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The Sulfuric Acid Generated By Combustion Of A Fossil Fuel And The Relation In Which Trees Wither

-Prevention From Withering And Carbon Dioxide Reduction Of Trees By Charcoal-

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***Abstract*—The sulfur contained in Fossil fuel generates SOx by combustion, accumulates it into the atmosphere which moves, combines with moisture, and becomes sulfuric acid. In proportion to the quantity of the wind in contact with trees, and the surface area of trees, the amount of adhesion increases sulfuric acid. The sulfuric acid dropped to the root by rain water combines with the metal oxide of a soil ingredient, and becomes metal sulfate and water. As a result, pH does not fall in inverse proportion to the quantity of the sulfuric acid in which soil was added. However, metal sulfate elutes a metal ion with rain water, is absorbed into trees, combines with phosphoric acid, and tannin, and turns into an insoluble metal phosphate and metal tannic acid. Trees become the same phenomenon as the shortage of phosphoric acid, and photosynthesis becomes impossible. Metal tannic acid loses the insect control effect. Trees decline, lose the resistance over a damage by blight and harmful insects, and wither. Trees contain potassium as an essential element. If trees are carbonized, potassium will turn into potassium carbonate and will remain into charcoal. If charcoal is scattered to acid soil, with rain water, it elutes hydroxide ion and neutralizes sulfuric acid. As a result, elution of a metal ion is stopped and withering of trees can be prevented. Since it does not grow into carbon dioxide unless charcoal burns if trees absorb carbon dioxide, it grows up and scrap wood is carbonized, it is the most effective in carbon dioxide reduction.**

Keywords—Air pollutant, Sulfur oxide, Withering of trees, Reduction of carbon di-oxide, Charcoal

Introduction

Combustion of a fossil fuel generates SOx by combustion of the sulfur contained in proportion to the amount of emergence of carbon dioxide. SOx was measured as a sulfuric acid ion from the ice sheet of Greenland of the 1780s, and the frozen snow core of Site-J. The sulfuric acid ion is increasing in proportion to the consumption of solid fuel (Watanabe, Others 2003). SOx is accumulated into westerlies, combines with water, and becomes sulfuric acid. In proportion to the quantity of the westerlies in contact with trees, and the surface area of trees, the amount of adhesion increases sulfuric acid. Adhering sulfuric acid is dropped on soil by rain water, combines with the metal oxide of a soil ingredient, or iron sand, and becomes metal sulfate and water. As a result, pH of soil does not

fall in inverse proportion to the quantity of the added sulfuric acid. However, metal sulfate elutes a metal ion, is absorbed into trees, combines with phosphoric acid of an essential ingredient, and turns into an insoluble metal phosphate. It becomes the same phenomenon as the shortage of phosphoric acid, photosynthesis becomes impossible, and trees decline. Moreover, the tannin contained in trees combines with a metal ion, and if it becomes metal tannic acid, it will lose the insect control effect. As a result, trees lose the resistance over a damage by blight and harmful insects, and wither.

Since the fossil fuel was used, the quantity of the sulfuric acid which moved in the ground has been guessed by measuring the sulfuric acid ion concentration of the ground under the floor of the temple which rain water does not require. The temple was built in 1847 and investigated in 2005. The sulfuric acid ion concentration which adhered to surface soil in 158 years was 463 times the 10-cm-deep concentration. The sulfuric acid ion concentration of the soil of the pine wood of the reverse side measured simultaneously is very low. Sulfuric acid combines with a soil ingredient and the eluted metal ion is absorbed into trees. The remaining sulfate moves more than the adsorption maximum permissible dose of soil to the sea from a river with rain water. However, sulfuric acid adheres to trees and is always added to soil by westerlies.

The sulfuric acid accumulated into westerlies moves to the Southern Hemisphere from the Northern Hemisphere. The westerlies containing sulfuric acid can be drawn near by the ascending current generated in the equatorial neighborhood, and go up high up in the sky. It has withered with the sulfuric acid which the north-side needle-leaf tree and broadleaf tree of Mauna Kea (4205 m) of the Hawaii island (U. S, A) near the equator were able to draw near (North latitude 19° -20° , West longitude of 155 ° -156 °). The Dominican Republic can be guessed because the primeval forest and bamboo of the slope for north have disappeared (North latitude 19° , West longitude 70°). It is cooled and the atmosphere which went up high up in the sky becomes heavy, is divided into north and south and descends. That to which sulfuric acid descended in the Northern Hemisphere is absorbed by Westerlies, and what descended to the Southern Hemisphere is absorbed by Circumpolar Vortex. As for the area of land, the Southern Hemisphere is set to 3 to the Northern Hemisphere 7. The sulfuric acid which moved to the Southern Hemisphere has few trees which land is narrow and adhere. Moreover, since Circumpolar Vortex which blows the Antarctic circumference has a quick speed (Erick 1999), and the added sulfuric acid do not trespass upon the South Pole, and is accumulated into Circumpolar Vortex (Watanabe and others 2003). In Tierra del Fuego of the southernmost tip through which Circumpolar Vortex passes in the South American Continent, neither a young tree nor grass is grown in the marks on which the beech withered(Argentina, South latitude 55° , West longitude 68°). In New Zealand South Island, the trees of the west side of a mountain range have withered regardless of the kind of trees (South latitude 41° - 47 ° , East longitude 167° - 174°).

Trees contain potassium as an essential element. If trees are carbonized, potassium will turn into potassium carbonate and will remain into charcoal. Since hydroxide ion will be eluted by rain water if charcoal is sprinkled to acid soil, sulfuric acid is neutralized. As a result, elution of soil to a metal ion becomes impossible, phosphoric acid of trees is protected, and withering can be prevented.

If trees absorb carbon dioxide, it grows up and scrap wood is carbonized, a volatile component will burn, but the remaining charcoal does not grow into carbon dioxide, unless it burns. Training of

trees and carbonization of scrap wood are the methods most effective in carbon dioxide reduction. Since the absorbed carbon dioxide is emitted when charcoal is used as fuel, it does not become the increase in carbon dioxide. As for the ashes which remained when trees and charcoal were used as fuel, the rate of the part potassium content whose carbon was lost becomes high. Ashes are effective as a neutralizer of acid soil.

Examination method

The rain sample was extracted 100 cm^3 per precipitation of 1 mm, and rain with a precipitation of not less than 5 mm was extracted to the package. A sensor is a 1-mm interval, and if the meantime gets wet, the lid of a water bottle will open it automatically. Rain water was extracted within 24 hours after the end of rain, pH was measured immediately after extraction, and the ingredient was measured after filtration. The sample of the ground separated from the root of trees 50 cm, and was extracted in the low direction by the sloping ground. Sampling of surface soil is 3 cm from the place except the fallen leaves of the previous year. A depth of 10 cm and the 20-cm ground extracted the ±1.5-cm ground from the place. The ground which carried out natural seasoning removed a not less than 2-mm stone. The leaf, the root, and the ground which are mixed were ground and the standard sieve with the pore size of 2 mm was all passed. The water 25g was added to 10 g of samples, and it filtered after 60 minutes (the soil examining method). Measurement of the elution ingredient of charcoal ground and used the charcoal carbonized at 800 ℃ ±5 ℃. Charcoal passed the sieve with the pore size of 2 mm, and used what remained on a 1-mm sieve. Charcoal was measured at same rate as the ground after 2-hour dryness at 110 ℃ before measurement.

Measurement machine. pH: It measures with a pH-meter immediately after extraction,

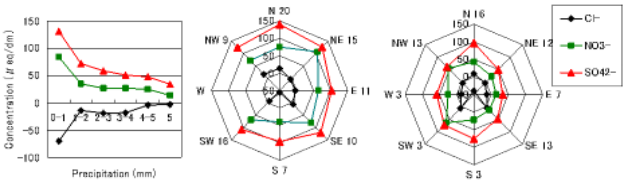
Ion : Ion chromatography (IC), Alkali metal ion: Atomic absorption photometer (AA),

The metal ion : Inductively-coupled-plasma atomic emission spectrophotometer (ICP-AES).

On the basis of sea water composition, the non-sea salt concentration of the elution ingredient of rain water or soil was computed based on the measured sodium ion concentration, and equivalent concentration showed it (eq/dm^3). It dried on the 1st, and by the above-mentioned method, the foreign sample was brought home as solution and measured.

