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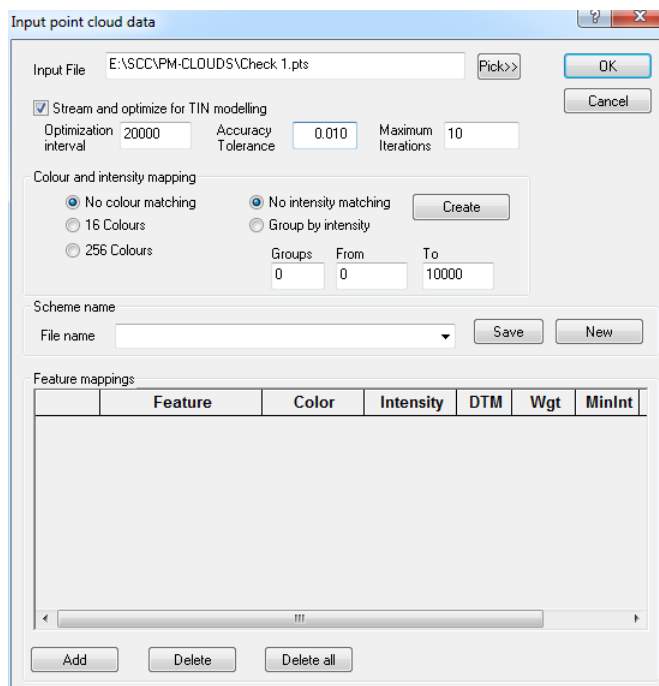
Web: www.atlascomputers.ie

Memo

By: Shane MacLaughlin
Date: 8/8/2012
Re: Comparing point clouds in SCC 10.0.6

This memo explains how to reduce, process and compare point clouds in PTS format using SCC. It requires **SCC 10.0.6** or later. The steps are as follows;

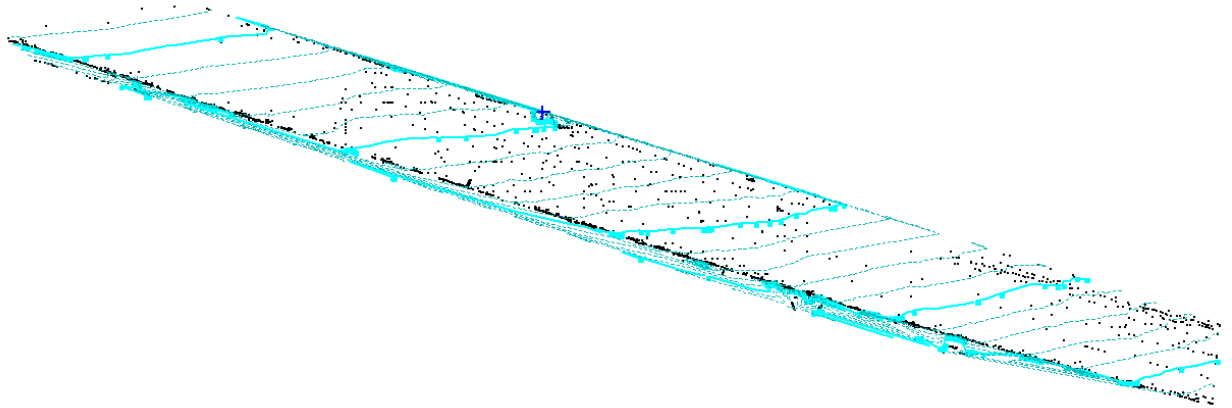
- Create a new project, or open an existing one. E.g. **File / Open / SCC Project** and pick **PM-Clouds.project**
- Select **File / Model / Point clouds & LIDAR / PTS file** which will show the following dialog;



