Topographic map

1.Topographic map – Base of the land
2.Surveying and its application
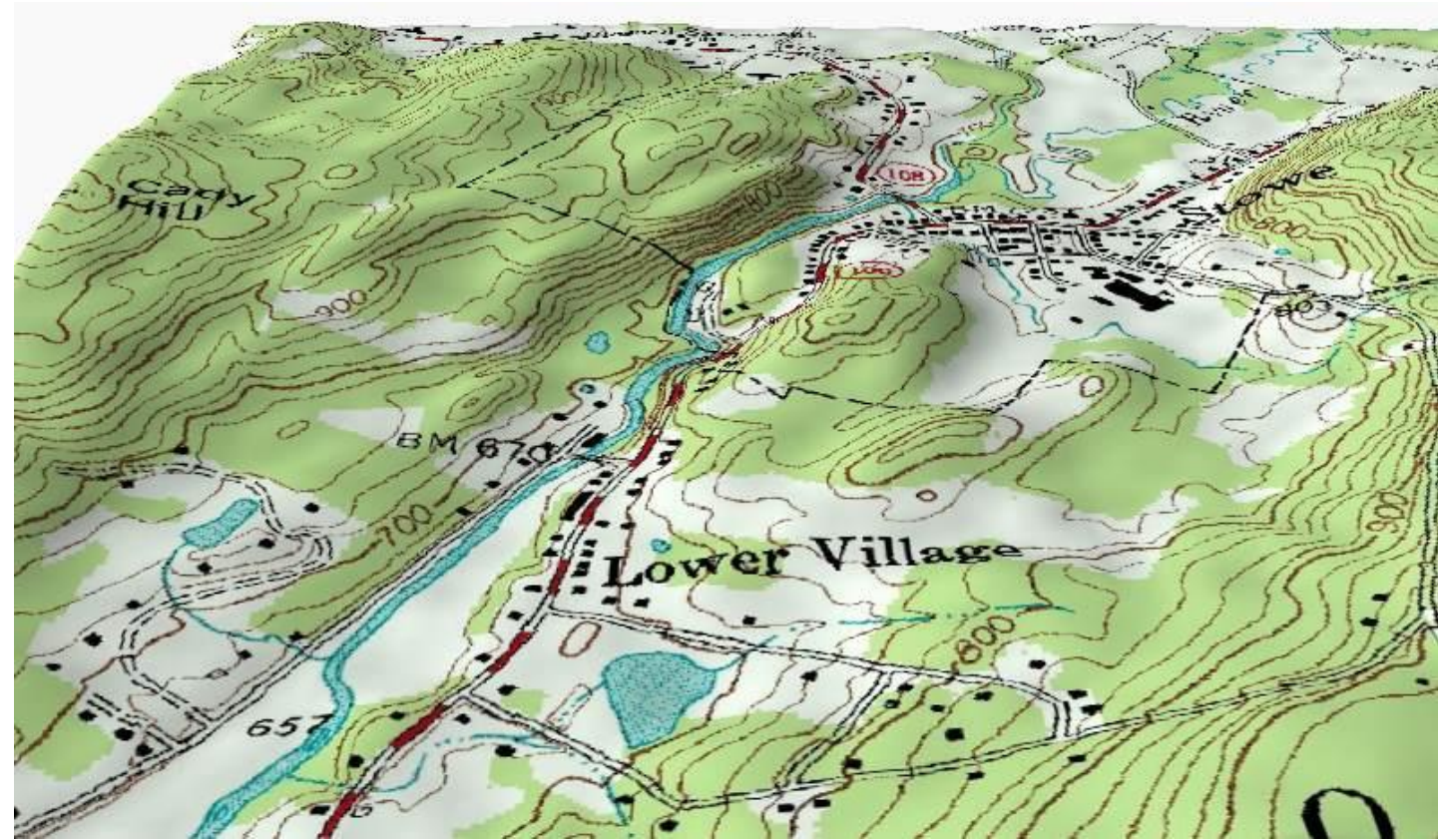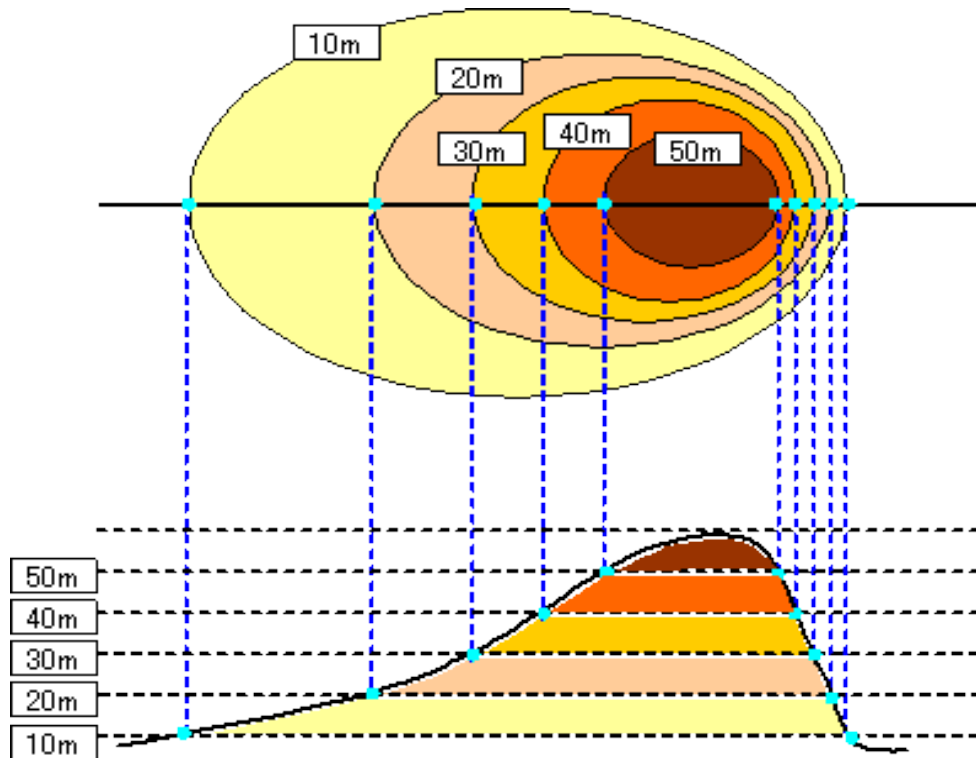3.Developing of Surveying technics