1. The contaminant in the atmosphere

The ingredient which dissolves in atmospheric water becomes clear by measuring the ingredient of rain water. If the sulfur contained in a fossil fuel burns, it will generate SOx. SOx is accumulated into the atmosphere which moves, combines with water, and becomes sulfuric acid. When non-sea salt concentration shows the ingredient of rain water according to precipitation, as shown in Fig.1 and A, its sulfuric acid ion concentration is the highest. The sulfuric acid concentration of rain water with a precipitation of 1-2 mm becomes half with a precipitation of 0-1mm. It becomes low gradually after that.



A 2004.1～2004.12(Rain 79) B 2000.1～2000.12(Rain 88) C 2001.1～2001.12(Rain 70)
Miyake-Island Volcanic eruption : 2000.7.8～8.29, Sign : Wind direction, Number : Number of rain
The ingredient according to precipitation The ingredient according to wind direction of initial rain (Precipitation of 0～1 mm)
Sampling place : Miyama, Funabashi, Chiba JAPAN (Tokyo Bay: It is 4 km to south)
Miyake Island, Tokyo, JAPAN. It is 180 km to the direction of marine and south.
Fig.1 The ingredient of rain water, and influence of volcanic

SOx is contained also in a volcanic product. Mt. Oyama in Miyake-Island (Tokyo Japan) was a catastrophic disaster from which it will erupt in July, 2000 and all the inhabitants take refuge. The altitude before an eruption is 815 m (Contact land

Miyake 1993). Miyake-Island is located in the Pacific Ocean from a measurement place in a south 180 km away place. The average concentration of the rain water for one year of the wind direction exception of an eruption this year (2000) was shown in Fig.1 and B (Zero to 1 mm precipitation). The average concentration of the rain water of the following fiscal year was shown without Fig.1 and C. Sulfuric acid ion concentration became low although the volcano was working also in the following fiscal year. Since it is increasing in proportion to the amount of the fossil fuel used as sulfuric acid ion concentration is shown in Site-J of Greenland, the way of combustion of a fossil fuel is considered that influence is greater than a volcanic eruption.

The reason non-sea salt chloride ion concentration grows into minus. (The south 4-km beyond of a measurement place is Tokyo Bay). When the particulates of sulfuric acid and soil are added the rain water containing sodium chloride, as it is shown in the equation 1), chloride ion oxidizes by manganese dioxide contained in particulates, and it becomes chlorine (Chitani 1960). As a result, chlorine is not measured by Ion chromatography. Chlorine destroys the cell of trees so that it may be used for a bleacher or a disinfectant.

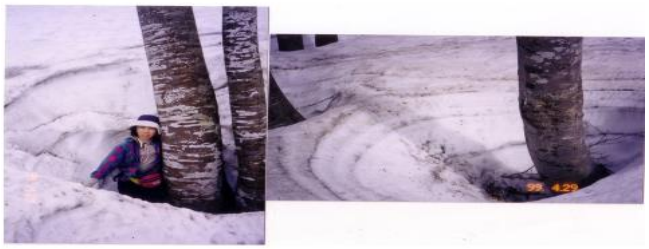
$$2NaCl+MnO_2+3H_2SO_4=2NaHSO_4+MnSO_4+Cl_2+2H_2O \quad 1)$$

In the same weight of fog and rain, since misty surface area is large and the residence time in the atmosphere is long, the amount of adsorption of a contaminant increases. Although the concentration of rain water of the contaminant of initial term rain is high, since concentration is low as shown in Fig. 1 and A, the rain water which falls later is flushed. The concentration of chlorine will become high, if fog adheres to trees and moisture evaporates. According to the fog which occurred on the seashore opposite to a crater, *Alnus firma* of Miyake-Island has withered from the sea side, as shown in Fig. 2 and A. Since the branch of *Abies homolepis Sepis.et Zucc* is horizontally near, water gathers in the undersurface of a branch and pine leaves gather for a root. If moisture evaporates, chlorine is condensed, and as shown in Fig. 2, B and C, a cell will be destroyed and it will be discolored.

A *Alnus firma* (2000.4.21) Miyake Island (Tokyo, JAPAN) A volcano is left side The sea is right side
B *Tsuga diversifolia* (Undersurface) (1995.7.29) Mt.Taro, Tochigi, JAPAN
C *Pinus Thunbgii* (1998.1.22) Tkasago, Hyogo, JAPAN (Photography Matumoto F. 1998)

Fig. 2 Destruction of cell of trees by fog containing sulfuric acid and chlorine

In the weight same also as snow and rain, surface area of snow is large. As a result, the amount of collection of snow of a contaminant increases. In an area with much snowfall, the sulfuric acid ion concentration of soil becomes high. However, if an atmospheric temperature becomes close to 0 degrees, since it will melt and descend by the principle of a depression of freezing point, the soluble contaminant in snow is not measured. In a heavy snowfall area, if temperature goes up, the snow around wooden will melt in the shape of a cone.



Matsunoyama, Tokamachi, Niigata ,JAPAN, Mt. Amamizu (1088 m)
Photography place, Altitude 750m(1999.4.29)
The primeval forest of a beech

Fig.3 The insoluble contaminant in snow

As shown in Fig. 3, insoluble smoke becomes a layer and is seen. However, there is very little sulfuric acid ion concentration in snow, as shown in Table 1, No.1 and No. 2. Since a sulfuric acid ion dissolves quickly and it flows into a river in spring,

pH of the water of a river may fall and may cause extensive death of the fry which hatched. Table 1 and No.3 are the ingredients of the soil of the pine grove after the snow of the Oga peninsula is lost (Oga, Akita, Japan). A pine wood has 211 pines in an area of 2455 m^2, and is about 30 m to the Sea of Japan (Since the pine wood is sprinkling charcoal, its pH is high). Since it is close to the sea and there is much snowfall, the concentration of sodium chloride and sulfuric acid changes highly. Since non-sea salt chloride ion concentration becomes chlorine at the reaction shown in the formula 1, it becomes a value of minus. As for the quantity of the sulfuric acid used for the reaction, 3 Equivalent of sulfuric acid is used to 1 Equivalent of chloride ion($Cl^- \rightarrow Cl_2$, SO_4^{2-}). It means that sulfuric acid equivalent to the quantity was added to soil. However, non-sea salt sulfuric acid ion concentration is low in minus or an emergency. The manganese sulfate generated by the equation 1 absorbs surrounding moisture by deliquescence, and a reason carries out dissolution diffusion and is not measured ($MnSO_4 \cdot 4H_2O$ and solubility: 136g / 100dm^3 water, 16 ℃). As a result, unless especially the quantity of contaminant of sulfuric acid of the soil near the seashore measures sodium ion concentration and non-sea salt chloride ion concentration and sulfuric acid ion concentration are checked, the quantity of the sulfuric acid added to soil is overlooked.

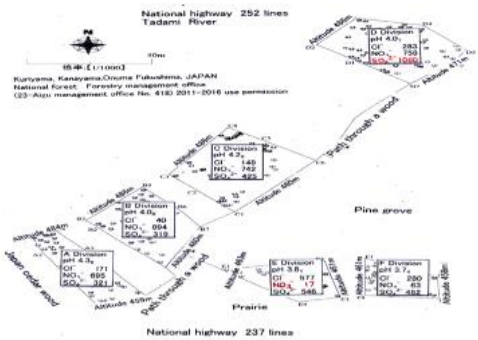
Table 1 Change of the ingredient in the snow by the principle of a depression of freezing point. Concentration of the contaminant of the soil after snow dissolves

