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Analyzing data of organic and inorganic contents and grain size distribution of core MDG-OWK 12 collected at Oiwake area of Midagahara wetland in Mt. Tateyama, central Japan *

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泥炭コアMDG-OW12の有機物量, 無機粒子量と粒径分布 *

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1. Introduction

Trans boundary transportation of Asian dust were observed in Mt. Tateyama. (Watanabe and Honoki, 2013). Inorganic particles for example Asian dusts were contained in precipitation collected in Mt. Tateyama (Honoki and Watanabe, 2013, Honoki and Watanabe, 2014, Honoki and Watanabe, 2015, Honoki and Watanabe, 2016). Peat sediment at Midagahara wetland of Mt. Tateyama contains pollens deposited in past age (Yoshii, 1981). Then, peat core sample named MDG-OWK12 was collected at Midagahara wetland to know past Asian dust transportation. Organic and inorganic contents and grain size distributions of inorganic contents in the core MDG-OWK12 were analyzed.

2. Sampling and analysis

2.1 Peat core sampling

Peat core sediments of 86 cm in total length, named MDG-OWK12, was collected by using a hand auger (5.5 cm of diameter, Daiki Rika Co. DK-110C) at St.2 in Midagahara wetland (36° 33' 52.02" N, 137° 32' 57.36" E, 1870 m asl) on Oct. 16, 2012. Surface part of this core (about 9 mm of thickness) was covered by leaves, stolon and roots of *Eriophorum vaginatum*s, and thus we did not conduct sediment grain analysis for this plant layer. As such this surface part was cut and new surface of the core was made for analysis. Core MDG-OWK12 consists of the surficial plant layer, peat sediments (55 cm deep), and basal clayey sediments (55-86 cm deep) with the gradual sedimentary boundary between peat and clayey sediments. Core MDG-OWK12 was divided into quarters for the sediment grain analysis, ¹⁴C dating, pollen analysis and geochemical analysis of inorganic contents.

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2.2 Inorganic particle contents and ignition loss of peat samples

Peat core samples were cut into 120 sample blocks with 5 mm thick. Small pieces for ignition residue analysis were bored from those blocks by using a cork borer with 4 mm of diameter and 5 mm of length. These small sample pieces were cut into two measuring pieces at around the center in the length. A measuring piece was put into a measuring cup and in total twelve measuring cups were placed on a heating tray. Then, this tray was heated at 110°C for 2 hours in electronic furnace. After cooling in a desiccator, weights of measuring cups holding measuring pieces were weighed (W_M) separately by an electronic balance (A&D Co. Ltd. GR-202, accuracy is 0.01mg).

Dry weight of each measuring pieces (W_D) were calculated by the following equation (1).

$$W_D = W_M - W_C \quad (1)$$

W_C is the initial weight of cup before putting the sample on it. Each length of a couple of measuring pieces which were bored from one sample block was calculated by proportional distribution of dry weight of a couple of samples. After measuring dry samples' weights, measuring cups holding dried sample pieces were put on a heating tray. Heating tray was put into electronic furnace and heated at 550°C for 1 hour. After cooling in desiccator, weights of measuring cups were measured (W_H). Then ignition residues (W_{IR}) of measuring pieces were calculated by the following equation (2).

$$W_{IR} = W_H - W_C. \quad (2)$$

Then ignition loss (biomass or organic matters) (W_O) of samples were calculated by following equation (3).

$$W_O = W_D - W_{IR} \quad (3)$$

Contents of ignition residue particles (i.e., lithogenic particles) (C_{LP}) and organic matters (COM) of 1 mm of peat were calculated by the following equations (4) and (5).

$$C_{LP}(g/m^2/1mm) = W_{IR} \times (1 / ((rs/2)^2 \times 3.14) / Ts / 1000 \quad (4)$$

$$COM(g/m^2/1mm) = W_O \times (1 / ((rs/2)^2 \times 3.14) / Ts / 1000 \quad (5)$$

Here, rs is an inside diameter of cork borer (unit is m) and Ts is a thickness of measuring piece (unit is mm).

3.2.2 Size distribution of inorganic particles in peat samples

Ignition residues of measuring pieces became a clod. Then, ignition residues were taken into a beaker (300 ml) and 20 ml to 30 ml of de-particle water was poured into this beaker. The clod of ignition residues was crushed in the water with silicon spatula (hard type). This beaker was put into ultrasonic washing

apparatus and small clods were further broken into individual particles. About 250 ml of de-particles water was poured into this beaker. Weight of water poured in this beaker was measured using the unit of 0.1 g (W_w). Particles in this beaker were well suspended by magnetic stirrer and a part of this water was poured into a Teflon beaker (50 ml). Number of concentrations of ignition residues in peat samples (M_N) were measured by liquid particle counter (HIAC 9703+). Total number of particles in each grain size (N_t) was calculated in following formula (6)

$$N_t \text{ (number)} = M_N \times W_w \quad (6)$$

Ranges of particle size and total particles numbers were showed in Table 1

Acknowledgement

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Table1 Grain size distributions of core MDG-OWK 12.