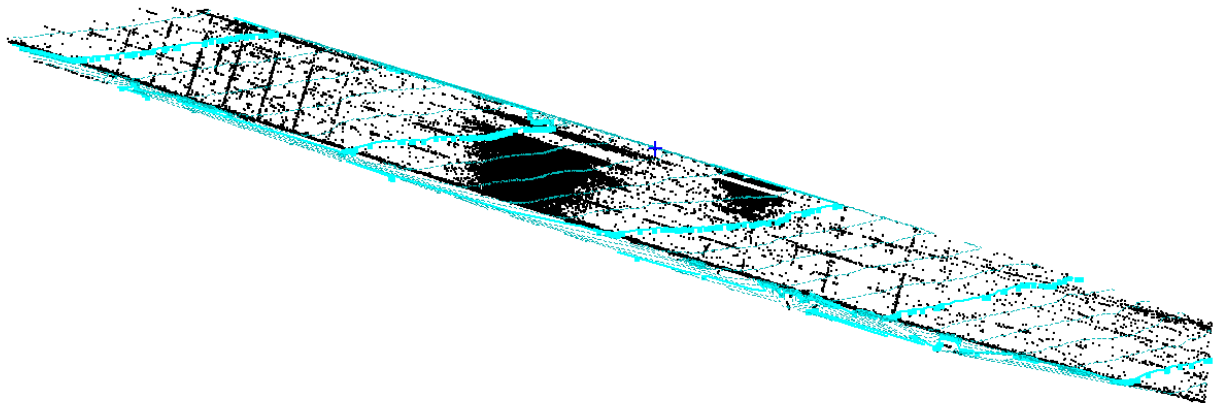
- The default options shown above stream in a file in monochrome to an accuracy of 10mm. The fields are used as follows;
 - *Stream and optimize for TIN modelling: Selecting this option inputs processes the point cloud in smaller sections such that SCC can handle very large point clouds relatively quickly. As data is input it is optimized to the specified vertical tolerance, and any points that would not make a change to the final surface are discarded. This eliminates vast number of co-planar points where they exist, leading to a much smaller, faster and more efficient TIN model without sacrificing any accuracy as would be the case with simpler decimation techniques.*
 - *Accuracy Tolerance: This is the vertical accuracy to which the TIN model is optimized. All points that would not affect the final surface by more than this amount are removed.*
 - *Maximum Iterations: This specifies the maximum number of times the optimization process is repeated. If no changes are made on any given iteration, the optimization is halted.*
 - *Optimization interval: This is the number of points at any given time that are held in memory when streaming and optimizing.*
 - *Colour and intensity mapping: These fields control how the RGB colours and intensities in the input data are mapped onto SCC features. Default colour mappings are No colour matching, 16 Colours, and 256 Colours*
 - *Intensity matching is either off (No intensity matching), or grouped into a number of equal ranges (Group by intensity), controlled by the Groups, From and To fields.*
 - *Pressing Create will generate a list of features for the number of colours multiplied by the number of intensity ranges. Each feature is mapped to the nearest SCC palette colour and named based on colour and intensity. The scheme also includes a DTM field to allow certain points to be either excluded from the surface or removed entirely. For example, setting the DTM code to IGNORE for all colours that represent a shade of green would strip most vegetation from the input data. Similarly points with low intensity values could be easily excluded.*
 - *File name, Save, New*
 - *These fields allow colour and intensity schemes to be saved and loaded to and from file such that they can be re-used*

Using the 16 million point file, CHECK1.PTS yielded the following results on an older 2ghz Athlon based PC under XP with 2GB of memory.

Vertical tolerance set to 10mm, monochrome, processing took 29 minutes and resulted in an optimized TIN model of 32 thousand points taking 4.6mb on disk. The model is shown below with 0.1 meter contours;