No.	Sampling day	Sample (n)	Altitude (m)	Depth (cm)	pH	Measured value (μ eq/dm^3) Na^+	Cl^-	NO_3^-	SO_4^{2-}	Non-sea salt Cl^-	Non-sea salt SO_4^{2-}	$Cl^- \rightarrow Cl_2$ SO_4^{2-}
1 Snowy ingredient	1999.4.29	1	800	15	4.9		44	4	16			
				40	4.7		43	2	15			
		1	750	50	5.4		10	2	6			
				150	4.9		24	1	3			
				250	5.2		22	1	2			
2	2008.4.5	1	800	0	4.9		25	6	8			
				10	4.9		25	6	10			
				20	4.6		20	15	15			
3 Ingredient of the soil after snow melts	2004. 5. 6	6	10	0	5.5	2180	1070	190	320	−1470	58	−4410
	2006. 5. 14	7	10	0	5.7	17900	7940	680	1830	−12900	−318	−38700
		5		10	5.3	5820	2180	260	740	−4600	42	−13800
	2009. 2. 22	6	10	0	4.6	6180	3510	0	600	−3700	−142	−11100
		5		10	4.7	1890	1200	50	420	−1000	153	−3000
4 Sea water composition (eq/dm^3)						0.469	0.535		0.055			

1 Amemizugoshi,Metsuruoyama, Tokamachi, Niigata ,JAPAN (Mt.Amemizu 1088m). (North latitude 37.1°)
2 Tenigawa, Minakami, Tone, Gunma, JAPAN (North latitude 36.8°)
3 Shiobama,Toga, Ogai, Akita,JAPAN (North latitude 39.7°)
Soil scatters charcoal for the prevention from withering of a pine, and its pH is high.
2006.5.14 : Heavy snow, 2008.2.22 : After 1 time of snowfall . It is 30 m to the Sea of Japan. Altitude of 20 m
$2NaCl + MnO_2 + 3H_2SO_4 = 2NaHSO_4 + MnSO_4 + Cl_2 + 2H_2O$
$MnSO_4$ Solubility : $MnSO_4 \cdot 4H_2O$ 136g/100dm^3/16℃ H_2O

2. Relation between sulfuric acid and soil.

An investigation place is in the mountain of Onuma, Fukushima, Japan which becomes an almost middle position in the Sea of Japan and the Pacific Ocean. The 35 cm - 50 cm diameter which is a tree in the wood of the Japanese oak of area 12ha, and the density of a tree are about 4 /100^2 (National forest). Although there is a trace of punching of an insect, there is no withered tree. Altitude is located in 486 m from 458 m, altitude of the west is high and the east becomes low. The north side has a railroad, the national highway No. 252 line, and the Tadami river, and south has the national highway No. 237 line. The investigation place was divided into six divisions, defined the standard tree of the Japanese oak of one three division, and measured the elution ingredient by the water of the ground. Westerlies pass through Niigata Plain from the Sea of Japan along a road or a river, blow between mountains toward the east, and collide with the tree of the Japanese oak of Fig.4 and D division. Sulfuric acid adhering to a Japanese oak tree is dropped on soil by rain water.



Kanayama, Ohnuma, Fukushima, JAPAN. National forest 547 (12ha) (2011.11.9) (Concentration of ion μ eq/dm^3)

Fig. 4 The difference in the concentration of the contaminant by the position of the wood of a Japanese oak

Since western altitude is high, A division - C division have little influence of westerlies. D division sulfuric acid ion concentration is twice about as high as other areas. On the south of a Fig.4 and E division is a prairie, and the national highway No. 237 line passes along it in on the south. The chloride ion of Fig. 4 and E division is twice about as expensive as Fig.4 and D division. The thaw agent ($CaCl_2$) scattered by the way

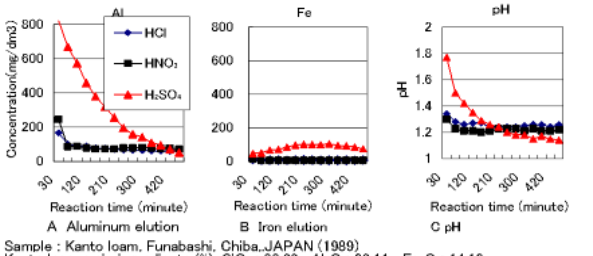
became particulates, and the reason was carried by many south winds in a summer. If a thaw agent combines with sulfuric acid, it will become calcium sulfate and hydrochloric acid. Since reaction velocity of hydrochloric acid with silica (SiO_2) is quick, it turns into jelly-like silicic acid (H_4SiO_4), and wraps an aluminum oxide（Iwasaki 1986）. The hydrochloric acid which remained remains on the surface of silicic acid, and pH of soil becomes low（$pH3.8_1$）.

As for Nitrification bacteria, activity will be controlled if pH becomes low. As a result, it becomes impossible to change into a nitric compound the ammonium added from the atmosphere. Although the average value of the nitrate ion concentration of A division - D division is 772 μeq/dm^3, E division is very as low as 17 μeq/dm ^{3} (2011.11.9) . This phenomenon was generated also in the wood of *Chamaecyparis obtusa* of Nagano Prefecture (Agematsu, Kiso, Nagano, Japan, National forest). The area (Cl^-:1140μeq/dm^3, SO_4^{2-}: 279μeq/dm^3) where chloride ion concentration is high showed $pH\ 3.4_1$, and nitrate ion was not measured. Acid soil is liked *Athyrium yokascense Christ* spread and there were very few young trees of a *Chamsecyparis obtusa Endl* (2006.7.13). In the reduction in nitric acid ion concentration, supply of the nitrogen for protein composition of trees becomes impossible. Moreover, the fall of pH of soil is considered that activity of effective bacteria or the hypha of a mushroom is also controlled. Since on the south of Fig.4 and A division has a Japan cedar wood, a thaw agent adheres to a Japan cedar and the chloride ion concentration of Fig.4 and A division is decreasing to one eighth of Fig.4 and E divisions. Contamination of soil differs in a substance or concentration according to geographical feature or environment. Although it is said that a thaw agent is harmless and it is used without restriction, when sulfuric acid is added, it is generating calcium sulfate and chloride, and it is necessary to take that activities in soil differ into consideration with sulfuric acid and chloride.

3. The kind of acid, and the relation of soil

The reaction velocity of acid and silica is Perchloric acid ＞ Hydrochloric acid ≈ Nitric acid > Sulfuric acid It becomes order（Iwasaki 1986）.

In order to clarify relation between acid and silica, the acid solution in which pH 1 differs from the Kanto loam was used, and the dissolution test was done by the fraction collector (a part for 10-cm^3/). Since reaction velocity of sulfuric acid with silica is slow, as shown in Fig.5 and A, it combines with an aluminum oxide previously and aluminum ion is measured from initial outflow water.



Sample : Kanto loam, Funabashi, Chiba, JAPAN (1989)
Kanto loam main ingredients (%) SiO_2 : 33.99, Al_2O_3: 29.11, Fe_2O_3: 14.12,
Reaction velocity of acid and silica :
Perchloric acid ＞ Hydrochloric acid ≈ Nitric acid ＞ Sulfuric acid (Iwasaki 1986
Concentration of acid: pH 1 . The dissolution rate of acid 10dm^3/One minute

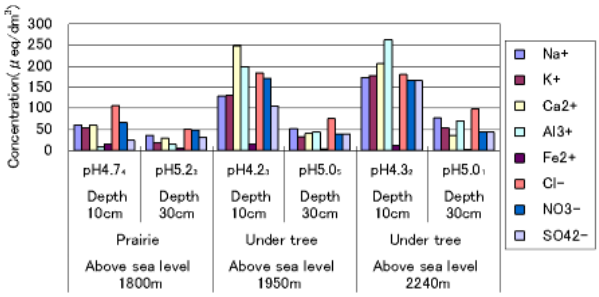
Fig. 5 The elution ingredient by the acid in which Kanto loam and pH 1 differ

However, sulfuric acid will also combine with silica, if time passes, it becomes silicic acid, and the amount of elution of aluminum ion decreases and pH becomes low. Since chloride and nitric acid have quick reaction velocity with silica, the generated jelly-like silicic acid covers a metal oxide, and a metal ion is not eluted. The ferric iron of 3 values which ferric oxide combines with sulfuric acid and are eluted becomes ferric hydroxide immediately, and the ferric iron of 3 values is not measured. However, if sulfuric acid is added to the iron sand contained in a very small quantity, as shown in Fig. 5 and B, the ferrous ion of 2 values will elute. Change of the pH of elution liquid is shown in Fig. 5 and C. Sulfuric acid combines with an aluminum oxide, and since it grows into aluminum sulfate and

water, pH goes up. However, if time stands as for sulfuric acid with slow reaction velocity, it will combine with silica and will become silicic acid, and an aluminum oxide is covered, a reaction becomes impossible, and pH falls. Hydrochloric acid and nitric acid combine with silica, it becomes jelly-like silicic acid, superfluous acid remains on silicic acid, and pH does not go up. As a result, the bamboo and bamboo grass which use silica as the main ingredients become a cause by which it becomes impossible to absorb silica and withers. As sulfuric acid is shown in Fig. 5 and A, aluminum ion is measured from initial outflow water. If the rain water containing sulfuric acid is added to soil, it is clear to elute aluminum ion and to be absorbed into trees. Or less by pH 4.5, aluminum becomes ion(Al^{3+}) and is absorbed into trees. In pH 4.5-8.5, it becomes hydroxide($Al(OH)_3$) and is not absorbed into trees. Although it becomes the Aluminate and dissolves in the pH 8.5 above, it does not happen in a nature($[Al(OH)_4]^-$)(Tanaka 1976) (Omori 1983).

