## Table II-1-2 Amount of river water flow

| No. | Flow rate (m3/sec) | Width (m) | Max.depth (m) | Reference |
|---|---|---|---|---|
| 1 | 10.4 | 29.0 | 0.70 | |
| 2 | 20 | 57.0 | 1.34 | |
| 3 | 10.1 | 39.5 | 0.80 | |
| 4 | 0.26 | 6.0 | 0.46 | |
| 5 | 0.2 | 7.8 | 0.12 | |
| 6 | 1.33 | 9.0 | 0.60 | |
| 7 | 1.43 | 16.0 | 0.24 | |
| 8 | 6.26 | 25.5 | 0.78 | |
| 9 | 0.79 | 8.5 | 1.26 | |
| 10 | 4.23 | 18.5 | 0.80 | |
| 11 | 1.42 | 11.5 | 0.76 | |
| 12 | 0.77 | 7.0 | 0.74 | |
| 13 | 0.49 | 6.8 | 0.60 | |
| 14 | 0.28 | 5.5 | 0.25 | |
| 15 | 0.54 | 6.4 | 0.32 | |
| 16 | 1.88 | 9.2 | 0.52 | |
| 17 | 1.98 | 18.5 | 0.20 | |
| 18 | 0.66 | 8.2 | 0.43 | |
| 19 | 3.7 | 26.6 | 0.52 | |
| 20 | 2.12 | 14.3 | 0.36 | |
| 21 | 1.81 | 17.0 | 0.70 | |
| 22 | 5.47 | 36.5 | 0.54 | |
| 23 | 29.1 | 76.0 | 0.86 | Using boat |
| 24 | 43.7 | 95.0 | 1.24 | Using boat |
| 25 | 33.7 | 62.5 | 1.62 | |
| 26 | 9.39 | 37.0 | 0.58 | |
| 27 | 23.9 | 43.0 | 1.08 | |
| 28 | 10.1 | 29.0 | 0.58 | |
| 29 | 2.75 | 25.0 | 0.64 | |
| 30 | 0.29 | 5.0 | 0.38 | |
| 31 | 0.51 | 7.0 | 0.36 | |
| 32 | 0.36 | 13.0 | 0.40 | |

| No. | Flow rate (m3/sec) | Width (m) | Max.depth (m) | Reference |
|---|---|---|---|---|
| 33 | 0.32 | 3.5 | 0.46 | |
| 34 | 339 | 251.0 | 6.00 | Using boat |
| 35 | 24 | 75.0 | 3.38 | Using boat |
| 36 | 52.1 | 237.5 | 3.72 | Using boat |
| 37 | 0.66 | 6.0 | 0.30 | |
| 38 | 7.73 | 38.5 | 0.52 | |
| 39 | 28.7 | 58.0 | 1.58 | Using boat |
| 40 | 92.4 | 110.0 | 1.96 | Using boat |
| 41 | 1.56 | 9.5 | 1.14 | |
| 42 | 70 | cm3/sec | | Seeping water |
| 43 | 86.9 | 90.0 | 2.12 | |
| 44 | 2.36 | 15.7 | 0.44 | |
| 45 | 0.03 | 2.9 | 0.24 | |
| 46 | 1.61 | 23.7 | 0.40 | |
| 47 | 2.22 | 17.1 | 0.42 | |
| 48 | 11.4 | 31.5 | 0.66 | |
| 49 | 18.2 | 39.4 | 0.64 | |
| 50 | 8.49 | 48.5 | 0.78 | |
| 51 | 12.4 | 32.3 | 1.30 | |
| 52 | 2.08 | 13.5 | 0.66 | |
| 53 | 87.9 | 227.0 | 3.18 | Using boat |
| 54 | 0.05 | 2.9 | 0.22 | |
| 55 | 11.7 | 50.0 | 0.84 | |
| 56 | 0 | 21.0 | 0.92 | |
| 57 | 0.11 | 4.0 | 0.10 | |
| 58 | 0.12 | 8.0 | 0.54 | |
| 59 | 0.44 | 13.0 | 0.32 | |
| 60 | 0.13 | 5.0 | 0.26 | |
| 61 | 0.83 | 20.0 | 1.12 | |
| 62 | 0.89 | 13.5 | 0.60 | |
| 63 | 0.39 | 6.5 | 0.26 | |
| 64 | 2080 | cm3/sec | | Hot spring water |
| 65 | 0.6 | 16.0 | 0.36 | |
| 66 | 0.72 | 8.5 | 0.36 | |
| 67 | 7.16 | 84.0 | 0.64 | |
| 68 | 0.33 | 8.3 | 0.28 | |
| 69 | 0.94 | 30.0 | 0.46 | |
| 70 | 3.55 | 19.0 | 0.68 | |
| 71 | 1.02 | 8.0 | 0.60 | |
| 72 | 0.39 | 10.0 | 0.28 | |
| 73 | 1.04 | 7.3 | 0.46 | |
| 74 | 0.53 | 6.7 | 0.32 | |
| 75 | 1.27 | 11.0 | 0.76 | |
| 76 | 0.71 | 8.0 | 0.20 | |
| 77 | 41.4 | 46.5 | 2.46 | Using boat |
| 78 | 0.39 | 16.7 | 0.52 | |
| 79 | 1.04 | 8.1 | 0.30 | |
| 80 | 0.68 | 4.4 | 0.56 | |

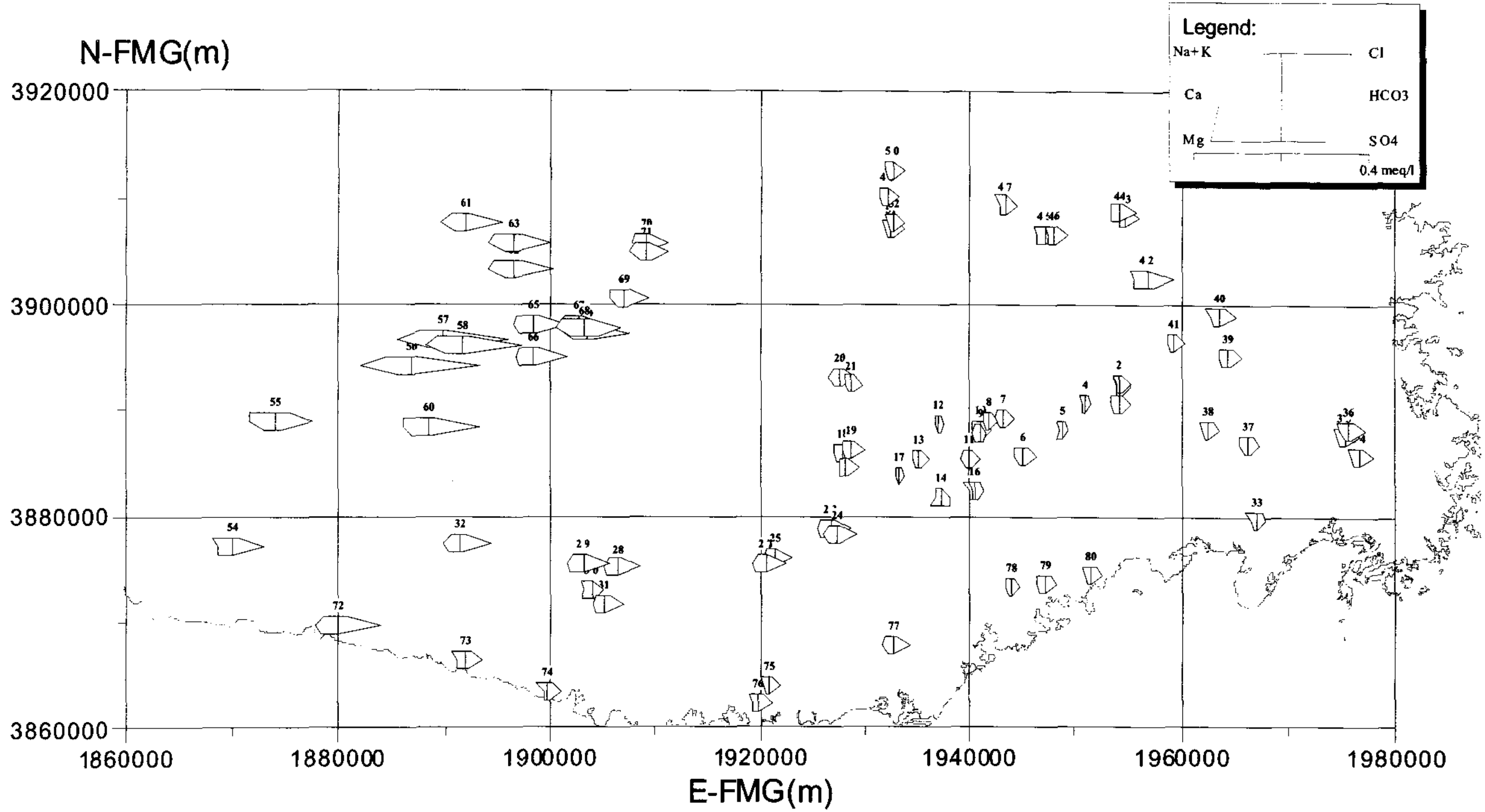



Fig.II-1-2 Stiff diagrams of the surface water chemical compositions.