Sample No.	Thickness (mm)	Depth from surface to center of sample (mm)	Dry weight (mg)	Organic matter weight (mg)	Inorganic matter weight (mg)	Range of grain size															
						1.5~2μm	2~3μm	3~4μm	4~5μm	5~6μm	6~8μm	8~10μm	10~12μm	12~16μm	16~20μm	20~30μm	30~40μm	40~50μm	50~60μm	60~80μm	80~150μm
			(mm)	(mg)	(mg)	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)
1-1-11	3.1	1.5	3.34	3.1	0.24	671303	279472	227648	150348	77984	78125	42947	23492	25168	6823	8783	3400	1015	425	71	47
1-1-12	1.9	4.0	2.08	1.93	0.15	545046	217794	163102	108337	54059	51187	26677	16697	16162	5087	6913	1923	341	49	0	0
1-1-1	2.7	6.4	3.22	2.94	0.28	850323	366951	297958	189918	95274	83581	42619	23363	23247	5438	5485	2147	957	584	280	23
1-1-2	2.3	8.9	2.71	2.45	0.26	914165	391699	326200	214114	104849	92226	45593	24253	21594	4971	6011	1618	555	208	231	46
1-1-3	3.0	11.5	4.99	4.41	0.58	1389002	629547	530253	350525	171028	157745	80134	45840	43388	10158	12750	4258	1643	532	301	139
1-1-4	2.0	14.0	3.25	2.9	0.35	558551	260679	233877	162830	85271	76972	39967	24544	26801	7288	9545	3785	1669	729	353	71
1-1-5	2.1	16.0	3.76	3.33	0.43	976363	456464	404549	276005	140016	132313	69321	44073	47192	11379	14520	4933	1699	605	326	140
1-1-6	2.9	18.5	5.39	4.63	0.76	2221984	945687	738452	472985	221476	203299	99699	51547	54238	12079	17190	3690	1810	282	118	141
1-1-7	3.1	21.6	4.56	3.95	0.61	1446527	645851	543078	348904	170003	154683	75866	45177	43821	10824	12966	4354	1903	714	333	48
1-1-8	1.9	24.1	2.72	2.49	0.23	466563	209414	176346	121404	67931	67255	35470	22107	20592	5247	6483	1936	420	187	70	93
1-1-9	2.4	26.2	5.12	4.54	0.58	1443593	693200	610417	422908	220088	228106	111167	58002	56027	13380	13237	2027	282	0	95	0
1-1-10	2.6	28.7	5.39	4.6	0.79	2069599	935516	786352	498351	257764	228106	111167	58002	56027	13380	13237	2027	282	0	95	0
1-2-1	2.4	31.2	5.05	4.15	0.9	1851468	839248	724302	481146	244298	222888	110308	62381	68501	16019	19409	6156	2119	789	565	0
1-2-2	2.6	33.7	5.38	4.65	0.73	2000971	866001	749702	477933	237542	218969	103423	61651	61251	12382	16125	2342	400	0	0	141
1-2-3	2.5	36.3	6.11	4.99	1.12	3243457	1445969	1201647	772479	377682	335752	150714	82440	73991	14731	17427	5019	1155	84	578	0
1-2-4	2.5	38.8	6.03	5.01	1.02	2724408	1228909	1050397	705688	341110	322853	156750	90008	85627	17713	15368	3919	1539	225	142	142
1-2-5	2.7	41.3	6.57	5.47	1.1	4855192	2055769	1580502	937657	418486	334568	130809	59462	45435	7344	7001	2460	441	86	0	0
1-2-6	2.3	43.8	5.64	4.64	1	3027572	1416342	1209129	800670	382357	347068	174262	93126	84703	16559	16630	2088	262	84	286	0
1-2-7	2.3	46.2	4.6	3.88	0.72	2907318	1309117	1043498	632405	283967	249561	109519	60949	48507	7279	7848	1247	568	0	189	0
1-2-8	2.7	48.7	5.28	4.3	0.98	3532827	1562641	1248736	768468	337034	280393	127514	64284	55271	8931	10710	2891	983	82	702	0
1-2-9	2.4	51.2	5.78	4.92	0.86	3356252	1481531	1196976	753635	349670	302394	136920	75972	63726	11363	9243	1919	424	82	0	0
1-2-10	2.6	53.7	6.29	5.4	0.89	3601668	1556640	1265411	765005	341920	277412	111824	59241	43800	9052	5782	1203	420	0	140	0
1-2-11	2.6	56.3	5.9	4.87	1.03	2123498	984026	865563	573795	294852	273117	136918	80990	81771	18785	17761	3011	1024	524	293	146
1-2-12	2.4	58.8	5.34	4.29	1.05	2086356	959509	796002	525954	251116	241308	111200	68928	65743	13879	12250	3245	1006	515	287	144
1-3-1	2.4	61.2	6.32	5.18	1.14	2493367	1141847	925837	601169	287573	251197	126611	68395	72447	19790	21263	3958	1555	424	0	141
1-3-2	2.6	63.7	6.94	5.3	1.64	2142607	978540	850541	560898	272191	252447	120958	69907	77224	17249	20308	7341	1727	1152	720	288
1-3-3	2.5	66.2	6.48	5.34	1.14	3933665	1719019	1428479	877429	403145	331397	155398	82288	64028	13336	12249	5449	1147	1004	143	143
1-3-4	2.5	68.7	6.65	5.5	1.15	3396041	1548338	1310419	860038	412000	372637	171750	103769	82159	16593	15350	2840	142	0	426	0
1-3-5	2.8	71.4	5.79	5.03	0.76	2473530	1052145	891318	585963	265271	237020	110486	62365	54911	10541	14446	3846	570	142	285	142
1-3-6	2.2	73.9	4.42	3.86	0.56	1411848	623703	527785	326878	163599	147358	63922	40354	36490	7089	8263	2703	996	569	285	285
1-3-7	2.8	76.4	6.87	5.93	0.94	1905895	901692	818455	547017	274635	248403	122102	63952	70558	11748	14638	4812	1132	991	425	142
1-3-8	2.2	78.9	5.36	4.79	0.57	1361592	614459	524684	377650	167921	156336	81942	45513	39847	10438	9371	2753	688	275	275	275
1-3-9	2.9	81.4	6.92	6.18	0.74	907840	423936	376396	275798	137336	148022	80794	46948	50246	14635	13996	6272	2788	1533	558	139
1-3-10	2.1	83.9	5.11	4.6	0.51	1141419	522122	438479	296095	147208	143468	80797	47402	43805	12267	14018	3001	1429	0	143	143
1-3-11	2.5	86.2	5.59	4.79	0.8	2409578	1024343	831621	506519	222829	180146	80143	40354	27742	2541	4012	706	424	0	282	141
1-3-12	2.5	88.7	5.64	5.08	0.56	1941438	829785	709397	447274	213975	185488	85580	40840	31135	4166	3913	289	289	0	0	144
1-4-1	2.4	91.2	6.55	5.98	0.57	2901158	1240142	1012053	590858	267447	209895	87122	40510	26795	3270	3362	518	357	0	0	138