4 The contaminant of the soil

The elution ingredient by the water of the ground under a prairie and *Abies veitchii Lindley* was measured. Since there are more atmospheric amounts of contact than a prairie, *Abies veitchii Lindley* becomes high as the concentration of the contaminant of the soil of a root is shown in Fig. 6. The concentration of a contaminant becomes so high that altitude becomes high. If altitude becomes high, the quantity of the wind to which wind velocity contacts trees early will increase. As a result, by the altitude of 2240 m, aluminum ion is also eluted in large quantities. Calcium, magnesium and chloride ion originate in pain lime and the thaw agent which were scattered by farmland and the road.



Nikko Tochigi JAPAN Mt. Taro (altitude 2367 m) : 1995.7.7

Fig. 6 The elution ingredient by the water of the soil under a *Abies Veitchii Lindlry* and prairie

The wind which collided with the trunk of trees whirls around at leeward. As a result, the amount of adhesion of sulfuric acid of a lee bark increases more than the windward (Ludwing 1927). The sulfuric acid ion concentration of the bark of the lee of *Pinus Thunbergii Parl* (ϕ30cm) with an altitude of 20 m is 1.6 times as high as the windward (Shimane, JAPAN, Seashore 2007.3.25). The bark of the lee of *Pinus densiflora Sieb. et Zucc* (ϕ 13cm) with an altitude of 230 m is 7.5 times higher (Gumma, JAPAN 2004.5.29). The bark of the lee of *Cryptomeria Japonica D.Don* (ϕ26cm) with an altitude of 1244 m of Mikuni Pass becomes high 11.8 times (Gumma Pref. and Niigata Pref. border between pref., Japan 2005.5.28). The amount of adhesion of sulfuric acid increases in proportion to the amount of contact of a wind, and acidification of the soil of a root becomes early.

Table 2 Comparison of the soil which adsorbed the contaminant for 158 years under the floor of a temple, and the soil of a pine grove

Altitude (m)	Under a floor ground	Depth (cm)	Moisture of the ground (%)	The ground of 2 mm or less (%)	pH	NH_4^+	Na^+	Mg^{2+}	Ca^{2+}	Cl^-	NO_3^-	SO_4^{2-}
							(μeq/dm³)					
36	East gate	0	8.40	92.82	4.2₈	—	7350	7750	7780	19200	16200	167
		10	11.12	82.05	4.7₃	—	1250	609	618	237	1400	17
36	Center	0	7.11	70.06	4.3₅	—	19100	43700	40400	**48500**	**52600**	2230
		10	12.74	79.03	4.6₇	—	6610	2730	3230	4880	4260	158
36	West gate	0	8.02	91.73	5.5₁	—	**32100**	**134000**	**58900**	4600	20600	**7790**
		10	9.64	80.54	6.1₃	244	135	626	734	65	290	115
84	Under a pine	0	16.30	54.79	5.0₈	222	117	560	579	127	174	54
		10	15.96	50.50	5.1₇	205	91	494	429	96	127	62
84	Under a pine	0	13.28	42.70	4.5₁	122	196	872	539	299	118	479
		10	12.04	52.56	4.8₉	167	252	564	374	260	116	323
84	Under a pine	0	12.35	49.62	4.5₁	150	218	255	689	293	169	291
		10	11.65	60.62	4.5₇	139	270	140	324	403	23	175

Temple Yamakawacyourinji, Yamakawa, Ashikaga, Tochigi,JAPAN, Foundation 1847 of a temple. Sampling day 2005.4.9
An area of 20 m x 14 m, under a floor and 1 m in height . Magnesia lime scattered by farmland
Magnesia lime : $MgCO_3$ 10%, $CaCO_3$ 55%, Phosphoric acid, Manganese, Humus acid, Iron, Silicic acid, Boron. Asahi industry KK
The thaw agent scattered by the road : $CaCl_2$

Since acid rain became the center of attention, the quantity of the sulfuric acid which moved by the wind has been investigated. As an examination method, the elution ingredient by the water of the ground under the floor of the house which rain does not require was measured. The sample extracted the ground under the floor of the temple

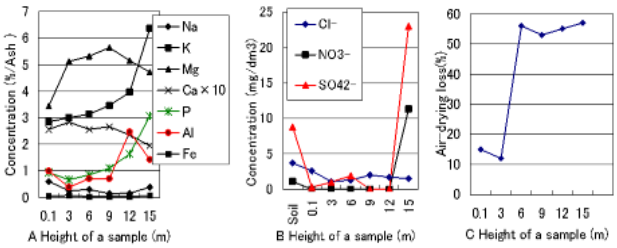
built in 1847 in 2005. A temple is for south and the frontage of 20 m, the depth of 14 m, 1 m in height under a floor, and the four quarters are opened wide. The sample was extracted on the east gate of a north-south center, the center, and the west entrance (an east gate and a west entrance are 1-m inner sides from felloe). As the state of the ground is shown in Table 2, air-drying loss in quantity of surface soil is 7.11% - 8.40%. The grounds which passed the standard sieve with the pore size of 2 mm were 70.08% - 92.82%. Na+, K^+, Mg^{2+}, Ca^{2+}, and Cl^- originate in the thaw agent scattered by the magnesia lime scattered by farmland and the road. In winter, there are few crops and a contaminant is carried to a west entrance by many west winds in winter. The reason NO_3^-concentration is very high is based on the following thing. In order to escape war fire from August, 1944 to September, 1945, 84 evacuation-of-schoolchildren children, teachers, and seven care staffs of Tokyo were living in the temple (Yamakawa, 2010). The ground was adsorbed in the ammonium by which it was generated from the rest room of the reverse side of a temple. Ammonium was changed into the nitric compound by the nitrification. Since direct rays did not hit, nitric acid was saved. The sulfuric acid ion concentration before being polluted is assumed to be concentration with a depth of 10 cm of an east gate (17 μeq/dm^3). From the amount of sum totals of with the surface soil of a west entrance, and a depth of 10 cm concentration, the concentration which subtracted the quantity of 17 μeq/dm^3 is equivalent to the quantity of the sulfuric acid to which it was carried by westerlies in 158 years and stuck. The quantity increases 463 times of 158 years ago. Simultaneously, the ingredient of the ground of the pine grove of the hill at the back of a temple was measured (High 48 m from the yard of a temple). Sulfuric acid ion concentration under the floor of a temple 7790 μeq/dm^3 and the average concentration of the surface soil of a pine grove were as low as 274 μeq/dm^3. However, the pine grove was destroyed totally after that. However, the pine grove was destroyed totally after that. The sulfuric acid added to soil combines with the metal oxide of soil, and becomes metal sulfate. Metal sulfate dissolves in rain water and becomes a metal ion and a sulfuric acid ion. Even if the dissolved metal ion is little, trees always absorb water. Although the absorbed moisture evaporates from the surface of trees, a metal ion combines with phosphoric acid, and is remained and accumulated into trees. As for more than the adsorption maximum permissible dose of the ground, the sulfated compound which remained in soil flows out of a river into the sea with rain water, and is not measured.