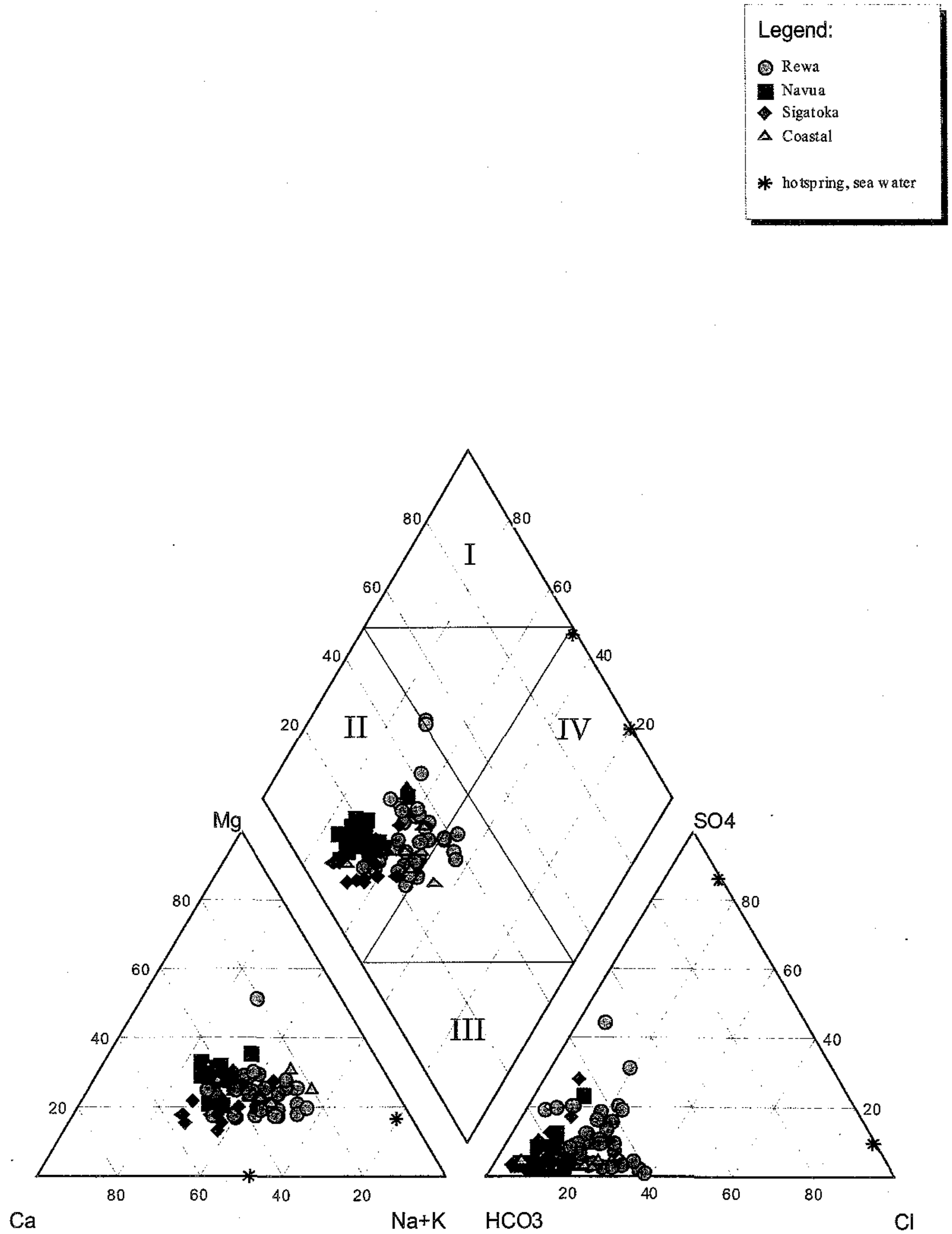



Fig. II-1-3 Piper plot of the surface water chemical composition

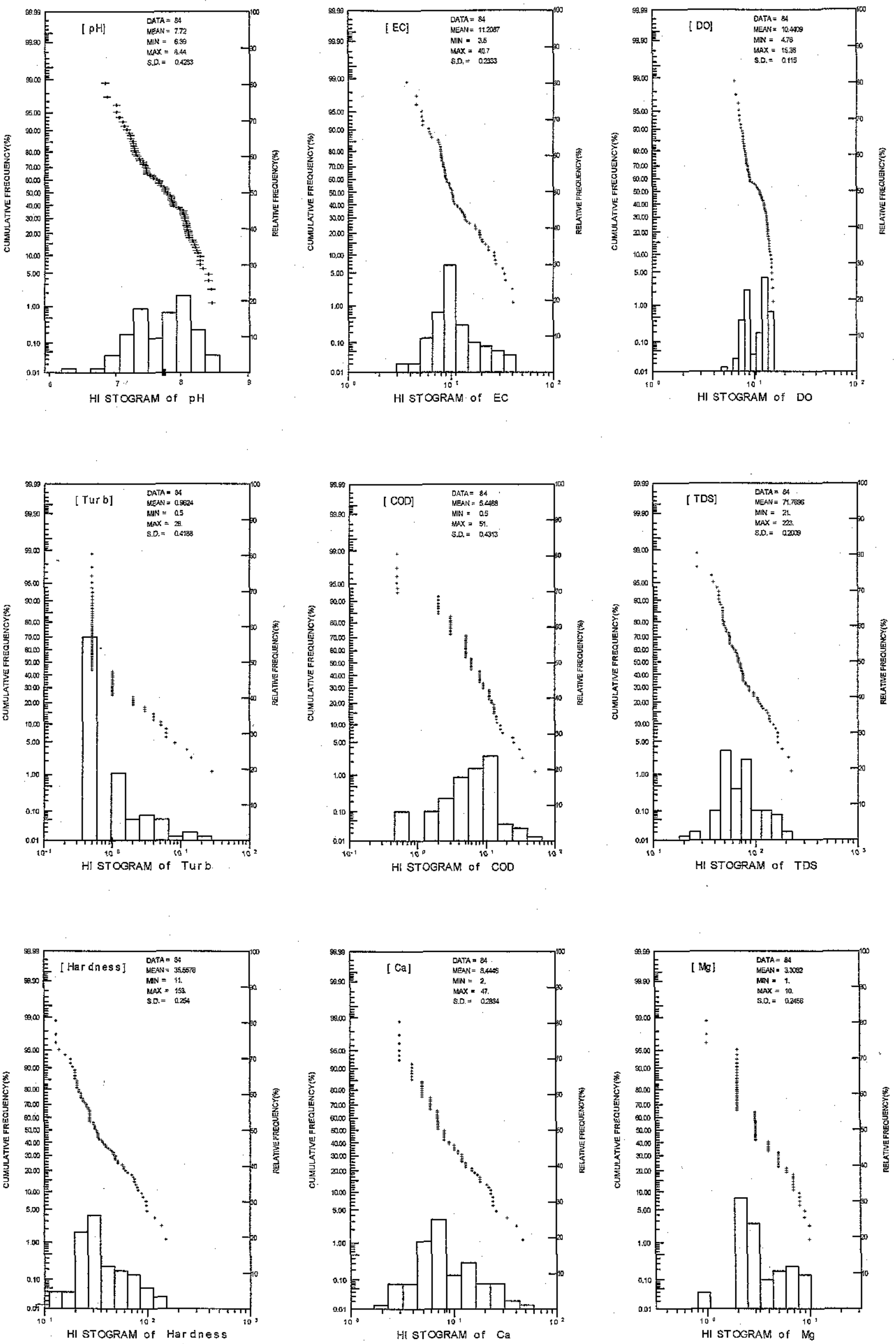



Fig. II-1-4 Probability plot of the surface water samples(1)

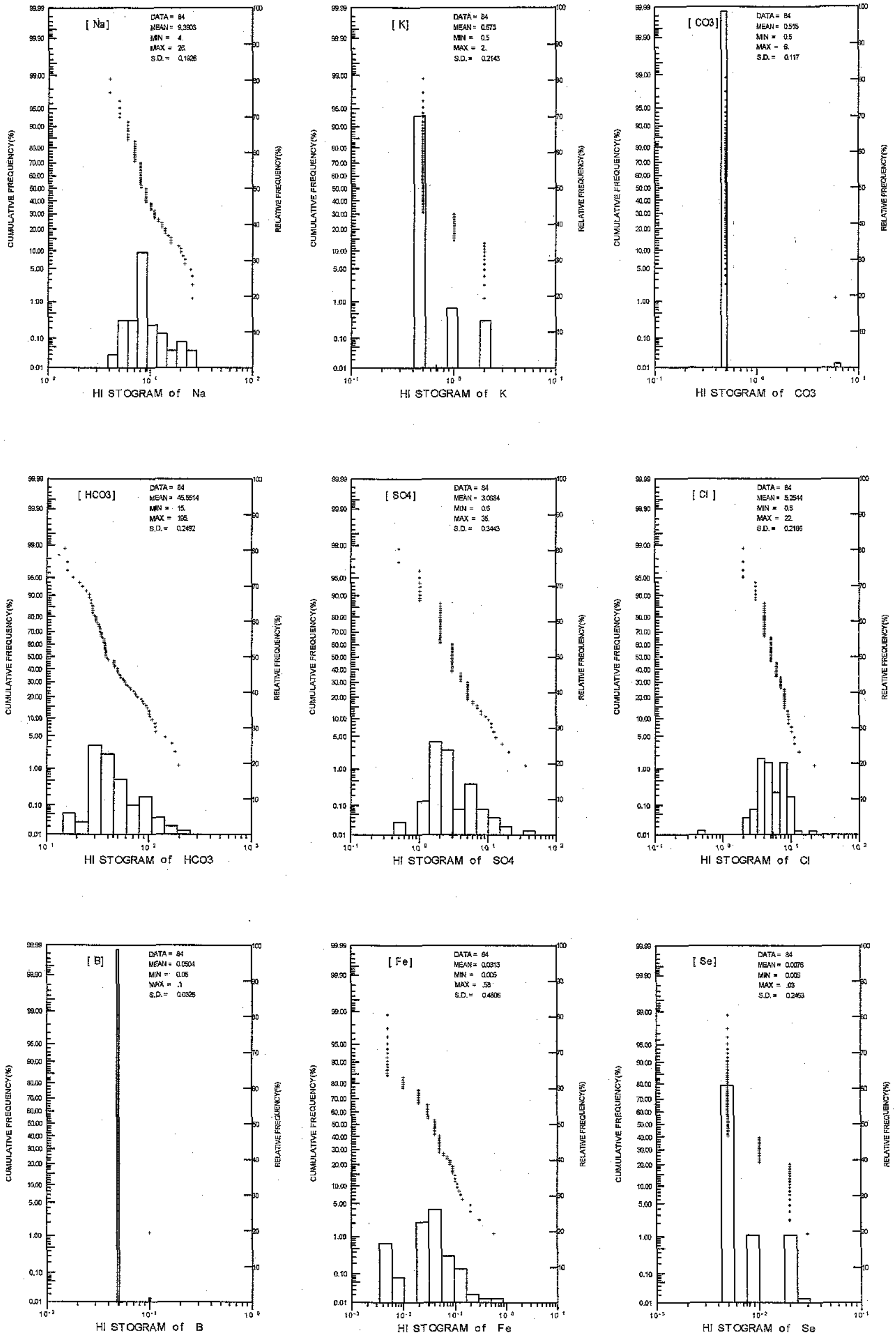



Fig. II-1-4 Probability plot of the surface water samples(2)

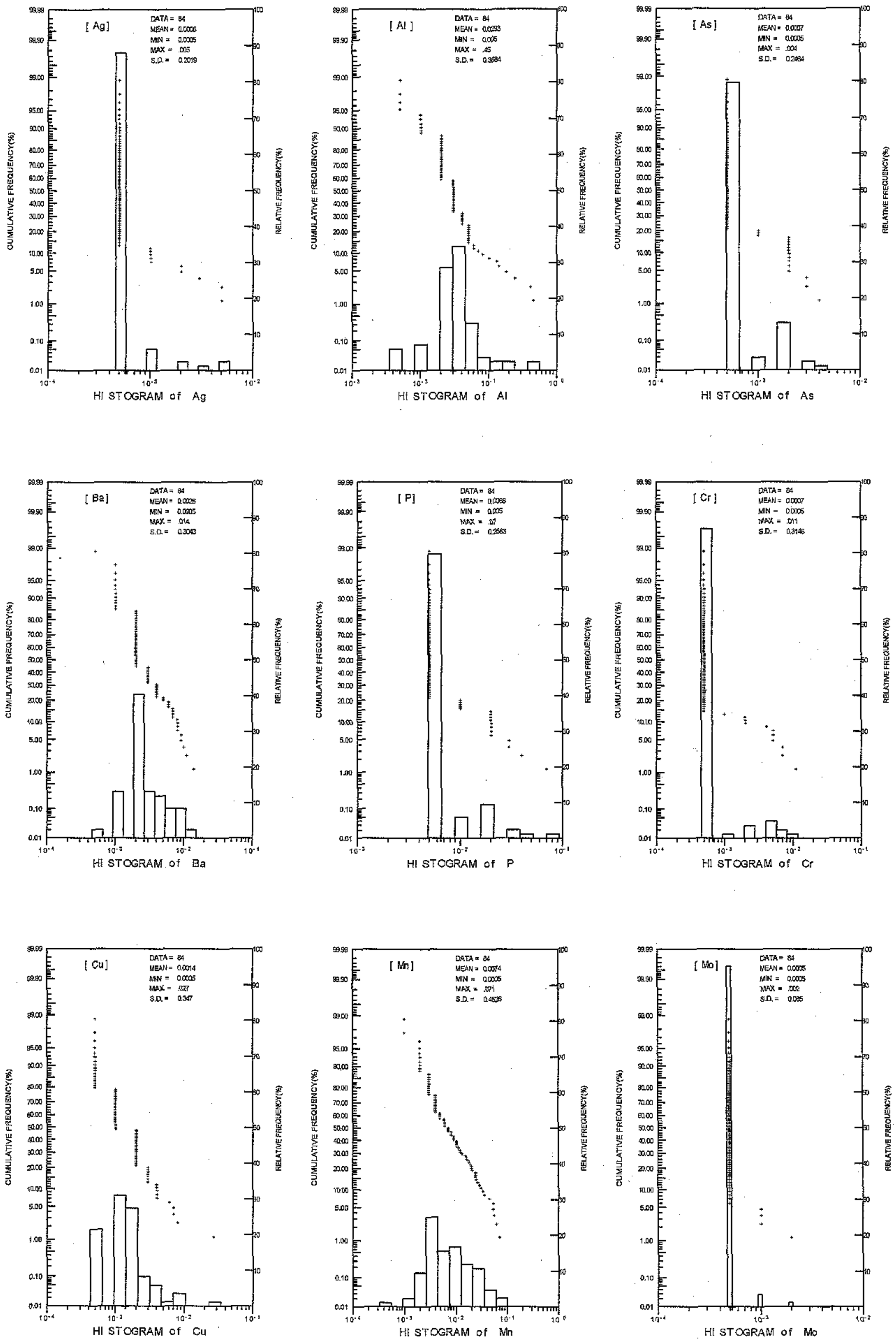



Fig. II-1-4 Probability plot of the surface water samples(3)