Topographical relief can be readable by contour lines in the map

Surveying is developing with a use of satellites

Changes of the earth are known by surveying
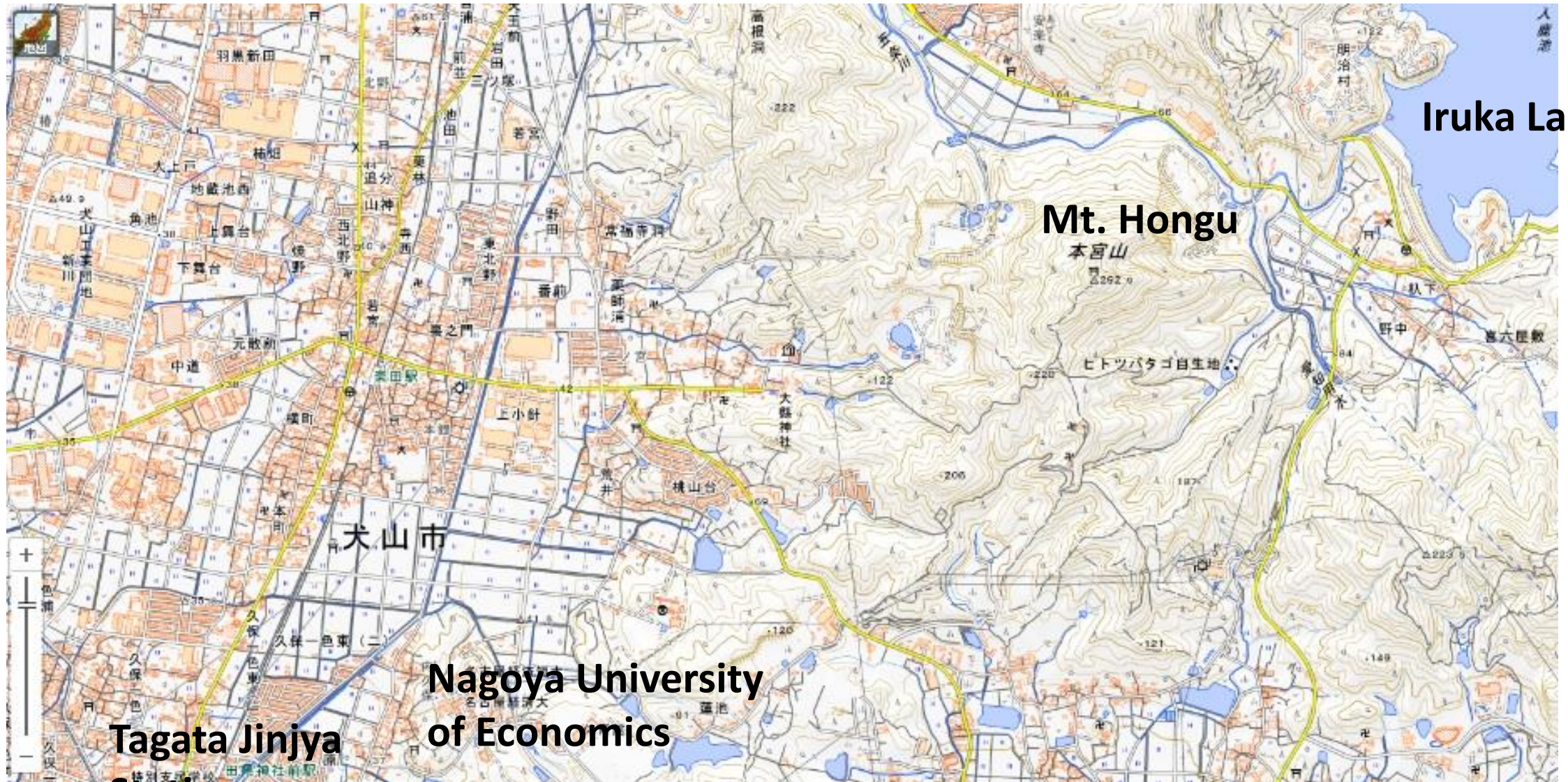
How to interpret contour lines

- Dense contour lines; Steep relief
- Sparse contour lines; Gentle relief

Map around the University

Northeast part shows dense contour lines, meaning steeper than the other parts.

Iruka Lake

Mt. Hongu

Nagoya University of Economics

Tagata Jinjya Station

300m

# History of mapping in Geospatial Information Authority of Japan

In Edo Period, Tadataka Ino (1745–1818) surveyed territory of Japan since 1800 to 1818) and completed drawing of the map. The figure is "Mt. Fuji area" of his map.

・1869: Mapping section of the government

・1888: Mapping was one mission of Japanese army.

・1924: All areas in scale 1:50,000 were completed.

・1945: Geographical Survey of Japan

・1950: Mapping in scale 1:25,000 started.

・1960: Geographical Information Authority of Japan

・2001: Under Ministry of Land, Infrastructure, Transport and Tourism

Surveying ; Latitude and Longitude

・A latitude is any imaginary line around the earth that is parallel to the equator. Such lines are given numbers ("degrees") from 0 to 90 to show their distance from the equator.

・A longitude is any imaginary line around the earth that passes through the North Pole and the South Pole. Such lines are given numbers ("degrees") from 0 to 180 to show their relative positions east or west of other such lines.
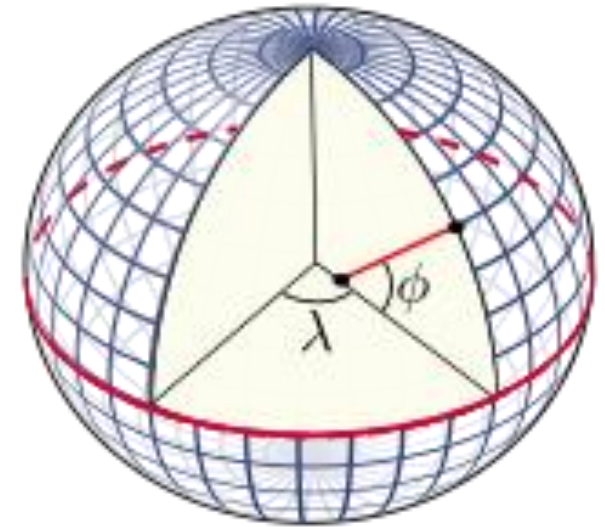
Longitude in the days of Columbus

· The latitude can be known relatively easily. For example, Angle with the polestar and the horizon.

