COMPUTATIONAL DIALECTOLOGY USING GLAPS
— Automated Processing of Field Survey Data —

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Summary

The author developed GLAPS (Generalized Linguistic Atlas Printing System) in 1975 and has since applied it, with modifications, to various field survey data. GLAPS has also been employed by other dialectologists. These applications of GLAPS reveal that this system is a useful new tool for analyzing dialect survey data even for persons ignorant of computer programming.

1. Introduction

Linguistic geography and sociolinguistics have been widely employed among dialectologists in postwar Japan. Over the last ten years, computer-processing of field survey data has become more and more common.

The author originally developed the GLAPS processor to produce linguistic atlases by computer. GLAPS has since been modified to produce glottograms and crosstables and to handle sociolinguistic data in general.

This paper presents an outline of GLAPS and an example of its usage.

2. Characteristics of GLAPS

2.1 Easy Understandability

The GLAPS processor is a FORTRAN program of about 13,000 lines. It is a package program whose strongest point is that even people ignorant of computer programming can obtain output results using it.

About thirty students of the Department of Linguistics, University of Tokyo, have used or are using GLAPS to produce crosstables from field survey data. (See, for example, Sapporo 1977[4], 1978[5].) Most of the students had never used a computer system before, but just a few hours of instruction were sufficient for them to understand how to use GLAPS and obtain their desired line-printer output.

2.2 Applicability to Various Data

GLAPS is applicable to various data, whether on fixed format cards, free format cards, or binary format disc files, and to any number of informants and variables or investigated items.

The author and University of Tokyo colleagues have applied GLAPS to data in different formats from five field surveys (Shizukuishi 1973[1], 1974[2], Tokunoshima 1976[3], and Sapporo 1977[4], 1978[5]). Moreover, other researchers have used GLAPS to process their own dialect data[6].

2.3 Compatibility with Various Computers

GLAPS is written in Japanese Industrial Standard (JIS) FORTRAN, level 7000, which is equivalent to Draft Recommendation FORTRAN of International Organization for Standardization at its maximum level (ISO Full FORTRAN) or ASA FORTRAN. It does not use assembly language and so is compatible with virtually all computer systems. In fact, GLAPS has been run on nine different computers without modification.

2.4 Flexibility with regard to Data Processing

To run GLAPS, users simply prepare their dialect data and compose a short program written in 'GLAPS language'. (There are 75 different statements in this so-called language. Some of these appear from lines 2 to 75 in Fig. 3.) In this program, the user must specify all of the functions and operations to be performed. Most programs run only 20 to 30 lines, as we shall see below.

GLAPS can perform a variety of functions needed for dialect data processing, such as the re-categorization of data, the pairing and combining of investigated word-forms, the deletion of unnecessary data, and the division of informants into subgroups by specified variables. Thus, GLAPS provides a versatile and flexible system for the user.

2.5 Processability of Multiple Answers

GLAPS resembles the SPSS (Statistical Package for the Social Sciences), originally developed at Stanford University. But GLAPS is capable of processing multiple answers often given to questions about word-form. The user simply specifies the number of answers to be accomodated in any given variable. GLAPS then automatically executes all statements related to the data and processes the specified number of answers.

3. An Example of the Application of GLAPS

As mentioned above, the author has applied GLAPS to several field studies. The following describes one of these.

3.1 Field Survey at Shizukuishi in 1974

In 1974, a team from the Department of Linguistics, University of Tokyo conducted an intensive investigation to interview all the residents of the Nishiyama area of Shizukuishi township, Iwate prefecture. The team interviewed 348 of about 500 residents above age 15, to examine distribution patterns of word-forms and the process of language change within a small area.

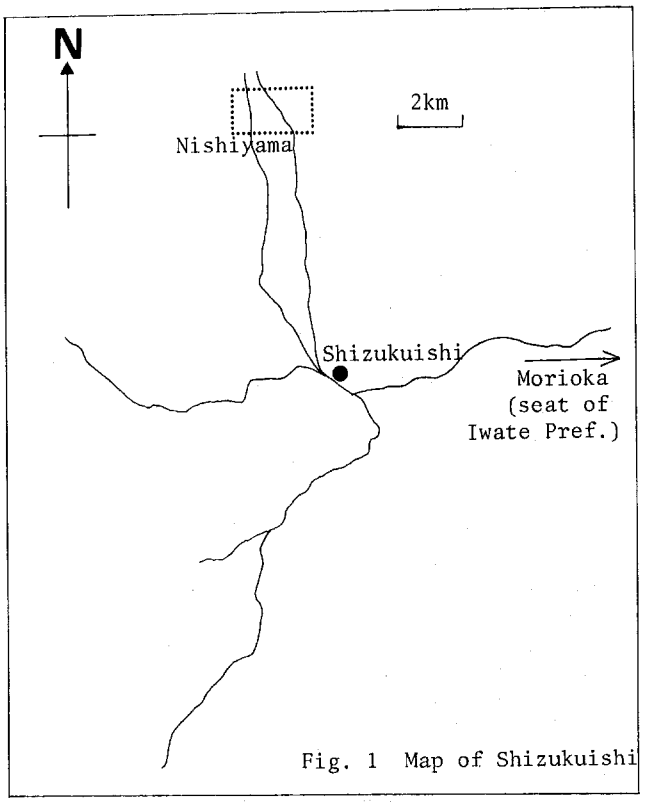


Fig. 1 Map of Shizukuishi

```
KZN 1011   0413 INF406 2912022 121061251
B10 1011 31    81    2151  C43    3261  61    65    21    52    63
E35 1011 20    30    20    20     20    30    20    20    20
G31 1011 09    09    09    09     09    C09   212223C23
KZN 1012   0413 INF410 1923111 411081135
B10 1012 31    51    51    4481   21    62    02    21    51    12
E35 1012 20    30    20    20     20    30    20    20    20    20
G31 1012 09    09    09    09     09    09    22    22
KZN 1013   0413 INF405 2930022 153062651
B10 1013 31    81    21    4386   0171  C71   65    21    51    63
E35 1013 20    30    20    20     20    30    20    20    20    30
G31 1013 09    09    09    09     09    09    212223 22
KZN 1014   0413 INF413 1951041 111092154
B10 1014 31    81    21    24     01    10    65    21    51    6387
E35 1014 20    30    20    20     20    30    20    20    20
G31 1014 09    09    09    01     09    01    22    01
:
:
```

Fig. 2 Some Data Cards from Shizukuishi 1974

Fig. 1 is a map of Shizukuishi township, which is surrounded by mountains. The dot in the center of the map indicates the town of Shizukuishi. The rectangle at the top of the map indicates the Nishiyama area. The map shows the six bus routes of the township, equivalent to its main roads. In between the two roads at Nishiyama area runs a river from north to south. The investigated area covers the nine communities of Nishiyama, divided naturally into east and west by the river.

