

Recent result of tumulus(古墳) study by muon radiography using nuclear emulsion detector

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for collaborators in Kashihara archeological institute of Nara prefecture
and Nagoya University

Aim

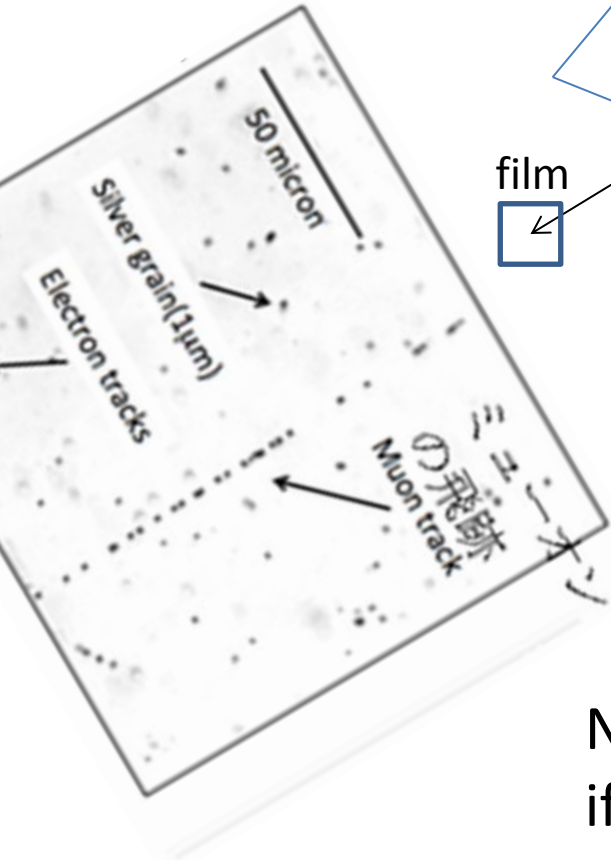
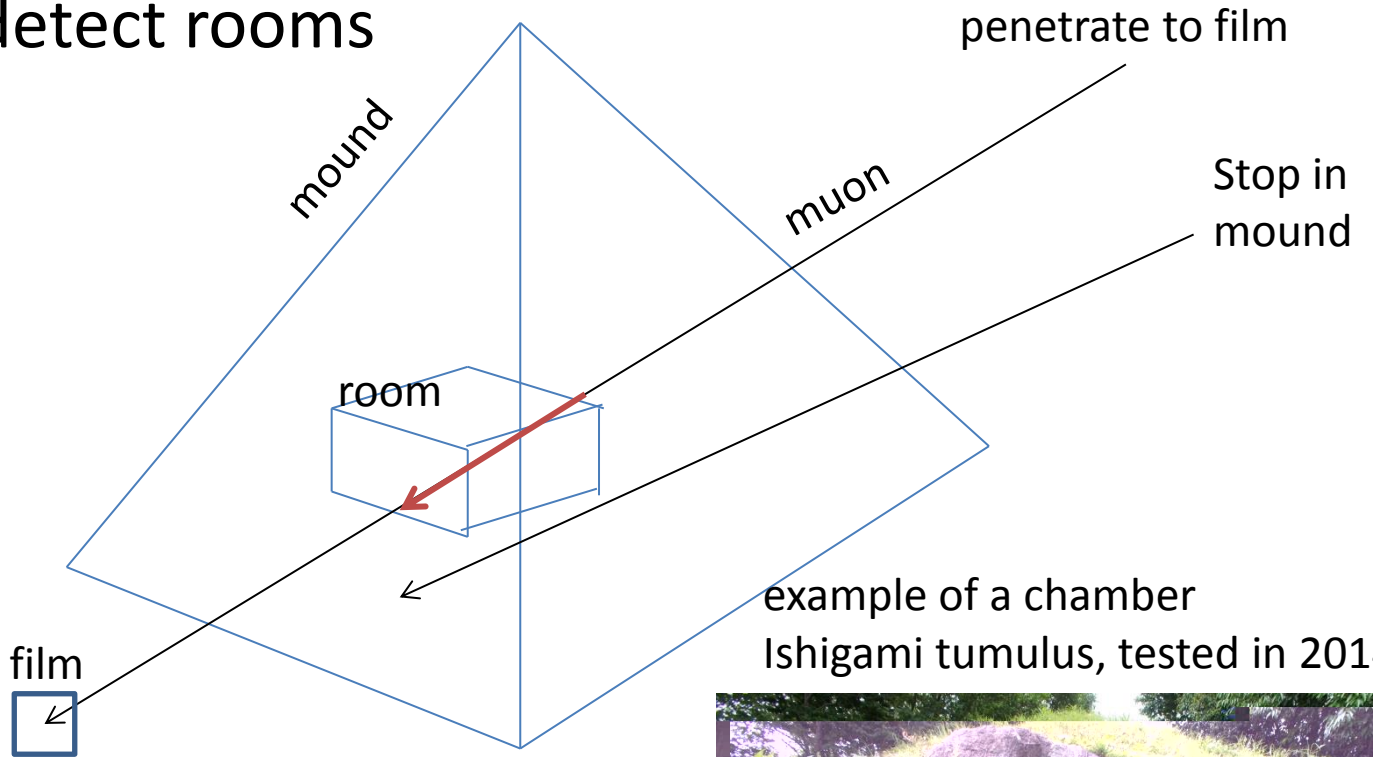
Archaeologically, deciding room existence or its direction in tumulus is important. (例:文献との比較、時代決定、勢力圏の解明など)



Most of huge tumulus is not permitted to excavate

Muon radiography for tumulus(circle shaped) in Ikomagun, Nara.
Try to detect the chambers, against the difficulty of excavate.

