1. Epicenters of Earthquakes

Epicentral Distribution of Shallow Earthquakes (Focal Depth = 60 km)
Epicentral Distribution of Intermediate and Deep Earthquakes (Focal Depth ≥ 61 km)

Japan is known to be an earthquake-prone country. The energy generated by earthquakes in Japan and the surrounding area is said to correspond to approximately 10% of the total earthquake energy generated in the world. Shallow earthquakes with a focal depth of 60 km or less are concentrated in the continental side of the sea bed; they occur sporadically in island areas. Particularly dense areal distribution of shallow earthquakes is seen around the Tottori-Kurashiki Trench and the Japan Trench. Major earthquakes almost always occur at a depth of less than 60 km.

The shallowness of an earthquake is, the closer to the sea tends it occurs, the deeper the epicenter is, the nearer the continent it occurs. This trend is particularly noticeable near the northern part of Japan.

2. Crustal Movement

Horizontal Strain, Maximum Shear Strain

Rocks which constitute the earth’s crust are considered to be elastic. When a force is applied to rocks deep below the earth’s elastic deformation takes place. The rocks are deformed if the elastic deformation exceeds a given limit. At the same time, strain energy stored in the rocks is released as vibrations, which is transmitted through the crust, this phenomenon is thought to be an earthquake.

As a result of breaking experiments on rocks and from crustal movement around faults associated with earthquakes, it is thought that destruction of the crust is induced if the elastic deformation exceeds approximately 1.5% of the original form. Thus, earthquake generation can be estimated by measuring the state of crust deformation with geodetic methods.

Maximum Shear Strain

Maximum shear strain is described according to the difference in the size of the principal axes of the strain ellipse. This map shows the maximum shear strain based on the results received from surveys carried out for horizontal strains. Areas where major earthquakes have occurred show greater strain due to crustal movement. Moreover, there are areas which show great strains as a result of artificial crustal movement, such as the pumping-up of ground water and thermal gas extraction of coal near mines, etc.

Vertical Movement


References:
1. Japan Meteorological Agency, Earthquake Summary
2. Geographical Survey Institute, Results of First Order Leveling
EPICENTRAL DISTRIBUTION OF INTERMEDIATE AND DEEP EARTHQUAKES (FOCAL DEPTH>61km) (1926-1987)

FOCAL DEPTH OF EARTHQUAKES
- ≤61 km
- 61 - 200 km
- 200 - 500 km
- 500 - 1000 km
- >1000 km

MAGNITUDE
- 6 - 7
- 7 - 8
- >8

Based on the records of the Japan Meteorological Agency.

Scale: 16.000,000