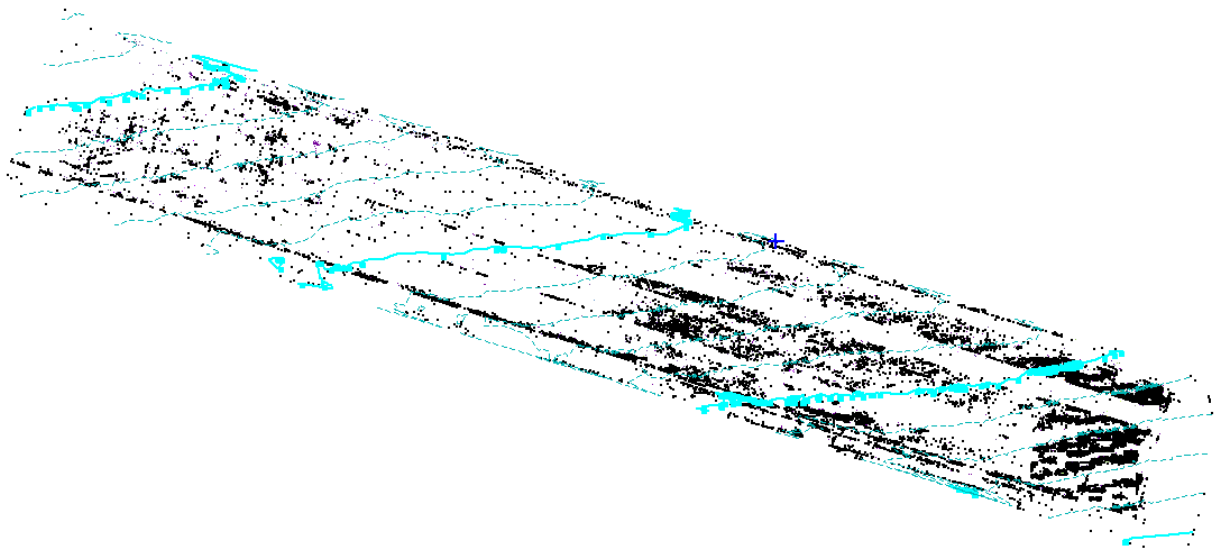
Vertical tolerance set to 5mm, monochrome, processing took 42 minutes and resulted in an optimized TIN model of 242 thousand points taking 25.5mb on disk. The model is shown below with 0.1 meter contours;



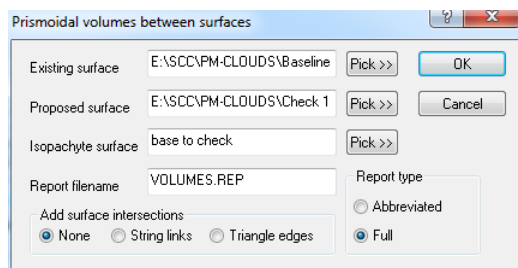
While contours and sections from these models look almost identical, the higher resolution model shows up line work relating to very shallow (<10mm) depressions in the surface that may be of value to the client. There is also a dark patch near the centre of the model, which is not present in the 10mm model, which I'm guessing correlates to the scanner position. This suggests that the scanner is slightly less accurate or prone to interference at very close ranges (e.g. ~5mm of noise at less than 10 meters range in this case).

Vertical tolerance set to 2mm, monochrome, processing took just under 4 hours and resulted in an optimized TIN model of 2.3 million points taking 362mb on disk.