Use muon to detect rooms

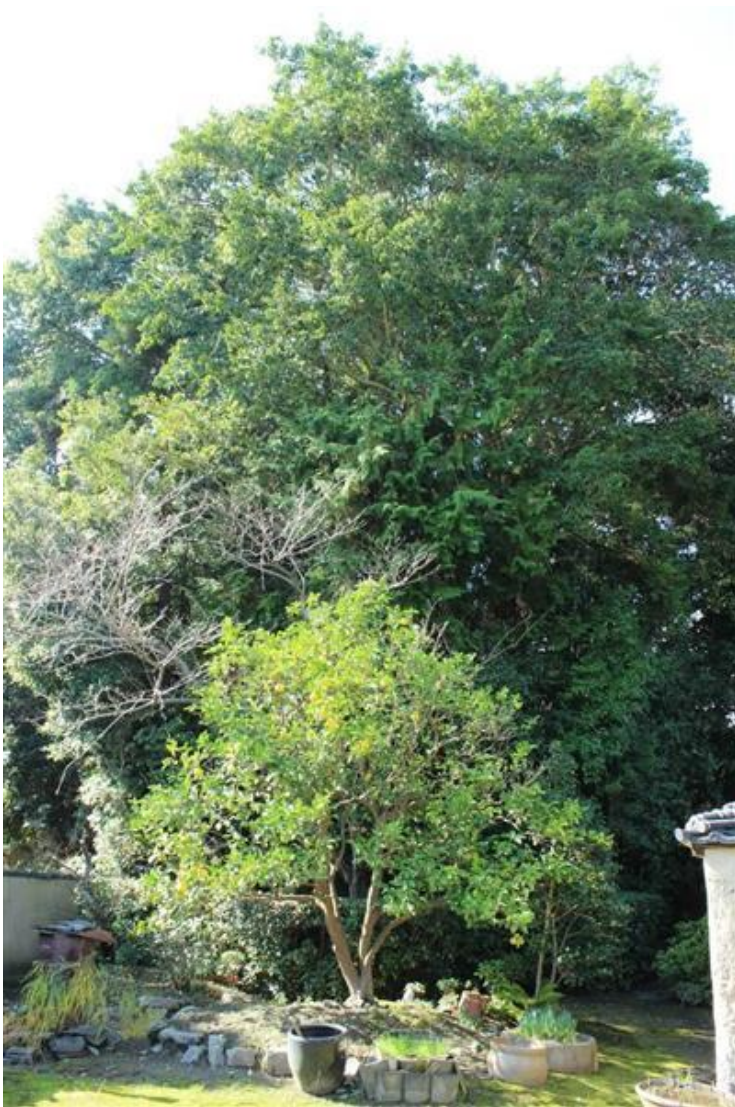


example of a chamber
Ishigami tumulus, tested in 2014



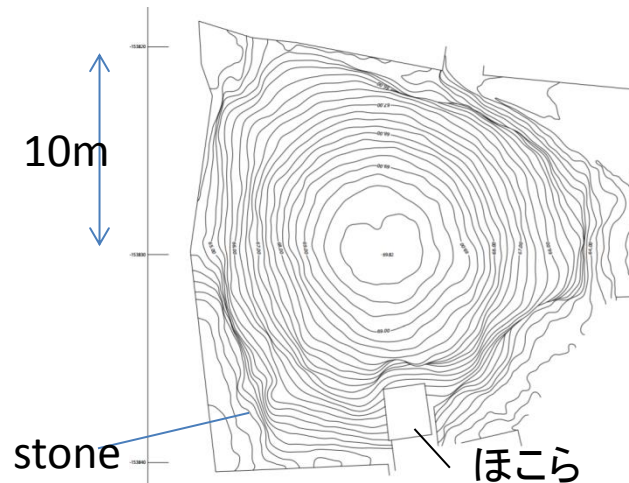
Number of penetrate muon increase
if empty space exist