As for the sulfuric acid ion, concentration 463 times the quantity of in 1847 adhered to a building or trees in westerlies from 1847 to 2005. It is thought that this fact also influences sea water. On the coast in Akita Prefecture, or the Sea of Japan coast in Hokkaido, seaweed disappeared and the chlorosis phenomenon has happened (Matunaga 2010). Furthermore, the fish which makes seaweed the amount of food and a spawning ground place has disappeared. It is thought that the calcium ion concentration in sea water is lower than the concentration of the 1847s by the increase in the carbon dioxide in the atmosphere and inflow of a sulfuric acid ion since the solubility of those compounds is very low（$CaCO_3$ 0.014g/100g 25℃ Water, $CaSO_4$ 0.298g/100g20℃ Water). There are many living things which need calcium ion all over the sea so that a plant may grow with carbon dioxide. Furthermore, the Sea of Japan has less movement of sea water than the Pacific Ocean, and since it is surrounded by Japan and the continent, concentration may become high by inflow of the sulfuric acid ion to which trees stuck.

5. Relation between a metal ion and trees

The metal ion eluted from soil is absorbed into trees, combines with phosphoric acid of the essential ingredient of trees, and grows into an

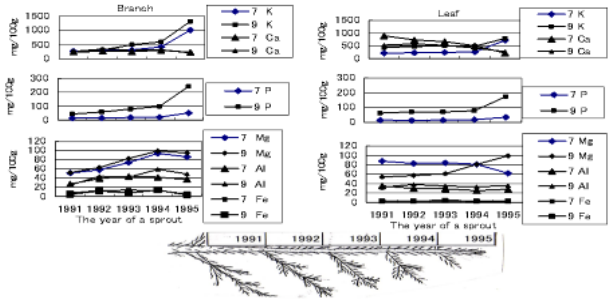
insoluble metal phosphate. Trees become the same phenomenon as the shortage of phosphoric acid, and photosynthesis becomes impossible.



Ishii,Fujimi, Maebashi,Gumma,JAPAN *Pinus densiflora Sieb. et Zucc* 2000.8.19
A Measurement is based on dryness, incineration, and nitric acid at the dissolution and ICP AES
B Grind a dried sample, add the water 25g to 10 g of samples, and measure by IC after 60 minutes.
C The rate of loss in quantity by natural seasoning

Fig. 7 Concentration of the ingredient according to height of declined *Pinus densiflors Sieb et Zucc*

The ingredient of trees extracted the 15-m *Pinus densiflora Sieb.rt Zucc* 3 cm at intervals of 3 m. It dried, ground and incinerated, melted in nitric acid, and measured by ICP AES. As shown in Fig.7 and A, it is parallel, and it exists and aluminum and phosphorus stop at the combined place. Sulfuric acid ion concentration ground the sample which carried out natural seasoning until it passed the sieve with the pore size of 2 mm. Measurement added the water 25g to 10 g of samples, filtered it after 60 minutes, and was measured by IC. As sulfuric acid is shown in Fig.7 and B, it is contained in the ground of a root, and since there is no necessity, a pine is carried at a tip, and evaporates and accumulates only moisture. In a twig, phosphoric acid runs short, and since an unnecessary sulfuric acid ion is accumulated, it becomes a cause by which a treetop withers. As natural seasoning loss in quantity is shown in Fig.7 and C, in 3 m or less, it is 15% or less, and 50% is exceeded in not less than 6 m. Resin is contained 3 m or less, and since the amount of volatilization of resin is few at normal temperature, air-drying loss in quantity decreases. Since aluminum ion and phosphoric acid combined and declined, the amount of generation of resin decreased, and since a not less than 6-m pine became the watery quality of the material, its air-drying loss in quantity increased. If the amount of generation of resin decreases, an insect will permeate easily and will cause large generating. Seven years afterward, the pine wood which extracted the sample was destroyed totally.



Nikkoi, Tochigi, JAPAN Mt. Taro (2367 m) 1995.7.29, 1995.9.30. Extraction place 1959m

Fig. 8 Concentration of the sprout age exception of the branch of *Abies veitchii Lindley* , and the ingredient in July and September (mg /100g dried samples)

Ota, Gumma, JAPAN Kanayama ruined castle *Pinus densiflora*(2004.5.29)
A: The compound of the ferrous ion(Fe^{2+}) absorbed from soil, and phosphoric acid Ferrous Phosphate (dark blue)
B: The Ferrous phosphate is hydrolysis. Carried out with moisture in the atmosphere, and turns into ferric hydroxide (yellow brown)
C: Coloring by bacterial breeding

Fig.9 The Ferrous ion and the reaction of phosphoric acid which were absorbed from soil

The branch of *Abies veitchii Lindley* was extracted from the same tree in July and September, and measured the ingredient according to the sprout age. As shown in Fig.8, at the tip of this branch that carried out the year sprout, it is clear that phosphorus and potassium are required in September in large quantities from July. However, as shown in Fig.7 and A, phosphorus combined with aluminum stops at the combined place, and is not carried at a tip. Phosphoric acid of trees is insufficient and photosynthesis becomes impossible.

If sulfuric acid is added to iron sand, the ferrous ion of 2 values will elute. If ferrous ion of 2 values is absorbed by *Pinus densiflors Sieb* and it combines with phosphoric acid, the Ferrous Phosphate of dark blue will be generated. Pine material removes the place which lost the bark by thunderbolt, and the place through which central water does not pass, as shown in Fig.9 and A, it colors from a root to a tip. However, if it is chopped and the time passes, as shown in Fig.9

and B, the Ferrous Phosphate will absorb moisture in the atmosphere, will hydrolyze, and will turn into ferric hydroxide of a cinnamon color. *Pinus densiflora Sieb* received the obstacle for which one fifth of the barks of area are lost from a tip to a root by thunderbolt. However, and annual rings have piled up five. The obstacle of the pine by phosphoric acid having combined with ferrous iron was more serious, most pines of the Kanayama ruins of a castle withered, and it was chopped（Ota, Gumma, Japan）(2004.5.29). Near the Kanayama ruins of a castle was a place of production of iron sand a long time ago. Chopped *Pinus densiflora Sieb* was all colored. Although this phenomenon has an opinion by blue bacteria, as shown in Fig.9 and C, the coloring by bacteria is not discolored, even if it is uneven and time passes (The pine stake insect 1997). Although Aluminium phosphate is colorless, coloring of the Ferrous phosphate becomes the proof of trees absorbing a metal ion and combining with phosphoric acid. A metal phosphate has very low solubility (Solubility product $AlPO_4$:Ksp=6.3×10^{-19}, $FePO_4$:Ksp=1×10^{-22}). As a result, phosphoric acid is taken from a metal phosphate, composition of adenosine triphosphate is impossible, and photosynthesis also becomes impossible. A metal ion combines also with the tannin of trees powerfully, and if it becomes metal tannic acid, the insect control effect will be lost (Omori 2015).

If sulfuric acid is added to soil and combines with a metal oxide, it will become metal sulfate and water and a hydrogen ion will be lost. As a result, judgment of the cause by which trees wither only in pH value of soil cannot be performed.

6. The shape of stripes of a forest withers.

The reason a needle-leaf forest withers in the shape of stripes is defined as "the change of generation peculiar to a needle-leaf tree" (Yamawaki 1999). The wind which blew the tree crown top of low trees in the mountain with a level difference collides with trees high one step, and makes sulfuric acid adhere, as shown in Fig. 10 and A, and trees wither in the shape of stripes along the stage (Mt.Yatugatake over Nagano Pref. and Yamanashi Pref. Japan）. *Abies veitchii Lindley* drops a lot of seeds, before withering, and as shown in Fig. 10 and B, it buds at the root of the withered parent tree (2000.7.30). If it grows up and surface area becomes large, the amount of adhesion of a young tree of sulfuric acid in the atmosphere will increase. Sulfuric acid is dropped on the root of a young tree by rain water, and elutes a metal ion. A metal ion is absorbed by the young tree and combines with phosphoric acid. As a result, young trees are wiped out before dropping a next-generation seed, as inactivation of phosphoric acid is shown in Fig. 10 and C (2013.7.13). It is supposed that it had happened that the needle-leaf tree of Mt. Yatsugatake withered in the shape of stripes before air pollution received attentions. In Nagano Pref., from 1873, there is a silk mill of foreign style and coal was used. The half of silk mills all over the country was in Nagano Pref. in the 1890s. As a result, in the mountain around Nagano pref., from early, the shape of stripes withered and the mountain was seen.