3.2 Data Stored in One Disc File

All the data gathered from interviews was coded and punched on 80-column data cards, and transfered onto a disc file. Fig. 2 shows some of these cards. Four data cards were prepared for each informant. The KZN cards contain information about an informant's attributes. The B10, E35, and G31 cards include answers about language usage. Though three answer fields were allowed for each language usage question, most

```
1   =GLAPS      LAST80,NFMLST
2   ********************************************************************************
3   *                                                                              *
4   *           Shizukuishi  1974  (Univ. of Tokyo)                                *
5   *                                                                              *
6   ********************************************************************************
7   CASES       348
8   VARIABLES   COMMUNITY,INFORMANT-NUMBER,NORTH/SOUTH,EAST/WEST
9               ,INTERVIEWER,SEX,AGE,NATIVE-OR-NOT,OCCUPATION,BIRTHPLACE
10              ,PRIMARY-SCHOOL-NAME,YEARS-OF-SCHOOLING,YEARS-OUTSIDE-OF-TOWN
11              ,FATHER'S-BIRTHPLACE,MOTHER'S-BIRTHPLACE,SPOUSE'S-BIRTHPLACE
12  ************        data  definitions  of  "B10"          ************
13  VARIABLES   CHOPSTICKS(3),SCORCHING(3),FLOSS-SILK(3),THREAD(3),ICICLE(3)
14              ,THIN-ICE(3),CHARCOAL-SACK(3),SHIBARERU(3),FROSTBITE(3)
15              ,COWLICK(3)
16  READ(7,700) ALL
17  700 FORMAT  (4X,I1,2X,I1,3X,2I2,1X,A3,4X,I1,I5,I1,1X,3I1,I2,4I1
18              /10X,10(3I2,1X)//)
19  TITLES      "**** intensive investigation at Nishiyama ****"
20              ,"          (Shizukuishi, Iwate Pref.)"
21  *
22  *           distribution of informants' communities
23  *
24  SIZE        25,45
25  LOCATION    NORTH/SOUTH(SOUTH),EAST/WEST(WEST)
26  PRETITLES   "NORTH/WEST                              NORTH/EAST"
27  POSTTITLES  "SOUTH/WEST                              SOUTH/EAST"
28  DELETE      INFORMANT-NUMBER(2-9)
29  NAMES       COMMUNITY(1=Tate)(2=Shinogamori)(3=Shinokawara)(4=Hayasaka)
30                       (5=Higashi-Hayasaka)(6=Kami-Shinozaki)
31                       (7=Shimo-Shinozaki)(8=Higashi-Shinozaki)
32                       (9=Nishi-Shinozaki)
33  SYMBOLS     COMMUNITY(1=1)(2=2)(3=3)(4=4)(5=5)(6=6)(7=7)(8=8)(9=9)
34  ATLAS       COMMUNITY
35  NDELETE
36  *
37  *           crosstabulations of cowlick by other variables
38  *
39  SUBTITLES   COWLICK("(the whirl of hair on the head)"
40                      ,"  // rough classification //")
41  IGNORE      COWLICK(21-33,40-41,59,75,78,81-82,84-88,94-99)
42  RECODE      COWLICK(1=1-16)(34=34,42,44,46-48)(36=35-36,43,49,83,89)
43                     (50=50-52)(53=53-58,77)(60=60-65,69-74)(67=67-68,76)
44                     (90=90-92)
45  NAMES       COWLICK(1=uzumaki)(34=makizyumonzi)(36=makiguri)
46                     (45=makibosi)(50=makure)(53=makurebosi)(60=maruhosi)
47                     (67=makurezyumonzi)(90=tsumuzi)
48  RECODE      AGE(1=1-90404)(2=90404-91404)(3=91404-92404)(4=92404-93404)
49                     (5=93404-94404)(6=94404-95404)(7=95404-99999)
50  NAMES       AGE(1=over 70)(2=over 60)(3=over 50)(4=over 40)(5=over 30)
51                 (6=over 20)(7=over 10)
52  NAMES       NATIVE-OR-NOT(1=native)(2=non-native)
53  NAMES       PRIMARY-SCHOOL-NAME(1=nagayama)(2=nishine)(3=etc.)
54  CROSSTABS   (NATIVE-OR-NOT,AGE,COMMUNITY,PRIMARY-SCHOOL-NAME),COWLICK
55  *
56  *           linguistic maps of cowlick (grouped by informants' age)
57  *
58  SYMBOLS     COWLICK(1=@)(34=+)(36=G)(45=*)(50=X)(53=W)(60=O)(67=H)(90=C)
59  CONTROL     AGE
60  ATLAS       COWLICK
61  CONTROL
62  *
63  *           glottograms of both sides of the river
64  *
65  SIZE        25,64
66  RESTORE     AGE
67  LOCATION    NORTH/SOUTH(SOUTH),AGE(WEST)
68  PRETITLES   "NORTH/YOUNG                                          NORTH/OLD"
69  POSTTITLES  "SOUTH/YOUNG                                          SOUTH/OLD"
70  RECODE      COMMUNITY(1=1-5)(6=6-9)
71  NAMES       COMMUNITY(1=east-side)(6=west-side)
72  CONTROL     COMMUNITY
73  ATLAS       COWLICK
74  CONTROL     COMMUNITY,NATIVE-OR-NOT
75  ATLAS       COWLICK
76  =END
```

Fig. 3 User's Program for Analysis of 'Cowlick'

informants gave only one or two answers to a question. Thus, on the B10 card of informant 1011, there are only twelve answers for the thirty possible answer fields.

3.3 User's Program and Output Results

Fig. 3 is a sample program, using GLAPS language, for analysis of the item 'cowlick' (the whirl of hair on the head). This figure is a fairly large program derived from many smaller programs which were used to analyze 'cowlick' trial and error.

'=GLAPS' of line 1 is the top line of the program, and '=END' of line 76 indicates the end of the program. The lines starting with '*' are comment lines which the GLAPS processor ignores,

and so any useful notes or references can be entered here.