The tumulus



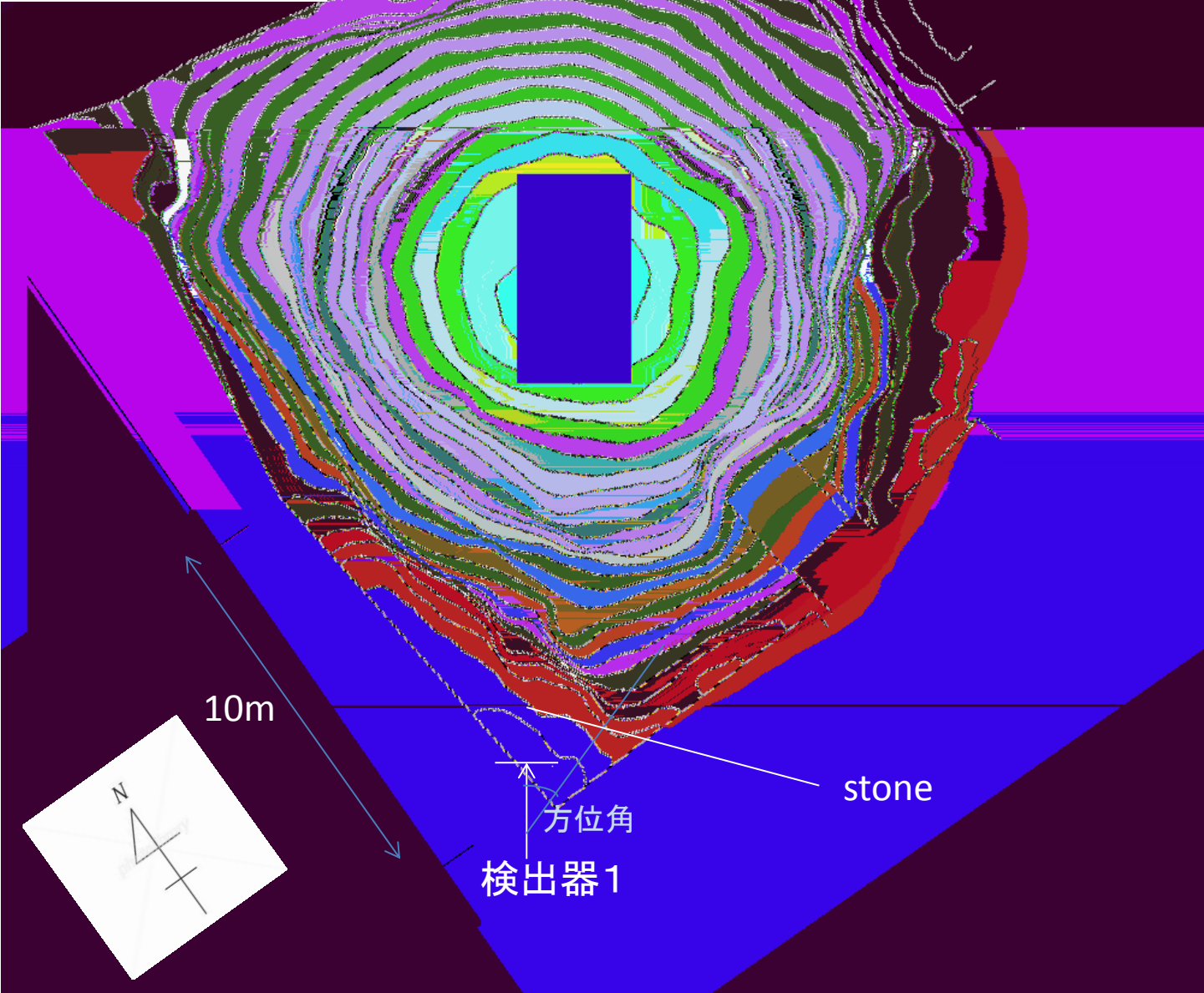
diameter~30m height6.5m

Stones exist which can consist of inside structures



place1,2
Near stone and oposite point
size 30cm*13cm
period last winter~3months