1-4-2	2.6	93.7	7.14	6.45	0.69	1033488	480899	428551	301286	145040	151723	78487	51620	51313	11479	11570	3375	761	273	818	682
1-4-3	2.6	96.3	6.68	6.06	0.62	898440	412198	383900	262659	129122	124635	72288	47456	48275	12202	12012	3525	1935	570	855	0
1-4-4	2.4	98.8	5.95	5.49	0.46	965494	441499	391219	269745	136806	142642	76497	44537	41723	9056	8175	2328	637	695	0	417
1-4-5	2.5	101.3	6.04	5.47	0.57	3082243	1286352	962375	565070	239848	179763	70933	35384	23093	4039	2442	0	82	0	0	0
1-4-6	2.5	103.8	5.86	5.35	0.51	626270	297501	269095	189003	104172	102936	51846	34816	39039	8126	11788	2575	1179	687	275	412
1-4-7	2.4	106.2	5.06	4.65	0.41	1713933	716859	578752	337943	157739	129308	58336	26278	20908	2480	3557	386	0	281	140	0
1-4-8	2.6	108.7	5.61	5.13	0.48	1000397	458868	399457	260063	128911	122123	61720	38306	42843	9305	11476	3013	219	139	139	277
1-4-9	2.4	111.2	6.72	6.2	0.52	603175	310047	284260	191442	101187	105473	46562	32330	32512	9412	11476	2994	408	680	408	0
1-4-10	2.6	113.7	7.23	6.68	0.55	624805	311043	299223	204888	102657	96676	53190	31595	32895	7967	7872	3381	709	284	567	567
1-4-11	2.4	116.2	5.99	5.46	0.53	1230028	588279	514693	355999	178125	159128	81656	44531	38702	7955	7818	1760	869	114	46	91
1-4-12	2.6	118.7	6.47	5.73	0.74	1164138	591943	552742	410802	213827	224639	124274	77541	73741	16739	15608	3461	656	294	181	158
1-5-1	2.7	121.3	7.17	6.52	0.65	927037	472584	438777	332414	178560	188755	104964	70774	69945	15435	16787	4410	948	427	356	213
1-5-2	2.3	123.8	6.15	5.62	0.53	700346	334619	311415	224525	118652	124482	75720	50395	55128	13992	14598	3195	1073	513	280	210
1-5-3	2.5	126.3	7.05	6.35	0.7	2226284	987782	828039	537521	247696	241886	124547	72818	63971	13653	12529	1435	143	287	0	0
1-5-4	2.5	128.8	6.82	6.13	0.69	1212098	598689	585737	487350	263429	273161	145381	89089	81588	16947	11185	1041	145	73	48	48
1-5-5	2.5	131.2	6.28	5.78	0.5	700441	356399	332557	252283	138547	135421	74822	46400	52773	11340	14974	3877	1454	509	533	170
1-5-6	2.5	133.7	6.3	5.95	0.35	1404761	620752	512273	332686	156689	136279	58181	29794	21325	3707	3214	399	211	94	0	0
1-5-7	2.1	136.0	4.24	3.93	0.31	558441	263468	236893	172895	90909	85618	44565	27609	31073	6133	7961	1900	697	337	289	241
1-5-8	2.9	138.5	6	5.46	0.54	1341403	657581	598563	438379	230832	202788	117788	66491	57936	11558	10189	1994	553	192	168	120
1-5-9	2.8	141.4	6.77	6.13	0.64	1064484	547070	507754	390435	202788	185738	89959	57163	58540	16253	16301	5265	1570	773	411	193
1-5-10	2.2	143.9	5.15	4.72	0.43	1117494	535644	493234	349836	184877	167066	78327	45472	37461	7154	6787	1838	686	319	221	196
1-5-11	2.4	146.2	5.79	5.31	0.48	571228	292585	277057	210876	114468	109900	50677	32026	33706	7409	8687	2959	1160	710	568	284
1-5-12	2.6	148.7	6.07	5.52	0.55	1326340	626516	569925	391346	192773	172411	77664	42283	33891	6443	5641	1490	252	138	161	69
1-6-1	2.3	151.2	5.66	5.05	0.61	1011054	500815	486797	382120	212794	219838	116198	74332	69266	14160	11356	2003	306	283	141	24
1-6-2	2.7	153.7	6.5	6.04	0.46	967338	446162	403963	293381	152503	146286	76147	46613	44741	9937	9660	2727	948	416	162	231
1-6-3	2.7	156.3	6.02	5.44	0.58	656521	354331	358145	287265	160879	163935	82939	54179	56430	13409	15399	4454	1753	805	805	166
1-6-4	2.3	158.8	5.22	4.7	0.52	2029460	919545	772097	530833	235668	197721	73250	40874	29895	3219	4553	1065	140	140	0	0
1-6-5	2.6	161.3	8.55	7.5	1.05	4072319	1755382	1476088	981998	445092	372360	165462	79390	64009	10985	9384	1195	0	116	0	139
1-6-6	2.4	163.8	7.69	6.86	0.83	1125845	567187	542525	403226	215114	211142	111347	72574	73792	17303	18229	5069	1901	707	634	317
1-6-7	2.1	166.0	4.97	4.39	0.58	1341210	669804	618558	439090	230784	221635	112547	65805	55774	11030	9590	2159	441	186	186	0
1-6-8	2.9	168.5	6.89	6.21	0.68	3126557	1242898	935747	549504	222536	173175	60229	30344	19547	1590	1849	683	424	0	0	0
1-6-9	2.2	171.1	5.96	5.33	0.63	3010260	1309451	1086690	688397	318083	270928	120998	55995	40618	6766	4571	579	145	121	0	0
1-6-10	2.8	173.6	7.72	6.89	0.83	3408208	1434710	1167322	720172	324504	280998	122599	62311	45068	8983	4698	686	426	0	142	142
1-6-11	2.1	176.1	5.06	4.47	0.59	2059309	905400	762908	491888	235980	206594	101869	57372	39547	9576	6970	1148	287	120	0	0
1-6-12	2.9	178.6	6.72	6.16	0.56	1067624	499672	447828	305980	163917	163155	84073	52988	53643	11469	11303	4550	1429	143	715	429
1-7-1	2.1	181.1	5.27	4.68	0.59	3579962	1358978	983262	549884	215832	158838	64228	29038	21218	3071	3347	472	196	0	81	0
1-7-2	2.9	183.6	7.06	6.15	0.91	3202025	1402370	1210314	788989	373651	337311	158995	88920	72063	12683	7824	1197	221	279	0	0
1-7-3	2.4	186.2	6.98	5.74	1.24	2887320	1304554	1103926	710635	331623	291907	140398	81736	70696	13788	17297	6093	901	842	924	140
1-7-4	2.6	188.7	7.29	6.33	0.96	1880999	867141	734215	505533	243738	229482	121660	71267	67396	13618	14893	4532	1889	1252	1055	417
1-7-5	2.1	191.0	6.2	5.57	0.63	1432735	643030	540562	351202	167151	156532	71433	45626	39063	8263	8052	2379	1184	422	293	0
1-7-6	2.9	193.5	8.9	7.8	1.1	2661738	1168009	933737	582310	287942	263053	126724	75076	71454	14431	15015	643	643	0	-58	0