· Columbus moved to the west and reached the United States (San Salvador Island) in 1492. Columbus thought the land was Asia, not the unknown land.

· At that time, a longitude estimate was tended to widen, so Asia in the map was extended to the east.

In the map at 15th century, American continent was not drawn.

Travel route by Columbus

Triangulation point

A triangulation station, also known as a trigonometrical point, and sometimes informally as a trig, is a fixed surveying station, used in geodetic surveying and other surveying projects in its vicinity.


Left: Triangulation point   Right: Electronic reference point

GNSS surveying

GNSS: Global Navigation Satellite Systems

Global Navigation Satellite System (GNSS) refers to a constellation of satellites providing signals from space that transmit positioning and timing data to GNSS receivers. The receivers then use this data to determine location.

ベクトル（位置関係）を求める。

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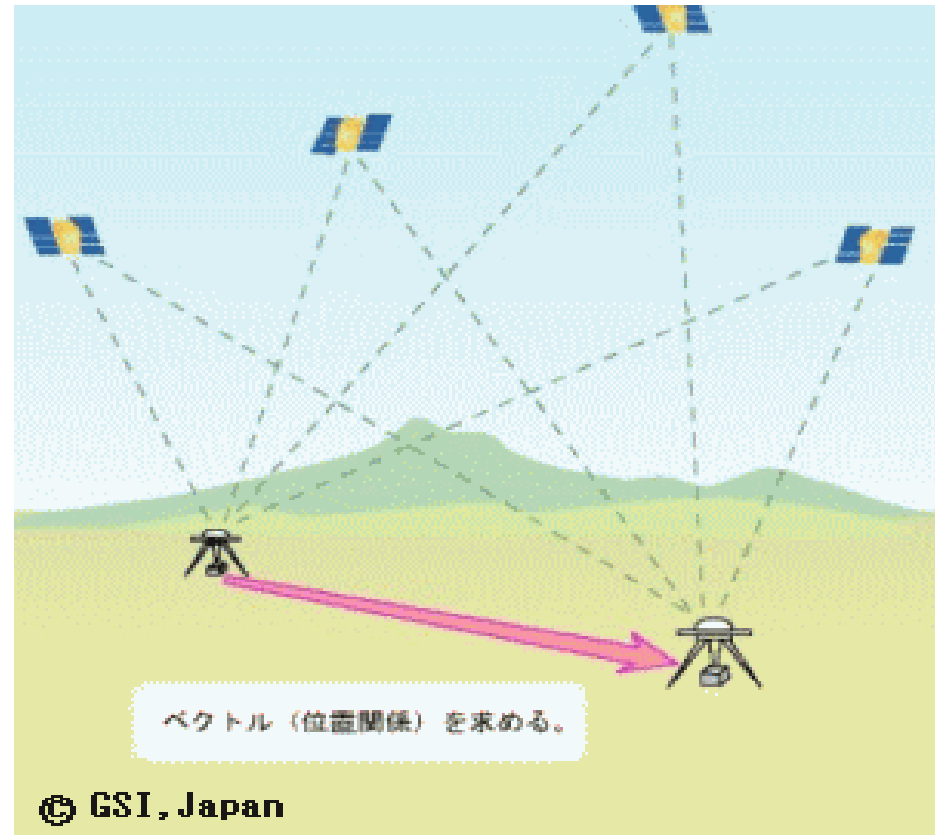
Introduction to surveying