検出器2

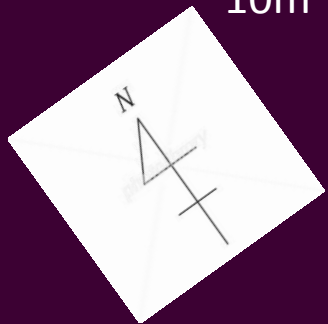


height~6.5m
25cm pitch

stone

方位角
検出器1

10m



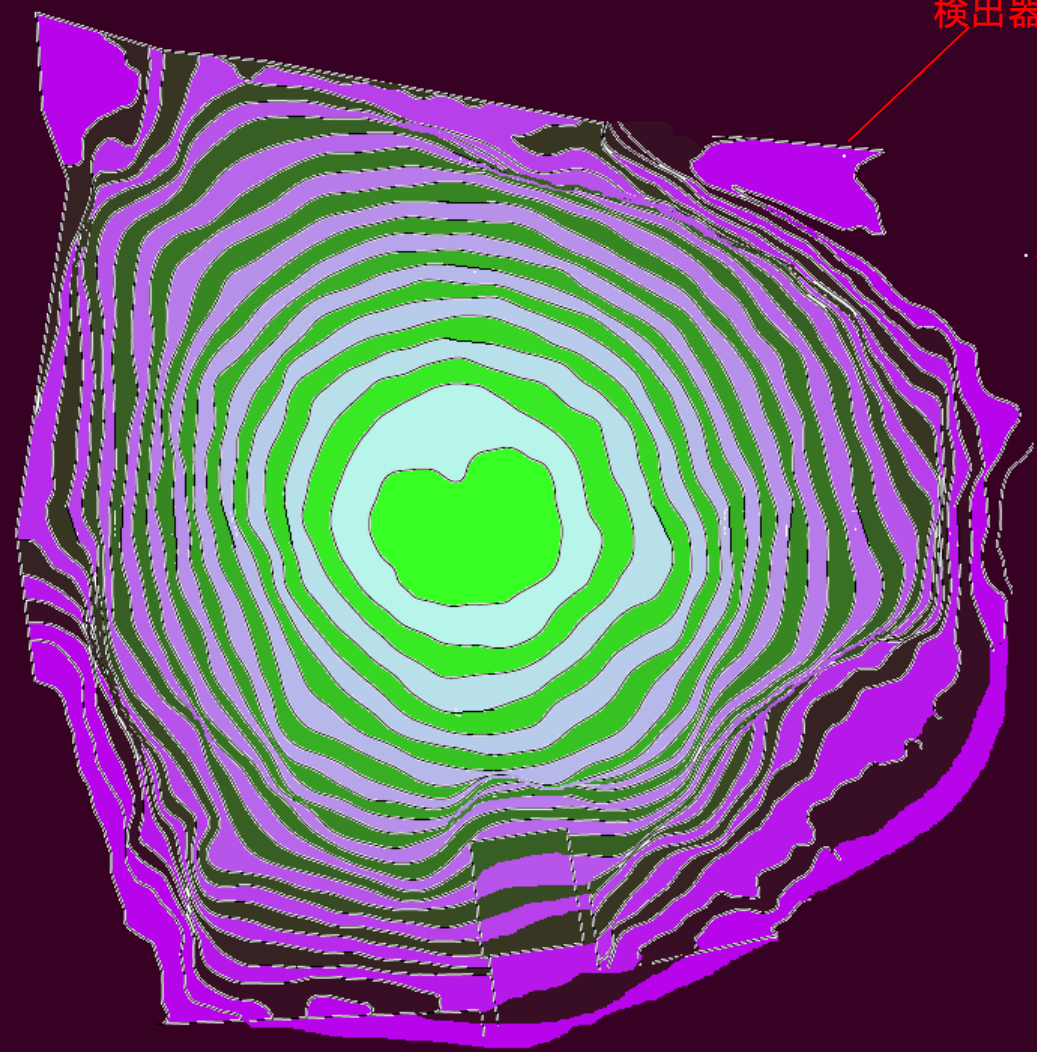
Set detectors



Film put on ground with vertical
measured by level,
compass, total station

