elastic strain energy, the parallel stereographic cross model play a part to discouple the locked fault and make the earthquake to occur. Of course no long time before earthquake occurrence the perpendicular stereographic cross model may trigger the earthquake. The combination of both the two models is named multiple stereographic cross model.

8. In Haikuo, Nan'ao, the eastern sea area off the Quanzhou Coast, and Tancheng, there were very strong earthquakes in history, but its frequency is very low. According to the reduction principle of strong earthquakes, in the above mentioned region not only do not repeat strong earthquake in original meizoseismal regions for the future 50 years, but also its vicinity regions do not occur strong earthquakes for the

future 50 years. Therefore in the above mentioned meizoseismal region of historical earthquakes and its vicinity, the seismic intensity may be determined as 7—8 degree.

The exposition mentioned above are our criteria for compiling the seismic intensity zoning map of the Sea area of China and its vicinity. For lack of data and experiences, this zoning only is a preliminary result and a reference for the development of economy and the countermeasure of earthquake in Sea area.

The seismic intensity zoning map is drawn by Feng Aimin.

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宋代建隆时期,上海尚为一荒凉的渔村,人口分布稀疏,因而低估实际地震烈度的可能性是存在的。

(3)修正的极值 I 型分布在公式上较极值 I 型分布有所改善,如百年超过概率为 0.01 (大坝或核反应堆常用基准)的极值烈度为: 9.9 (极值 I 型、矩法)、9.1 (修正的极值 I 型)。在小概率情况下,修正的极值 I 型分布有明显的优越性。

(4)参照国内外工业和民用建筑采用 50 年超过概率为 10% 的标准,根据表 3 所得结果,本文认为,取上海市设计烈度为 VII 是合理的。

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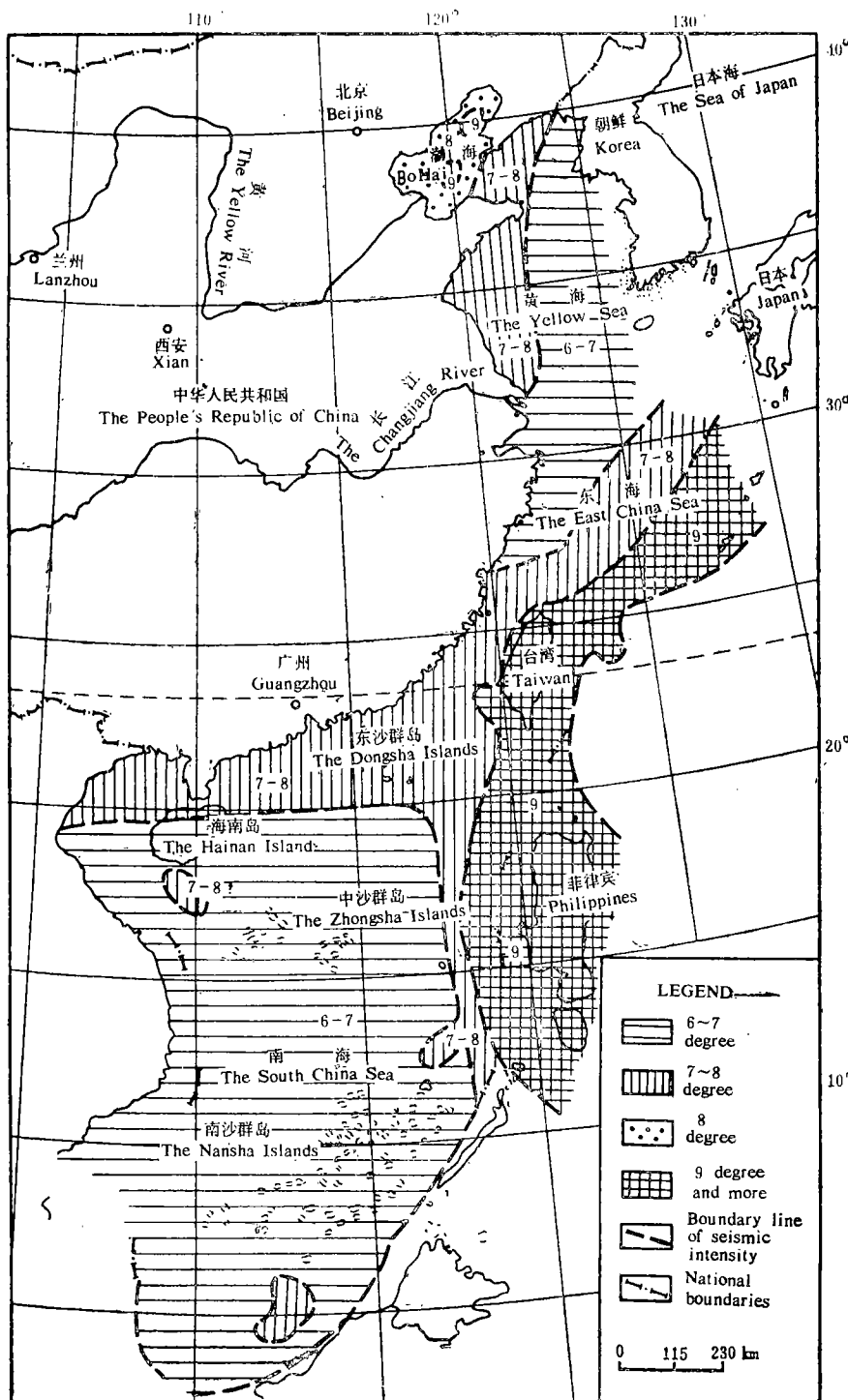
AN APPLICATION OF THE EXTREMAL VALUE THEORY TO THE SEISMIC RISK ANALYSIS OF SHANGHAI CITY