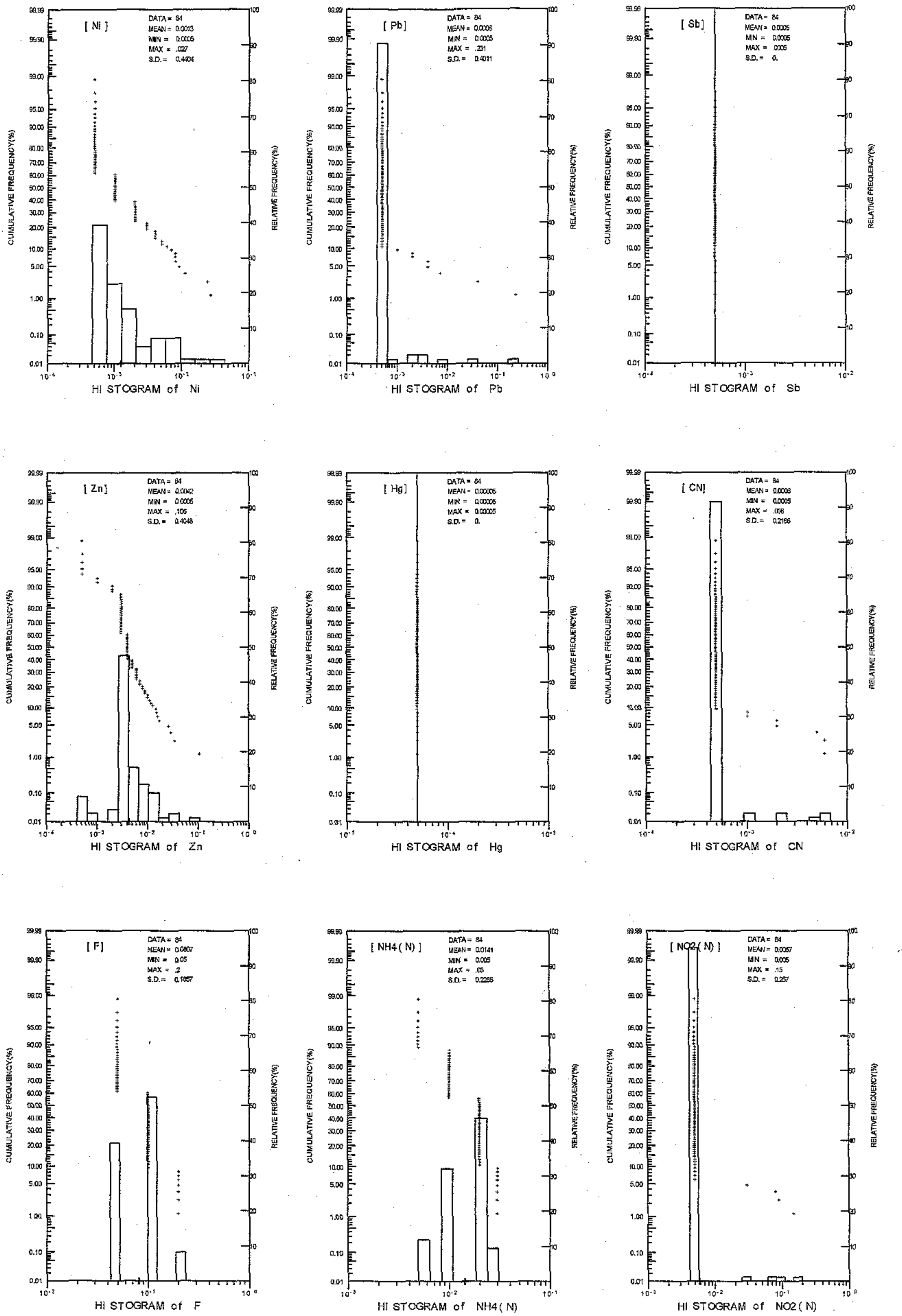
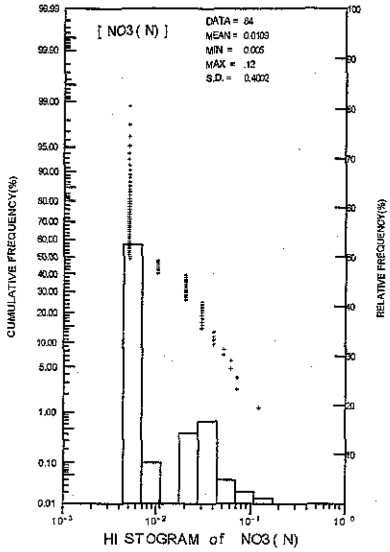



Fig. II-1-4 Probability plot of the surface water samples(4)



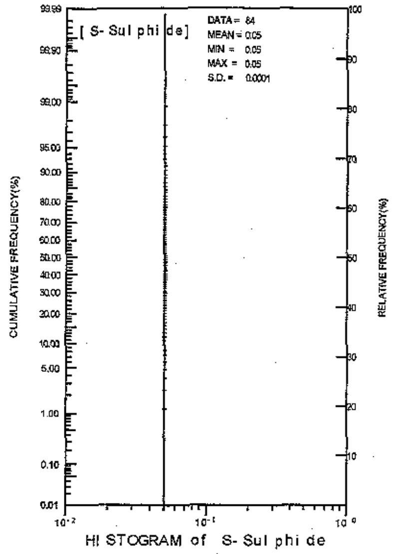




Fig. II-1-4 Probability plot of the surface water samples (5)

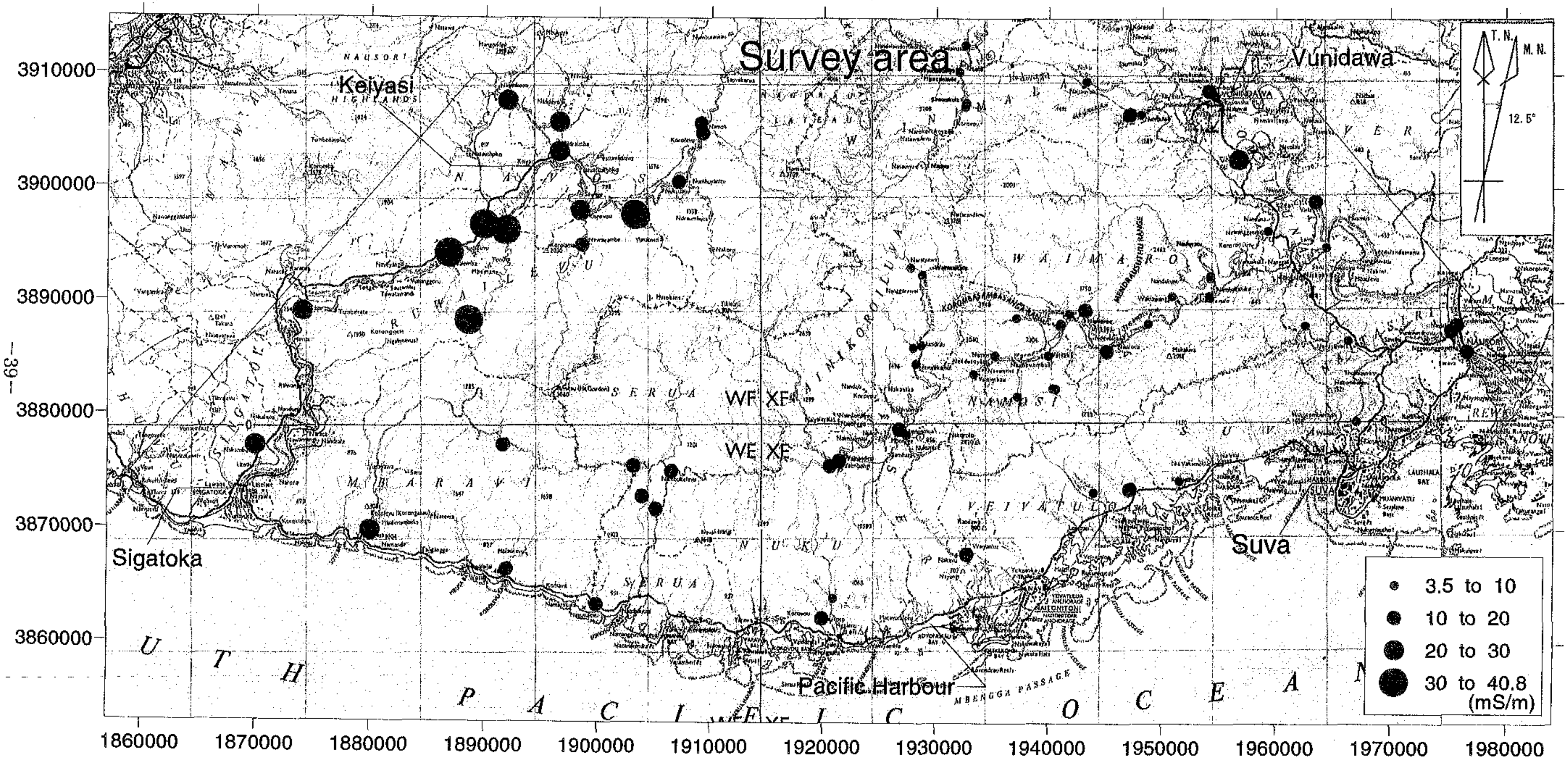



Fig.II-1-5 Distribution of geochemical anomaly of the surface water samples (1) EC

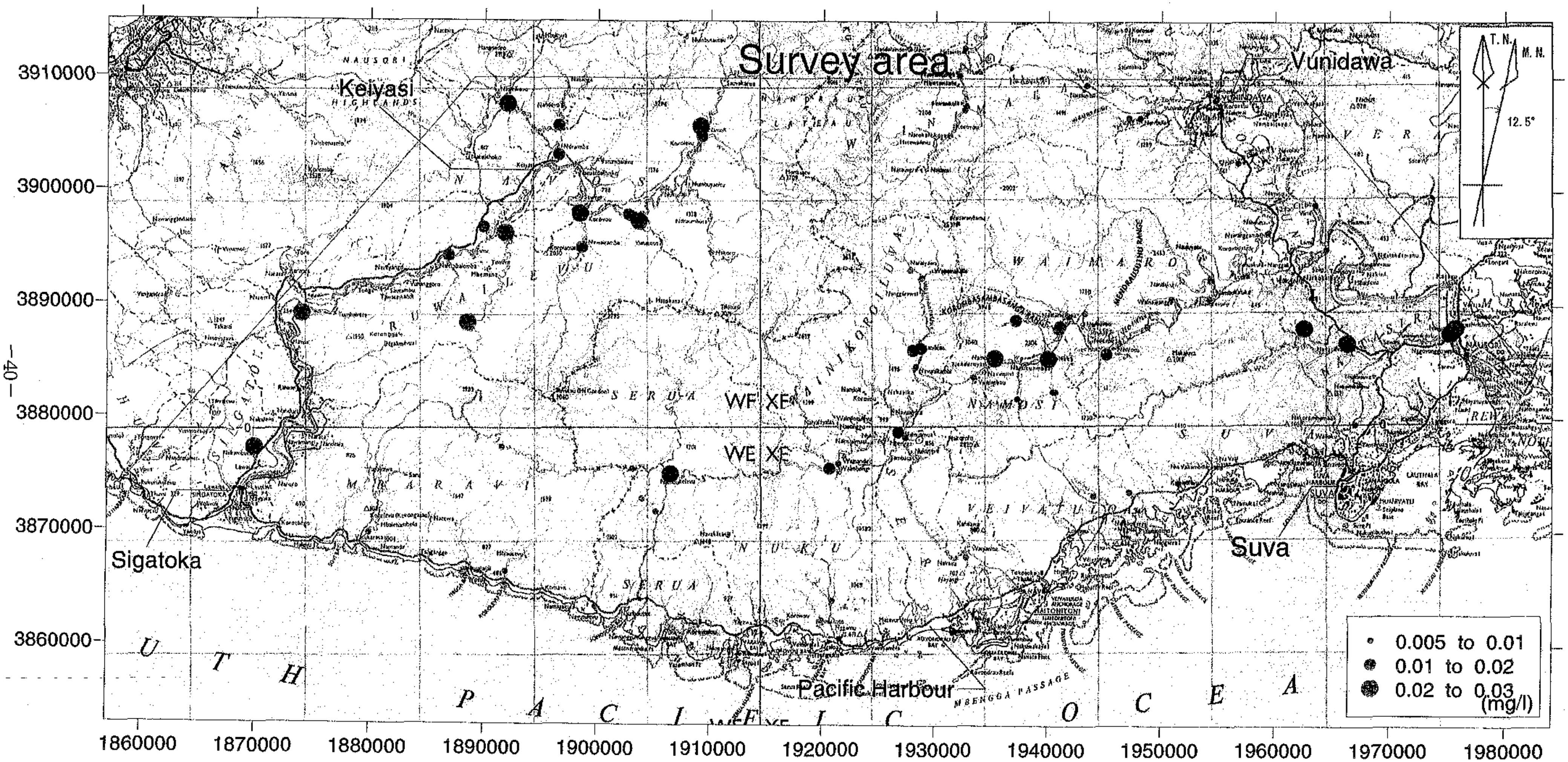



Fig.II-1-5 Distribution of geochemical anomaly of the surface water samples (2) Se