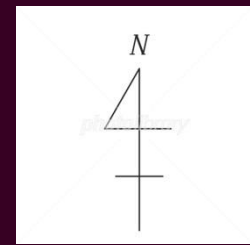


place3

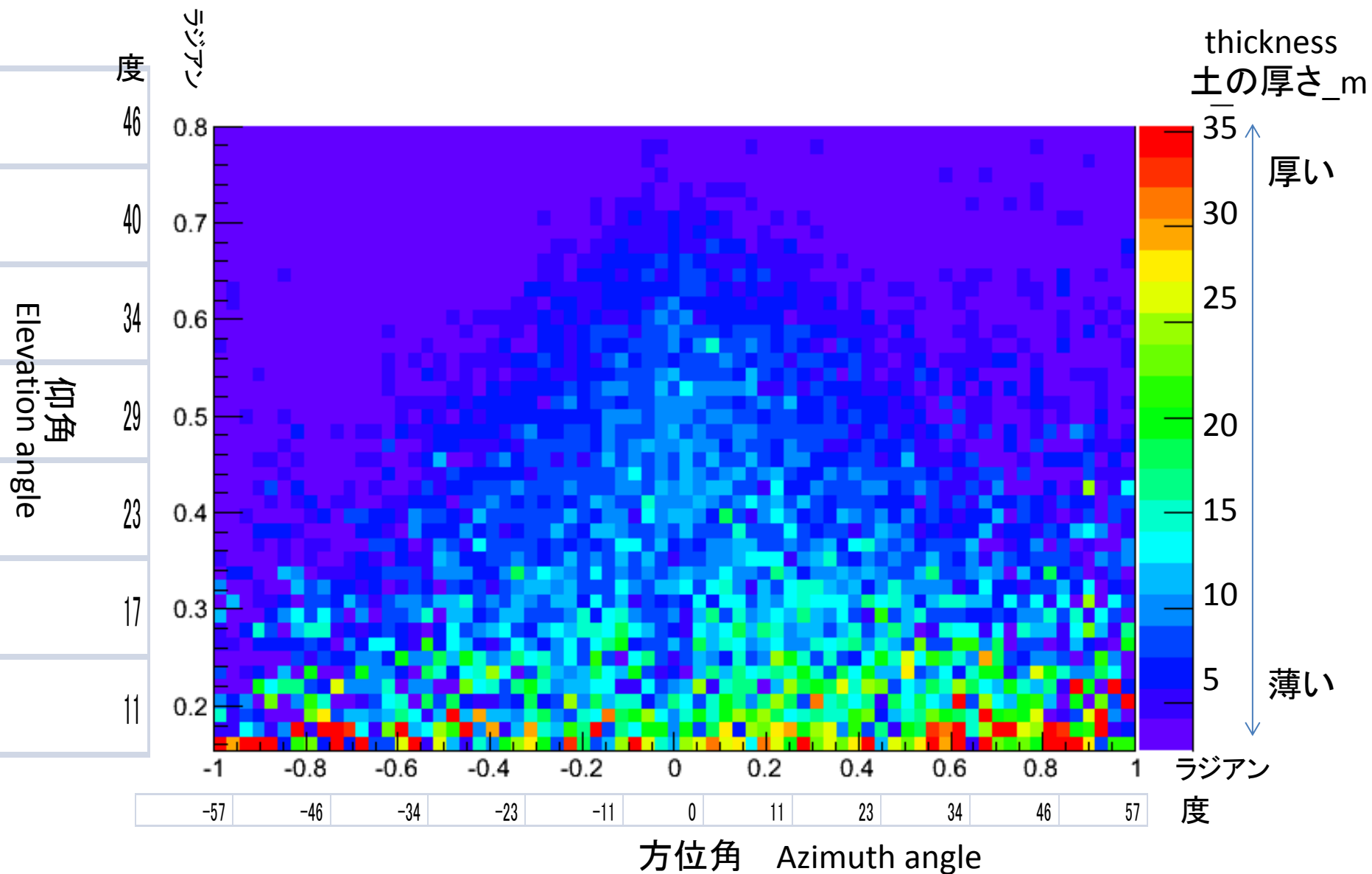


検出器2

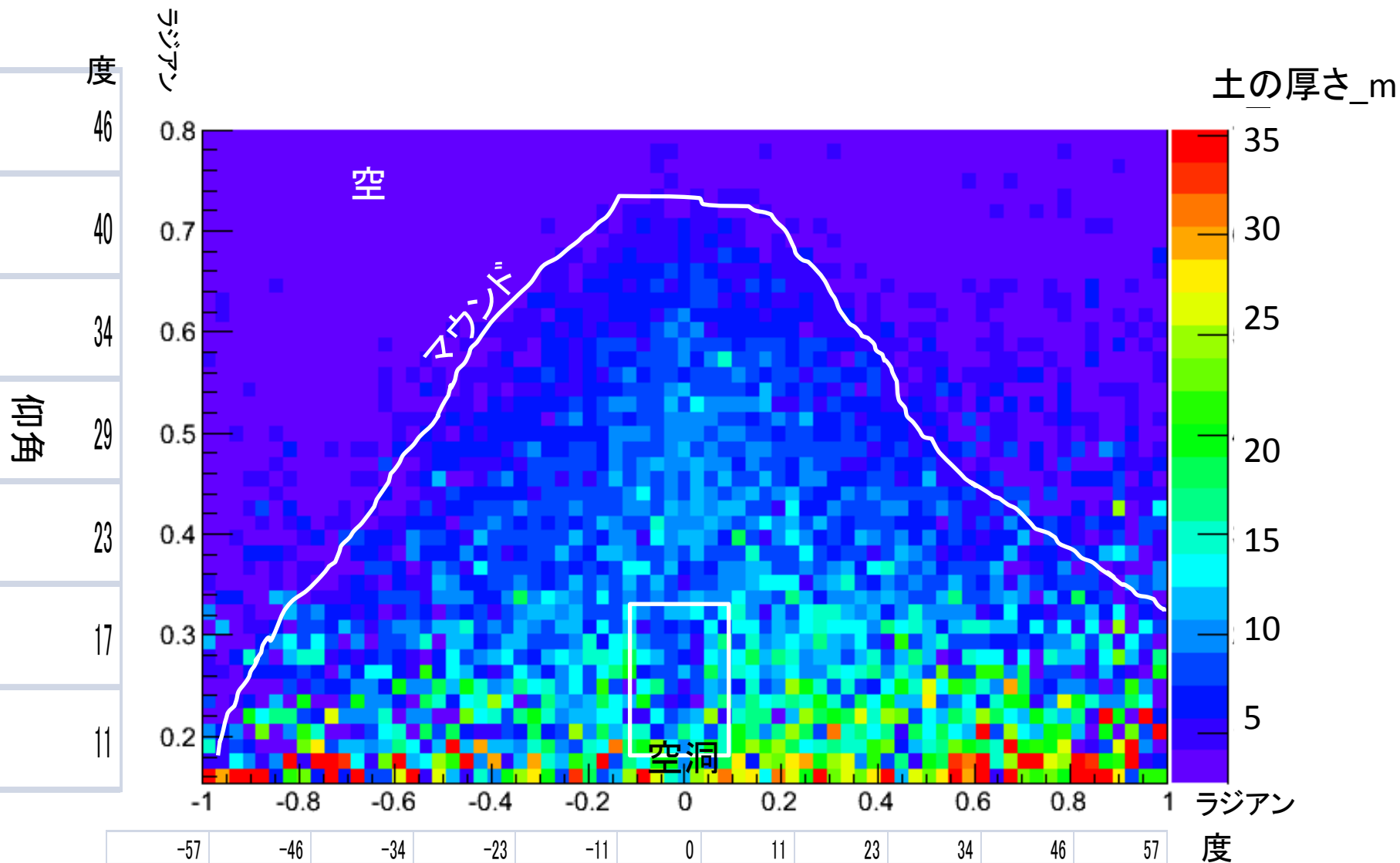
検出器3



Distribution of mound thickness from detector1(from south)