1-7-7	2.3	196.2	5.76	4.92	0.84	4109006	1700917	1322935	760797	310561	236862	99562	44494	30470	4499	4738	883	0	143	0	0
1-7-8	2.7	198.7	6.5	5.68	0.82	2390855	1054166	878175	579739	296705	270397	135640	84766	68958	17202	15134	1138	418	279	139	0
1-7-9	1.5	200.7	4.66	4.19	0.47	887327	392345	316857	197679	101228	86989	40711	23735	25671	6793	8122	4284	2451	275	550	0
1-7-10	3.5	203.2	11.02	9.86	1.16	2763699	1199839	1001459	640684	291209	276036	135057	80191	77857	17827	21688	6989	2416	1279	426	569
1-7-11	2.2	206.1	5.18	4.65	0.53	684002	298372	269988	172257	91533	84223	39922	20668	29298	6314	13079	5306	1506	1112	973	556
1-7-12	2.8	208.6	6.78	6.22	0.56	1181572	513127	427409	280846	135837	123040	75926	48374	43726	11401	12234	4885	2026	540	270	270
1-8-1	1.9	211.0	5.92	5.05	0.87	3501594	1504022	1228689	731904	328909	283310	126775	69800	66436	15476	13876	3562	280	140	140	0
1-8-2	3.1	213.5	9.26	8.12	1.14	3359556	1495960	1204412	723924	332686	305705	156389	91285	84746	19824	18795	3572	1163	727	145	0
1-8-3	1.4	215.7	3.49	3.11	0.38	1142584	493124	402560	248628	115606	106607	51078	29837	38362	10431	6820	2048	852	0	142	0
1-8-4	3.6	218.2	8.72	7.78	0.94	3245017	1441172	1206860	750450	361183	310430	144620	76933	67710	11553	11257	2921	284	851	0	0
1-8-5	1.6	220.8	4.68	4.12	0.56	1977909	833252	655731	399030	174650	159848	68798	41260	33762	6116	7690	1670	0	288	0	0
1-8-6	3.4	223.3	9.57	8.39	1.18	3230383	1466456	1211920	749060	355526	326336	160705	88266	96214	18883	26494	8285	697	558	139	0
1-8-7	2.6	226.3	7.65	6.26	1.39	4550662	2175878	1862431	1164048	504997	432725	193488	97526	86781	14883	17003	2097	272	136	0	0
1-8-8	2.4	228.8	6.99	5.83	1.16	2602032	1153035	974130	644723	305261	280608	127930	76114	76824	17094	19922	4767	1420	142	284	367
1-8-9	2.0	231.0	6.36	5.45	0.91	2097839	939649	775548	513790	232852	211272	107053	58156	54453	13362	10973	4995	549	0	274	0
1-8-10	3.0	233.5	9.18	7.85	1.33	3687922	1616815	1295994	849559	378113	336519	159412	86336	74754	13432	17143	3390	414	0	0	0
1-8-11	2.1	236.0	8.4	6.42	1.98	3950842	1715315	1410015	886805	379346	345291	165096	88506	84882	19153	21743	10790	3206	836	279	81
1-8-12	2.9	238.5	11.95	9.05	2.9	8321815	3668399	2909656	1721524	782766	681368	312173	169951	135892	26912	23348	5908	710	568	0	0
1-9-1	2.2	241.1	7.62	6.26	1.36	3364295	1517548	1246668	784054	343520	310700	152494	77928	76582	18629	17691	4088	1175	253	147	0
1-9-2	2.8	243.6	9.72	8.4	1.32	2913313	1264326	984766	608204	266990	240701	117798	64846	60582	15745	20358	7146	715	675	429	0
1-9-3	1.8	245.9	6.67	5.26	1.41	2647930	1193009	972031	599168	280158	240313	115514	65333	69173	16862	17522	3554	859	246	143	143
1-9-4	3.2	248.4	11.53	9.57	1.96	4748746	2099752	1640826	1003626	447634	427096	211367	115166	111521	24533	24281	5870	2201	693	440	440
1-9-5	2.1	251.1	7.42	6.21	1.21	3797446	1630463	1292081	769255	343368	308671	141934	77620	61471	14700	11560	2641	841	241	0	0
1-9-6	2.9	253.6	9.84	8.71	1.13	1467201	648007	524355	361846	172172	164785	82857	56900	59439	16737	20476	6803	1775	255	148	148
1-9-7	2.5	256.3	6.67	5.6	1.07	1860109	846350	728409	480163	230026	218975	111968	66312	66265	16238	18120	4036	1400	241	140	0
1-9-8	2.5	258.8	6.59	5.64	0.95	1505643	659147	564650	360286	182827	169861	93674	62475	65056	16216	19247	3403	685	-38	388	137
1-9-9	2.7	261.3	8.39	7.2	1.19	3177180	1449074	1252427	795274	387476	364409	184871	105366	106173	25639	25560	5959	1140	245	0	0
1-9-10	2.3	263.8	7.43	6.49	0.94	2236087	1006195	819409	509417	241404	235935	124173	75914	75324	18888	19612	4226	1133	386	260	142
1-9-11	2.5	266.3	8.64	7.45	1.19	6298407	2624889	1990402	1127480	495984	391781	166169	88931	66531	9870	9208	2443	726	105	0	0
1-9-12	2.5	268.8	8.33	7	1.33	5424303	2307454	1791924	1043049	473618	413966	182265	98332	81150	14694	11501	2627	558	101	-23	0
1-10-1	2.2	271.1	6.83	5.64	1.19	4317007	1852938	1538270	960082	436215	404663	192256	98859	86302	17889	15336	3466	582	396	291	0
1-10-2	2.8	273.6	8.54	6.99	1.55	7288897	3059386	2371884	1398322	614791	517746	231655	117038	83851	15504	13974	2506	141	242	258	0
1-10-3	2.5	276.3	9.46	7.61	1.85	5272476	2442474	2028467	1302318	597092	547673	270443	153779	129527	26681	29225	8286	2479	543	292	146
1-10-4	2.5	278.8	9.16	7.3	1.86	8256633	3502243	2700253	1527213	671718	558449	261194	129636	106725	16515	16391	3605	837	240	675	0
1-10-5	2.0	281.0	7.64	6.17	1.47	6854336	2819204	2118195	1179267	510165	437587	186594	95433	82930	15844	16581	5259	1896	639	677	0
1-10-6	3.0	283.5	11.37	8.96	2.41	8450382	3786120	3074236	1886495	885739	768989	380059	200355	176727	33689	31805	8253	1899	369	-23	0
1-10-7	2.1	286.1	5.49	4.35	1.14	2175972	955826	776552	470762	217266	188896	89068	54961	62372	14921	17180	8899	3511	983	585	0
1-10-8	2.9	288.6	7.37	5.91	1.46	4029327	1743307	1394250	884133	412237	365430	189382	106957	90267	20274	25275	6101	1424	103	119	0
1-10-9	1.9	291.0	7.1	5.51	1.59	3531308	1647845	1372609	860057	407869	376451	181574	113294	105568	24174	27081	8793	2986	1525	711	142
1-10-10	3.1	293.5	11.33	7.9	3.43	2790621	1278252	1103357	712810	336101	324486	171447	98948	113863	28363	35763	13746	7366	3711	2474	275
1-10-11	2.9	296.4	9.93	6.38	3.55	6288711	2843225	2351957	1523218	719905	649569	311086	179326	161074	35102	37361	12456	2804	1083	538	421