The CASES statement of line 7 denotes the number of informants, here 348. The VARIABLES statement is from line 8 to 11. If a line starts with a space (such as lines 9, 10, and 11), it means the line continues from the previous one. Names of different variables are listed in VARIABLES statements. Any words, letters, and symbols except ',', '=', '(', and ')' can be used for variable names. Unlike FORTRAN or COBOL, the length of variable names is not restricted. Lines 13 to 15 is another VARIABLES statement. But in this statement, a parenthesized three (3) follows every variable name. This means that these variables have three answer fields, that is, room for three different multiple answers to each question. The CASES and the VARIABLES (and the FORMAT of lines 17 and 18) are non-executable statements.

The READ statement of line 16 orders GLAPS to read ALL variables (defined by the VARIABLES statements) from input device number '7' using FORMAT statement labeled 700. Input device numbers like this are associated with data files outside a program. The number '7' here refers to the data file of Fig. 2. The FORMAT statement of lines 17 and 18 specifies data format. This is similar to the standard FORMAT statement of FORTRAN.

The TITLES statement of lines 19 and 20 gives the title of the output results, in this case, two lines in length. The title can be revised by means of a different TITLES statement if needed.

3.3.1 Map of Investigated Houses. The purpose of lines 21 to 35 is the production of a map showing the distribution pattern of the nine communities as well as informants' houses. The SIZE statement of line 24 indicates that the map size is 25 lines by 45 columns. The LOCATION statement of line 25 indicates which variables to use for location decisions. In this case, they are NORTH/SOUTH and EAST/WEST. The PRETITLES statement of line 26 and the POSTTITLES statement of line 27 indicate the character strings to be printed at the top and the bottom of the map, respectively. The DELETE statement of line 28 deletes informants with informant-numbers from 2 to 9, that is, it selects the first informant from each family.

The NAMES statement of lines 29 to 32 identifies the meaning of numbers used in the coded data. For example, the code number 1 of line 29 indicates 'Tate', and so on. The SYMBOLS statement of line 33 assigns symbols (including numbers, as in this case) for the numbers of the data code, for the purpose of mapping the data. This allows for much greater flexibility of design. The ATLAS statement of line 34 is an

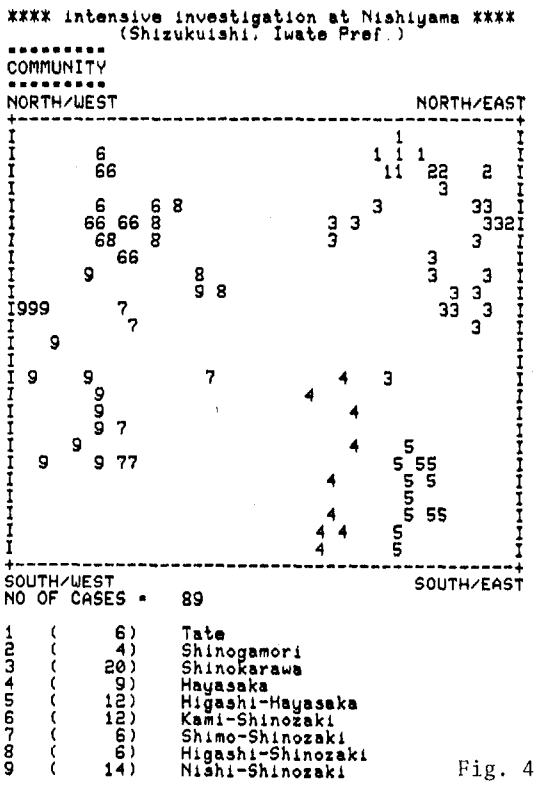


Fig. 4

**** intensive investigation at Nishiyama ****
(Shizukuishi, Iwate Pref.)
CROSSTABULATION OF NATIVE-OR-NOT BY COWLICK
COWLICK
(the whirl of hair on the head)
// rough classification //
NATIVE-OR-NOT

COUNT / ROW PERCENT / COLUMN PERCENT	1 uzumaki	34 makizyumonzi	36 makiguri	45 makibosi	50 makuresi	53 makurebo	60 maruhosi	67 makurezyumonzi	90 tsumuzi	ROW TOTAL
native	41	8	7	1	12	15	64	4	20	172
	23.84	4.65	4.07	0.58	6.98	8.72	37.21	2.33	11.63	62.55
	68.33	47.06	87.50	33.33	66.67	57.69	56.14	80.00	83.33	
non-native	19	9	1	2	6	11	50	1	4	103
	18.45	8.74	0.97	1.94	5.83	10.68	48.54	0.97	3.88	37.45
	31.67	52.94	12.50	66.67	33.33	42.31	43.86	20.00	16.67	
COLUMN TOTAL	60	17	8	3	18	26	114	5	24	275
	21.82	6.18	2.91	1.09	6.55	9.45	41.45	1.82	8.73	

NO OF CASES = 348

Fig. 5

**** intensive investigation at Nishiyama ****
(Shizukuishi, Iwate Pref.)

CROSSTABULATION OF AGE BY COWLICK

COWLICK
(the whirl of hair on the head)
// rough classification //

AGE

COUNT / ROW PERCENT / COLUMN PERCENT	1 uzumaki	34 makizyum onzi	36 makiguri	45 makibosi	50 makure	53 makurebo si	60 maruhosi	67 makurezy umonzi	90 tsumuzi	ROW TOTAL
over 70	2 10.53 3.33	6 31.58 35.29	5 26.32 62.50	0 0. 0.	0 0. 0.	2 10.53 7.69	4 21.05 3.51	0 0. 0.	0 0. 0.	19 6.91
over 60	7 22.58 11.67	7 22.58 41.18	1 3.23 12.50	2 6.45 66.67	1 3.23 5.56	2 6.45 7.69	10 32.26 8.77	0 0. 0.	1 3.23 4.17	31 11.27
over 50	9 24.32 15.00	3 8.11 17.65	0 0. 0.	0 0. 0.	5 13.51 27.78	4 10.81 15.38	15 40.54 13.16	0 0. 0.	1 2.70 4.17	37 13.45
over 40	12 16.67 20.00	1 1.39 5.88	2 2.78 25.00	1 1.39 33.33	10 13.89 55.56	11 15.28 42.31	31 43.06 27.19	3 4.17 60.00	1 1.39 4.17	72 26.18
over 30	9 20.93 15.00	0 0. 0.	0 0. 0.	0 0. 0.	2 4.65 11.11	7 16.28 26.92	23 53.49 20.18	1 2.33 20.00	1 2.33 4.17	43 15.64
over 20	10 21.28 16.67	0 0. 0.	0 0. 0.	0 0. 0.	0 0. 0.	0 0. 0.	21 44.68 18.42	1 2.13 20.00	15 31.91 62.50	47 17.09
over 10	11 42.31 18.33	0 0. 0.	0 0. 0.	0 0. 0.	0 0. 0.	0 0. 0.	10 38.46 8.77	0 0. 0.	5 19.23 20.83	26 9.45
COLUMN TOTAL	60 21.82	17 6.18	8 2.91	3 1.09	18 6.55	26 9.45	114 41.45	5 1.82	24 8.73	275