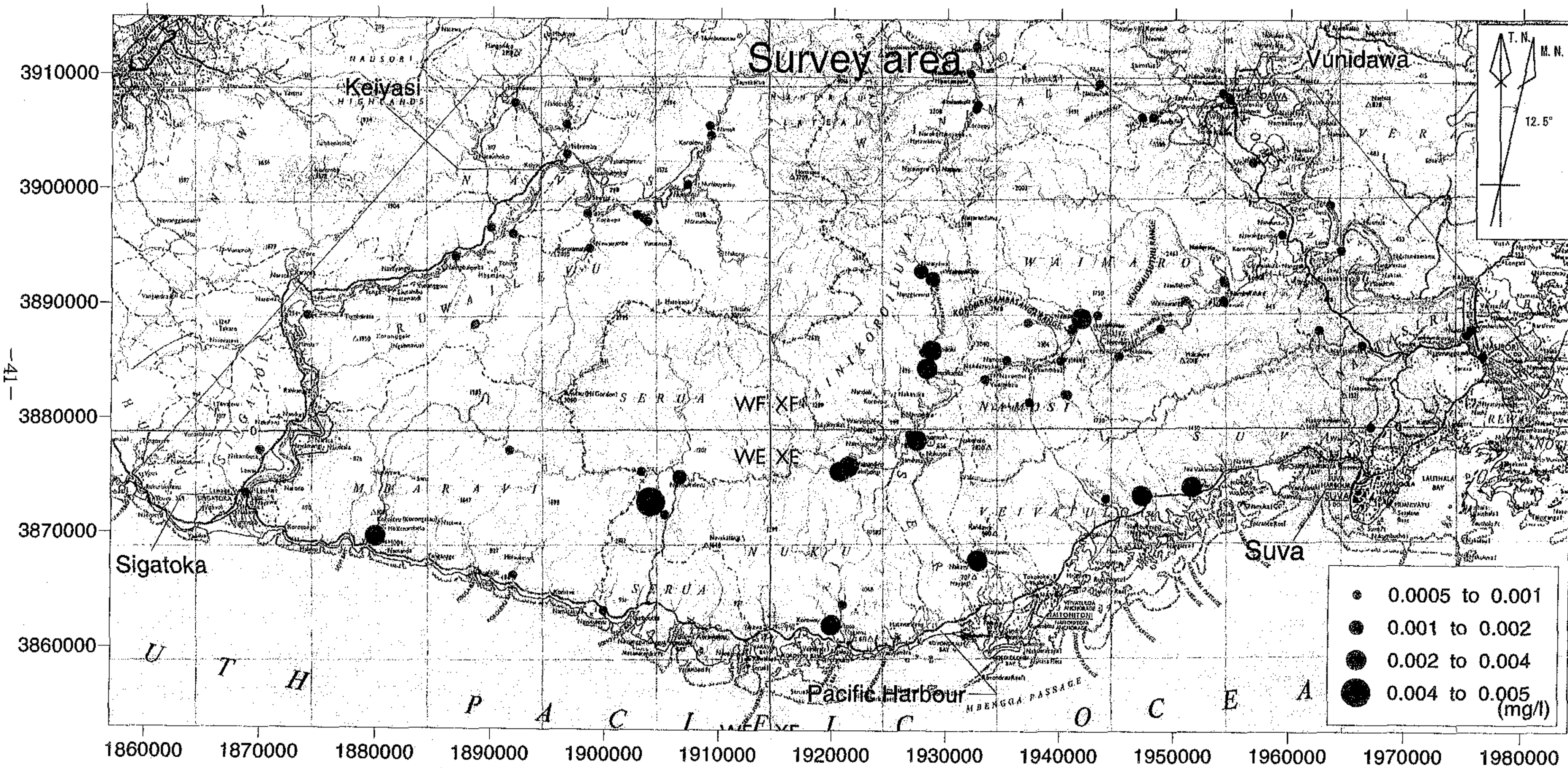



Fig.II-1-5 Distribution of geochemical anomaly of the surface water samples (3) As

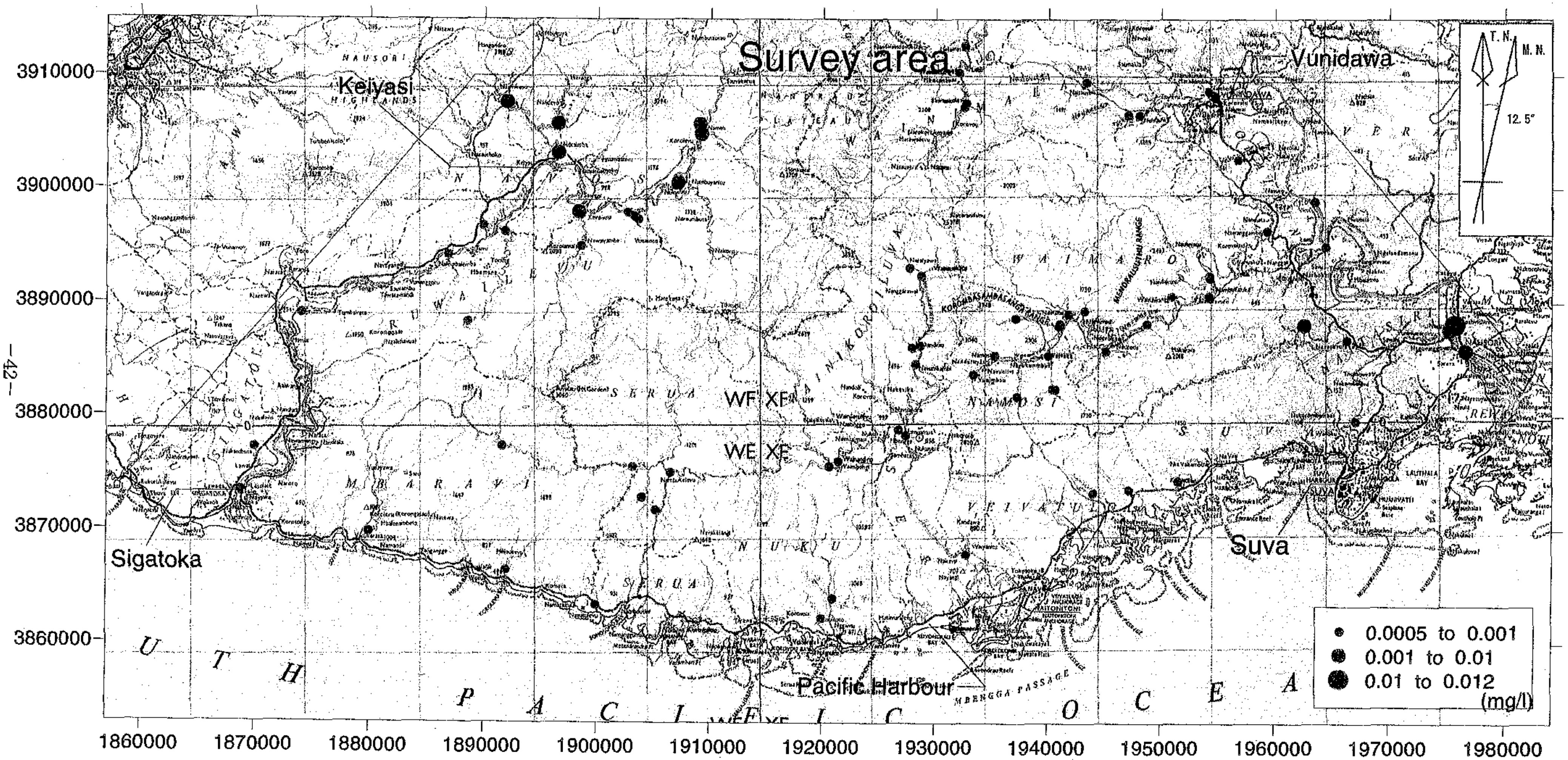



Fig.II-1-5 Distribution of geochemical anomaly of the surface water samples (4) Cr

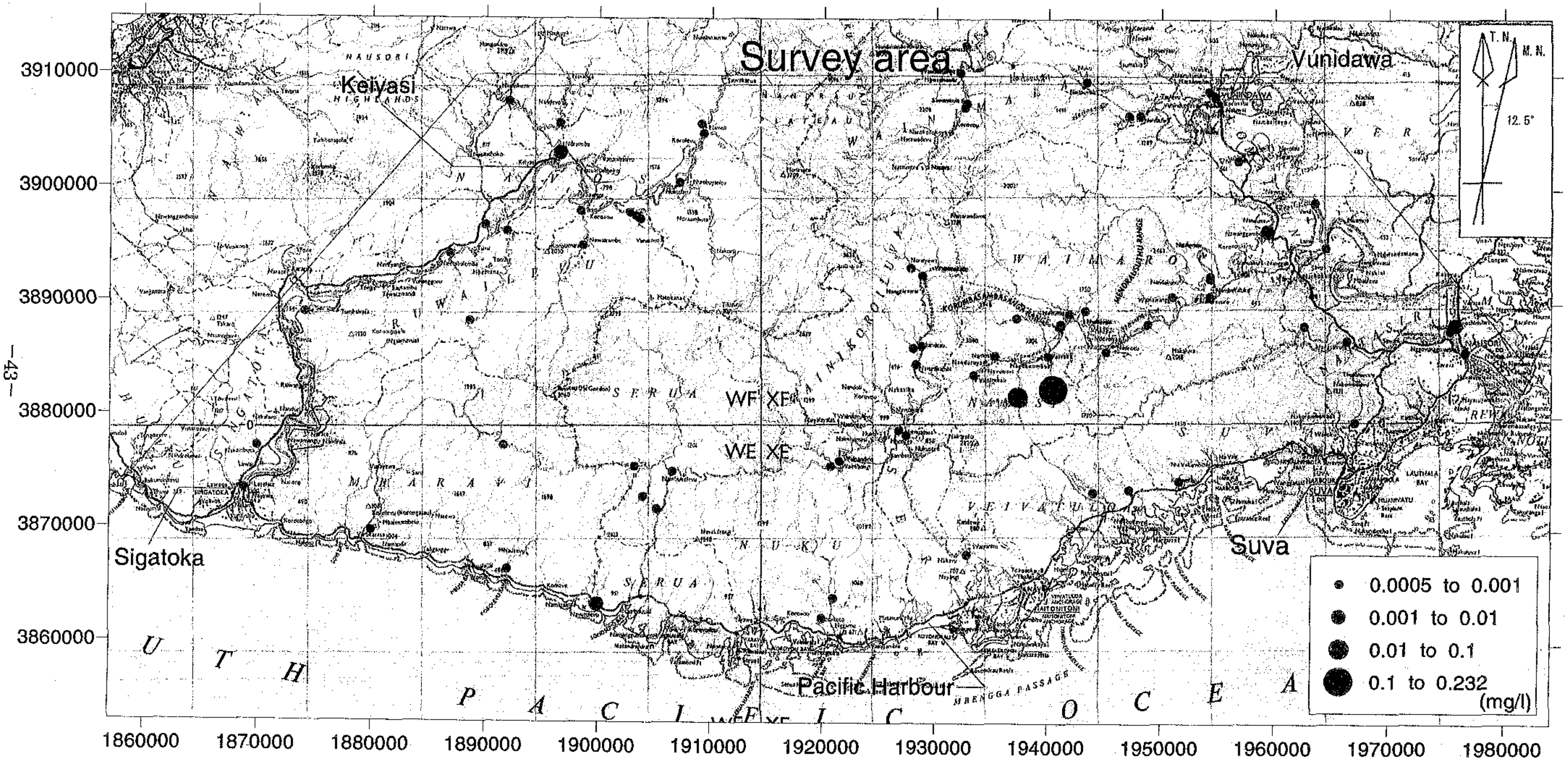



Fig.II-1-5 Distribution of geochemical anomaly of the surface water samples (5) Pb