Sample No.	Thickness (mm)	Depth from surface to center of sample (mm)	Dry matter weight (mg)	Organic matter weight (mg)	Inorganic matter weight (mg)	Range of particle size												Range of particle size			
						1.5~2μm	2~3μm	3~4μm	4~5μm	5~6μm	6~8μm	8~10μm	10~20μm	20~30μm	30~40μm	40~50μm	50~60μm	60~80μm	80~100μm		
1-10-12	2.1	298.9	7.27	5.72	1.55	3976720	1766891	1462160	946074	443374	402098	189623	124176	126490	29458	36151	14779	4416	1941	1344	448
1-10-13	1.8	300.9	5.9	4.75	1.15	2861680	1300062	1106226	721454	340330	322500	158405	89102	81540	19763	25223	5943	3274	725	145	0
1-10-14	3.2	303.4	10.12	6.59	3.53	2826489	1269892	1030939	677241	306317	281015	134092	77151	77127	15286	17251	6469	2240	575	719	0

Sample No.	Thickness (mm)	Depth from surface to center of sample (mm)	Dry matter weight (mg)	Organic matter weight (mg)	Inorganic matter weight (mg)	1.5~2μm	2~3μm	3~4μm	4~5μm	5~6μm	6~8μm	8~10μm	10~20μm	20~30μm	30~40μm	40~50μm	50~60μm	60~80μm	80~100μm		
2-1-1	2.5	316.3	11.97	9.16	2.81	693340	428840	464140	377120	217600	227220	128660	198060	25700	10500	4840	2700	2540	1320		
2-1-2	2.5	318.8	11.81	7.85	3.96	930028	546551	566024	453288	255106	258055	138552	211312	27755	11292	5313	2606	2808	990		
2-1-3	2.2	321.1	8.4	5.62	2.78	741240	418840	429620	334840	179780	176820	90460	135200	17880	7320	2680	1720	1800	680		
2-1-4	2.8	323.6	10.64	7.34	3.3	2479107	1219448	1095929	749797	361460	321707	157187	216382	23159	9575	2119	1620	1869	748		
2-1-5	2.6	326.3	9.86	7.49	2.37	1916240	1136240	1157720	885780	484340	435100	225300	298660	34140	11640	4440	2160	2020	240		
2-1-6	2.4	328.8	9.44	5.66	3.78	3081880	1591120	1530260	1077800	536340	501300	237760	329440	40780	13900	5640	2400	2640	840		
2-1-7	2.3	331.2	9.44	7.24	2.2	1464288	799368	831514	625977	334463	314192	154011	221721	26562	10176	4127	3035	2428	587		
2-1-8	2.7	333.7	10.8	7.61	3.19	1635166	930329	910294	689713	354161	345569	161156	225294	29877	10127	3025	2477	2367	789		
2-1-9	2.1	336.0	7.34	6.08	1.26	481181	307399	351289	297583	174577	182572	100506	148770	19046	7053	3056	1570	1653	544		
2-1-10	2.9	338.5	10.3	8.42	1.88	1362614	802181	791826	622936	342316	344511	175621	254982	30837	10562	4225	1719	2609	746		
2-1-11	2.3	341.2	7.43	6.06	1.37	690163	451096	505803	438819	253441	256556	131444	168825	19871	7676	2830	1690	1893	489		
2-1-12	2.7	343.7	8.58	7.4	1.18	587327	354143	387803	325571	183962	188912	105494	149391	18414	6752	3188	1386	1445	634		
2-2-1	2.7	346.3	9.06	7.6	1.46	853878	541457	589017	491419	272898	268745	137038	173916	18718	6012	2789	1611	1260	537		
2-2-2	2.3	348.8	8.03	6.44	1.59	1904046	990787	928098	651937	314433	277285	137387	177467	21466	8072	3253	1305	1205	361		
2-2-3	2.0	351.0	7.14	6.4	0.74	576498	357589	375823	308256	168746	163782	90481	115947	12845	4640	1823	1114	831	284		
2-2-4	3.0	353.5	10.77	8.37	2.4	2153720	1172304	1100946	814495	413190	377424	196972	240185	29379	7404	3248	1537	2468	390		
2-2-5	2.4	356.2	7.81	6.21	1.6	1435229	805954	800684	634794	330385	318137	141831	158683	16477	6228	3624	1375	1500	854		
2-2-6	2.6	358.7	8.26	6.58	1.68	1815271	999409	975194	695896	348559	309428	139681	166640	20208	6043	2572	1007	1157	900		
2-2-7	2.5	361.2	8.86	7.04	1.82	769286	462788	480676	376134	203905	195789	101477	142314	16490	5826	2748	1386	1198	681		
2-2-8	2.5	363.7	9.22	7.5	1.72	1022849	589802	601225	449842	228678	217268	110025	151686	16674	6510	2190	1416	1016	629		
2-2-9	2.8	366.4	8.5	7.05	1.45	793844	442440	441679	342113	182367	181442	97867	142630	19916	7006	2812	1992	1429	750		
2-2-10	2.2	368.9	6.85	5.82	1.03	789912	425835	411051	302641	153901	148194	75473	110083	13146	4319	1815	795	854	237		
2-2-11	2.7	371.4	8.72	6.95	1.77	1759095	965735	909329	664309	344141	308444	158374	202507	23556	5112	2800	715	1430	429		
2-2-12	2.3	373.9	7.31	5.88	1.43	1060629	581557	590619	450562	248435	247676	133092	188871	20606	6387	2928	1603	1277	241		