NO OF CASES = 348

Fig. 6

**** intensive investigation at Nishiyama ****
(Shizukuishi, Iwate Pref.)

CROSSTABULATION OF COMMUNITY BY COWLICK

COWLICK
(the whirl of hair on the head)
// rough classification //

COMMUNITY

COUNT / ROW PERCENT / COLUMN PERCENT	1 uzumaki	34 makizyum onzi	36 makiguri	45 makibosi	50 makure	53 makurebo si	60 maruhosi	67 makurezy umonzi	90 tsumuzi	ROW TOTAL
Tate	1 22.22 6.67	0 0. 0.	0 0. 0.	0 0. 0.	2 11.11 11.11	1 5.56 3.85	9 50.00 7.89	0 0. 0.	2 11.11 8.33	18 6.55
Shinogamori	3 16.67 5.00	1 5.56 5.88	0 0. 0.	0 0. 0.	1 5.56 5.56	3 16.67 11.54	9 50.00 7.89	0 0. 0.	1 5.56 4.17	18 6.55
Shinokarawa	20 30.77 33.33	9 13.85 52.94	1 1.54 12.50	2 3.08 66.67	2 3.08 11.11	10 15.38 38.46	14 21.54 12.28	1 1.54 20.00	6 9.23 25.00	65 23.64
Hayasaka	8 30.77 13.33	1 3.85 5.88	0 0. 0.	0 0. 0.	3 11.54 16.67	2 7.69 7.69	6 23.08 5.26	4 15.38 80.00	2 7.69 8.33	26 9.45
Higashi-Hayasaka	5 13.89 8.33	6 16.67 35.29	0 0. 0.	0 0. 0.	3 8.33 16.67	8 22.22 30.77	10 27.78 8.77	0 0. 0.	4 11.11 16.67	36 13.09
Kami-Shinozaki	13 32.50 21.67	0 0. 0.	1 2.50 12.50	0 0. 0.	3 7.50 16.67	1 2.50 3.85	18 45.00 15.79	0 0. 0.	4 10.00 16.67	40 14.55
Shimo-Shinozaki	2 10.00 3.33	0 0. 0.	2 10.00 25.00	1 5.00 33.33	0 0. 0.	0 0. 0.	13 65.00 11.40	0 0. 0.	2 10.00 8.33	20 7.27
Higashi-Shinozaki	1 7.69 1.67	0 0. 0.	0 0. 0.	0 0. 0.	2 15.38 11.11	0 0. 0.	9 69.23 7.89	0 0. 0.	1 7.69 4.17	13 4.73
Nishi-Shinozaki	4 10.26 6.67	0 0. 0.	4 10.26 50.00	0 0. 0.	2 5.13 11.11	1 2.56 3.85	26 66.67 22.81	0 0. 0.	2 5.13 8.33	39 14.18
COLUMN TOTAL	60 21.82	17 6.18	8 2.91	3 1.09	18 6.55	26 9.45	114 41.45	5 1.82	24 8.73	275

NO OF CASES = 348

Fig. 7

**** intensive investigation at Nishiyama ****
(Shizukuishi, Iwate Pref.)

CROSSTABULATION OF PRIMARY-SCHOOL-NAME BY COWLICK

COWLICK
(the whirl of hair on the head)
// rough classification //

PRIMARY-SCHOOL-NAME

COUNT / ROW PERCENT / COLUMN PERCENT	1 uzumaki	34 makizyumonzi	36 makiguri	45 makibosi	50 makure	53 makurebosi	60 maruhosi	67 makurezyumonzi	90 tsumuzi	ROW TOTAL
1 nagayama	30	12	2	1	12	18	23	4	12	114
	26.32	10.53	1.75	0.88	10.53	15.79	20.18	3.51	10.53	41.45
	50.00	70.59	25.00	33.33	66.67	69.23	20.18	80.00	50.00	
2 nishine	20	2	5	2	5	7	62	0	10	113
	17.70	1.77	4.42	1.77	4.42	6.19	54.87	0.	8.85	41.09
	33.33	11.76	62.50	66.67	27.78	26.92	54.39	0.	41.67	
3 etc.	10	3	1	0	1	1	29	1	2	48
	20.83	6.25	2.08	0.	2.08	2.08	60.42	2.08	4.17	17.45
	16.67	17.65	12.50	0.	5.56	3.85	25.44	20.00	8.33	
COLUMN TOTAL	60	17	8	3	18	26	114	5	24	275
	21.82	6.18	2.91	1.09	6.55	9.45	41.45	1.82	8.73	

NO OF CASES = 348

Fig. 8

instruction for the output of a map.

Fig. 4 is the output result of this ATLAS statement. This figure shows the distribution of the nine communities, plotting the locations of all informants' houses.

The NDELETE statement of line 35 of Fig. 3 cancels the effect of the DELETE statement of line 28, that is, the GLAPS processor begins to treat all the informants hereafter.

3.3.2 Crosstables. Lines 36 to 54 are for the production of crosstables. This is the first of three steps in our analysis of 'cowlick'.

The SUBTITLES statement of lines 39 and 40 gives a more detailed explanation of the meaning of a variable — in this case, COWLICK. The IGNORE statement of line 41 orders that those data codes for COWLICK indicated on this line be ignored.

The RECODE statement of lines 42 to 44 is for re-categorization. In the original dialect data, informants' answers were coded separately from other variants. But by using this RECODE statement, a new code is substituted for the original and a variety of codes put together. The NAMES statement of lines 45 to 47 associates the new code numbers with specific word-forms.

Lines 48 to 51 contain another pair of RECODE and NAMES statements. Originally an informant's age was coded using a five-digit system. If an informant were born in Feburuary 1941, for example, his code was 94102. Someone born in August of 1896 was coded 89608. Lines 48 to 51 classify all the varieties of informants' age into seven groups. The CROSSTABS statement of line 54 means

```
CROSSTABS  NATIVE-OR-NOT,COWLICK
CROSSTABS  AGE,COWLICK
CROSSTABS  COMMUNITY,COWLICK
CROSSTABS  PRIMARY-SCHOOL-NAME,COWLICK
```

and produces four crosstables.