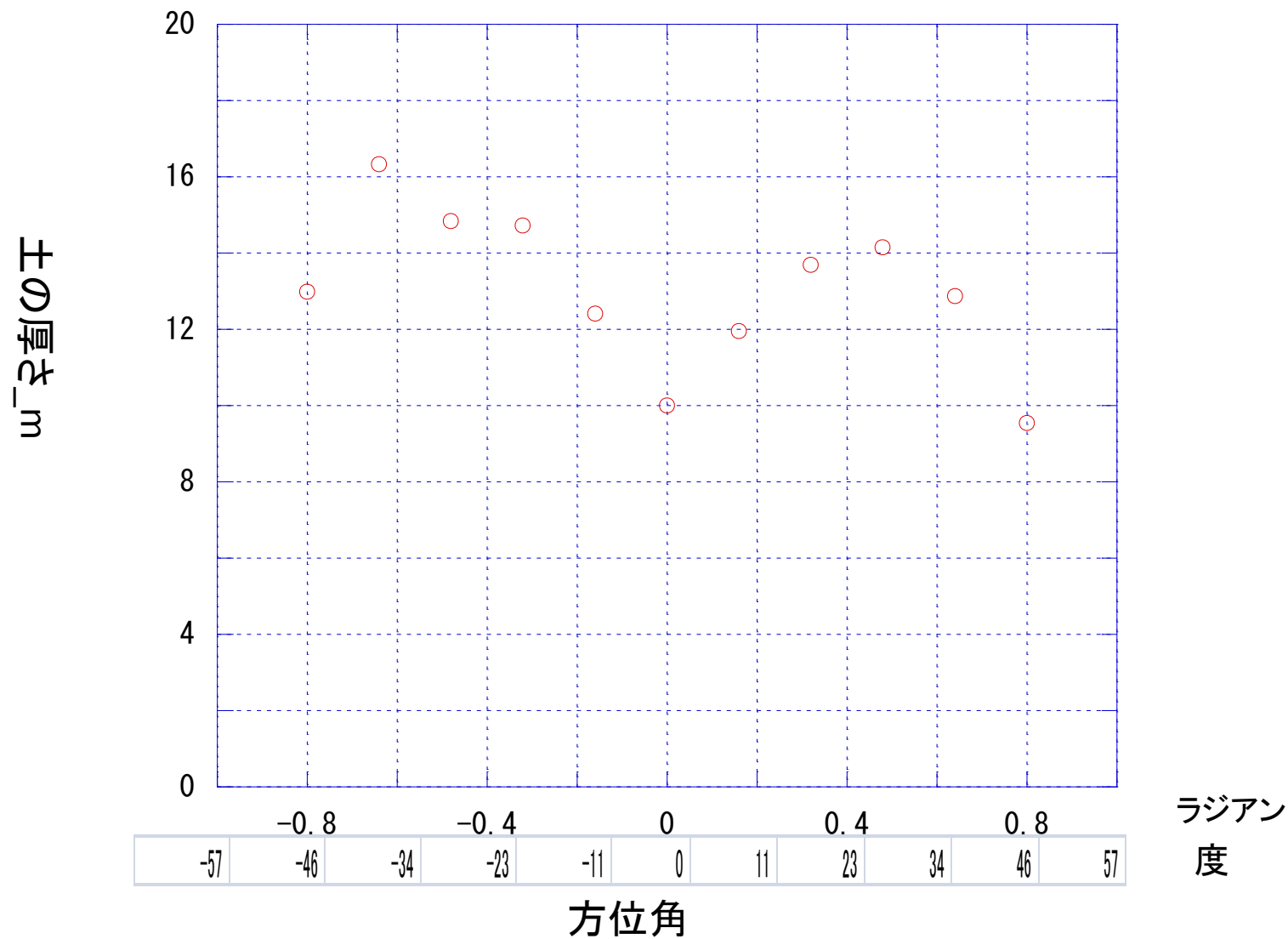


Distribution of mound thickness from detector1(from south)

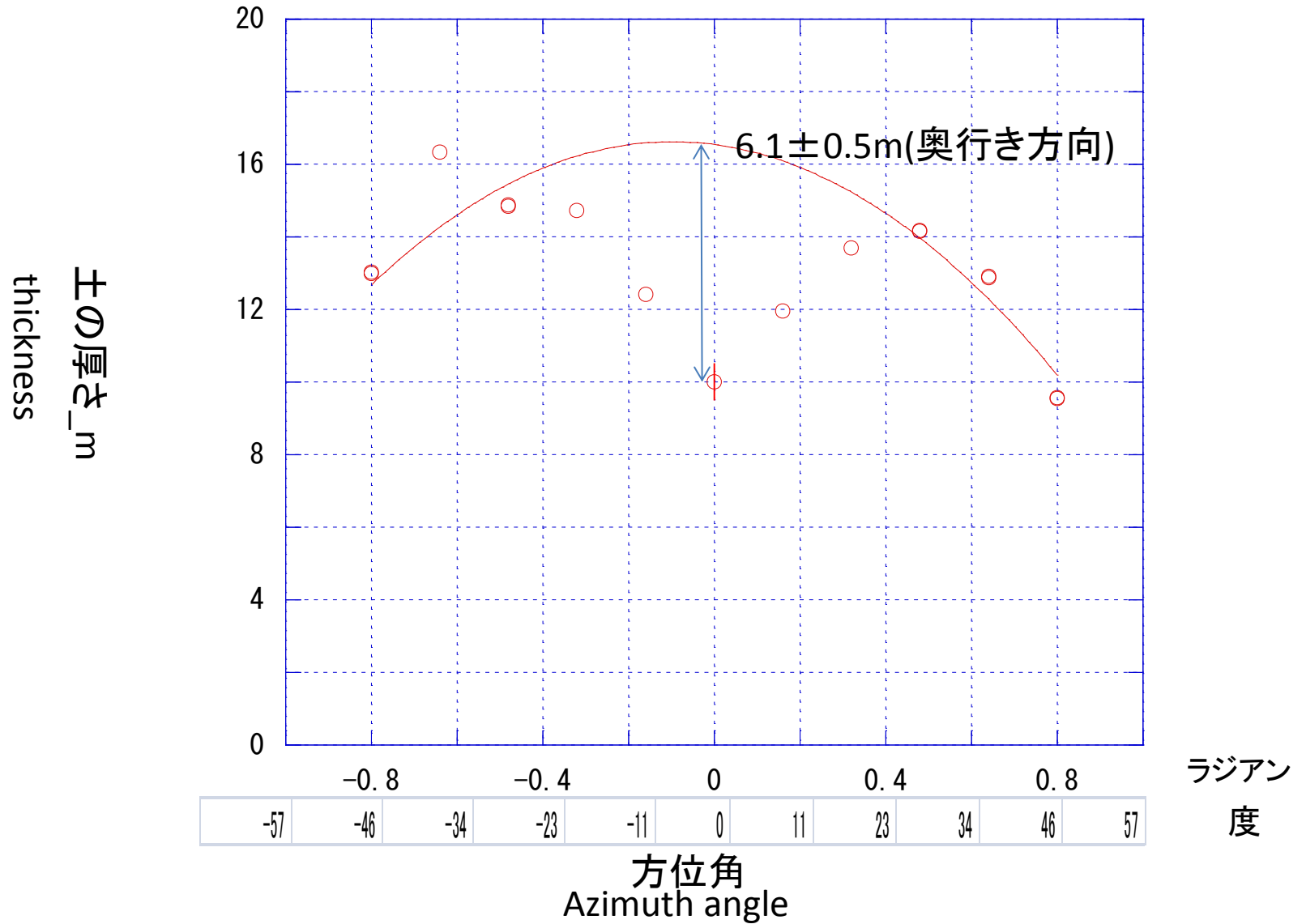


正面、低い部分からのミュオンが多く、空洞が有る(奥行 6.1 ± 0.5 m)
Empty space(6.1 ± 0.5 m) exist from low part in front of detector

