Reference data 2

About National Active Fault Zone Information Development (making of “Active Fault Map in Urban Areas”)

1. Background and purpose of making

The “1:25,000 scale Active Fault Map in Urban Areas” was developed in the wake of the Great Hanshin Earthquake of January 1995, as part of the Japanese Government’s measures for earthquake research promotion in the form of basic materials for detailed active fault location information, regional disaster prevention plans and making all kinds of hazard maps, which are essential for long-term assessment of inland earthquakes, with surveys promoted to cover urban areas and their surroundings, as major active faults are distributed in such areas and there is a particularly high probability of serious damage being caused by earthquakes in such areas.

2. Placement of measures

The need for investigation in this policy is supported by “Comprehensive earthquake Investigation and Observation Planning”, formulated by a governmental organization, the Headquarters for Earthquake Research Promotion in August 2014, and “Promotion of Earthquake and Volcano Observation and Research for the Purpose of Disaster Mitigation” proposed by the Council for Science and Technology in November 2013.

3. Definition of active faults and main content of maps

In these maps, the term “active fault” refers to topography in which there are clear observable traces of repeated activity within intervals of around thousands to tens of thousands of years during the past hundreds of thousands of years, and where it is thought to be likely that repeated activity will occur again in the future. Among these active faults, broken lines indicate sections where the position of the active fault cannot be clearly expressed due to erosion/sedimentation caused by rainfall, effects of development and other factors, and dotted lines are used to indicate sections where it is presumed that traces of activity have been concealed beneath earth and sand.

As well as the locations of active faults, these maps also show main topographies formed in the late Quaternary Period (from hundreds of thousands of years ago down to the present), such as terrace, alluvial lowlands and landslide forms, in relation to the assessment of active faults, and can also provide information useful in disaster prevention, such as ascertainment of ground conditions around active faults, and estimation of regions where there is potential for reactivation of landslides by the activity of active faults, etc.

4. Survey method and map format

This survey is conducted by the “National Active Fault Zone Information Development Investigative Commission” comprising active fault researchers from various organizations, who extract active faults by aerial photo-interpretation (see Fig. 1) while also referring to existing survey results and compile detailed locations of faults in Digital Topographic Maps 25000.

With 1:25,000 scale, the extent of information shown on a single map sheet covers in the width of a landscape-oriented map approximately 20-23km East-West (varying according to latitude) and approximately 18km South-North, and in the width of a portrait-oriented map approximately 17-19km East-West (varying according to latitude) and approximately 26km South-North. These dimensions correspond to four sheets of 1:25,000 scale maps published by GSI, and are printed on paper measuring 788 mm x 1091 mm. Topographic base maps are monochrome (gray), on top of which active faults, etc. are depicted using two colors (red and black) while a further two colors (orange and green) are used for topographical classifications, etc., bring the total number of colors to five.

5. Limits of what can be ascertained from these maps, etc.

This survey has not researched the timing of past movements of each active fault. Therefore, we cannot tell from these maps when the active faults will move next, or in other words, when the next earthquake will occur.

The regions shown in green in the Active Fault Map in Urban Areas (fans, alluvial lowlands, or filled-up land/reclaimed land) are tracts of land that have been formed in the past several thousands of years by earth and sand carried by rivers. In these regions, there remains the possibility of concealed, as-yet-unknown active faults that have not been confirmed in this survey.

Aside from this survey, other surveys (activity history surveys) are being conducted to research the timing and extent of past active fault activity in the form of boring and trench surveys, etc. conducted by the Headquarters for Earthquake Research Promotion, the National Institute of Advanced Industrial Science and Technology and universities, etc.

6. Development situations of Active Fault Maps in Urban Areas

A total of 189 maps, including the seven now being published (of which, 20 maps have a 2nd edition or a revised edition), have been supplied for the three major metropolitan areas of Japan, ordinance-designated cities, prefectural capitals and regional urban centers and their vicinities. Of these, 169 have been released as Active Fault Maps in Urban Areas (as of November 2014).

7. GSI Website Releases

The GSI website contains summaries of Active Fault Maps in Urban Areas, covered areas and map browsing, explanation for each fault zone, usage guidelines, and more.