Sample No.	Thickness (mm)	Depth from surface to center of sample (mm)	Dry matter weight (mg)	Organic matter weight (mg)	Inorganic matter weight (mg)	1.5~2μm	2~3μm	3~4μm	4~5μm	5~6μm	6~8μm	8~10μm	10~20μm	20~30μm	30~40μm	40~50μm	50~60μm	60~80μm	80~150μm		
2-3-1	2.8	376.4	10.01	7.71	2.3	4323483	1755351	1356343	860377	385617	369680	185071	117015	104204	20896	25989	8335	2913	260	781	509
2-3-2	2.2	378.9	7.89	5.72	2.17	3204916	1401201	1104539	693041	331352	284016	154145	83505	78364	20916	22565	11349	3395	1455	291	146
2-3-3	2.4	381.2	7.17	5.07	2.1	4580142	2017491	1614794	992904	461631	388113	195680	119042	98114	21744	29810	10895	2561	838	140	0
2-3-4	2.6	383.7	7.73	5.45	2.28	5619080	2378454	1916909	1184839	537212	500398	225383	150984	145287	30404	37743	5890	797	266		

2-3-5	2.6	386.3	9.6	6.53	3.07	4025553	1901558	1607193	1065043	511211	440032	228931	136566	123078	31902	34519	16808	7113	4080	2569	143
2-3-6	2.4	388.8	9.12	5.73	3.39	6369732	2833775	2361834	1516682	691296	628271	276547	152781	143245	27533	37021	13133	4708	1661	550	0
2-3-7	2.5	391.3	10.52	5.89	4.63	5702580	2947956	2756586	1894680	953221	845462	382498	213532	210095	45420	44884	16347	6266	3596	2926	1170
2-3-8	2.5	393.8	10.28	5.4	4.88	8740288	3982923	3236404	2061451	912644	818549	387233	239668	213425	52294	58512	22593	7107	2257	240	0
2-3-9	2.4	396.2	9.22	4.75	4.47	6831967	3083284	2629827	1660203	802820	729220	371779	226728	224059	56971	63892	25368	8291	4559	2338	0
2-3-10	2.6	398.7	10.39	5.28	5.11	6775690	3136442	2647948	1871140	961122	880591	398613	222315	209697	51952	51032	14532	5038	3342	1041	266
2-3-11	2.3	401.1	9.96	4.75	5.21	5736755	2548283	2130078	1348325	636602	587640	300973	165939	167143	34957	44286	14932	6598	3704	3056	509
2-3-12	2.7	403.6	12.01	6.34	5.67	7657178	3550058	3035957	1980724	951280	850398	419087	259470	265135	63239	76743	22741	9010	3669	1410	143
2-3-13	3.1	406.6	10.91	5.12	5.79	7265819	3406171	2865074	1863219	888695	798516	407538	239345	234414	56266	63756	21167	7420	2373	1256	0
2-3-14	1.9	409.1	6.46	3.16	3.3	4927563	2163732	1788843	1123439	514987	479262	232358	128526	143882	34791	40147	16241	4275	2531	442	147
2-3-15	2.8	411.4	11.6	7.68	3.92	3431002	1539321	1256398	810842	369541	335018	188659	100464	99314	24173	30337	12236	4301	2208	1104	138
2-4-1	2.2	413.9	9.4	4.83	4.57	5613893	2525794	2095767	1370938	640600	585144	277212	166489	168934	39029	46340	15692	6552	2588	1567	142
2-4-2	2.3	416.1	8.68	4.55	4.13	5223825	2354326	1944661	1236725	550269	510215	245348	149575	153182	33968	39468	14831	8813	3516	2164	270
2-4-3	2.7	418.6	10.17	5.57	4.6	5600849	2498849	2014373	1285309	608885	532134	275538	165229	175545	42864	52076	20892	7755	3267	2961	141
2-4-4	2.2	421.1	6.64	3.75	2.89	3122081	1357658	1116982	690821	321370	278255	142039	82174	95011	21212	25745	11405	4748	2434	859	429
2-4-5	2.8	423.6	8.22	4.2	4.02	3338050	1453297	1162215	727929	349478	319381	153110	104956	108347	25470	34004	15250	4043	966	674	270
2-4-6	2.6	426.3	12.14	4.66	7.48	7148077	3318574	2788665	1855497	905419	845431	458617	288490	300659	72874	90714	34750	11444	4303	1675	419
2-4-7	2.4	428.8	11.63	3.68	7.95	6894987	3048312	2540894	1726486	853224	841173	431735	285787	310056	75969	105277	34371	13406	3566	1426	285
2-4-8	2.6	431.3	12.08	3.92	8.16	6052514	2758464	2396985	1613988	812591	774476	412905	254919	281933	74226	97141	35512	12851	5228	3455	967
2-4-9	2.4	433.8	11.15	4.56	6.59	5251958	2362310	2000935	1326865	649135	619684	317781	251800	205088	51153	65914	27240	12265	4421	3566	143
2-4-10	2.6	436.3	11.27	5.52	5.75	4563478	1963043	1649930	1074807	523550	469433	231995	133279	143386	34798	37602	17670	8623	3369	1838	141
2-4-11	2.4	438.8	10.13	5.94	4.19	4362261	1857387	1525540	994239	464142	446588	210820	120472	113561	34049	35133	14737	8091	2745	1734	433
2-4-12	2.1	441.0	7.67	4.82	2.85	3015615	1318577	1118297	712074	353519	316620	169813	87389	91375	23380	29510	11888	5734	2914	1399	420
2-4-13	2.9	443.5	10.62	5.18	5.44	5286817	2344520	1966336	1342595	685561	623545	324056	91869	196592	50017	57578	23932	9396	4258	1909	734
2-4-14	2.1	446.1	7.28	4.58	2.7	4615406	2053683	1704422	1123704	529829	808160	256019	152319	149018	32846	38140	14214	6051	1441	1729	144
2-4-15	2.9	448.6	9.83	4.98	4.85	5934602	2664128	2272283	1526153	739896	692990	349151	212136	216714	49095	58428	19709	5820	2697	2129	142
2-5-1	3.2	451.6	11.69	6.66	5.03	5832512	2598090	2204794	1439704	697551	636686	319671	177637	166733	40068	43076	24511	13442	4912	2068	1293
2-5-2	1.8	454.1	6.82	4.22	2.6	3187540	1371111	1125556	746964	372465	324279	157984	86118	82107	16159	17937	9881	4046	2790	1953	140
2-5-3	2.5	456.2	8.94	5.67	3.27	4524071	2010535	1636928	1026673	498598	442660	208568	125534	120137	30644	34769	14929	8181	3189	2912	277
2-5-4	2.5	458.7	9.3	4.83	4.47	4317725	1953456	1644057	1127635	566336	528665	266119	152974	165157	36268	46475	16219	7756	3512	1756	293
2-5-5	2.1	461.0	7.25	4.46	2.79	3252548	1418915	1127498	731355	347549	303383	145285	84087	78950	19897	20697	11085	5148	2226	974	417
2-5-6	2.9	463.5	10.17	6.17	4	4792452	2040967	1634984	1033831	480288	429886	216510	117413	121255	27927	33744	15488	8927	1756	2488	146
2-5-7	2.6	466.3	10.44	5.77	4.67	3944735	1782936	1509128	990502	456745	412517	195789	116532	110266	24353	34984	12944	5120	3242	2417	275
2-5-8	2.4	468.8	9.58	4.8	4.78	3493161	1536800	1256114	812493	389169	363894	180907	107537	114490	28862	30732	13905	7373	2746	3447	982
2-5-9	2.7	471.3	10.97	4.3	6.67	3743727	1640936	1389524	927703	470365	453686	243324	154050	174615	37245	59063	20671	9165	2891	4015	1264
2-5-10	2.3	473.8	9.42	4.55	4.87	4632338	1960256	1600712	1046181	499943	439123	225679	134605	134686	29815	35134	14040	4383	2301	2024	278
2-5-11	2.3	476.2	8.89	3.93	4.96	5840826	2647067	2214892	1470497	709775	679010	316487	192501	175964	41231	40715	17182	5098	2614	2192	563
2-5-12	2.7	478.7	10.28	6.08	4.2	7277651	3127609	2592357	1681785	813305	714135	322317	178663	156359	32823	38175	12103	5241	3327	2001	737
2-5-13	2.8	481.4	8.68	6.26	2.42	3411253	1387758	1093206	670652	303988	278223	129340	75648	72411	15935	23293	9198	4623	2234	2090	287
2-5-14	2.2	483.9	6.89	4.2	2.69	4045731	1684916	1345237	868677	417524	363902	166896	101334	85071	20302	18360	8410	4631	1362	1362	142
2-5-15	2.5	486.2	9.29	5.32	3.97	5812869	2584315	2167474	1436113	679591	593770	283780	153032	137626	34425	32449	12744	6974	2541	1674	578