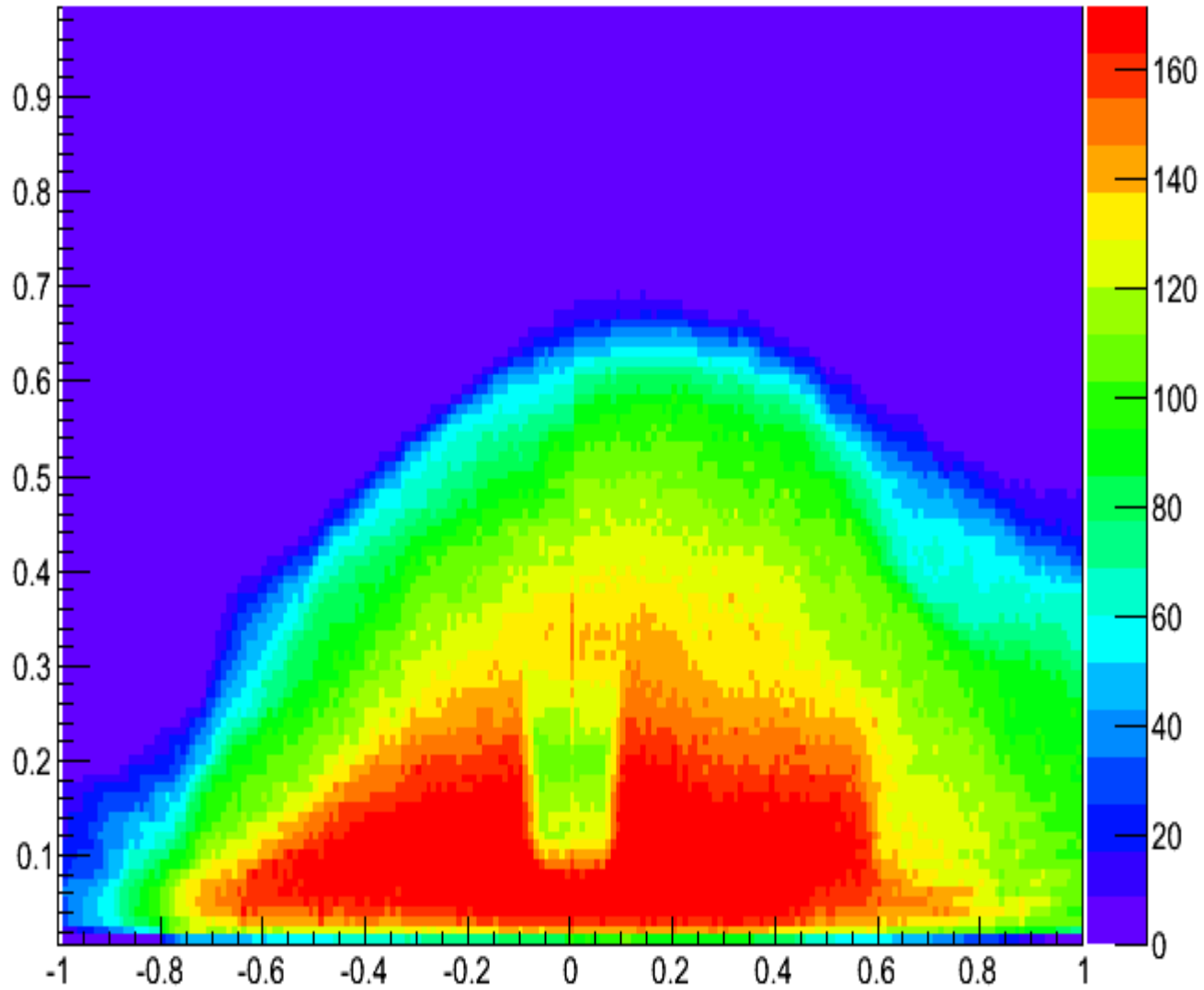
Thickness distribution at elevation angle $\sim 15^\circ$



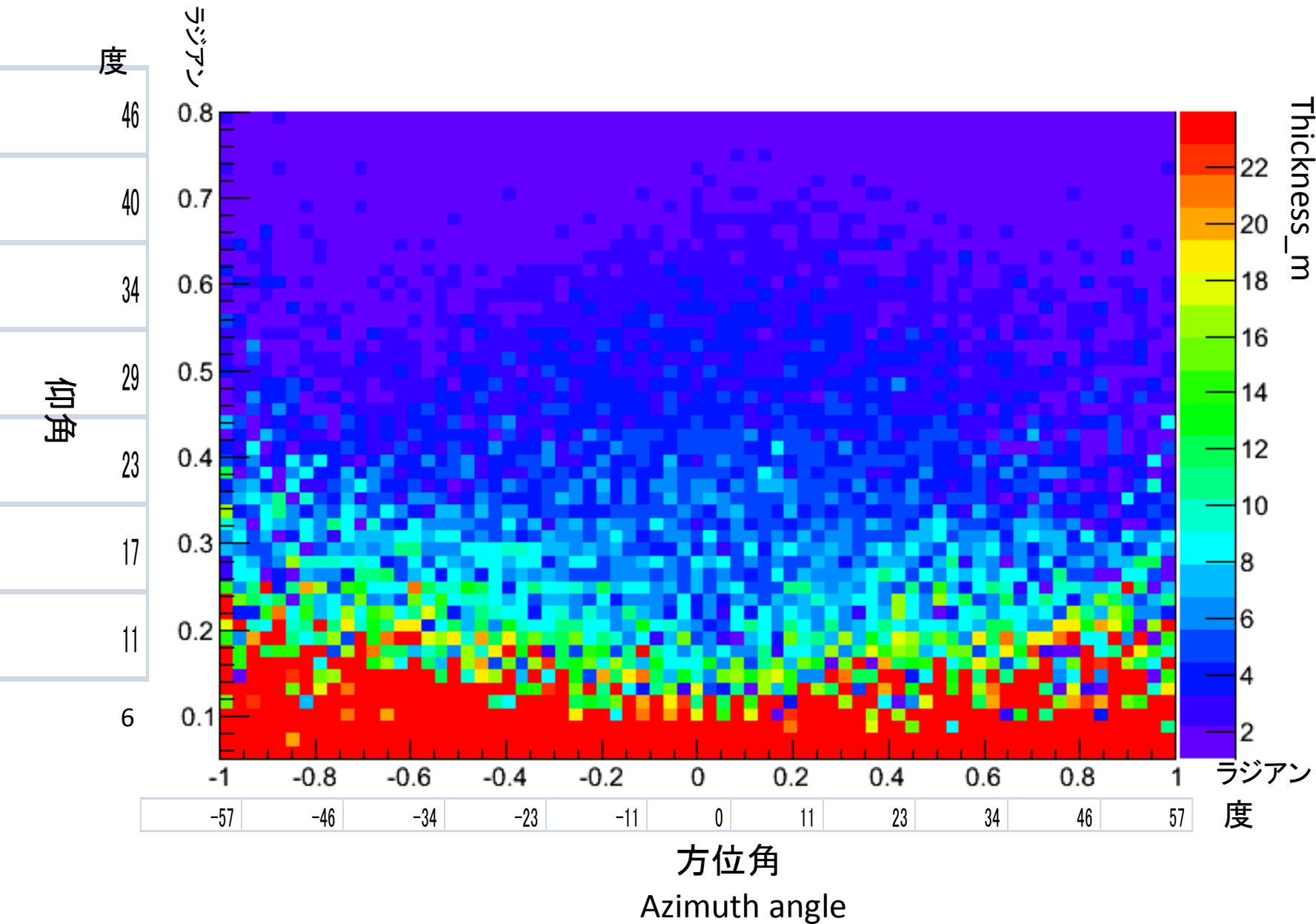
Thickness distribution at elevation angle ~15°



