Calculating and Mapping Regional Speech Variation in Tokunoshima

Chitsuko Fukushima

1. Introduction

One of the characteristics of my research in dialect geography is making maps using a personal computer. That is not a new approach these days, but it helps us to grasp the regional speech variation efficiently from various viewpoints. For example, when you make many linguistic maps, how do you review them? You need to quantify the regional variation. The recent solution would be using complicated statistics. But then the produced result might be far from each linguistic map. My approach is in-between. Stick to each linguistic map, but synthesize them. It is rather simple and the produced map is still two-dimensional, but it is helpful. This paper will focus the speech variation on an island as an example of our method.

I will introduce our system called SEAL. It works on a personal computer and is now adapted to work on Windows98. The system has three main functions. See Table 1. In addition to preparing data and drawing linguistic maps, synthesizing maps is included. We use a simple arithmetic method, namely the cumulative identity method called by Inoue 1996a and 1996b. In this paper, the third group of functions are used to grasp and display the regional speech variation.

2. Amami, the surveyed area: its history and language

2.1 History

The data used here is from a geolinguistic survey conducted in Tokunoshima, Amami, Japan. See Fig. 1. Tokunoshima is one of the southwestern islands located in the southernmost part of Japan, far south from Kyusyu. This area used to be called Ryukyu and it was an independent nation until the beginning of the 17th century. Then one of the local government in Kyusyu, which was a strong feudal domain, specifically Satsuma, conquered the kingdom. Afterwards the kingdom became a subject country controlled by the conqueror, and the northern half of the area called Amami was ceded to

<table>
<thead>
<tr>
<th>Table 1 Basic functions of the SEAL system</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PREPARING DATA</strong></td>
</tr>
<tr>
<td>1. To help input the linguistic data</td>
</tr>
<tr>
<td>2. To display the linguistic data</td>
</tr>
<tr>
<td><strong>DRAWING LINGUISTIC MAPS</strong></td>
</tr>
<tr>
<td>3. To assign symbols to linguistic forms</td>
</tr>
<tr>
<td>4. To draw linguistics maps</td>
</tr>
<tr>
<td><strong>SYNTHESIZING MAPS</strong></td>
</tr>
<tr>
<td>5. To count word-forms to gain frequencies</td>
</tr>
<tr>
<td>6. To express frequencies on the map</td>
</tr>
</tbody>
</table>
Satsuma. Thus Amami including Tokunoshima lead a history different from the rest of Ryukyu. In the late 19th century, Ryukyu was officially annexed to Japan and Okinawa Prefecture was established. On the other hand, Amami stayed under control of Satsuma and belonged to Kagoshima Prefecture.

Another map, FIG. 2, depicts the present situation. The island is very small, and the population is around thirty thousand. There are three towns: Amagi, Tokunoshima, and Izen. The small circle shows the center of each town. The arrow shows the direction of the migration inside the island. The connected areas often show linguistic similarities.

Linguistically, there is an important language border between Amami-Oshima and Kyusyu. To the south, the Ryukyu dialects of Japanese language are spoken and are so different from dialects spoken on the Mainland Japan. And the dialects spoken in Amami belong to an important sub-dialect group of Ryukyu dialects. The Tokunoshima dialect belongs to the Amami dialect. This paper mainly focuses on the phonological aspects of the Tokunoshima dialect.

2.2 Language

There are three phonological characteristics of the Tokunoshima dialect.

First, it is often said that the Ryukyu dialect has three basic vowels. That is the result from phonetic changes like /o/ > /u/ and /e/ > /i/. This is basically true in the Amami dialect including the Tokunoshima dialect, but there are two central vowels /i/ and /æ/. So in Amami, /e/ > /i/ and partly /i/ > /i/. Thus the vowel system is a seven-vowel system (See FIG. 3).

Second, the Amami dialect has a distinction between glottalised consonants versus unglottalised consonants. Glottalised consonants often appear after a syllable is deleted. For example, the standard Japanese /hutaku/ (two) is /?ta:c'i/ in Tokunoshima. Here, /hu/ was deleted and /t/ was glottalised, instead. In the case of /k/ sounds, when the consonant followed by the original high vowels /i/ and /u/, /k/ became glottalised. As a result, /?ku/ is distinguished with /ku/ which developed from /ko/.

Third, when a word begins with a vowel, there is a distinction between the clear beginning and the gradual beginning. The gradual beginning occurs in
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a word part of which corresponds to classic Japanese sound /wo/. For instance, the classic Japanese /wonago/ (woman) is /'unagul with the gradual beginning, while the standard Japanese /obi/ (belt) is /?ubi/ with the clear beginning.