8. Explanation of terms

・Strike-slip

Direction of displacement of relative horizontal direction of active fault. When facing the fault line, if the far side is slipping to the right, this is a right strike-slip fault; if the far side is slipping to the left, this is a left strike-slip fault. In this map, the direction of displacement is shown with red arrows.

・Dip-slip

Direction of displacement of vertical direction of active fault. Shown in this map with short lines on the relatively lower side.

・Active fold

Wavy topography due to currently ongoing crustal movement. Shown with lines linking convex or concave parts.

・Tilting

A place where the topographical surface is tilting due to currently ongoing crustal movement. Shown in this map by maximum direction of inclination.

・En echelon

When multiple faults are arranged in a pattern similar to the shape of the Japanese katakana symbol for “mi” 「ミ」 or the right side of kanji character for “cedar” (“sugi”)「杉」. The former group is called right echelon, while the latter is known as left echelon.

・Active flexure

As displacement is spread in soft stratum, active fault is expressed as flexure rather than as difference in surface level. Shows extent and direction of flexure.

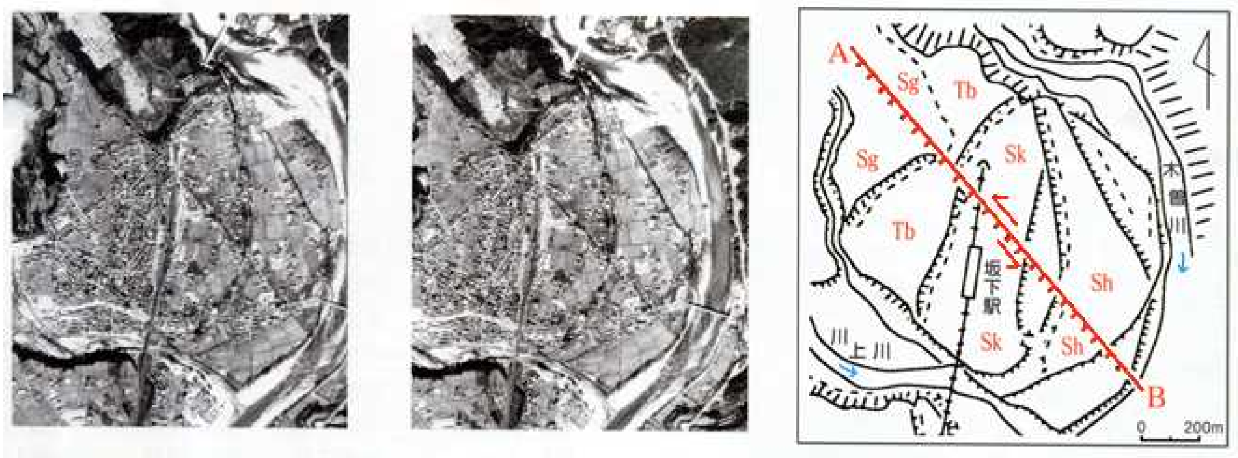
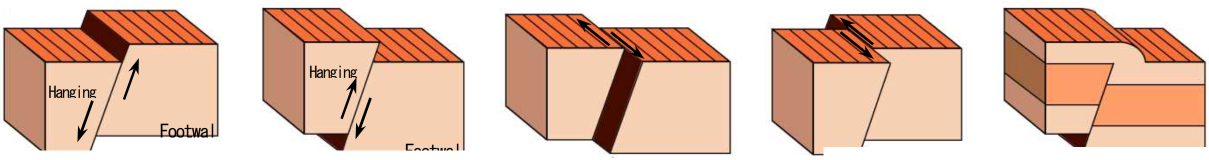


Fig. 1 Aerial photo-interpretation

Displaced terrain is searched for while using a stereoscope to provide a three-dimensional view of two aerial photographs taken in order to make a map. Displaced topography is then extracted from the displaced terrain by faults, and a judgment is made as to whether or not this is an active fault based on a consideration of the potential of future repeated activity.

The cliff running from Northwest to Southeast (A to B on the map) around the town in the center of the aerial photograph is an active fault where a difference in level has been formed. This example has been judged to be an active fault from the fact that up/down and left strike-slip displacement can be seen when cutting through the multiple bench surfaces (Sg, Tb, Sk, Sh) with different ages of formation.

Types of active fault



Dip-slip fault (normal Dip-slip fault (reverse Right strike-slip fault Left strike-slip Active flexure