A,B,C: Mt Yatsugatake The cluster of summits over Nagano Prefecture and Yamanashi Prefecture, 30 km of north and south. Photograph altitude of 2402 m(2000.7.30)
C: Total destruction of the young tree in B (2013.7.13). (Photography Miyashita Shoji)
D: The shape of stripes of the needle-leaf tree of a Adirondack district U.S.A withers(1999.8.6)
Fig. 10 The shape of stripes of *Abies Veitchii Lindley* withers.

Fig.10 and D shows signs that *Abies firma Sieb. et Zucc* of the Adirondack district in U.S.A. withered in the shape of stripes. Sulfuric acid is supplied to westerlies from the factory near the Great Lakes, and they pass through a *Abies firma*

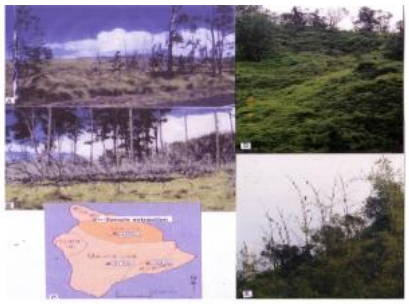
Sieb. et Zucc top. When seen from the lookout platform of Mt. White face (1250 m) in a Adirondack district, as shown in Fig. 10 and D, as long as it overlooked, *Abies firma Sieb et Zucc* had withered in the shape of stripes. When it entered into the wood, the tip of the young tree had all withered（1999.8.6）.

Munchen-Kassel, Germany(2002.4.27-5.6) (Guide, Mr.Miyashita Shoji)
Fig 11 The situation of a decline after a needle-leaf tree withers. Signs that a broadleaf tree buds.

Investigation of Germany went and came back to the way with Munchen to Cassel near a mountain path. As for going, return moved the way from the east by car on the way from the west. As shown in Fig. 11, after the needle-leaf tree withered, it broke down from passage of the strong wind. The broadleaf tree was afforested by the marks on which the tree fell. The needle-leaf tree with a blue branch had caused the spaghetti phenomenon（2002.4.27～5.6）. From the position of the wood where the cause withered, acidification of soil is considered to be the cause by adhesion of sulfuric acid by passage of westerlies. The situation of the decline with the time of a sprout with a big deciduous broad-leaved tree was not seen. A needle-leaf tree withers in the same area. Reason a deciduous broad-leaved tree does not wither. In evergreens, a needle-leaf tree has many amounts of adsorption of sulfuric acid in the atmosphere through every year, and, also in the amount of elution of aluminum ion, its acidification of the soil of a root increases more than a deciduous broad-leaved tree early. As a result, the aluminum ion and phosphoric acid which were absorbed combine, and photosynthesis becomes impossible, and declines and withers.

7. Sulfuric acid of an air pollutant moves to the Southern Hemisphere from the Northern Hemisphere.

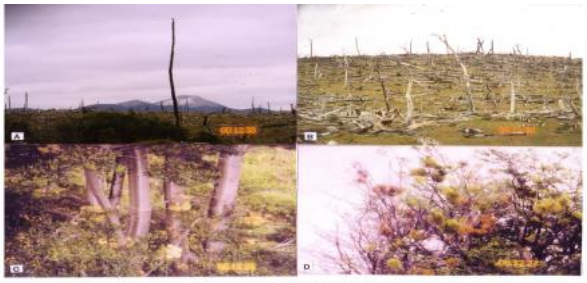
In the equatorial neighborhood, since temperature is high, an ascending current occurs. The sulfuric acid by which it was generated in the Northern Hemisphere can be drawn near to an ascending current. As the fact is shown in Fig 12, the needle-leaf tree and broadleaf tree of the north side of Mt. Mauna Kea(4205 m) in the Hawaii island have withered. (U.S.A., North latitude 20 ° , West longitude of 155 °)(2006.8.8). The Hawaii island has an active volcano south. Since trees withered after growing, it is clear that the cause's of having withered it is not influence of volcanic. The sulfuric acid which was able to be drawn near from the continent adheres to trees, it is dropped on soil by rain water, and it is thought that it withered in acidification of soil. The Dominican Republic is located in the south in the United States of America(North latitude 19° , Diameter of west of 71 °). As shown in Fig. 12, the forest of the slope facing north of rarimeval forest disappeared, the bamboo withered, and, in the broadleaf tree of the roadside tree, the tip had withered（North latitude 19° , West longitude 71°)(2003.2.25-3.4).



A-C: Hawaii island (U. S. A) (North latitude 20° , West longitude 155°) (Photo. Mr. Iwasaki Masat)
D, E: Dominican Republic (North latitude19° , West longitude 71°)
Fig. 12 The trees by the sulfuric acid which was able to be drawn near by the ascending current wither.

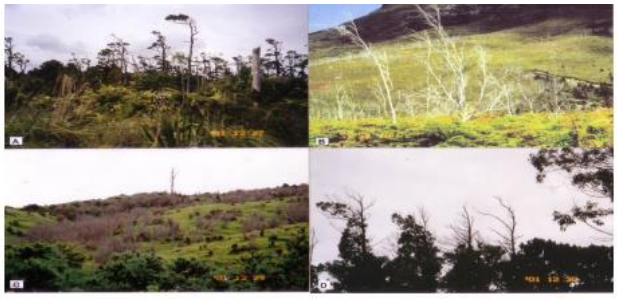
The polluted air which was able to be drawn near to an ascending current kills the trees which contacted, high up in the sky, it is cooled, and

becomes heavy, and is divided into north and south, and descends. The atmosphere which descended is absorbed by westerlies in the Northern Hemisphere, and is absorbed by Circumpolar vortex in the Southern Hemisphere. In for north latitude 30 to 60 degrees, the Southern Hemisphere also blows constantly for south latitude 30 to 60 degrees east from the west, and an Werterlies is called Circumpolar vortex in the Southern Hemisphere(Erick 1998).



Tierra del Fuego (Argentina, South latitude 53° 68° West longitude)
A: Beeches are wiped out 1960 years ago. B: The beech withered with the fire of underground peat for 1960 to two years. (300m × 9km). C: *Pan Del Indio* which was parasitic on the beech
D: *Witchs Broom* which was parasitic on the beech. (2000.12.26-30) (Guide Mr. Ueno Nobutaka)
Fig.13 After the beech forest in Tierra del Fuego withers and Parasitic plant

As for Tierra del Fuego (Argentina, South latitude 55° , West longitude 68°) at the southernmost tip in the South American Continent, the soil of the beech forest which withered as shown in Fig.13, A, and B has neither a young tree nor grass. The beech forest shown in Fig.13 and B withered with the fire of underground peat for about two years after 1960 (300 m x 9 km). If the state exhausting of the tree of Fig.13, and A, B is compared, it will be thought that a branch disappears, and the tree of Fig.13 and A is only a trunk, and withered before 1960 old persons. The beech of Tierra del Fuego is three sorts, Lenga of an endemic species, Nire and Guindo, in evergreens, and Lenga in it occupies an abbreviation half. As the beech of a valley with little quantity which a wind hits is shown in Fig. 13 and C, the mushroom of a yellow tennis ball size called Pan Del Indio is parasitic. In other valleys, the Witchs Broom spread, the autumnal leaves of the leaf which gathered were carried out, and as shown in Fig. 13 and D, it seemed to the mountain that the flower was in bloom. The rain water which flowed through the slope of the mountain where the beech withered, pH 4.0, and sulfuric acid ion concentration were 6400m μ eq/dm^3, and nitrate ion concentration was 8 μ eq/dm^3. Rain is a light rain which began to fall from on the daytime of the previous day. Nearby springwater is pH 6.8_1 and sulfuric acid ion concentration 256μeq/dm^3, and nitrate ion concentration is zero (2000.12.26-30). (Tierra del Fuego is a national park. Guide is Mr. Ueno Nobutaka living in Tierra del Fuego).