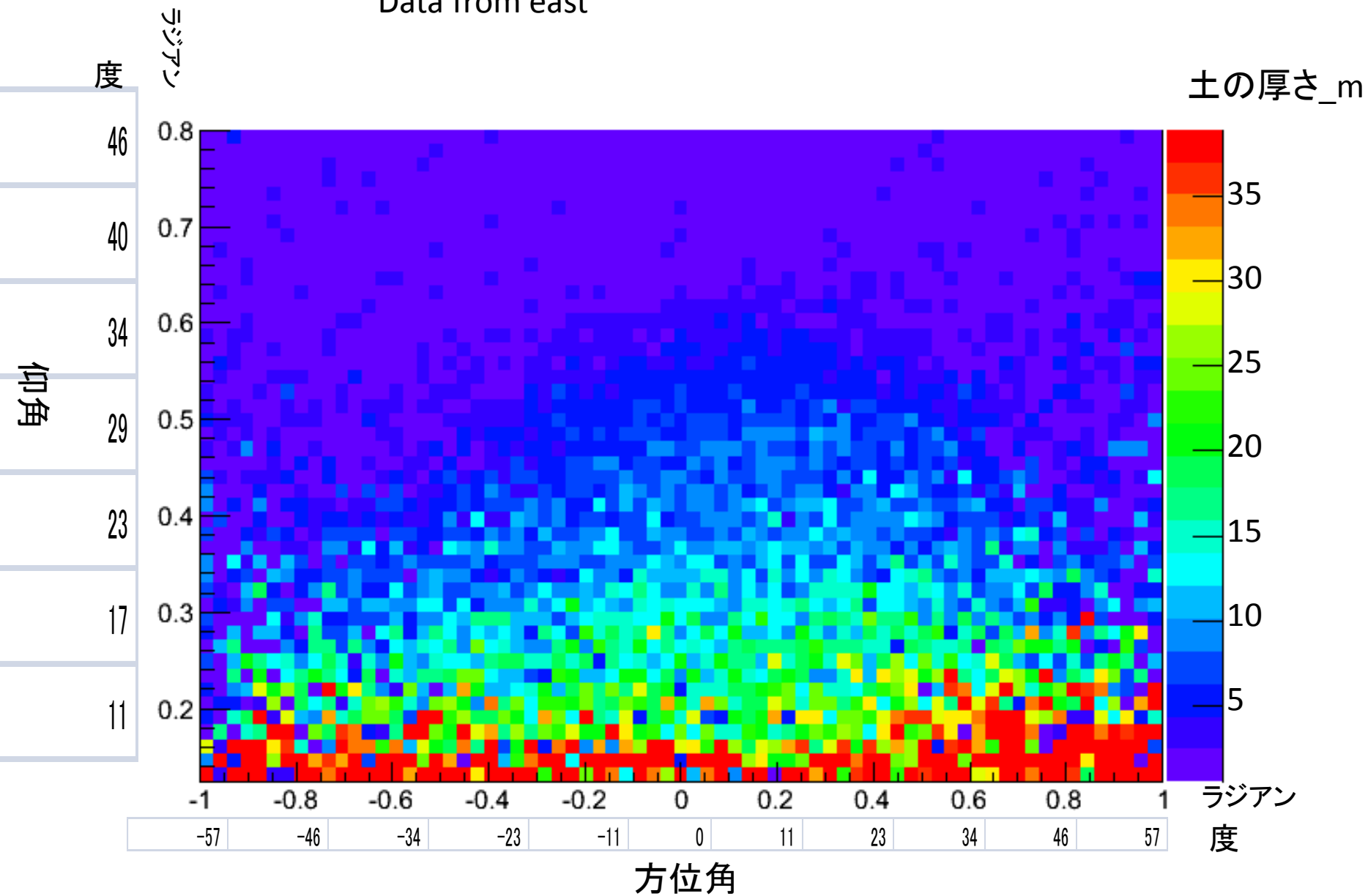
Simulation ,width2m height 2m(1~3m) length6.1m at center of tumulus



Data from north



Data from east



Consideration,result

- Empty space detected in front of South detector. This is consistent with result from north detector.
- Empty space length is measured $6.1 \pm 0.5\text{m}$
- Empty space could not be measured from east of the tumulus. This is thought that width of room is narrow in west-east direction. This is also consistent as result from north and south.

next

- 3d discrimination to increase clarity
- Test in Hashihaka tumulus, candidate of Himiko's, written that room is not made.