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中国海域及其相邻海域地震烈度区划图

The Map of Seismic Zoning of Sea Area of China and Its Vicinity



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中国海域及其相邻海域地震烈度区划图及简要说明*

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我国具有辽阔的海域,随着国民经济的发展,我国海域资源的开发和利用将日趋重要,海上活动愈来愈频繁。因此编制中国海域及其相邻海域地震烈度区划图(它是海域地震对策的组成部份)就成为十分必要的了。由于我国海域地震资料和地质构造资料较少,精度较差,故已往未进行过海域地震烈度区划。本文综合研究了海域地震资料、地质资料、地形资料和物探资料,提出了编图原则,初步编制了我国第一张“中国海域及其相邻海域地震烈度区划图”,以作为我国海域地震对策的参考。

现将海域烈度区划图划分原则简述于下。

1.海洋型地壳因缺失花岗岩或花岗岩层极薄,且有海水长期浸透,难以发生强震,但有发生6—7度地震的可能。我国南海中部即属此种情况。

2.海底地形在地震分区上具有重要意义。例如在山东半岛东端大致沿122°经线至钱塘江口为一南北向海底等高线带,已往6级和6级以上地震皆限于此线以西。因此该线以西为7—8度区,以东为6—7度区。

3.地震纬向活动带所显示的分区特征主要在我国南海北纬20°线附近,在此线附近和以北地区以往有6级以上地震发生,在以南地区地震活动较为平静。因此20°线附近和以北地区海域地震烈度应划为7—8度。

4.历史上属强烈而频繁的大震活动带,近一、二十年内如活动水平比以前低者,今后五十年内可能要强烈活动,因之应划为9度或更高烈度地区,如台湾岛东边海域、巴士海峡和紧邻菲律宾岛的我国海域等。

5.渤海是很浅的海,地质构造与华北类似,强震较多,烈度背景值可划为8度。

6.在北黄海地区,其西部海域地震活动水平高,其东部地震活动水平低。根据该区的地质构造以北东向为主,且1944年丹东地震和1948年威海地震震中迁移也是这个方向,故烈度分区大致以此迁移线为界,以西为7~8度区,以东为6—7度区。

7.根据立交模式的研究,本世纪6级以上地震的震中迁移线与发震构造呈垂直立交或近垂直立交的地区,今后50年内可能发生强震。在渤海有两个地区,在南海有三个地区。一般考虑在立交部位烈度比背景值提高一度。但9度以上高烈度区仍维持原来的背景值。立交模

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* 国家地震局科技监测司资助项目

式可分垂直立交和平行立交（即下岩石圈剪切蠕滑断层从上岩石圈发震断层下方同方向而过）两种情况。垂直立交主要使发震断层锁住而积累能量，当然在能量积累足够时也可触发地震；平行立交在震前出现时可使孕震区解锁而发震。凡具有上述两种立交情况者称为复式立交。

8.根据大地震的减震原则，历史上发生过大震的海南岛、南澳、泉州东海和郟城等地区，今后50年内不仅本身不会发生强震（属低频强震类型）而且在其周围的减震范围内也不会发生强震。故这些地区的海域烈度按背景烈度值考虑。

以上是我们编制中国海域及其相邻海域地震烈度区域图的基本准则。由于资料有限，再加之海域地震区划尚无经验可以借鉴，故该图仅是学术讨论，仅作中国海域开发建设和海域地震对策研究参考。该图的详细说明见另文。

本区划图由冯爱敏制图。

新书信息

由冯德益编著的《地震波理论与应用》一书，将于1988年上半年由地震出版社出版，全书约70万字。

本书系作者根据二十多年来在地震波理论与应用方面的研究成果与国内外文献调研结果综合编写而成的专业性参考书。全书内容广泛，共分15章。前九章叙述地震波理论知识、平面波理论、均匀分层介质中的地震波、非均匀分层介质中的地震波、球对称介质中的地震波、非理想弹性介质中的地震波、多相介质中的地震波、各向异性介质中的地震波、几何形状复杂的介质中的地震波；后六章为应用部分，内容分别为地震波的反演方法以及地震波在地震研究、地震勘探、地球内部构造研究、地震工程和爆炸研究中的应用。本书可供地学、石油、矿业、工程、国防等部门有关专业人员及大专院校有关专业师生和研究生参考。欲订购者请与北京市复兴路63号国家地震局地震出版社发行组联系（邮政编码100036）。