About National Active Fault Zone Information Development (making of "Active Fault Map in Urban Area")

1. Background and purpose of making

The "1:25,000 scale Active Fault Map in Urban Area" 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 necessity of surveys in these measures has been placed in position by the "Basic Earthquake Survey and Observation Plan" enacted by the Japanese Government's Headquarters for Earthquake Research Promotion in August 1997, and by the July 2008 proposal from the Council for Science and Technology entitled "Promotion of Observation and Research Plans to Predict Earthquakes and Volcanic Eruptions".

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 to make 1:25,000 scale topographic maps with detailed location of active faults.

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. Development situations to date, etc.

Up until FY 2012, some 156 maps had been published covering the areas around Japan's three largest cities, ordinance-designated cities, prefectural capitals and core provincial cities (covering approximately 62,200 km^2), and the seven newly published maps bring the total number of maps to 163 (covering approximately 65,000km^2).

In addition, outlines of active faults, viewable active fault maps and detailed development ranges, etc. have been published on GSI homepage.

(http://www1.gsi.go.jp/geowww/bousai/menu.html)

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

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

The regions shown in green in the Active Fault Map in Urban Area (fans, alluvial lowland, 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.

7. 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" or the kanji character for "cedar" ("*sugi*"). The former group is called right echelon, while the latter is known as left echelon.

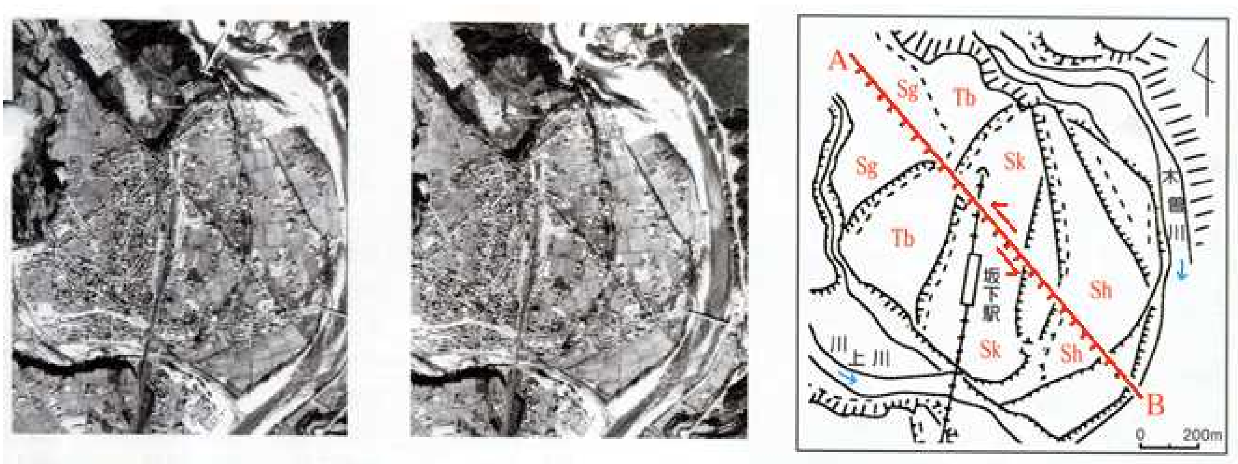
・Active flexure

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.

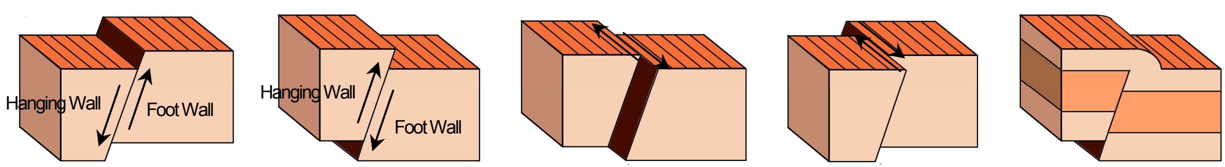
Fig. 1 Aerial photo-interpretation

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