3. Distributions of the phonological variation in Tokunoshima

The survey was conducted by a Tokunoshima native and Japanese teacher, Mr. Takahiro Okamura, in the 1970's. We helped him to make a questionnaire and analysis of the data. But I am responsible for the data input and analysis in this paper.

In total, 52 localities were investigated. The informants were mostly in the 60's or older: 50 male and 12 female. The survey focused on the phonological variation and also included questions on interesting lexical items. In addition to this survey, I was personally involved in the survey on the kinship terms in Tokunoshima (Fukushima 1995).

Many linguistic maps of Tokunoshima were made using a personal computer. Among them, the maps of phonological variation are especially interesting. They are classified based on the phonological correspondence to standard or mainland Japanese.

Here, I would like to explain two types of phonological distributions. One type shows clear-cut systematic distributions which depict phonologically contrastive regions in Tokunoshima. On the other hand, the other type shows transitional distributions. In the latter type, the distribution varies upon the lexical items.

3.1 Distributions of sounds corresponding to standard Japanese: /s/- and /z/-

The following linguistic maps were chosen to make an analysis of the phonological aspects in Tokunoshima.

The phonological distributions are often similar, but if you examine thoroughly, they are not completely the same. What we did is piling up the maps. The frequency of the relevant form was counted for each locality, and the result was drawn up in the map. Thus each map is the result of this simple addition. But here the amount of the frequency was not directly expressed in the map. The figure was used to decide the dominant form at each locality.

After getting the necessary frequencies of the relevant form, a very simple statistical calculation was done, and after examining the statistics, I set a figure as the criteria to show the form on the map. See TABLE 2 for the relationship of the combined map and original maps.

See the map of /sa/ (FIG. 4). Here, [sa] and [sja] are found, and three maps were involved. The "mode" of each form is used as a criteria here. "Mode" means the figure which was found most in statistics. In the case of /sa/, the mode was 2. If you find two or more [sa] at a locality, you can say that is dominant at the locality. In the case of /sja/, its mode was 1, so if you find one or more [sja], the appearance means something. Ten maps related with /s/- sounds and /z/- sounds were made like this. All the maps drawn on this principle depict the mode for each form as in "No. 1 Level = 2" and the number of the combined maps as in "No.of Items = 3."

See each map. In the map of /sa/, the

FIG. 3 Comparison of Vowel Systems

<table>
<thead>
<tr>
<th>Standard Japanese</th>
<th>Ryukyu Mainland Dialect</th>
<th>Amami Dialect</th>
</tr>
</thead>
<tbody>
<tr>
<td>/i/</td>
<td>/i/</td>
<td>/i/</td>
</tr>
<tr>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
</tr>
<tr>
<td>/o/</td>
<td>/o/</td>
<td>/o/</td>
</tr>
<tr>
<td>/a/</td>
<td>/a/</td>
<td>/a/</td>
</tr>
</tbody>
</table>

( /o/ > /u/, /e/ > /i/ ) ( /o/ > /u/, /e/ > /i/ )
palatalization occurs on the western side.

In the map of /si/ (FIG. 5), [sji] is found in the south, Isen, while [sji] with a central vowel is found in the two northern towns. Look at one [sji] in the north of Amagi. That is not just a coincidence.

In the map of /su/ (FIG. 6), the same forms as /si/ are found but in a different distribution. Here [sji] is found in the south Isen and also up in the north.

In the map of /se/ (FIG. 7), [s\texti] with a central vowel is found in the south Isen, and in the north a peculiar [s\texti] sound is found. [s\texti] is a combination of the palatalized s and the central vowel. And in the middle of the region, the /s/- sound changed into the /h/- sound. You can identify the small area as the one connected by migration. And [s\texti] is found both in the north and the southwestern part.

In the map of /so/ (FIG. 8), [su] is found in the south Isen, and the palatalized form [sju] is found in the north.

In summary, the variation related to both the vowel and the consonant can be found. So the whole system involved should be considered. See TABLE 3.

Three systems are actually identified. One is found in the two northern towns, Amagi and Tokunoshima, and another is in the south, Isen. And as the latest trend, the simplest system is found in up north and the southwestern part. This system is considered new because two other systems will not develop from the last system where /si/, /su/ and /se/ are all one sound [sji]. Also, in both regions, there were reasons for language contact which could spur the change into the simple system. In the north, there used to be a mine, and in the southwestern region, the migration caused the mixing of the Isen dialect and the Tokunoshima Town dialect which were supposed to be so different.