2.5	488.7	9.32	5.35	3.97	7217487	3273086	2738234	1794316	861800	763680	358475	202019	183944	38581	43061	14036	6518	3086	2228	289
2.6-1																				
2.6-2	3.1	491.6	9.13	5.62	3.51	5066142	2283416	1892873	1201991	558315	492692	236814	129926	114434	24924	24476	9668	4527	931	2688
2.6-3	1.9	494.1	5.38	3.54	1.84	2920032	1316720	1082543	690241	321154	283146	131971	69031	61952	11713	11031	8632	2964	2058	1129
2.6-4	2.7	496.4	9.1	5.41	3.69	5698445	2560772	2039013	1275322	596606	503288	235024	132587	113341	22302	25662	10904	5076	2902	1410
2.6-5	2.3	498.9	7.57	4.51	3.06	5648707	2487997	2093208	1321588	623043	540513	251999	140513	122522	30277	31857	10352	5942	2346	1132
2.6-6	2.2	501.1	7.42	5.14	2.28	3031323	1343475	1077026	698603	322854	288648	136465	80681	73878	16781	18762	6922	3581	2948	1575
2.6-7	2.8	503.6	9.46	6.14	3.32	5584516	2389552	1860131	1134760	513603	430472	209893	110079	103420	22646	25555	10121	5481	2104	1154
2.6-8	2.6	506.3	7.97	4.83	3.14	5147197	2276023	1855589	1148356	527793	473761	228840	125954	125806	25685	25662	11744	4506	1343	2185
2.6-9	2.4	508.8	7.49	4.12	3.37	6939624	3155121	2497048	1556116	733056	640545	321938	195195	177608	39868	49826	11176	7021	2149	1003
2.6-10	2.5	511.2	10.83	6.04	4.79	4891372	2102830	1744806	1150564	544614	507832	283369	176091	176790	41819	45208	13793	5261	1541	1280
2.6-11	2.5	513.7	11.04	3.39	7.65															
2.6-12	2.3	516.1	6.96	4.15	2.81	2525428	1049909	812314	491401	233547	199429	98532	58919	56413	12600	13518	4235	1835	1129	282
2.6-13	2.7	518.6	8.3	4.51	3.79	7094913	3274825	2688912	1702317	811655	724980	359239	207931	197573	42623	48182	18515	8168	4742	1361
2.6-14	2.8	521.4	11.37	5.13	6.24	14423925	6053724	4706416	2775572	1186718	1024214	510248	254480	254737	58859	58786	12368	10601	2650	1767
2.6-15	2.2	523.9	8.7	4.37	4.33	10943193	4840963	3852503	2372986	1072975	966662	473627	255498	252891	50139	51973	22040	7170	5552	1328
2.7-1	2.7	526.4	10.36	4.79	5.57	14474621	6692674	5625716	3562481	1666795	1493966	712202	420669	383970	90964	94589	33588	11835	8679	3300
2.7-2	2.4	528.9	10.58	4.35	6.23	18066085	8449459	6935143	4342415	2031298	1865745	870874	524920	479778	110942	113262	29361	8679	3300	263
2.7-3	2.6	531.4	11.02	3.61	7.41	16879102	7984746	6451467	4087960	1886510	1699580	840875	504928	492243	107857	137091	46306	18257	6923	3130
2.7-4	2.8	534.1	14.56	4.57	9.99	37134897	15652471	11969508	6848905	3078334	2832026	1225442	720016	600936	120749	127179	28381	16196	2442	0
2.7-5	2.2	536.6	11.21	3.43	7.78	24464073	10582751	8195441	5052616	2143717	1726704	917580	517593	468535	97279	112866	30359	10894	2346	1556
2.7-6	2.1	538.7	11.38	3.32	8.06	24875267	10654991	7971316	4674825	2051266	1867287	978971	547806	526912	127549	119777	50250	9270	3874	0
2.7-7	2.9	541.2	15.98	4.71	11.27	33050268	14066215	10950649	6622851	3075550	2657692	1361804	808558	688086	188238	189384	53572	21123	6801	1509
2.7-8	2.1	543.8	12.41	3.61	8.8	29962631	12741561	9708835	5738931	2483383	2224518	1120629	634404	572426	107502	141954	40024	10977	-772	0
2.7-9	2.9	546.3	16.47	4.35	12.12	36931530	15680296	12067099	7324440	3220998	2767068	1373898	821246	762503	165174	160501	55588	14090	3926	9393
2.7-10	2.3	548.9	14.97	3.28	11.69	44766205	18484423	14231304	8652559	3829810	3150987	1601764	944808	820211	163128	147478	28900	9361	2352	0
2.7-11	2.7	551.4	17.76	3.76	14	47818710	19915663	15301621	8610176	3747797	3162824	1443176	763012	620700	90624	139162	48725	13150	9251	4637
2.7-12	2.4	553.9	18.08	3.01	15.07	54268918	22557539	16962477	10181458	4451333	3779285	1638059	912283	710736	122493	142341	42397	26388	6370	7968
2.7-13	2.6	556.4	19.33	2.84	16.49	54743496	23041018	17517022	10150641	4524964	3971741	1682670	946889	795135	146590	135181	35319	15777	5983	3003
2.7-14	2.4	558.9	21.45	2.78	18.67	63081591	26420113	20330900	11632881	5295104	4506949	2001411	1077459	920419	184237	190714	34497	15410	7310	4377
2.7-15	2.6	561.4	23.22	2.5	20.72	77077801	32201798	24673137	13968840	6007433	5048888	2174501	1140328	789414	171788	128168	43505	12976	3027	3051
2.8-1	2.4	563.9	22.3	2.18	20.12	72698901	30807747	22904531	13172105	5923233	5027976	2241472	1189240	989798	164748	170027	51795	23960	7702	3067
2.8-2	2.4	566.4	24.75	2.59	22.16	61303243	25741782	19633958	11502098	5326214	4480535	2020463	1135024	1038005	180136	152727	47324	11461	12987	3053
2.8-3	2.6	568.9	26.84	2.63	24.21	102186046	42785230	32051967	18434214	7958013	6575048	2576023	1253977	871871	129849	112246	33652	8826	5621	1602
2.8-4	2.6	571.5	25.98	2.81	23.17	73180025	30895920	23405577	13549590	5972406	5005952	2255444	1155511	881937	148236	127550	25200	15576	2235	2965
2.8-5	2.4	574.0	23.72	2.55	21.17	89219568	36749327	28115330	16092799	6976255	5747414	2483141	1221905	968042	142071	135919	26244	13133	3871	1544
2.8-6	2.6	576.5	25.89	2.87	23.02	85448896	35704414	26733270	15360657	6470481	5559135	2448879	1308344	967703	188186	153022	37469	14042	8593	4681
2.8-7	2.4	579.0	23.39	2.62	20.77	79566863	32440204	24348417	13950563	5959609	5050830	2152124	1168399	963531	166202	140421	46791	20266	2350	3118
2.8-8	2.7	581.5	26.64	3.05	23.59	97131003	38457058	28918287	16453134	7178092	5723404	2486123	1346720	1085424	184126	195710	60564	10866	0	0
2.8-9	2.3	584.0	23.37	2.78	20.59	80333959	32548211	23791159	13646441	6072353	4754156	2002517	1096454	804246	168684	130221	29806	20378	7838	0
2.8-10	2.7	586.5	24.13	3	21.13	74386574	30210066	22831923	13111189	5605259	4686182	2114942	1068895	911752	170591	138252	36059	19520	8270	7508
2.8-11	2.3	589.0	20.93	2.46	18.47	76412264	31306482	22811743	13138922	5602285	4643759	2026759	1054133	904336	128352	147714	35757	10875	3896	4661