Figs. 5 to 8 are the output results of this CROSSTABS statement. According to Fig. 5, no great difference exists between native and non-native informants. Note that all these word-forms are used by native speakers as well as non-native speakers. This means that even word-forms borrowed from outside have a strong foundation in this area now.

Fig. 6 shows differences by age-group. 'Uzumaki' and 'maruhosi' are used by all age-groups. But, primarily older groups use 'makizyumonzi', 'makiguri', younger groups use 'tsumuzi', and middle-age groups 'makure', 'makurebosi', and 'makurezyumonzi'.

Fig. 7 shows differences by community. For example, 'makizyumonzi' and 'makurebosi' are more common in 'Shinokawara' and 'Higashi-Hayasaka', and so on.

In Fig. 8, 'Nagayama' Primary School can be regarded as equivalent to the east side of the river and 'Nishine' to the west side.

These figures reveal that each word-form has its own distribution pattern.

3.3.3 Linguistic Maps. There are two ways to examine the combined influence of age and geography on the word cowlick: by linguistic maps and by glottograms. Lines 55 to 61 of Fig. 3 are instructions for producing linguistic maps classified by age.

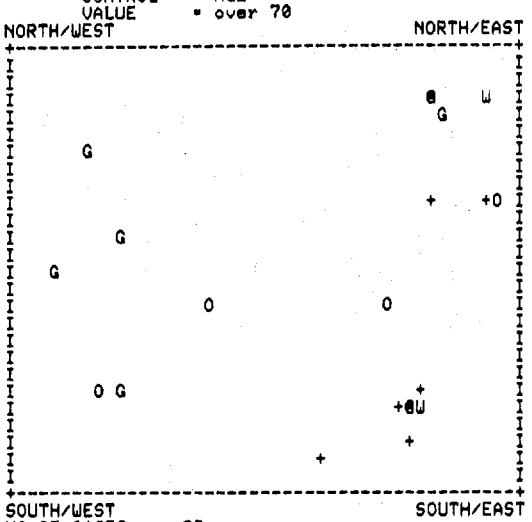
The CONTROL statement of line 59 instructs GLAPS to divide informants into subgroups by AGE and to print out maps for every age group. Since AGE was recoded into seven categories on lines 48 to 51, seven maps of COWLICK — Figs. 9 to 15 — are produced by the single ATLAS statement of line 60.

Fig. 9 is for persons over 70, Fig. 10 for persons over 60, and so on. Fig. 9 shows a clear contrast between east and west. The eastern part uses 'makizyumonzi' whereas the western part 'makiguri'. These seven maps show a great difference between east and west. This suggests that glottograms of both sides of the

**** intensive investigation at Nishiyama ****
(Shizukuishi, Iwate Pref.)

COWLICK

(the whirl of hair on the head)
// rough classification //
CONTROL • AGE
VALUE • over 70



NO OF CASES • 28

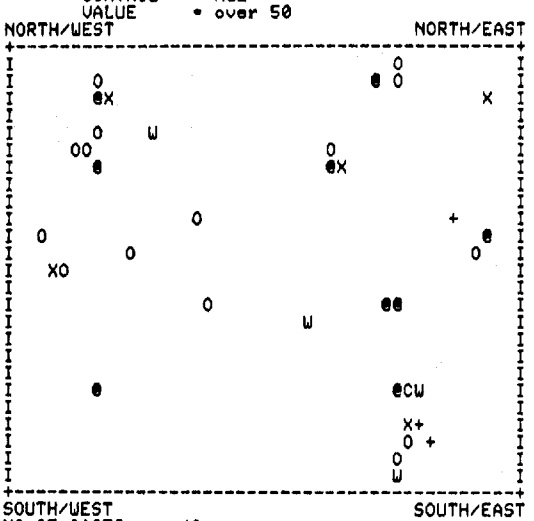
@	(	2)	uzumaki
+	(	6)	makizyumonzi
G	(	5)	makiguri
W	(	2)	makurebosi
O	(	4)	maruhosi

Fig. 9

**** intensive investigation at Nishiyama ****
(Shizukuishi, Iwate Pref.)

COWLICK

(the whirl of hair on the head)
// rough classification //
CONTROL • AGE
VALUE • over 50



NO OF CASES • 40

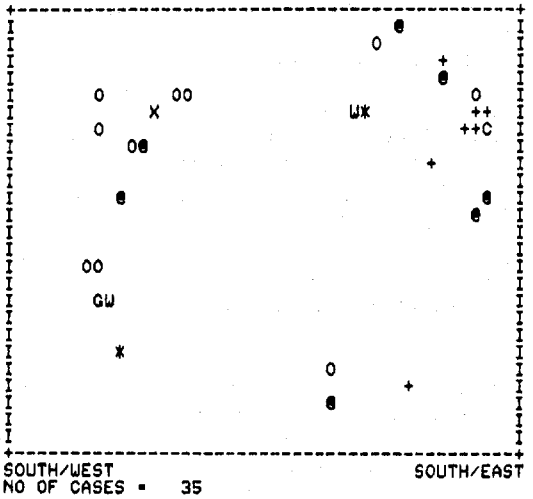
@	(	9)	uzumaki
+	(	3)	makizyumonzi
X	(	5)	makure
W	(	4)	makurebosi
O	(	15)	maruhosi
C	(	1)	tsumuzi

Fig. 11

**** intensive investigation at Nishiyama ****
(Shizukuishi, Iwate Pref.)

COWLICK

(the whirl of hair on the head)
// rough classification //
CONTROL • AGE
VALUE • over 60



NO OF CASES • 35

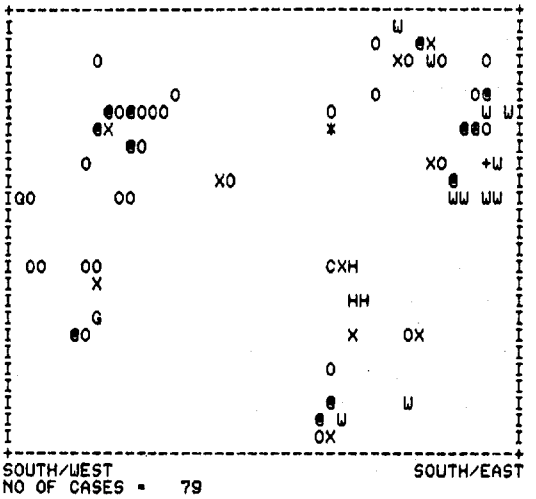
@	(	7)	uzumaki
+	(	7)	makizyumonzi
G	(	1)	makiguri
*	(	2)	makibosi
X	(	1)	makure
W	(	2)	makurebosi
O	(	10)	maruhosi
C	(	1)	tsumuzi