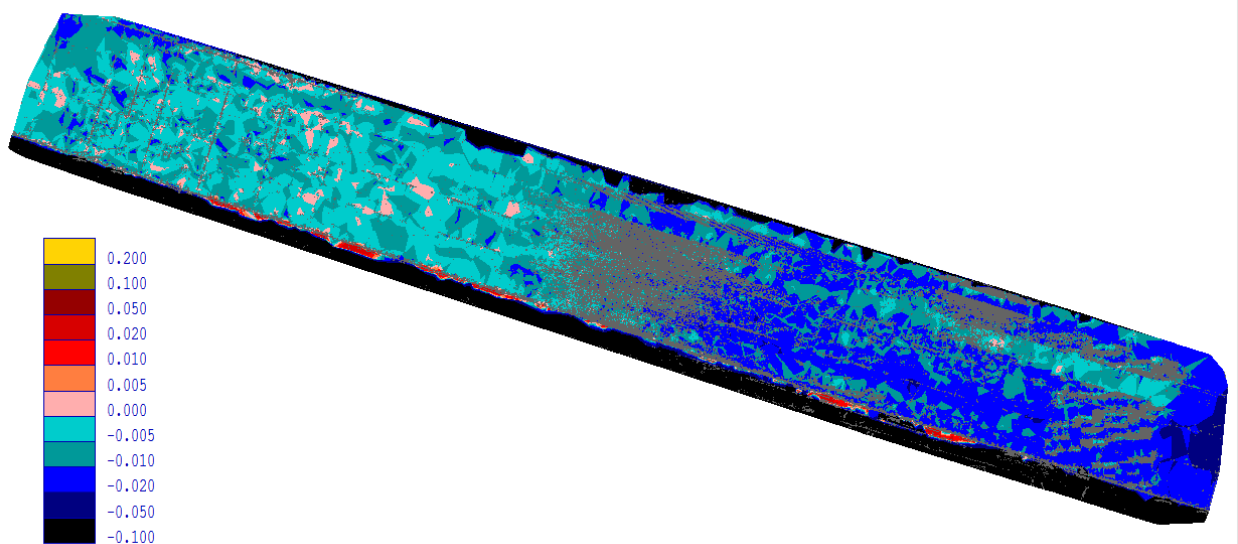
For the purposes of this exercise a 5mm vertical tolerance was used throughout. The same process was applied to BASE1.PTS which yielded a 48 thousand point model based on 5mm optimization as shown below.



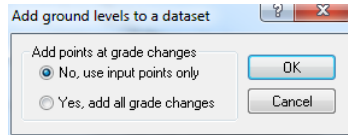
- To compare the base and check models, use **Volumes / Volumes between surfaces (prismoidal)** using the default values, as shown below;



This generated an isopachyte (height difference) model shown below, which I coloured using relief contours as shown.

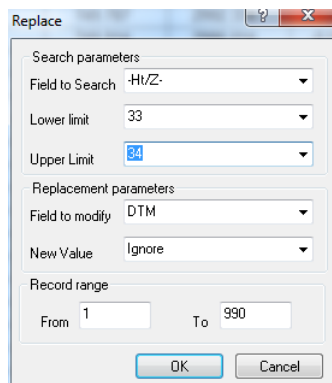


- To take the test points in select **File / Import / ASCII X,Y,Z** and pick the text file provided, **Laser Scan Pointstxt.txt**. The file will initially have the levels in the text file. Select **File / Save** to save this to disk as an SCC dataset.
- To extract height differences for the points in the text file, go back to the isopachyte model and select **Tools / Add ground levels to a dataset** picking the dataset just saved and the parameters shown.



Going back to the dataset view, we now see that any points that overlaid the two models now have a height difference in the Z column.

- To get rid of all the other points, select **Edit / Replace** with the values shown below, followed by **Tools / Delete ignored points**



Columns can then be copied and pasted to other programs such as Excel, Word, Notepad, etc... as required. The values below have been copied from SCC;

95	654.559	3009.412	-0.1127
99	655.153	3011.322	-0.0074
103	655.748	3013.231	-0.0017
107	656.342	3015.141	-0.0027
109	656.468	3008.818	-0.1453
112	656.937	3017.051	-0.0076
114	657.063	3010.727	-0.0060
117	657.531	3018.960	-0.0106
119	657.657	3012.637	-0.0077
124	658.252	3014.547	-0.0072
126	658.378	3008.223	-0.3666
130	658.846	3016.456	-0.0084
132	658.973	3010.133	-0.0103
135	659.441	3018.366	-0.0056
137	659.567	3012.043	-0.0081
140	660.035	3020.276	-0.0070
142	660.161	3013.952	-0.0028
144	660.288	3007.629	-0.1311
148	660.756	3015.862	-0.0012
150	660.882	3009.539	-0.0026
153	661.350	3017.771	-0.0096
155	661.477	3011.448	-0.0069
158	661.945	3019.681	-0.0122
160	662.071	3013.358	-0.0103
162	662.197	3007.035	-0.3326
166	662.665	3015.267	-0.0039