2-8-12	2.7	591.5	24.73	3.2	21.53	87473316	35391882	26305587	14836063	6366610	5189651	2326611	1143630	917355	150948	159394	41776	17010	11610	9278	0
2-8-13	2.3	594.0	21.87	2.76	19.11	85722010	34566957	25116521	14692757	6154700	5181874	2300403	1106344	837191	106788	126470	30032	7897	0	3159	0
2-8-14	2.6	596.5	25.32	3.14	22.18	88073662	34983296	26001239	14806032	6329748	5350006	2259879	1197259	969164	185480	169275	61535	19991	8470	6151	0
2-8-15	2.4	599.0	23.26	2.78	20.48	94491981	35919049	25665727	14062557	5808741	4840131	2066722	1064254	869206	151991	170404	33760	19277	2422	4819	0
2-9-3	2.6	601.4	28.39	3.25	25.14	138889842	53346691	37258096	19782627	7862844	6018842	2414480	1154187	912992	157862	123282	39085	3049	4505	3026	762
2-9-4	2.4	603.9	27.14	2.95	24.19	109137104	42121835	30290368	16435909	6839139	5322764	2215149	1163440	883516	172437	117731	37048	1659	8049	4829	817
2-9-5	2.0	606.2	21.5	2.28	19.22	104870600	40309448	28766025	15220731	5840436	4324239	1870101	929150	658825	120261	126371	33907	7742	7696	3102	0
2-9-6	2.0	608.2	21.82	2.44	19.38	111819315	41363089	28611351	15218324	6187382	4751156	2035302	957611	739284	140752	104106	32109	10742	4584	3056	776