Fig. 10

**** intensive investigation at Nishiyama ****
(Shizukuishi, Iwate Pref.)

COWLICK

(the whirl of hair on the head)
// rough classification //
CONTROL • AGE
VALUE • over 40



NO OF CASES • 79

@	(	12)	uzumaki
+	(	1)	makizyumonzi
G	(	2)	makiguri
*	(	1)	makibosi
X	(	10)	makure
W	(	11)	makurebosi
O	(	31)	maruhosi
H	(	3)	makurezyumonzi
C	(	1)	tsumuzi

Fig. 12

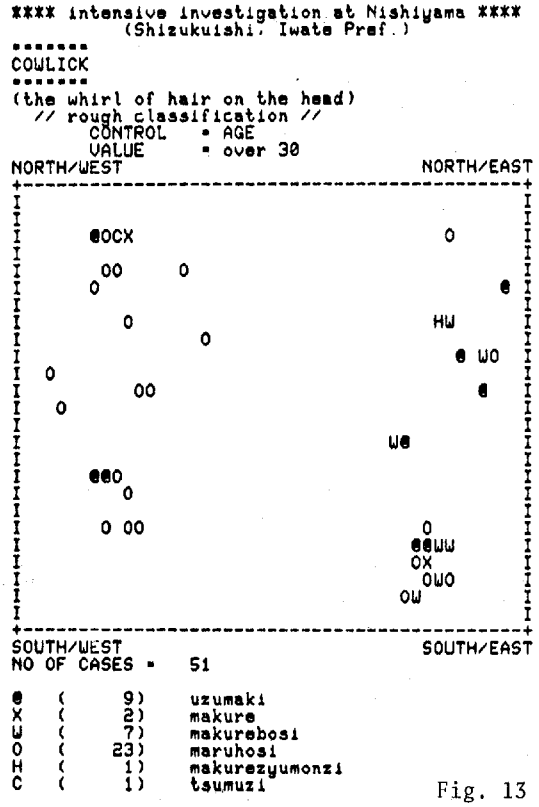


Fig. 13

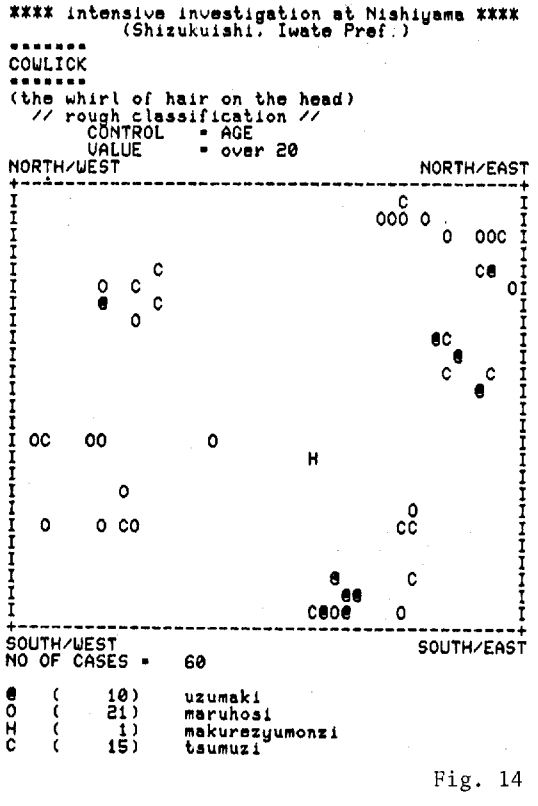


Fig. 14

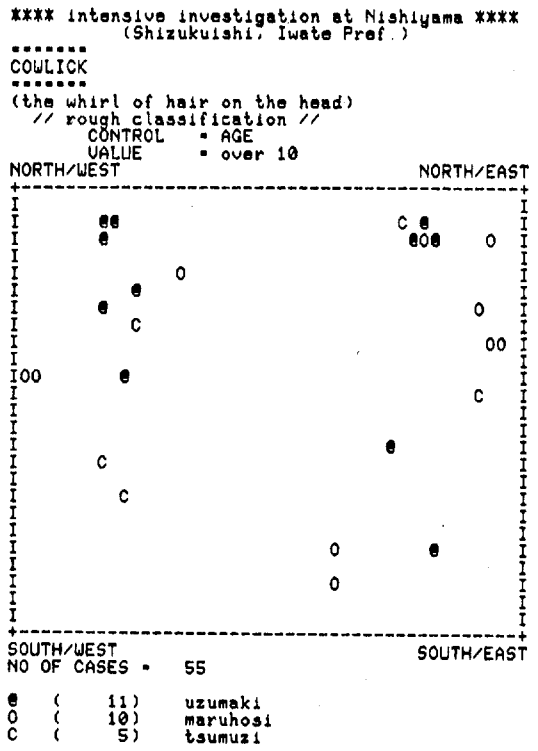


Fig. 15

river might be revealing.

The CONTROL statement of line 61 of Fig. 3 erases the effect of the CONTROL AGE statement of line 59.

3.3.4 Glottograms. Lines 62 to 75 of Fig. 3 contain instructions for producing glottograms.

The SIZE statement of line 65 changes the map size to 25 lines by 64 columns. The RESTORE statement of line 66 orders the restoration of original data, in this case AGE data. Hereafter, codes for AGE are not from 1 to 7 but are five digits as in the original.

The LOCATION statement of line 67 employs AGE and geography to make glottograms. The RECODE, NAMES, and CONTROL statements of lines 70 to 72 divide the investigated area into east and west. The ATLAS statement of line 73 orders two glottograms for the variable COWLICK, shown in Figs. 16 and 17. Since the CONTROL statement of line 74 specifies two variables, the ATLAS statement of line 75 produces four glottograms, that is, Figs. 18 to 21.

Figs. 18 and 19 plot the data of Fig. 16 (east side) according to whether informants are native or non-native, respectively. In Fig. 18, 'maruhosi' (symbol O) is used by only younger informants. However, in Fig. 19, it is widely used by all generations. This means that 'maruhosi' was brought into the east by non-native speakers and that young native speakers only recently began to use it. "Maruhosi' is thus a fairly new word-form in this area.