But how do you interpret the other two systems? Actually the southern system in Isen is the major system in Amami and Okinawa. On the other hand, the system in Amagi/Tokunoshima is peculiar. The main reason might be palatalisation. This is what

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**TABLE 2** Combined map and original maps

<table>
<thead>
<tr>
<th>FIG. 4</th>
<th>FIG. 5</th>
<th>FIG. 6</th>
<th>FIG. 7</th>
<th>FIG. 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>/sa/ AOSA (green seaweed), RANGASA (umbrella), SUNA (ISAGO; sand)</td>
<td>/si/ SIMA (island), NIWATORI (SIMADORI; chicken), HOSI (star), TOSI (age), ISI (stone), USI (cow)</td>
<td>/su/ ASI (SUNE; leg) SUZU (Bell), SUNA (sand), SUZI (tendon), USU (mortar)</td>
<td>/se/ SE (shallows), TOSIUE (SEDA; elder), ASE (sweat)</td>
<td>/so/ SOTO (outside), HESO (HOSO; navel), KUSO (feces)</td>
</tr>
</tbody>
</table>

**TABLE 3** Comparison of phonological correspondences in three systems /s/-

<table>
<thead>
<tr>
<th>/s/-</th>
<th>/s\texta/</th>
<th>/s\texti/</th>
<th>/s\textu/</th>
<th>/s\texte/</th>
<th>/s\texto/</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMAGI/TOKUNOSHIMA</td>
<td>sa/sja</td>
<td>s\texti</td>
<td>s\texti</td>
<td>sju</td>
<td></td>
</tr>
<tr>
<td>ISEN</td>
<td>sa</td>
<td>sji</td>
<td>s\texti</td>
<td>su</td>
<td></td>
</tr>
<tr>
<td>LATEST TREND</td>
<td>sa</td>
<td>sji</td>
<td>su</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TABLE 4** Comparison of phonological correspondences in three systems /z/-~ /d/-

<table>
<thead>
<tr>
<th>/z/-~ /d/-</th>
<th>/za/-~ /da/</th>
<th>/zi/-~ /di/</th>
<th>/zi/-~ /di/</th>
<th>/ze/</th>
<th>/zo/-~ /do</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMAGI/TOKUNOSHIMA</td>
<td>za/zja/da</td>
<td>zi</td>
<td>zi/di</td>
<td>zu</td>
<td></td>
</tr>
<tr>
<td>ISEN</td>
<td>za</td>
<td>zji</td>
<td>z\texti</td>
<td>zu</td>
<td></td>
</tr>
<tr>
<td>LATEST TREND</td>
<td>za</td>
<td>zji</td>
<td>zu</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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FIG. 4 /s\n
Linguistic Atlas of Tokunoshima

No. 1 Level = 2
No. 2 Level = 1
No. of Items = 3

FIG. 5 /s1/

Linguistic Atlas of Tokunoshima

No. 1 Level = 6
No. 2 Level = 6
No. of Items = 6

FIG. 6 /su/

Linguistic Atlas of Tokunoshima

No. 1 Level = 1
No. 2 Level = 5
No. of Items = 5

FIG. 7 /se/

Linguistic Atlas of Tokunoshima

No. 1 Level = 1
No. 2 Level = 3
No. 3 Level = 3
No. 4 Level = 1
No. of Items = 3

FIG. 8 /so/

Linguistic Atlas of Tokunoshima

No. 1 Level = 3
No. 2 Level = 3
No. of Items = 3
was supposed to have occurred. According to Masachie Nakamoto’s theory, the change in Isen can be easily explained. Throughout Ryukyu, /o/ changed into /u/ first and it triggered the change of /e/ into /i/. Both are the raising of the vowel. As to /s/- and /z/-, /u/ changed into the central vowel /i/. Basically, /si/ and /sa/ were intact. Then, in many dialects, the central vowel was lost finally.

In Amagi/Tokunoshima, /si/ and /su/ were combined, while /su/ and /se/ were combined in other areas. The former type of change is common in Mainland Japan, but not in Amami. As I wrote before, palatalisation could have taken an important role. For example, [sj'i] sounds are close to [sji]. They could not survive together. Several theories are possible. The centralization of [sji] might have prepared the opening for [s'i] to become [s'i]. Or, the vowel raising might have spurred the palatalisation. But why did the change happen only in Amagi/Tokunoshima? The final conclusion cannot be given now. More research is necessary to answer this question.