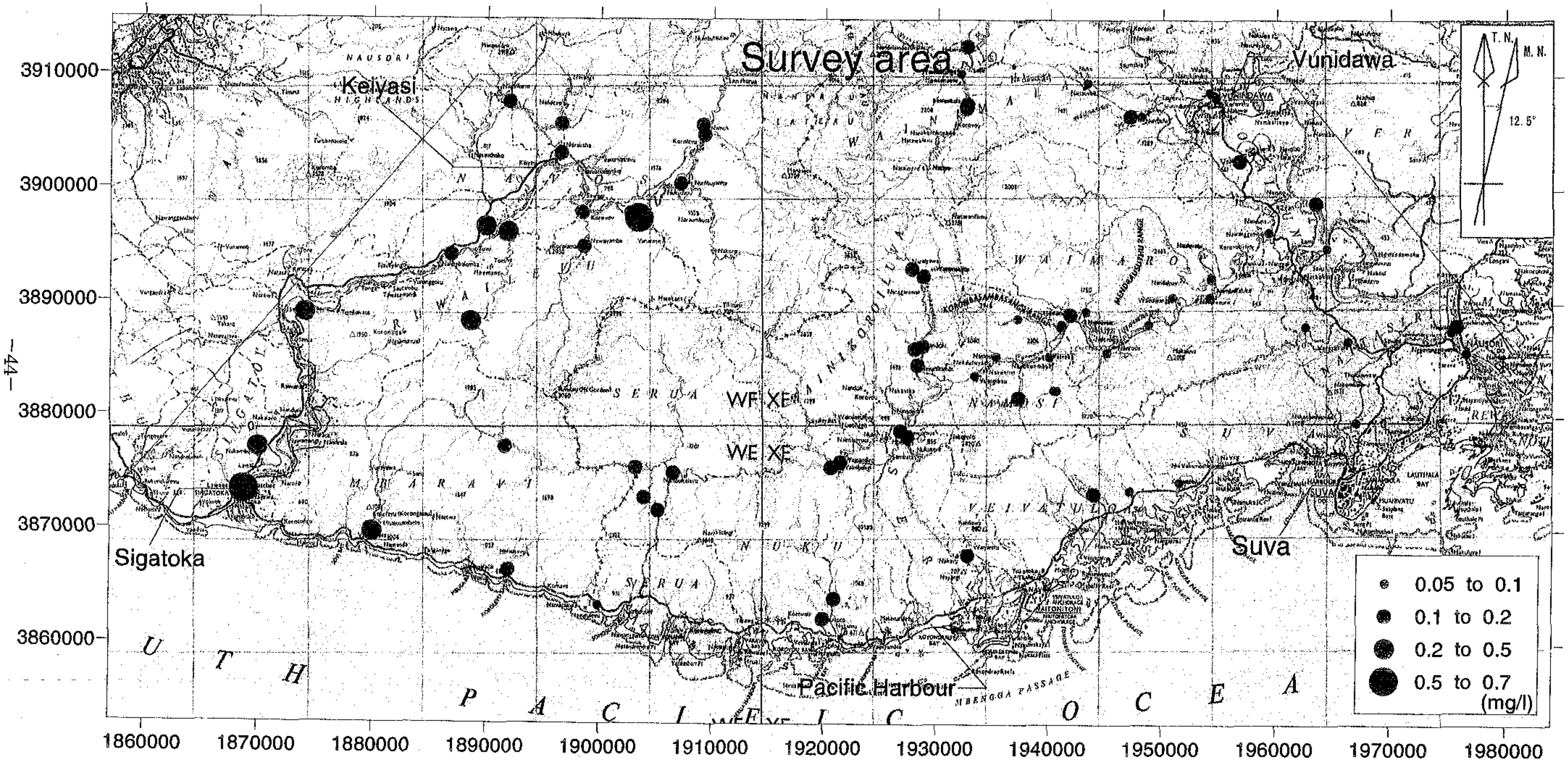



Fig.II-1-5 Distribution of geochemical anomaly of the surface water samples (6) F

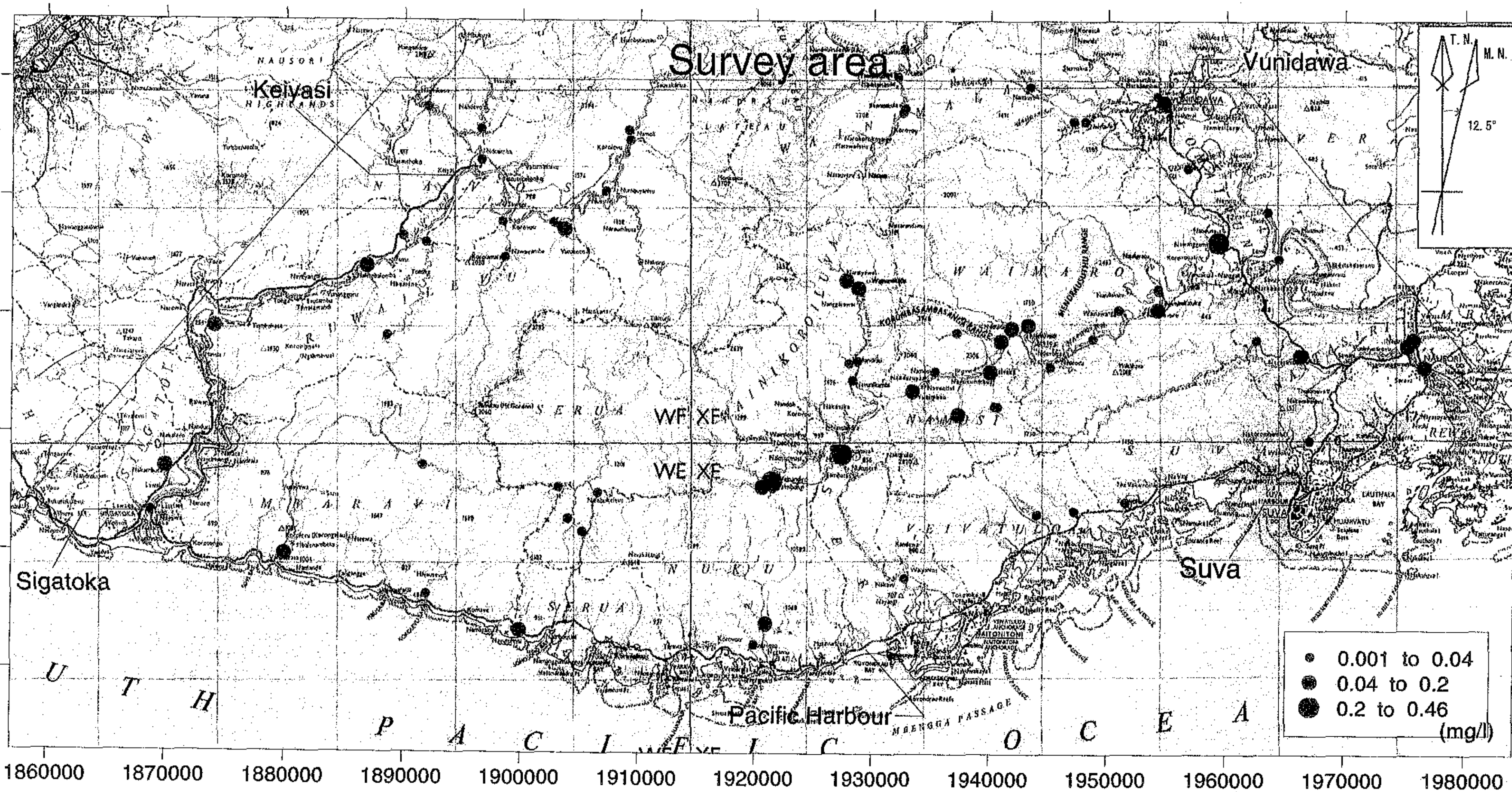



Fig.II-1-5 Distribution of geochemical anomaly of the surface water samples (7)Al

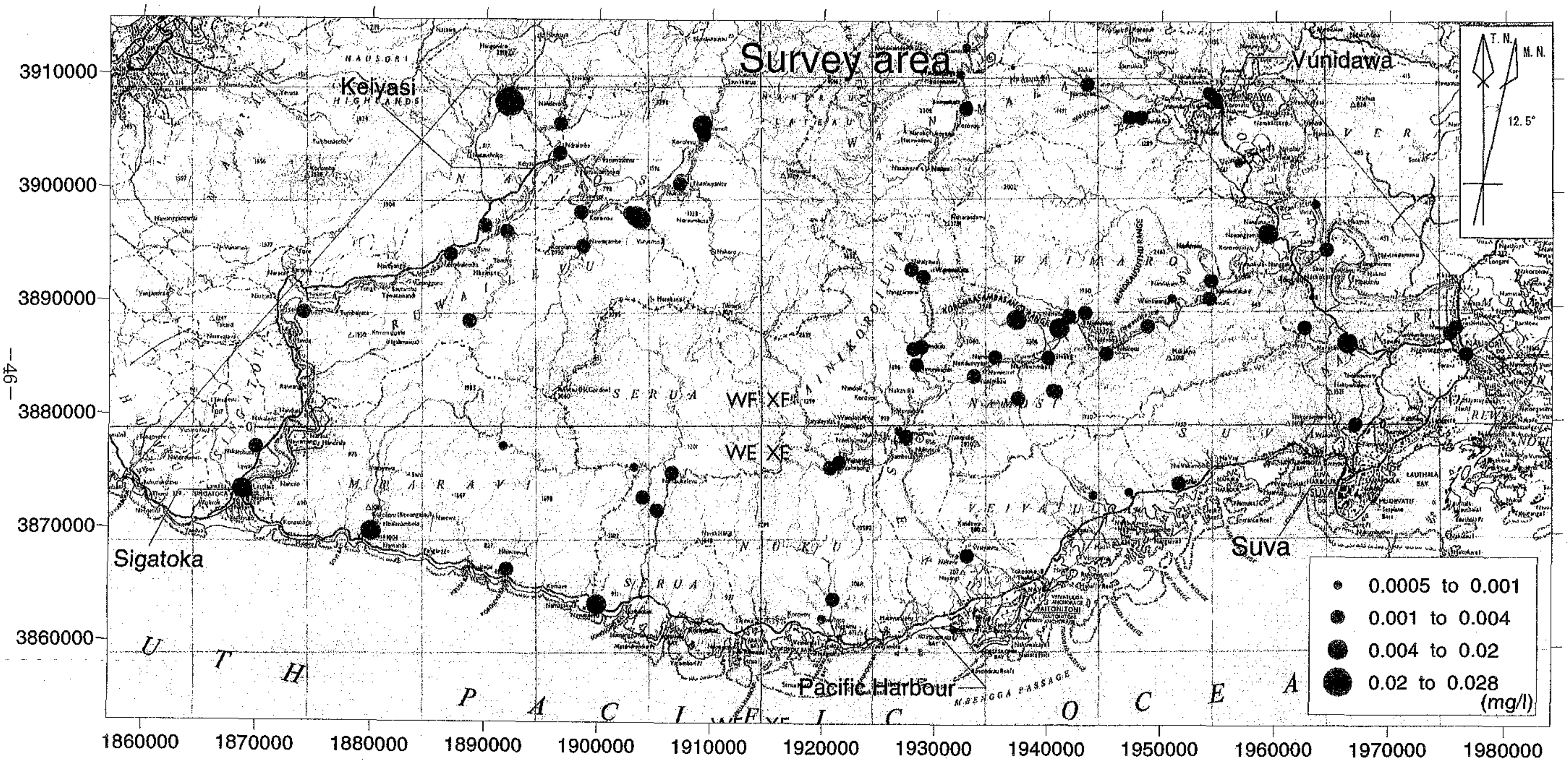



Fig.II-1-5 Distribution of geochemical anomaly of the surface water samples (8) Cu

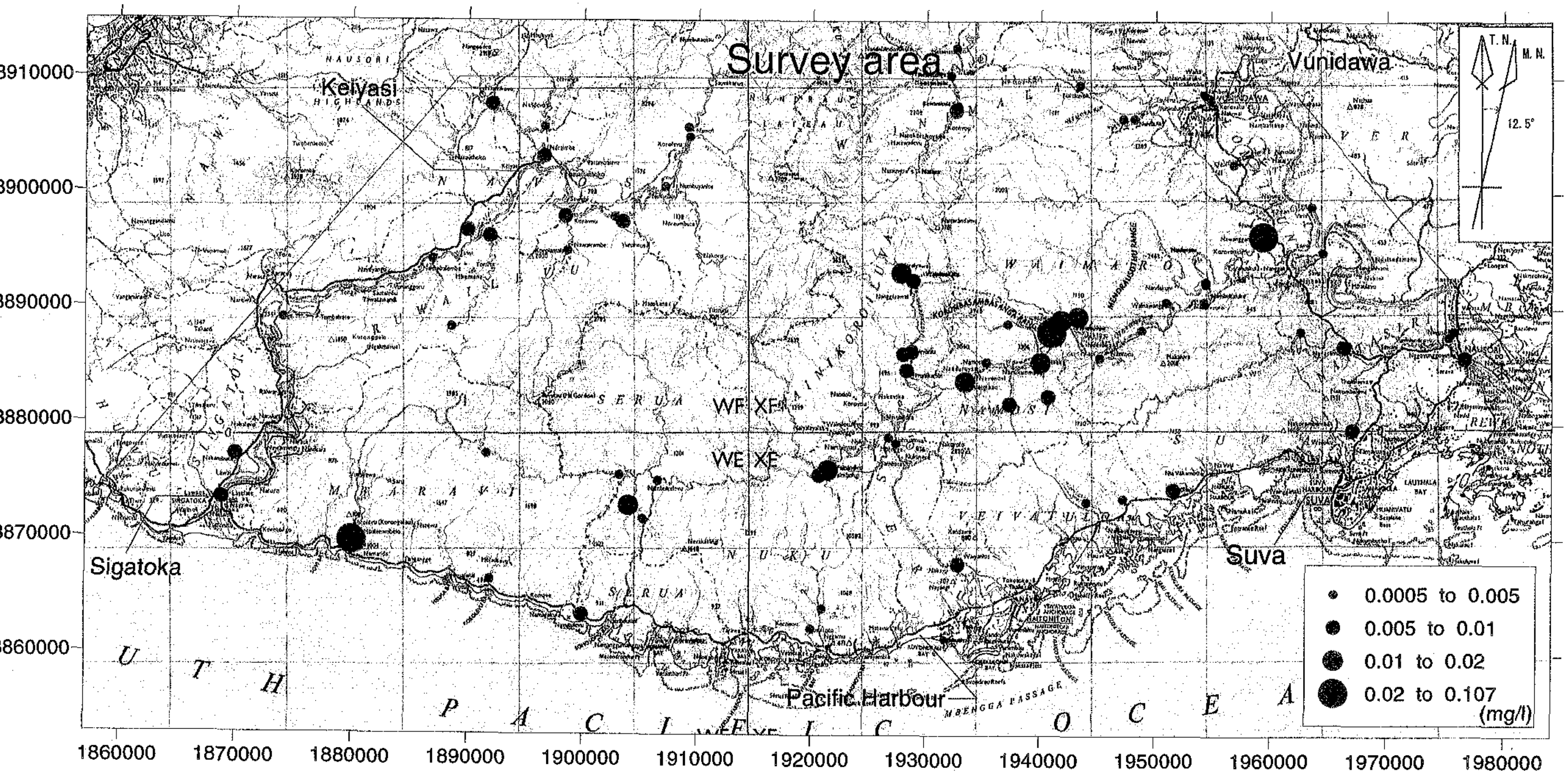



Fig.II-1-5 Distribution of geochemical anomaly of the surface water samples (9) Zn