・Review of trigonometrical function
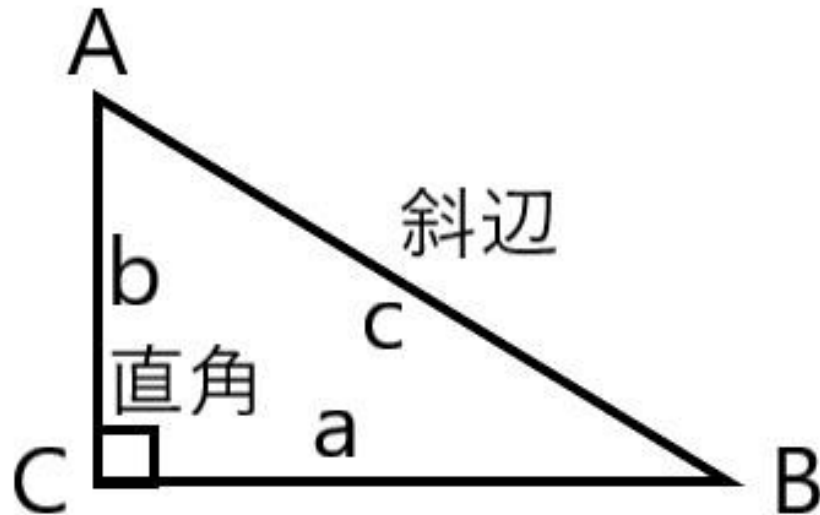
Sine ：sin B = b ÷ c (b/c)
Cosine ：cos B = a ÷ c (a/c)
Tangent：tan B = b ÷ a (b/a)

For example
Assume C=90° B=30° A=60°
a=square root 3(= 1.73), b=1, c=2
sin 30 = 1÷2 = 0.5,
cos 30 = 1.73 ÷2 = 0.87,
tan 30 = 1÷1.73 = 0.58

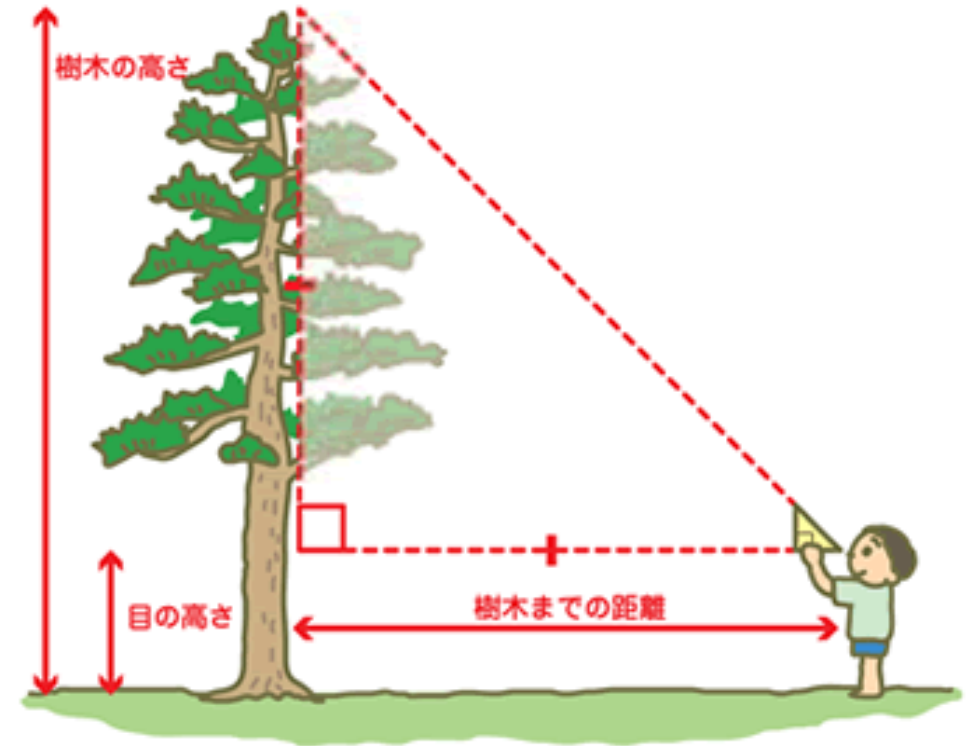# Calculate the height

Question
Top of the tree is measured 30 ° from horizon, Distance to the tree is 20 m, measure base (eyes) is 1.5 m height. How is the tree height?

Answer
20m x tan 30 =20 x 0.58 = 11.6 m, Measure base (eyes) height 1.5 m is added. Result is 13.1 m

樹木の高さ

目の高さ

樹木までの距離

Japan Green Center HP

Videos on survey are introduced.

Video：Showa Shinzan volcano and Mimatsu diagram (NHK)2 min 48 sec
https://www2.nhk.or.jp/school/movie/clip.cgi?das_id=D0005401233_00000&p=box

Video：Surveying by Ino Tadataka (NHK) 1 min 55 sec
https://www2.nhk.or.jp/school/movie/clip.cgi?das_id=D0005310099_00000