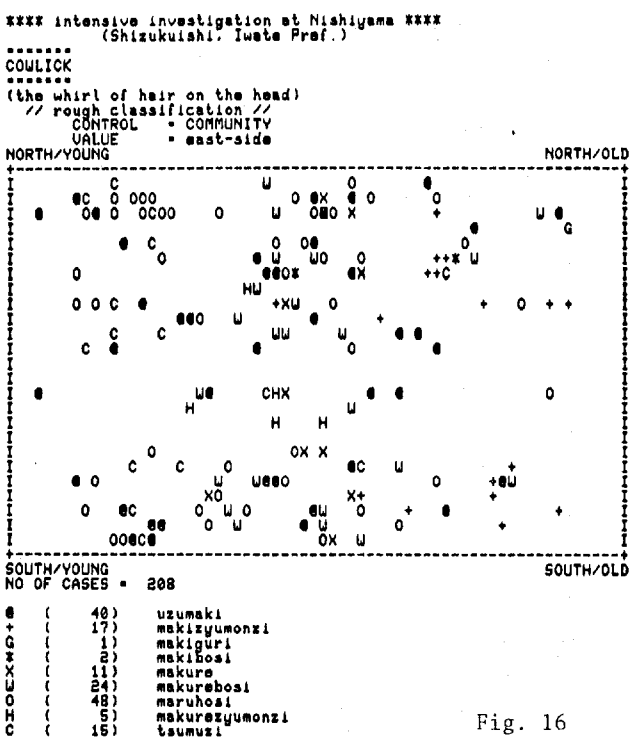


Fig. 16

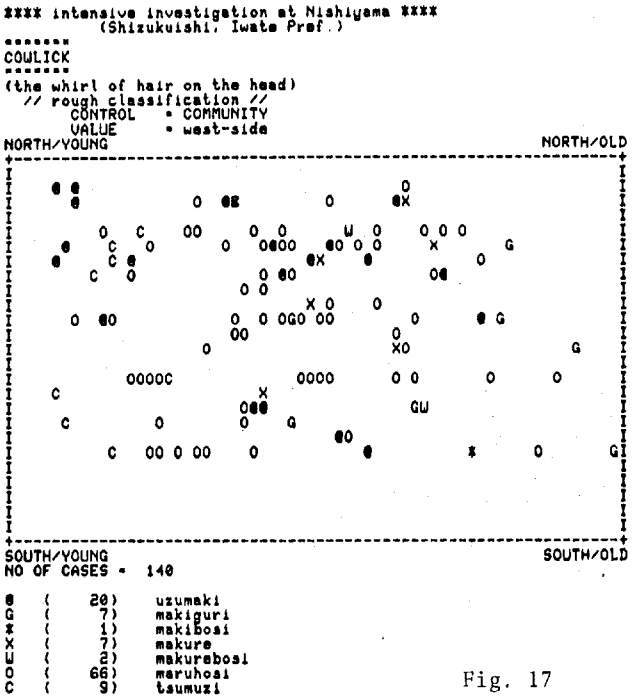


Fig. 17

Figs. 20 and 21 plot the same native/non-native information for Fig. 17 (west side). In the west side glottograms, 'maruhosi' is quite evenly distributed among natives and non-natives. Even older native informants use 'maruhosi', meaning that 'maruhosi' took root earlier in the west than in the east.

3.4 Interpretation of the Results

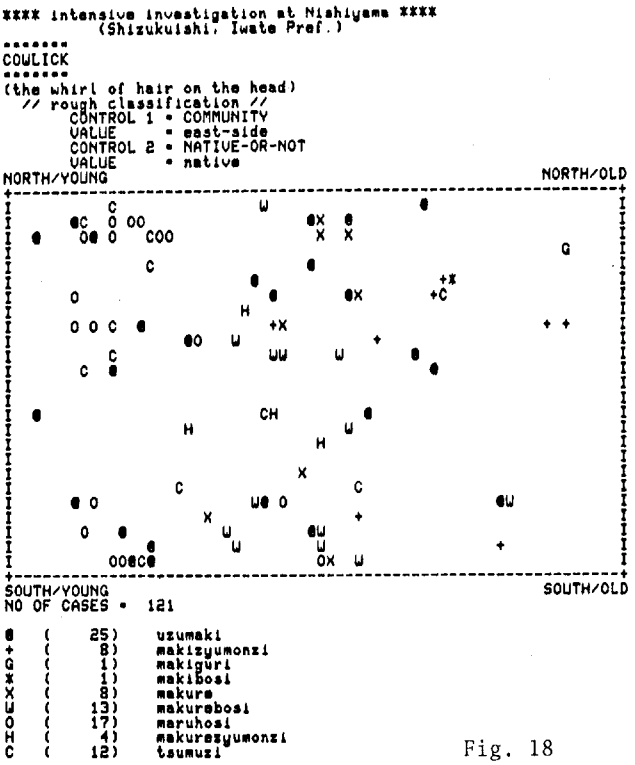


Fig. 18

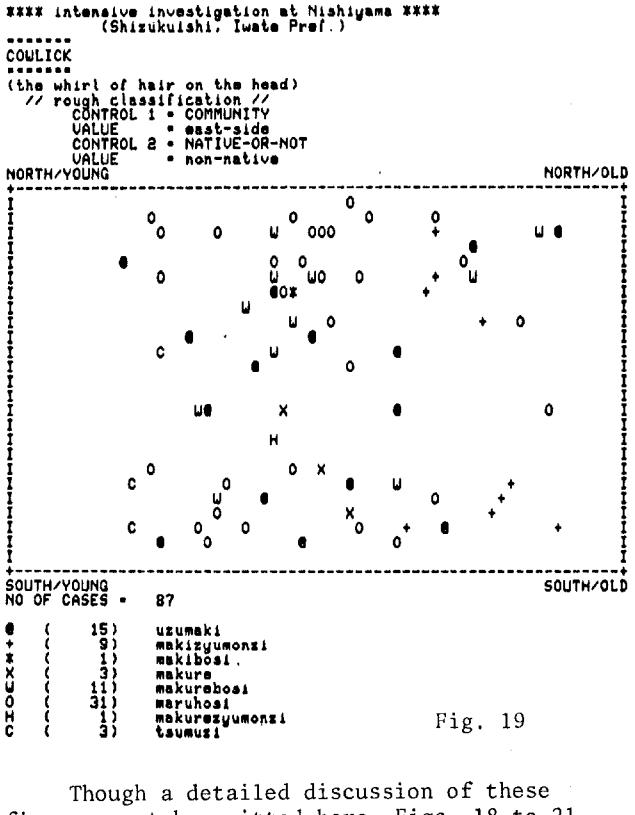


Fig. 19

Though a detailed discussion of these figures must be omitted here, Figs. 18 to 21 suggest the changes in terminology used for 'cowlick' in this area as Fig. 22.