# Table II-1-3 Duplicate water sample data

| | | | 5 | 81 | 6 | 84 | 17 | 85 | 22 | 86 | 23 | 87 | 32 | 88 | 53 | 83 | 64 | 82 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | (Dubri). | | (Dubri). | | (Dubri). | | (Dubri). | | (Dubri). | | (Dubri). | | (Dubri). | | (Dubri). |
| pH Value | | 0.01 | 7.39 | 7.36 | 7.55 | 7.62 | 6.98 | 7.01 | 7.32 | 7.57 | 7.82 | 7.85 | 7.8 | 7.71 | 8.02 | 7.95 | 8.62 | 8.68 |
| Conductivity @ 25'c | uS/cm | 1 | 52 | 53 | 98 | 103 | 45 | 45 | 82 | 82 | 125 | 121 | 175 | 176 | 22900 | 23600 | 1720 | 1730 |
| Total Dissolved Solids (TDS) | mg/L | 1 | 48 | 72 | 68 | 52 | 27 | 27 | 49 | 49 | 75 | 73 | 105 | 106 | 17300 | 16200 | 1280 | 1260 |
| Total Hardness as CaCO3 | mg/L | 1 | 16 | 14 | 30 | 32 | 13 | 13 | 28 | 28 | 49 | 52 | 75 | 75 | 3030 | 2950 | 465 | 454 |
| Calcium - Filtered | mg/L | 1 | 3 | 3 | 8 | 9 | 3 | 3 | 7 | 7 | 12 | 12 | 18 | 18 | 211 | 205 | 186 | 182 |
| Magnesium - Filtered | mg/L | 1 | 2 | 2 | 2 | 3 | 1 | 1 | 3 | 2 | 5 | 5 | 7 | 7 | 619 | 592 | <1 | <1 |
| Sodium - Filtered | mg/L | 1 | 6 | 6 | 8 | 7 | 5 | 4 | 7 | 6 | 10 | 8 | 11 | 11 | 5490 | 5160 | 216 | 223 |
| Potassium - Filtered | mg/L | 1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 1 | <1 | 1 | 1 | 220 | 215 | 6 | 6 |
| Carbonate as CaCO3 | mg/L | 1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 4 | 4 |
| Bicarbonate as CaCO3 | mg/L | 1 | 21 | 22 | 35 | 34 | 15 | 16 | 36 | 36 | 58 | 59 | 85 | 87 | 117 | 116 | 8 | 8 |
| Sulphate - Filtered | mg/L | 1 | 1 | 1 | 6 | 8 | <1 | <1 | 3 | 3 | 3 | 2 | 2 | 2 | 1400 | 1360 | 784 | 769 |
| Chloride | mg/L | 1 | 4 | 6 | 7 | 3 | 5 | 4 | 2 | 3 | 5 | 4 | 9 | 11 | 9710 | 9130 | 83 | 86 |
| Boron - Filtered | mg/L | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 2.2 | 2.1 | 0.3 | 0.2 |
| Iron - Total | mg/L | 0.01 | <0.01 | <0.01 | 0.03 | 0.06 | 0.2 | 0.05 | 0.03 | 0.03 | 0.03 | 0.04 | 0.01 | 0.02 | 0.01 | <0.01 | 0.01 | <0.01 |
| Selenium - Total | mg/L | 0.01 | <0.01 | <0.01 | 0.01 | 0.02 | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.02 | 0.01 | 0.01 |
| Silver - Total | mg/L | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Aluminium - Total | mg/L | 0.01 | 0.03 | 0.03 | 0.03 | 0.05 | 0.18 | 0.05 | 0.02 | 0.03 | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.03 | 0.03 | 0.03 |
| Arsenic - Total | mg/L | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.002 | 0.003 | <0.001 | <0.001 | <0.001 | 0.003 | <0.001 | <0.001 | 0.01 | 0.01 |
| Barium - Total | mg/L | 0.001 | 0.006 | 0.007 | 0.009 | 0.01 | 0.009 | 0.008 | 0.002 | 0.002 | 0.002 | 0.001 | 0.002 | 0.002 | 0.016 | 0.017 | 0.005 | 0.004 |
| Chromium - Total | mg/L | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.012 |
| Copper - Total | mg/L | 0.001 | 0.001 | <0.001 | 0.001 | 0.002 | 0.001 | <0.001 | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.001 | 0.006 | 0.007 | 0.003 | 0.003 |
| Manganese - Total | mg/L | 0.001 | 0.002 | 0.001 | 0.01 | 0.011 | 0.006 | 0.003 | 0.003 | 0.003 | 0.005 | 0.004 | 0.004 | 0.006 | 0.07 | 0.078 | 0.002 | 0.002 |
| Molybdenum - Total | mg/L | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.006 | 0.006 | 0.003 | 0.003 |
| Nickel - Total | mg/L | 0.001 | 0.001 | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.002 | 0.008 | <0.001 | <0.001 | 0.002 | <0.001 | 0.004 | 0.005 | <0.001 | <0.001 |
| Lead - Total | mg/L | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.004 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Antimony - Total | mg/L | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Zinc - Total | mg/L | 0.001 | 0.004 | 0.003 | 0.004 | 0.026 | 0.015 | 0.01 | 0.007 | <0.001 | 0.004 | 0.001 | 0.001 | <0.001 | 0.007 | 0.006 | 0.005 | 0.006 |
| Mercury - Total | mg/L | 0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Total Cyanide | mg/L | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.006 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Fluoride | mg/L | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.6 | 0.6 | 0.6 | 0.6 |
| Ammonia as N | mg/L | 0.01 | <0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.06 | 0.05 | 0.01 | 0.01 |
| Nitrite as N | mg/L | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.08 | <0.01 | <0.01 | <0.01 | <0.01 |
| Nitrate as N | mg/L | 0.01 | 0.02 | 0.03 | <0.01 | <0.01 | 0.05 | 0.03 | 0.03 | 0.02 | 0.03 | <0.01 | <0.01 | 0.04 | 0.01 | 0.01 | <0.01 | <0.01 |
| Phosphorus as P - Total | mg/L | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.02 | <0.01 | <0.01 | <0.01 | 0.03 | 0.03 | 0.01 | <0.01 | <0.01 |
| Sulphide | mg/L | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.1 | 0.1 |
| Chemical Oxygen Demand | mg/L | 1 | 17 | 16 | 5 | 2 | 12 | 11 | 2 | 6 | 2 | <1 | 5 | 6 | 739 | 668 | 16 | 20 |
| Total Cations | me/L | 0.01 | 0.59 | 0.54 | 0.96 | 0.96 | 0.49 | 0.47 | 0.88 | 0.86 | 1.42 | 1.44 | 2.01 | 2.02 | 306 | 289 | 18.8 | 18.9 |
| Total Anions | me/L | 0.01 | 0.56 | 0.64 | 1.01 | 0.95 | 0.46 | 0.45 | 0.84 | 0.87 | 1.36 | 1.34 | 1.99 | 2.1 | 305 | 288 | 18.8 | 18.6 |
| (Anion / Cation) Difference | me/L | 0.01 | 0.03 | 0.1 | 0.06 | 0.02 | 0.02 | 0.02 | 0.04 | <0.01 | 0.06 | 0.1 | 0.02 | 0.08 | 0.42 | 0.76 | <0.01 | 0.27 |
| (Anion / Cation) Difference | me/L | 0.01 | 0.12 | 0.12 | 0.12 | 0.12 | 0.11 | 0.11 | 0.12 | 0.12 | 0.13 | 0.13 | 0.14 | 0.14 | 4.84 | 4.57 | 0.4 | 0.4 |

## 1-4 Acquisition of meteorological data

A weather observation station was built in an elementary school of the Namosi village, and it is contributing to observe meteological data of this study area. The meteorological data before the station starting to work were collected from Department of Meteorology of Fiji government.

### 1-4-1 Settind of the weather station

#### (1) Observation items and specification of the station

Atomospheric temperature, wind direction, wind force, relative humidity, insolation and precipitation are measured by the weather station that can record those observation data automatically once par 10 minutes. Specification of the weather observation station is shown in Table II-1-4. An outward appearance of the weather station is shown in a photograph (PH-1).

#### (2) Installation site, observation period and observation system

The weather observation station was installed in an elementary school of the Namosi village, Namosi Region, and started to work in September 19th of 2002. The data until end of January of 2003 was downloaded and offered to analysis. After February 1st of 2003, observation data will be downloaded periodically by a Fijian observation team that has been established in Fiji National Institution.

#### (3) Data collection from the weather station

The meteorological data of the Namosi area until end of January of 2003 observed with the weather satation was downloaded using handheld PC as shown in Appendix 3.

### 1-4-2 Collection of the meteorological data

Recent meteorological data that had been observed in the study area by the Department Meteorology of Fiji government were collected.

Collected meteorological data are maximum atomospheric temperature, minimum atomospheric temperature, precipitation, relative humidity, wind direction and wind force at Keiyasi, Monasavu, Nacocolevu, Nausori, Suva and Tokotoko from January 1st of 1999 to October 31st of 2002. These meteorological data are shown in Appendix 4.

### 1-4-3 Weather condition of the survey area

#### (1) Result of weather observation

The changes of the precipitation, relative humidity and atomospheric temperature from 2002/9/19 to 2003/1/31 observed in Namosi area are shown in Fig.II-1-6.

Comparing observed meteorological data between dry season (October) and rainy season (January), distinct seasonal change can be seen in atmospheric temperature and the precipitation.

Observed atomospheric temperatures in October and January indicates 33.6℃ and 33.6 ℃ in the highest atomospheric temperature, 15.1℃ and 20.2℃ in lowest atomospheric temperature, and 22.9℃and 25.8℃ in mean atomospheric temperature, respectively, and so differences can be seen in lowest atomospheric temperature and mean atomospheric temperature.

Observed precipitation in October and January indicates 174.6mm and 479.2mm in monthly precipitation, 52mm and 107mm in dayly highest precipitation, respectively, and so seasonal change is clear in the precipitation.

(2) Meteorological data of the past

Among the meteorological data of the past by Fiji government, change of the precipitation data observed at 6 sites from 1999/1 to 2002/10 are shown in Fig. II-1-7. Comparing annual precipitation of 3 years at 6 points, differences can be found between the observation year and between the observation sites. For example, annual precipitation of Monasavu where is in the center of Viti Levu island and Nacocolevu where is in southwest part of Viti Levu island were recorded to 6296 mm and 2390 mm in 1999, to 4956 mm and 2554 mm in 2000, and to 4138 mm and 1600 mm in 2001 respectively. Those clearly express the difference of weather between central mountain zone and hill zone of westside of central watershed. In Tokotoko where is located on south east side of the central watershed, its large precipitation is next to Monasavu. That is considered to influence of topography.