168	662.792	3008.944	-0.0102
171	663.260	3017.177	0.0019
173	663.386	3010.854	-0.0020
176	663.854	3019.087	-0.0103
178	663.981	3012.763	-0.0030
180	664.107	3006.440	-0.1252
184	664.575	3014.673	-0.0022
186	664.701	3008.350	-0.0019
189	665.169	3016.583	-0.0029
191	665.296	3010.259	-0.0021
194	665.764	3018.492	-0.0183
196	665.890	3012.169	-0.0022
198	666.017	3005.846	-0.1227
202	666.485	3014.079	-0.0036
204	666.611	3007.755	-0.0031
207	667.079	3015.988	-0.0028
209	667.206	3009.665	-0.0095
212	667.674	3017.898	-0.0035
214	667.800	3011.575	-0.0113
216	667.926	3005.251	-0.1188
220	668.394	3013.484	-0.0004
222	668.521	3007.161	-0.0088
225	668.989	3015.394	-0.0039
227	669.115	3009.070	-0.0038
230	669.583	3017.303	-0.0081
232	669.710	3010.980	-0.0084
234	669.836	3004.657	-0.0023
238	670.304	3012.890	-0.0028
240	670.430	3006.566	-0.0042
243	670.898	3014.799	-0.0003
245	671.025	3008.476	-0.0101
248	671.493	3016.709	-0.0037
250	671.619	3010.386	-0.0038
252	671.745	3004.062	-0.0271
256	672.214	3012.295	-0.0055
258	672.340	3005.972	-0.0007
261	672.808	3014.205	-0.0054
263	672.934	3007.882	-0.0036
266	673.402	3016.115	0.0006
268	673.529	3009.791	-0.0030
270	673.655	3003.468	0.0141
274	674.123	3011.701	-0.0081
276	674.250	3005.378	-0.0050
279	674.718	3013.610	-0.0043
281	674.844	3007.287	-0.0056
284	675.312	3015.520	0.0019
286	675.438	3009.197	-0.0018
288	675.565	3002.874	-0.0299
292	676.033	3011.106	-0.0031
294	676.159	3004.783	-0.0047
297	676.627	3013.016	-0.0059
299	676.754	3006.693	-0.0049
302	677.222	3014.926	-0.0059
304	677.348	3008.602	-0.0022
306	677.474	3002.279	-0.0786
310	677.943	3010.512	0.0008
312	678.069	3004.189	-0.0006
315	678.537	3012.422	0.0010
317	678.663	3006.098	-0.0046
320	679.131	3014.331	-0.0062
322	679.258	3008.008	-0.0018
324	679.384	3001.685	-0.0088
328	679.852	3009.918	0.0012
330	679.978	3003.594	-0.0047
333	680.447	3011.827	-0.0051
335	680.573	3005.504	-0.0052
338	681.041	3013.737	-0.0021
340	681.167	3007.414	-0.0044
342	681.294	3001.090	0.0379
346	681.762	3009.323	-0.0038
348	681.888	3003.000	-0.0010
351	682.356	3011.233	-0.0032
353	682.482	3004.910	-0.0018
356	682.951	3013.142	-0.0004
358	683.077	3006.819	-0.0031
360	683.203	3000.496	0.0180