As for /z-/ sounds, changes parallel to /s-/ have occurred, but the distribution is more complex (See TABLE 4). In Japanese, /z-/ sounds are often pronounced with [dz] (affricate). Thus in Tokunoshima dialect, /z-/ and /d-/ were often combined. (The maps are not included in this paper)

4. Phonologically transitional regions in Tokunoshima

The distributions we have seen so far are rather clear-cut with a slight transitional area. But other phonological variation could be lexical or morphological and are often seen with a rather wide transitional area. Here three distribution patterns in Tokunoshima are introduced.

The first group of maps have the pattern with old forms in the northwestern region. In FIG. 9, /hi/ used to be [hwi] until medieval Japanese. The old sound [hwi] is found in the northern area, especially in Amagi. Hereafter the black symbols are assigned to the words estimated as the old, relic forms, and the blank symbols to the new forms.

The mapping of some maps shown here is done differently from the maps in the previous section. When there are only two choices of varieties, a special calculation is done to produce the following figures. If one form is used throughout, then it is 100%. If another form is used throughout, then it is -100%. Plus and minus are expressed using different color and size of a circle. In this type of map, the locality with no mark is neutral according to calculation. When there are three or more choices, the variation is simply expressed using different symbols as the maps in the previous section.

In FIG. 10, /k-/ sound in the middle of the word became /h-/ and was deleted finally.

In FIG. 11, /mi/ has four variation. This is really morphological, so a verb MIRU (see) has two or more variants in the paradigm. FIG. 12 shows a typical phonetic change seen in Ryukyu area. The northern region retains the original form.

The second group (FIGS. 13 & 14) has the pattern with old forms in the south, Isen. But in FIG. 14, the older form is also found in part of eastern region.

The third pattern shows new forms in the eastern region (FIG. 15). Actually this pattern possibly caused the first and the second patterns. As I explained before, there is a distinction between the clear beginning and the gradual beginning in Tokunoshima. But the distinction only survives in the western region. In Tokunoshima Town, the gradual beginning has become extinct.

5. Typical lexical distribution patterns in Tokunoshima

As expected from the explanation from the previous section, the lexical distribution patterns in Tokunoshima are almost parallel to the patterns explained above.

In FIG. 15, The forms used in Tokunoshima Town tend to be new, and those used in Amagi and Isen tend to be older. To show this, our method is useful.

FIG. 16 shows the similar distribution patterns of words with /N/ in pronouns. Words with /N/ are new and found in the eastern part of island. FIG. 17 shows the pattern of relic lexical forms, which are
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found both in the north and south.

6. Conclusion

Although Tokunoshima is a small island, there is rather big regional speech variation phonologically and lexically. In this paper, the regional speech variation in Tokunoshima is reported with the special focus on the phonological variation. The results clearly show the linguistic stratification on the small island. The southern Tokunoshima dialect often shows the remnant of the transported dialect relating to the dialects on the Ryukyu mainland, while the northern Tokunoshima dialect often shows new development, influenced by the language spread from the opposite direction. The two northern towns are not just homogeneous, however. The eastern town Tokunoshima often shows the new forms maybe because the political and cultural center is there. The phonological stratification and the lexical stratification in the area should be compared carefully. This analysis is not final. It should be strengthened by synthesizing more maps together in the future.

In conclusion, the merit of our method is that it is so basic. Some users just use our system to make clear linguistic maps. Others may use it to display the data which was produced by another program or software. We can combine this simple arithmetic method with other method. When I worked with Prof. Fumio Inoue on the CLAE data, he used some statistical device (multivariate analysis) to classify the maps, then I combined the maps based on his classification. It is flexible but not automatic. You have to choose the maps which should be combined on your own.

Acknowledgement

I would like to express my deepest appreciation to Mr. Takahiro Okamura who kindly let me analyze his data. This article is based on the paper, "Calculating and Mapping Regional Variation on an Island," read at the 10th International Congress on Methods in Dialectology in St. John's, Canada, August 2, 1999. All the maps, originally beautifully colored, were reproduced with black and white ink for the present paper. I am deeply thankful to those who listened to my lecture at the congress and gave me useful comments. This study is funded by the Japanese Ministry of Education, Science, Sports and Culture: a Grant-in-Aid for Scientific Research (C) Grant number 10610526.

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FIG. 15 /wo/

FIG. 16 Pronoun

FIG. 17 Relic/Modern Forms