South Island NEW ZEALAND (South latitude 41－47° , Eeast longitude 167－174°) (2001.12.24-31)
A: A decline of the child of the withered beech which is visible to the right
B: The young tree which budded from the kind which flew to the neglected pasture withered
C: Broom withers. D: A decline of a *Eucalyptus globulus Labill* (Guide Mr Miyashita Shoji)
Fig.14 Withering of the trees of South Island NEW ZEALAND

New Zealand South Island has a mountain range which spreads north and south on the west of an island. The west side of a mountain range has the high sulfuric acid ion concentration of soil, order that Circumpolar vortex may collide. Trees are in the state near total destruction, so that they decline regardless of a kind and become close to the South Pole. The beech which grew from the kind which the parent tree in which the right withered dropped is close to total destruction like Fig.14 and A. Young tree which grew from the kind which flew to the pasture site which grass stops having come out and was neglected. As shown in Fig, 14 and B, it was destroyed totally. Surface of the earth is covered only in *Pteridium aquilinum Kuhn which likes* the acid soil like height. As *Cytisus scoparius Link* of the marks cut off by a big tree withering shows Fig.14 and C, it is destroyed totally. The yellow flower was in bloom in the place where a wind does not hit. *Eucalyptus globulus Labill* planted in the boundary of the pasture of the east side of a mountain range as shown in Fig.14 and D, since wind velocity is early, a branch cannot be grown up to be the style upper part. Since a windward tree has much quantity which a wind hits, the amount of adhesion of sulfuric acid increased

and the area in which the treetop withered has increased. Trees of the west side of a mountain range various Beard moss is parasitic on the trunk and the branch. pH and sulfuric acid ion concentration of elution liquid by the water of the same kind of beard moss seen in various places were measured. The beard moss in a primeval forest was pH 4.0_9, and sulfuric acid ion concentration was 38 μeq/dm^3(n=2). pH 3.4_6 of the elution liquid of the beard moss of the edge of a wood and sulfuric acid ion concentration were 2480 μeq/dm^3, and nitrate ion was zero（n=8）(The water 25g was added to 10 g of samples dry one whole day and night, and it filtered 60 minutes afterward). From the Northern Hemisphere, it is decomposed by sunlight during movement and nitric acid is not measured (Chitani 1959). It is clear that the cause's of withering of trees it is a metal ion which soil acidifies and is eluted with sulfuric acid (2001.12.23-2002.1.1).

Perth Western AUSTRALIA (South latitude 32° ,East longitude 116°) (10.12-10.15 2000)
A. Eucalyptus , B. Needle-leaf tree , C. Erica , D. Marks of a fire.

Fig.15 The situation of the withered trees in Western AUSTRALIA

Perth (Australia, south latitude 31° east longitude of 115 °) becomes a passage way of Circumpolar Vortex facing the Indian Ocean. It withered and the *Eucalyptus globulus Labill* of the entrance with many amounts of contact of a wind skeletonized, as shown in Fig. 15 and A, and only the tree with few amounts of contact of a back wind has attached the leaf. A needle-leaf tree and Erica have also withered. Although the *Eucalyptus globulus Labill* by a fire withers in various places and marks are seen, charcoal remains on the ground and the place which withered with the fire is black (2000.10.12-15).

8. Sulfuric acid ion concentration of the soil of the equatorial neighborhood

Infanta (Infanta Gen Nakar Philipines) It is a town facing the Pacific Ocean located eastward from Manila (North latitude 14° , East longitude 121°). The pH of the elution liquid by the water of the ground with a depth of 10 cm of Infanta is 5.7_4, and sulfuric acid ion concentration is 52 μeq/dm^3. The 30-cm-deep ground was pH 6.1_0, and sulfuric acid ion concentration was 10 μeq/dm^3 (n= 8). That in which a surrounding needle-leaf tree and broadleaf tree declined was not seen. Latitude of Philippines is closer to the 6° (666 km) equator than Hawaii. It is thought that the polluted air which was able to be drawn near by the ascending current goes up high up in the sky, and there is little influence, without touching trees (2000.4.1-6).

West Kalimantan (Toho Ilir, Katamadya, Potianak, Indonesesia) is located in the South latitude 0.0° , East longitude 109° . It cuts down all trees, as long as a primeval forest is overlooked. All the marks are covered with nearly 2m weeds. The soil sample extracted the ground of the wood of a broadleaf tree afforested by the materials of charcoal. pH, nitrate ion, and sulfuric acid ion concentration of elution liquid by the water of the ground were measured. In a depth of 10cm, pH 4.4_9 and sulfuric acid ion are 26 μeq/dm^{3}and nitrate ion 91 μeq/dm^3. In a depth of 30cm, pH 4.7_0 and sulfuric acid ion are 29m μeq/dm^3 and nitrate ion 86 μeq/dm^3. pH 5.0 of well water, Sulfuric acid ion concentration is 18 μeq/dm^3, and there was nitrate ion concentration 5 μeq/dm^3(1999.11.13-20).

In order that sulfuric acid of an air pollutant may go up high up in the sky, without contacting trees near the equator, it is thought that it is uninfluential in soil. The sulfuric acid ion concentration of west Kalimantan has a near value as compared with the concentration (17microeq/dm3) of the east gate under the floor of the temple in 1847 of Table 2. It is thought that the sulfuric acid ion concentration of the soil of a time without air pollution is close to

this value. The sulfuric acid ion concentration of the soil which Westerlies and Circumpolar Vortex pass is very high, since the eluted metal ion is absorbed into trees and combines with phosphoric acid, photosynthesis becomes impossible and it is thought that trees decline and wither.

It is clear that West Kalimantan's there is a stump of a big tree when it goes into the prairie where it cut down all trees, and it was in the forest of the big tree. However, weeds grow about 2m and one young tree cannot be found, either. If the broadleaf tree which planted trees as materials of charcoal cuts surrounding grass so that sunlight may shine upon a year repeatedly, and there is no help of people, it cannot grow.

9. Reproduction of acid soil and prevention from withering of trees by charcoal

Trees contain potassium as an essential element. If trees are carbonized, potassium will turn into potassium carbonate and will remain into charcoal. If rain water is added to charcoal, potassium carbonate dissolves, combines with sulfuric acid of soil, and is neutralized. As a result, elution of a metal ion stops, phosphoric acid is protected, and withering of trees can be prevented.

Table 3 The elution ingredient by the water of charcoal

Elution ingredient Materials of charcoal	Na^+	K^+	Mg^{2+}	Ca^{2+}	Amount of elusion of OH^-
		(meq/dm^3)			
Quercus myrsinaefolia	2.26	117.34	10.86	5.24	135.7
Quercus acutissima	0.91	24.42	2.55	5.09	33.0
Cryptomera japonica	9.53	35.88	5.84	6.34	57.6
Pinus Thunbergii	1.26	24.37	2.71	2.20	30.5
Pinus Thunbergii/Branch	0.91	37.60	3.61	2.74	44.9
Pinus Thunbergii/Leaf	1.30	22.89	1.39	4.09	29.7
Chaff	3.00	48.85	2.63	3.54	58.0
Phyllostachys bambusoides	2.26	313.17	16.12	5.73	337.3
Phyllostachys bambusoides/Root	3.78	254.35	12.34	7.14	277.6
Phyllostachys heterocycla	30.70	147.31	22.94	4.19	205.1

Carbonization temperature : 800 ℃ ±5 ℃, Electric furnace, Manufacturer Mr.Iwasaki M.(2004)
The particle size of charcoal: 2 mm or less Concentration display : the charcoal 10g+ water 25g
It filtered after progress for 60 minutes.
$K_2CO_3 + H_2O = KHCO_3 + KOH$, $KOH = K^+ + OH^-$, $K2CO_3 + H2SO4 = K2SO4 + H2O + CO2$
$Al^{3+} + 3OH^- = Al(OH)_3 \downarrow$ $Fe^{3+} + 3OH^- = Fe(OH)_3 \downarrow$

The elution ingredient by the water of charcoal and the charcoal of a bamboo is shown in Table 3. In order for a bamboo to use silica as the main ingredients, in order that a potassium silicate may be absorbed from soil, there is much content of potassium and the charcoal of a bamboo is more effective as a neutralizer of acid soil than as charcoal.