TableII-1-4 Technical specifications of weather station

| meter | specification | | reference |
|---|---|---|---|
| Anemometer | range of measurement | 0.5～60m/S | |
| | accuracy | ±0.3 | |
| | wind force for start | 0.5m/S以下 | |
| | | | |
| Wind direction meter | range of measurement | 0～360°C | |
| | accuracy | Under 0.5m/S | |
| | wind force for start | Under 1m/S | |
| | | | |
| Thermometer | range of measurement | -40～60°C | |
| | accuracy | Under ±0.3 | |
| | | | |
| Hygrometer | range of measurement | 0～100% | |
| | accuracy | ±2% | |
| | | | |
| Rain gauge | diameter | 159.6mm | |
| | area | 200cm2 | |
| | sensibility | 0.2mm | |
| | accuracy | Under ±5% | Under 24mm/h |
| | | Under±10% | Under 120mm/h |
| | | | |
| Solar radiation meter | sensibility | 100 V/W/m2 | |
| | wave length | 0.4～1.1micron | |
| | response speed | under 1sec. | |
| | range of measurement | 2000W/m2 | |
| | depend on temperature | ±0.15%/°C | |
| | anti stability | under 2%/year | |
| | | | |
| | | | |

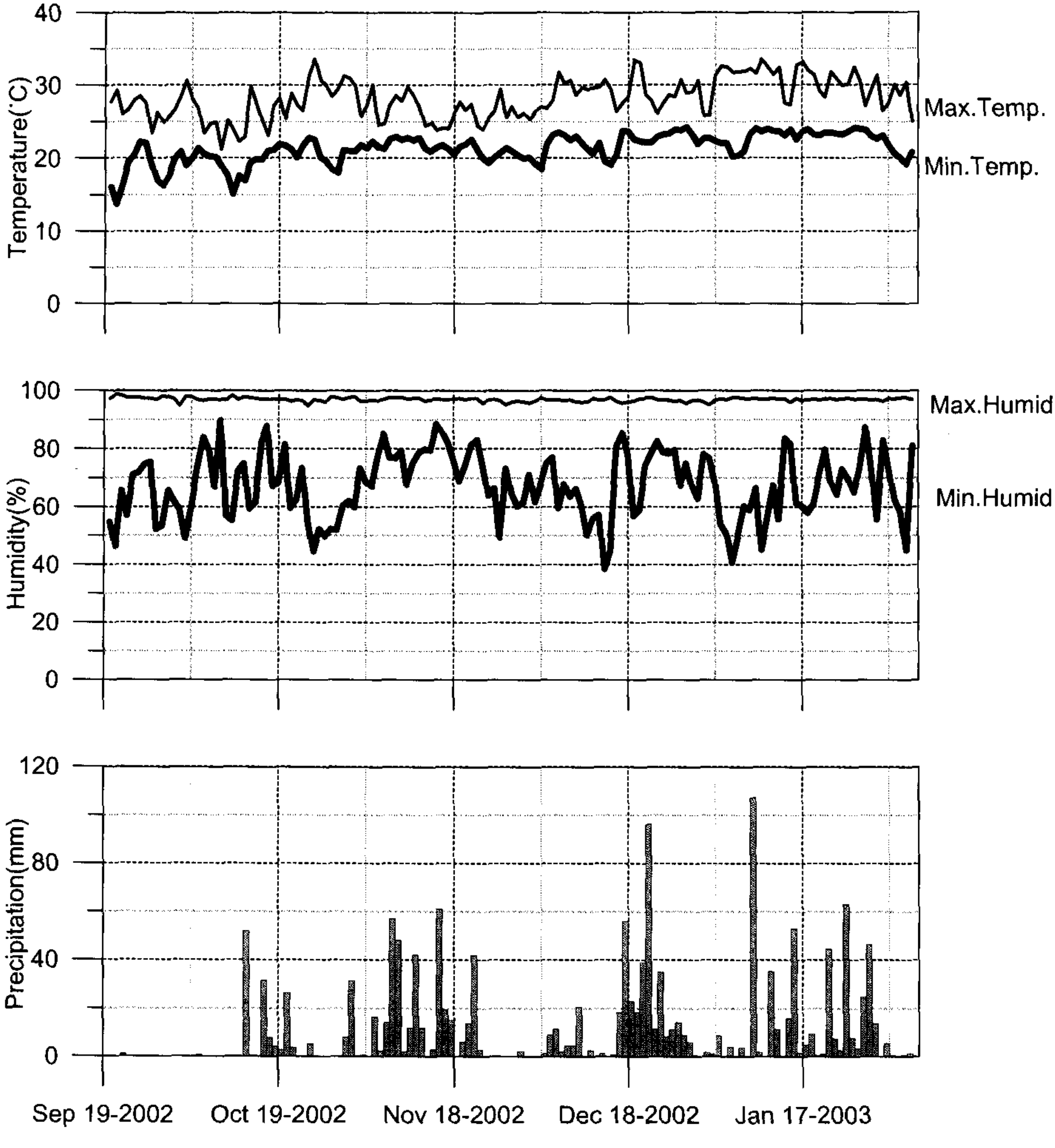



Fig.II-1-6 Daily precipatation, humidity and temperature (2002/09/19 - 2003/01/31)(Namosi area)

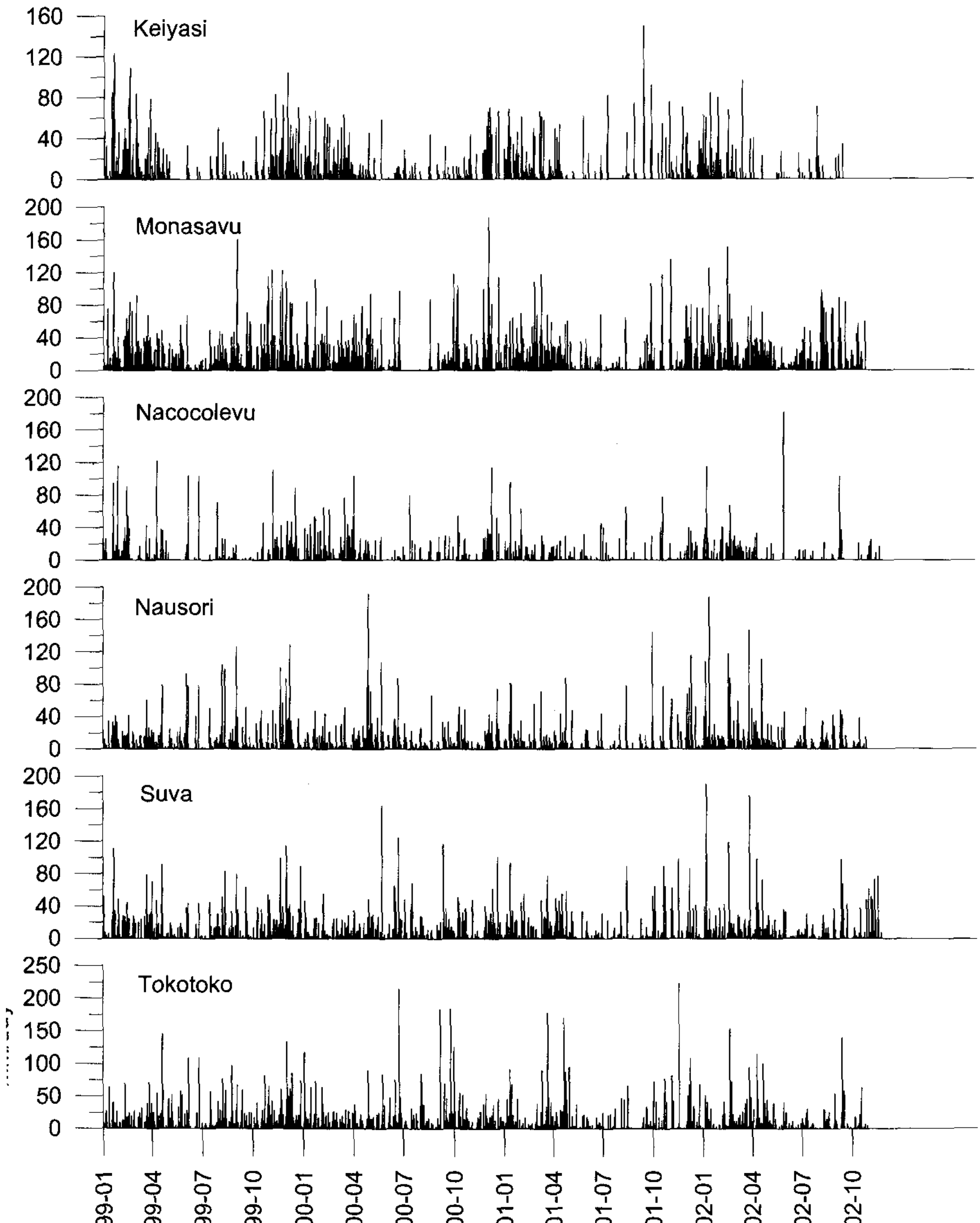



Fig. II-1-7 Daily precipitation (1999-2002)(6 sites)

## 1-5 Discussions

### 1-5-1 Feature of river water

The electric conductivity differs between each drainage system. The average conductivity is 8.44 mS/m in the Rewa River system, while 25.6 mS/m in the Sigatoka River system. The pH also differs between each drainage system. The average pH of the Rewa River system is 7.5, while that of the Sigatoka River system is 8.11.

In general, Na, K, Ca, Mg, $HCO_3$, $CO_3$, $SO_4$ are major dissolved constituents of the surface water. We found that the abundance and ratio of these components are different between river systems. For example, as for the anion $HCO_3$ is dominant in all river systems, and as for the cation Ca is dominant in the Navua River system and the Sigatoka River system while no large difference of the cation abundance is seen in the Rewa River system and the Coastal rivers. The Sigatoka River system shows higher total concentration of the major cations and anions in comparison with the other 3 river systems. This may be a primary factor that raises electric conductivity and pH. Furthermore, the cause why the abundance of Ca and $HCO_3$ are high in the Sigatoka River system is thought to be influence of sedimentary rocks such as limestones along the Sigatoka River system.

Although abundance and ration of some components somewhat differ among the survey area, the general feature of the river water of this survey area shows neutral pH, Ca as principal cation and $HCO_3$ as principal anion. Such water as rich in alkaline-earth carbonate is thought to be circulating free groundwater.

The chemical composition of the river water of the survey area shows the almost similar quality to the average of river water of the world, contrary to such expectations that the fueatures of the river water might be unique as the Fiji Islands belong to the climate of tropical rain forest, the air temperature is high and the precipitation is much.

### 1-5-2 Comparison with water quality standards

The chemical compositions of the river water of the survey area were compared with the regulation value of ADWG (Australian Drinking Water Guidelines). As a result, the following number of samples showed the high values in comparison with ADWG (Table II-1-5).

Se: 16 points (11, 13, 35, 36, 37, 38, 28, 54, 55, 58, 59, 60, 61, 65, 69 and 70)
Ni: 2 points (44 and 51)
Pb: 2 points (14 and 15)
Fe: 2 points (25 and 41)
Al: 3 points (24, 25 and 41)

### 1-5-3 Problems to be studied in the future

In the future suvey, the sampling of stream sediments and rocks in addition to water sampling are desired around the anomalous water sampling points to execute comparing examination, confirming reappearance and monitoring drinkable well.

One weather station was set up inside the Namosi village elementary school, which observes air temperature, wind direction, wind velocity, relative humidity, insolation and precipitation.

In addition, meteorological data of the past 4 years, which had been observed at 6 points inside the survey area, were acquired from Fiji Meteorological Service, Nadi. This data are used as a database for the future hydrological survey.

Table Ⅱ-1-5 Comparison with chemical composition and ADWG

| NAME | Limit of reporting | | Range of data | | | Guidelines | | |
|---|---|---|---|---|---|---|---|---|
| | | | MIN. | MAX. | AVER. | *ADWG | **WHO | ***JAPAN (Health) |
| Ca | 1 | mg/l | 2 | 47 | 10.6 | | | |
| Mg | 1 | mg/l | 1 | 10 | 3.88 | | | |
| Na | 1 | mg/l | 4 | 26 | 10.44 | 180 | | |
| K | 1 | mg/l | 0.5 | 2 | 0.78 | | | |
| CO3 | 1 | mg/l | 0.5 | 6 | 0.56 | | | |
| HCO3 | 1 | mg/l | 15 | 195 | 54.4 | | | |
| SO4 | 1 | mg/l | 0.5 | 35 | 4.36 | 250 | | |
| Cl | 1 | mg/l | 0.5 | 22 | 5.89 | 250 | | |
| B | 0.1 | mg/l | 0.05 | 0.1 | 0.05 | 4 | 0.3 | 1 |
| Fe | 0.01 | mg/l | 0.005 | 0.58 | 0.055 | 0.3 | | |
| Se | 0.01 | mg/l | 0.005 | 0.03 | 0.009 | 0.01 | 0.01 | |
| Ag | 0.001 | mg/l | 0.0005 | 0.005 | 0.0007 | 1 | | |
| Al | 0.01 | mg/l | 0.005 | 0.45 | 0.046 | 0.2 | | |
| As | 0.001 | mg/l | 0.0005 | 0.004 | 0.0008 | 0.007 | 0.01 | 0.01 |
| Ba | 0.001 | mg/l | 0.0005 | 0.014 | 0.003 | 0.7 | 0.7 | |
| Cr | 0.001 | mg/l | 0.0005 | 0.011 | 0.001 | 0.05 | 0.05 | 0.05 |
| Cu | 0.001 | mg/l | 0.0005 | 0.027 | 0.002 | 2 | 2 | |
| Mn | 0.001 | mg/l | 0.0005 | 0.071 | 0.013 | 0.1 | 0.5 | |
| Mo | 0.001 | mg/l | 0.0005 | 0.002 | 0.0005 | 0.05 | 0.07 | |
| Ni | 0.001 | mg/l | 0.0005 | 0.027 | 0.0025 | 0.02 | 0.02 | |
| Pb | 0.001 | mg/l | 0.0005 | 0.231 | 0.0039 | 0.01 | 0.01 | 0.01 |
| Sb | 0.001 | mg/l | 0.0005 | 0.0005 | 0.0005 | 0.003 | 0.005 | |
| Zn | 0.001 | mg/l | 0.0005 | 0.106 | 0.007 | 3 | | |
| Hg | 0.0001 | mg/l | 0.00005 | 0.00005 | 0.00005 | 0.001 | 0.001 | 0.0005 |
| CN | 0.001 | mg/l | 0.0005 | 0.006 | 0.00073 | 0.08 | 0.07 | nd |
| F | 0.1 | mg/l | 0.05 | 0.2 | 0.088 | 1.5 | 1.5 | 0.8 |
| NH3(N) | 0.01 | mg/l | 0.005 | 0.03 | 0.016 | 0.5 | | |
| NO2(N) | 0.01 | mg/l | 0.005 | 0.15 | 0.0089 | 3 | | 10 |
| NO3(N) | 0.01 | mg/l | 0.005 | 0.12 | 0.0175 | 100 | | 10 |
| T-P | 0.01 | mg/l | 0.005 | 0.07 | 0.0085 | | | |
| Sulphide | 0.1 | mg/l | 0.05 | 0.05 | 0.05 | 0.05 | | |