Both 'uzumaki' and 'maruhosi' are widely used in the town of Shizukuishi (Shizukuishi 1973). Past research has shown that new

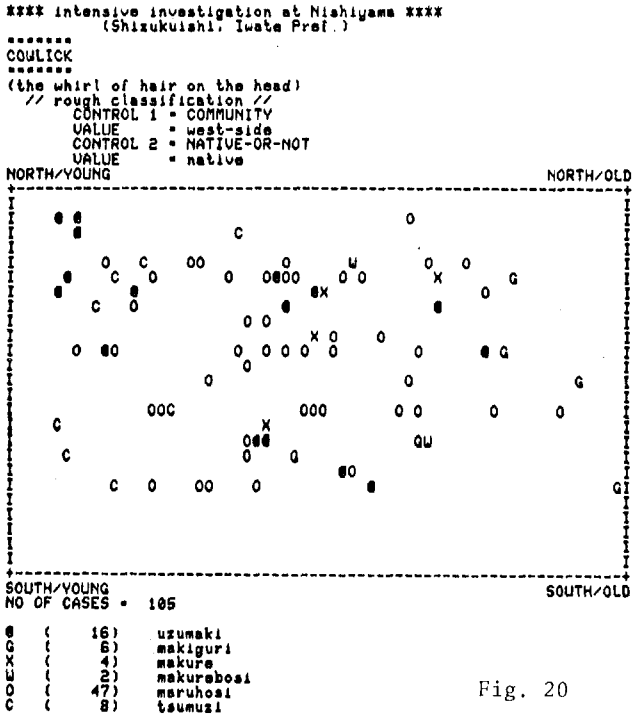


Fig. 20

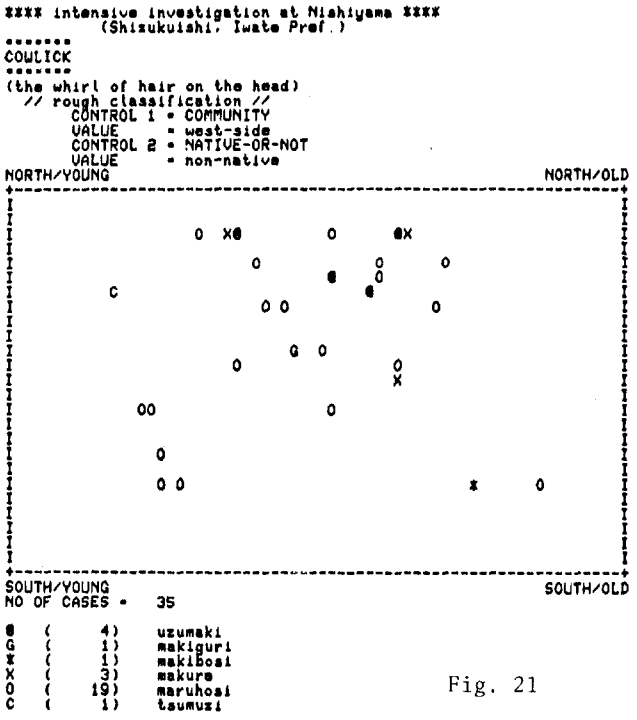


Fig. 21

West side
makiguri → maruhosi → uzumaki → tsumuzi

East side
makizyumonzi → makure → makurebosi → makurezyumonzi → uzumaki → maruhosi → tsumuzi

Fig. 22 Changes in 'Cowlick' in Nishiyama Area

terminology generally moves outward from prestige areas. In the case of 'uzumaki' and 'maruhosi', the prestige area is the town of Shizukuishi; in the case of 'tsumuzi', it is Tokyo. (Note that 'tsumuzi' is the word for cowlick in standard Japanese.)

This process of language change in even a small area was thus readily revealed by GLAPS analysis.

4. Conclusion

GLAPS is a convenient system easily accessible to dialectologists. Moreover, GLAPS may help create a new field of 'sociolinguistic geography'. Including sociolinguistic variables in linguistic geography research will enable us to gain a more sophisticated understanding of dialect distribution patterns.

In the past, dialectologists made no use of computer facilities. Recent dialect research teams, however, especially those involved with sociolinguistic field surveys, have found computers to be useful and efficient. GLAPS is meant as an aid for researchers who are professionals in field linguistics but amateurs in computer programming.

In the humanities, generally, a package program like GLAPS could play an important role. Japan, at least, is backward in training persons in the humanities in computer programming. As far as the author knows, Japan is also backward in the development of convenient program packages for humanists. GLAPS might help promote the spread of computational dialectology, especially computer-assisted dialectology. Needless to say, equipping students of the humanities with computer facilities is most necessary.

NOTES

[1] Shizukuishi 1973: A survey of the linguistic geography of Shizukuishi township, Iwate prefecture, unpublished.

[2] Shizukuishi 1974: An intensive investigation of the Nishiyama area of Shizukuishi town, described in section 3 of this paper, unpublished.

[3] Tokunoshima 1976: A linguistic geography of the small island of Tokunoshima, Kagoshima prefecture. See Sibata, Takesi, et al. (eds) The Language of Amami-Tokunoshima (Tokyo: Akiyama shoten, 1977), in Japanese.

[4] Sapporo 1977: Sociolinguistic research on honorific expressions of Sapporo, Hokkaido. See Sibata, Takesi (ed.) Urbanization and Honorific Expressions: Sapporo 1977 (Tokyo: Dept. of Linguistics, Univ. of Tokyo, 1979), in Japanese.

[5] Sapporo 1978: Sociolinguistic research on honorific expressions of Sapporo, Hokkaido. See Ogino, Tsunao, et al. Sociolinguistic Study of Honorific Expressions in a Japanese City: Sapporo 1978 (Tokyo: Dept. of Linguistics, Univ. of Tokyo, 1980), in Japanese.

[6] See, for example, Inoue, Fumio, et al. Atlas of New Dialects in Mogami District (Tokyo: Tokyo Univ. of Foreign Studies, 1980), in Japanese.