Table 4 Comparison of the effect of charcoal addition of acid soil
−The difference of vegetable generating−

Sprout age		1999	2000	2001	2002		1999	2000	2001	2002	
	Depth	Charcoal addition				Average	Charcoal additive−free				Average
pH of soil	0	4.4_3*	6.2_8	5.2_7	5.6_8	5.5_7	4.4_3	4.7_1	4.8_2	5.0_9	4.6_7
	30	4.2_6*	4.4_8	4.3_7	4.3_9	4.4_1	4.2_8	4.3_5	4.3_2	4.4_5	4.3
Sprout plant	No.					Total					Total
Larix leptolepis Murray	1	−	−	−	2	2	−	−	−	−	−
Clethra harbinervis Sieb	2	−	4	6	4	14	10	8	10	4	32
Salix chaenomeloides Kimura	3	−	1	5	6	12	−	−	−	1	1
Alnus firma Sieb. et Zucc	4	−	1	5	2	8	−	−	−	−	−
Vitis Coignetiae Pulliat	5	−	−	−	2	2	−	−	−	−	−
Athyrium yokascense Christ	6	−	2	8	4	14	−	10	10	17	37
Artemisia vulgaris L.var.indica Maxim	7	1	−	−	11	12	−	−	−	−	−
Miscanthus sinensis Aderss	8	−	−	−	2	2	−	2	−	3	5
Zoysia japonica Steud	9	−	1	−	−	1	−	1	−	−	1
Imperata cylindrica Beauv	10	1	−	−	−	1	−	−	−	−	−

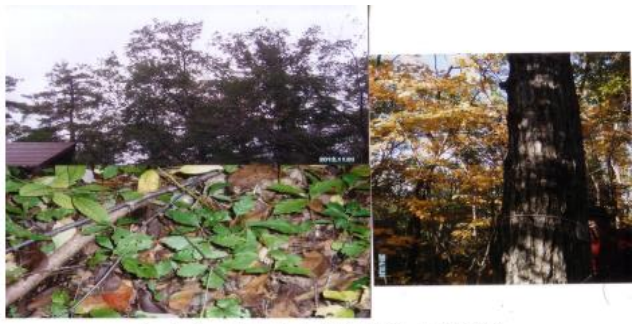
Extraction place:Ashio,Nikko,Tochigi JAPAN. Ashio Copper Mine(1610−1973) (Altitude: 922 m)
Addition of charcoal:1999.7.9. Extraction of a sample :2003.8.30
* : it is not contained in average value.

The place into which a help does not go by acidification of soil in the Ashio Copper Mine site does not have trees (Ashio Tochigi Japan, Foundation 1610 - Closed mountain 1973). Reproduction investigation of the soil by charcoal was conducted at the vacant lot in the afforested pine grove with an altitude of 922 m of the refinery north side. (1999.7.9〜2003.8.30). The root of all the plants of a site (80 cm x 200 cm) was deleted, and 1 kg of charcoal ground at one half of places was mixed with surface soil. For the prevention from a vermin damage of a deer, the examination place was enclosed with the fence of the wire net, and was neglected for four years. As the division which sprinkled charcoal was shown in Table 4, pH went up, and ten sorts of plants budded. *Athyrium yokascense* and *Clethra harbinervis* in which the unsprinkled division of charcoal likes acid soil bud in large quantities, and others have budded only three sorts of plants. In a Tirra del Fuego Argentina and New Zealand South island, it coincides with that the marks where trees withered were covered only by Fern. It is clear that acid soil's it is renewable by adding charcoal.

Oga peninsula Akita,JAPAN
A : *Pinus Thunbergii*(11.13.2003), B : *Tilia Japonica*(6.2.2011), C: *Bamboo grass*(6.2.2011)
D : The pine planted trees in the same area in 1993. From 2003 to charcoal spraying.
As shown in Table 1, pH of soil is adjusted to five or more. The pine is growing still now.

Fig. 16 Growth of *Pinus Thunbergii* by spraying of charcoal inside of area which trees were destroyed totally

The Oga peninsula (Siohama, Toga, Oga, Akita, Japan) is a peninsula projected to the Sea of Japan, and is affected by the influence of westerlies always. It was destroyed totally and *Pinus Thunbergii Parl* had skeletonized in 2003, as shown in Fig. 16 and A. Then, Fig. 16 and B *Tilia japonica simk* and *Pleioblastus Chino Makino* of Fig. 16 and C were destroyed totally. Fig.16. *Pinus Thunbergii Parl* shown in D planted trees in 1993, scattered charcoal from 2003, and kept pH of soil or more at five. It is growing up without the present and 1 withering (Table 1, the pine grove of the soil after being able to solve the snow shown in No.3, 211/2455 m^2 of pines). It was proved that the cause by which a *Pinus Thunbergii Parl* withers in this experiment is acidification of soil.



Kawachi , Kosado,I Sado , Niigata ,JAPAN. Momiji park (2014.10.24)
The treetop withered and the bud for the next generation had come out from the root of a trunk.
It will be charcoal spraying of1 kg/m^2 in 2011 and2012. The 2013 seed fall. 2014 sprout.

Fig. 17 The wood of the Japanese oak was recovered by scattering charcoal.

The Momiji park was a mixed wood of a pine and a Japanese oak whose Sea of Japan can be seen under its view (Kosado, Sado, Niigata, Japan, Island in the Sea of Japan). The pine withered and fell and the bark had exfoliated. Although the tip of a Japanese oak withers, and does not have a leaf and the bud was taken out with the root of the trunk for the next generation there were no marks which the insect punched. The reason a pine withers ahead of a Japanese oak has much quantity in which a pine collects sulfuric acid through every year by evergreens. A Japanese oak is a deciduous tree and surface area is narrow between winter. As a result, there are few amounts of collection of sulfuric acid, and there is less quantity of the soil of a root than a pine. pH of the surface soil of an examination place was 3.9_0, and sulfuric acid ion concentration was 1050 μ eq/dm^3 (n= 6). As a result of sprinkling charcoal for two years (1 kg/m^2), it was set to pH 4.4_7 of surface soil, as shown in Fig. 17, the leaf was attached to the treetop, and the seed was dropped in 3rd and the bud was shot out in 4th（2011～2014）. Furthermore, the same result was obtained as a result of conducting the same experiment by the Yuzuro park(Kanai, Sado, Niigata, Japan). It is clear that the cause's of withering of a Japanese oak it is acidification of the soil by the sulfuric acid sent by westerlies.

10. Reduction of carbon dioxide

Trees absorb carbon dioxide and grow. If scrap wood is carbonized, a volatilization ingredient will burn, but the remaining charcoal does not grow into carbon dioxide, unless it burns. Since the carbon dioxide by which it is generated when charcoal and trees are used as fuel is the absorbed carbon dioxide, it does not become an increase in the atmosphere. The carbon contained in charcoal is about 98%, and the charcoal of a bamboo contains 77%-82% of carbon. 1 kg of carbon can fix 3.7-kg carbon dioxide. Afforestation of trees and carbonization of scrap wood are the most effective carbon dioxide reduction methods. When scrap wood and charcoal are used as fuel, content of the potassium in the part in which carbon carried out carbon dioxide change, and the remaining ashes becomes high. It can be effectively used as a neutralizer of acid soil.

11. Conclusion

The sulfuric acid generated by combustion of a fossil fuel combines with the aluminum oxide of soil, or iron sand, and elutes a metal ion. A metal ion is absorbed into trees, combines with phosphoric acid of an essential ingredient, and becomes an insoluble metal phosphate. Trees become the same phenomenon as the shortage of phosphoric acid, and photosynthesis becomes impossible. Furthermore, a metal ion and combination power of tannin are strong, and if it combines, it will lose the insect control effect. As a result, acidification of soil loses the resistance over a damage by blight and harmful insects regardless of the kind of trees with the metal ion to elute, and withers. Trees contain potassium as an essential element. If trees are carbonized, potassium will turn into potassium carbonate and will remain into charcoal. If charcoal is sprinkled to acid soil, with rain water, it elutes hydroxide ion, neutralizes sulfuric acid, and can prevent the elution stop of a metal ion, and withering of trees. Trees absorb carbon dioxide and grow. the charcoal which carbonized scrap wood and remained unless it burns, it does not grow into carbon dioxide. Afforestation of trees and carbonization of scrap wood are the methods most effective in carbon dioxide reduction.

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