* ADWG(Australian Drinking Water Guidelines)
** Water Contamination Protection Low(health)
*** WHOguideline Value

## Chapter 2 Stream sediment survey

### 2 - 1 Objectives

The objective of the stream sediment survey is to collect stream sediment samples and to analyze for chemical composition and to obtain the data for understanding the regional geochemical characteristics. The sampling points were selected so that the secondary and the tertiary tributaries in the case that Rewa River, Navua River and Sigatoka River be called primary rivers and relatively small rivers which empty directly to the coast, can be appraised.

### 2 - 2 Survey methods

The stream sediment samples were picked up at the sellected points inside the survey area and analyzed for geochemical composition. 80 mesh sieves were used to make the approximately 100 g of samples. The samples were packed to the plastic backs to be taken back to the base camp and sent to the Labo. 905 samples were chemically analyzed, among which 83 samples were for duplication. At the Labo, the samples were analyzed for 29 elements (mainly matallic elements) using ICP-AES. The sampling locations are shown in Fig.II-2-1 and Pl-1 and the chemical analysis data are shown in Appendix 5.

### 2 - 3 Result of the survey

#### 2 - 3 - 1 Statistical treatments

In general, geochemical analysis values, especially in the case that reliability of analysis precision of the trace elements being sufficient and the population being single, show the logarithmic normal distribution. Therefore a common logarithm value of each analysis value is used for data processing. As for an analysis value lower than detection limit value, a half of that value is adopted in the statistical processing. Also as for an analysis value higher than a maximum detection limit value, the limit value is adopted.

Table II-2-1 shows statistical values of each element. The histograms and plobability plots of each element are shown in Fig.II-2-2-(1)-(4). The class interval of histgram is 1/2 of a standard deviation ($\sigma$). More than 75% of the values of Ag, As, Bi and Mo are lower than each detection limit value.

Table II-2-2 shows covariance matrix and Table II-2-3 shows correlation coefficient matrix. The calculation of correlation was done for 25 elements. The elements, Ag, Bi and Mo that have more than 75% values of the below the detection limit and W that have only 1 or 2 kinds values near the detection limit, are excluded. The value of As (arsenic) shows 93% of below the detection limit value, but considering it is harmful element and the over detection limit values shows quite high values, As was not excluded in this time.

In this survey, 83 duplication samples were collected. In order to appraise reappearance of duplication samples, the ratio of the values of duplication samples to the values of original saples were calculated. Appendix 6 shows the histograms and plobability plots of this ratio. This ratio approaches to 1 in the case that the value of duplication and the value of original are similar. The elements, which are generally included in relatively high values in the sample (several hundred ppm - several %) (Al, Ca, Fe, K, Mg, Mn, Na, Ni and V) and which are related to mineralization

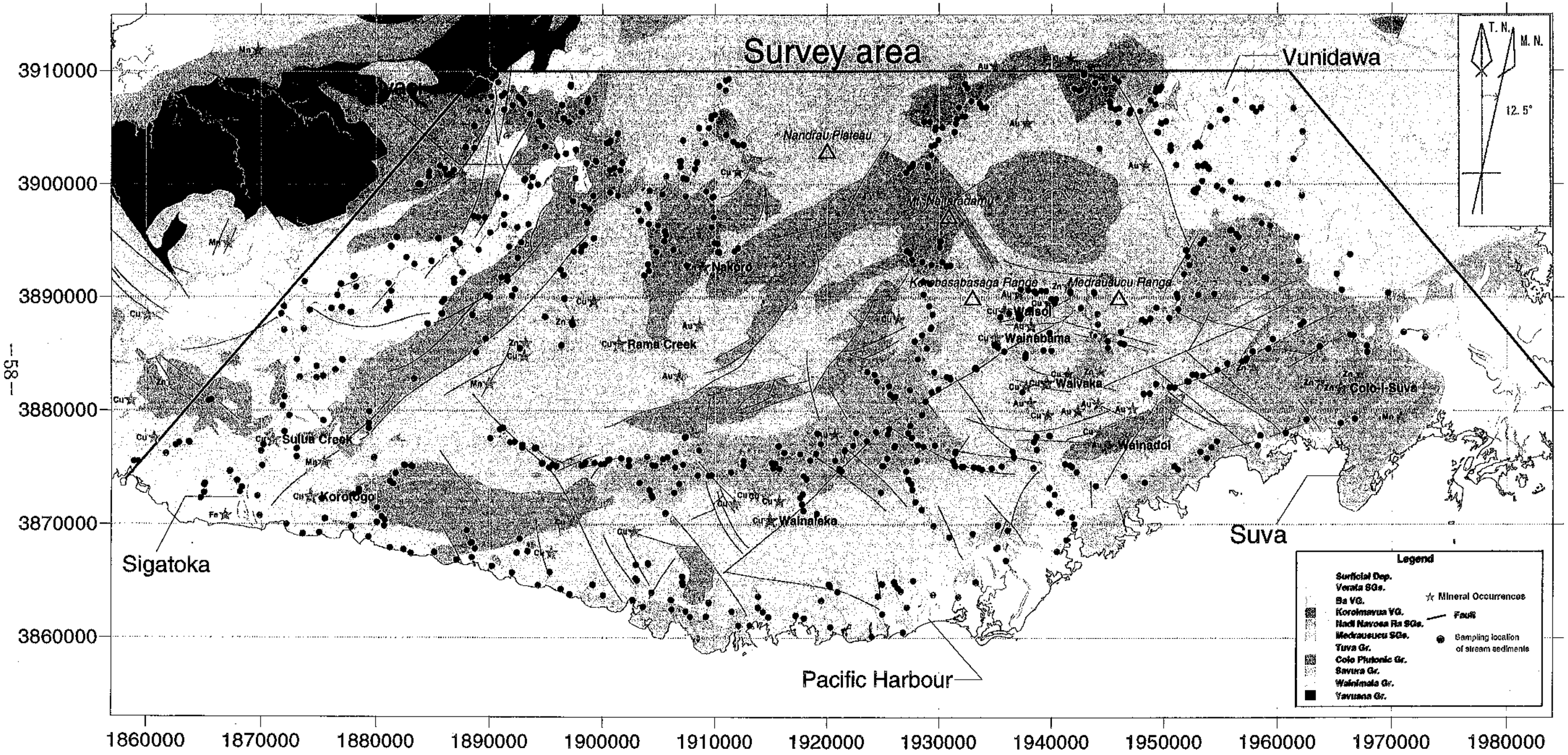



Fig.II-2-1 Location map of the stream sediment samples (1:500:000)

Table II-2-1 Basic statistics of the stream sediment samples

| Elements | Unit | Detection limit | Under detection limit | Max value | Minimum value | Log Average (m) | Log Standard dev(σ) | m+σ | m+2σ | m+3σ |
|---|---|---|---|---|---|---|---|---|---|---|
| Au | ppm | 0.001 | 517 | 7.28 | 0.0005 | 0.00125 | 0.63866 | 0.00542 | 0.02358 | 0.10263 |
| Hg | ppm | 0.01 | 362 | 0.15 | 0.005 | 0.0092 | 0.27685 | 0.01741 | 0.03293 | 0.06229 |
| Ag | ppm | 0.5 | 896 | 9 | 0.25 | 0.25319 | 0.06699 | 0.29542 | 0.34468 | 0.40217 |
| Al | % | 0.01 | 0 | 11.15 | 0.79 | 6.00905 | 0.11673 | 7.86208 | 10.2865 | 13.4587 |
| As | ppm | 5 | 844 | 105 | 2.5 | 2.81403 | 0.21163 | 4.581 | 7.45748 | 12.1401 |
| Ba | ppm | 10 | 5 | 570 | 5 | 81.77 | 0.25919 | 148.521 | 269.762 | 489.975 |
| Be | ppm | 0.5 | 215 | 7.4 | 0.25 | 0.86257 | 0.34925 | 1.92772 | 4.30819 | 9.62821 |
| Bi | ppm | 2 | 716 | 32 | 1 | 1.37769 | 0.3003 | 2.75073 | 5.49219 | 10.9659 |
| Ca | % | 0.01 | 0 | 11.55 | 0.09 | 1.73499 | 0.2924 | 3.40169 | 6.66948 | 13.0764 |
| Cd | ppm | 0.5 | 226 | 14.8 | 0.25 | 1.10369 | 0.47631 | 3.30491 | 9.89625 | 29.6334 |
| Co | ppm | 1 | 0 | 132 | 4 | 31.2604 | 0.22937 | 53.0104 | 89.8935 | 152.439 |
| Cr | ppm | 1 | 0 | 5010 | 15 | 154.532 | 0.40987 | 397.09 | 1020.38 | 2622 |
| Cu | ppm | 1 | 1 | 640 | 0.5 | 38.0303 | 0.31111 | 77.8473 | 159.352 | 326.191 |
| Fe | % | 0.01 | 0 | 25 | 3.46 | 12.4763 | 0.20036 | 19.7899 | 31.3906 | 49.7917 |
| K | % | 0.01 | 0 | 1.88 | 0.05 | 0.41208 | 0.24306 | 0.72118 | 1.26213 | 2.20883 |
| Mg | % | 0.01 | 0 | 4.64 | 0.12 | 1.35152 | 0.21134 | 2.19867 | 3.57682 | 5.8188 |
| Mn | ppm | 5 | 0 | 10000 | 404 | 1870.17 | 0.17012 | 2766.91 | 4093.65 | 6056.55 |
| Mo | ppm | 1 | 681 | 29 | 0.5 | 0.76703 | 0.37932 | 1.83709 | 4.39995 | 10.5382 |
| Na | % | 0.01 | 0 | 3.59 | 0.14 | 0.99717 | 0.26214 | 1.82353 | 3.3347 | 6.0982 |
| Ni | ppm | 1 | 0 | 141 | 1 | 20.7754 | 0.29061 | 40.5659 | 79.2086 | 154.662 |
| P | ppm | 10 | 63 | 1240 | 5 | 149.263 | 0.57679 | 563.308 | 2125.89 | 8022.97 |
| Pb | ppm | 2 | 210 | 39 | 1 | 4.28335 | 0.42504 | 11.3978 | 30.3291 | 80.7046 |
| S | % | 0.01 | 339 | 2.76 | 0.005 | 0.01425 | 0.52779 | 0.04802 | 0.1619 | 0.54581 |
| Sb | ppm | 5 | 489 | 25 | 2.5 | 4.45752 | 0.29324 | 8.7566 | 17.2019 | 33.7924 |
| Sr | ppm | 1 | 29 | 1494 | 0.5 | 86.1707 | 0.53565 | 295.809 | 1015.46 | 3485.91 |
| Ti | % | 0.01 | 0 | 2.18 | 0.13 | 0.82866 | 0.13463 | 1.12981 | 1.54041 | 2.10024 |
| V | ppm | 1 | 0 | 2199 | 23 | 454.304 | 0.27917 | 864.003 | 1643.18 | 3125.03 |
| W | ppm | 10 | 154 | 30 | 5 | 10.1817 | 0.18355 | 15.5371 | 23.7093 | 36.18 |
| Zn | ppm | 2 | 0 | 1440 | 43 | 175.073 | 0.21715 | 288.65 | 475.909 | 784.65 |

Valid sample number : 905

Value under detection limit is represented by 0.5*det_lim

Value over detection upper_limit is represented by detection upper_limit