364	683.671	3008.729	-0.0097
366	683.798	3002.405	-0.0060
369	684.266	3010.638	-0.0043
371	684.392	3004.315	0.0030
374	684.860	3012.548	-0.0072
376	684.986	3006.225	-0.0015
378	685.113	2999.901	-0.0240
382	685.581	3008.134	-0.0033
384	685.707	3001.811	-0.0086
387	686.175	3010.044	-0.0056
389	686.302	3003.721	-0.0059
392	686.770	3011.954	-0.0001
394	686.896	3005.630	-0.0005
396	687.023	2999.307	-0.0360
400	687.491	3007.540	-0.0022
402	687.617	3001.217	-0.0021
405	688.085	3009.450	-0.0052
407	688.211	3003.126	-0.0027
410	688.679	3011.359	-0.0395
412	688.806	3005.036	-0.0036
414	688.932	2998.713	0.0174
418	689.400	3006.945	-0.0056
420	689.527	3000.622	-0.0080
423	689.995	3008.855	-0.0048
425	690.121	3002.532	-0.0073
428	690.589	3010.765	-0.0056
430	690.715	3004.441	-0.0068
432	690.842	2998.118	0.0065
436	691.310	3006.351	-0.0050
438	691.436	3000.028	-0.0052
441	691.904	3008.261	-0.0063
443	692.031	3001.937	-0.0046
446	692.499	3010.170	-0.1699
448	692.625	3003.847	-0.0060
450	692.751	2997.524	0.0402
454	693.219	3005.757	-0.0042
456	693.346	2999.433	-0.0041
459	693.814	3007.666	-0.0043
461	693.940	3001.343	-0.0030
464	694.408	3009.576	-0.1147
466	694.535	3003.253	-0.0015
468	694.661	2996.929	0.0067
472	695.129	3005.162	-0.0023
474	695.255	2998.839	-0.0125
477	695.723	3007.072	-0.0066
479	695.850	3000.749	-0.0038
482	696.318	3008.981	-0.0022
484	696.444	3002.658	-0.0089
486	696.571	2996.335	-0.0016
490	697.039	3004.568	-0.0058
492	697.165	2998.244	-0.0095
495	697.633	3006.477	-0.0043
497	697.760	3000.154	-0.0027
500	698.227	3008.387	-0.0037
502	698.354	3002.064	-0.0047
504	698.480	2995.740	-0.0126
508	698.948	3003.973	-0.0058
510	699.075	2997.650	-0.0071
513	699.543	3005.883	-0.0063
515	699.669	2999.560	-0.0027
518	700.137	3007.793	-0.0092
520	700.264	3001.469	-0.0018
522	700.390	2995.146	-0.0384
526	700.858	3003.379	-0.0039
528	700.984	2997.056	-0.0074
531	701.452	3005.289	-0.0086
533	701.579	2998.965	-0.0065
536	702.047	3007.198	-0.0063
538	702.173	3000.875	-0.0056
540	702.299	2994.552	0.0028
544	702.768	3002.785	-0.0041
546	702.894	2996.461	-0.0117
549	703.362	3004.694	-0.0079
551	703.488	2998.371	-0.0074
554	703.956	3006.604	-0.1280
556	704.083	3000.280	-0.0063

558	704.209	2993.957	-0.0309
562	704.677	3002.190	-0.0084
564	704.803	2995.867	-0.0106
567	705.272	3004.100	-0.0066
569	705.398	2997.776	-0.0129
572	705.866	3006.009	-0.2985
574	705.992	2999.686	-0.0037
576	706.119	2993.363	-0.0136
580	706.587	3001.596	-0.0111
582	706.713	2995.272	-0.0093
585	707.181	3003.505	-0.0136
587	707.308	2997.182	-0.0048
590	707.776	3005.415	-0.0105
592	707.902	2999.092	-0.0046
594	708.028	2992.768	-0.0133
598	708.496	3001.001	-0.0091
600	708.623	2994.678	-0.0180
603	709.091	3002.911	-0.0161
605	709.217	2996.588	-0.0127
608	709.685	3004.820	-0.0986
610	709.812	2998.497	-0.0082
612	709.938	2992.174	-0.0051
616	710.406	3000.407	-0.0014
618	710.532	2994.084	-0.0180
621	711.000	3002.316	-0.0084
623	711.127	2995.993	-0.0052
626	711.595	3004.226	-0.0070
628	711.721	2997.903	-0.0110
630	711.848	2991.579	0.0068
634	712.316	2999.812	-0.0077
636	712.442	2993.489	-0.0099
639	712.910	3001.722	-0.0091
641	713.036	2995.399	-0.0173
642	713.163	2989.075	-0.3974
644	713.505	3003.632	-0.0067
646	713.631	2997.308	-0.0170
648	713.757	2990.985	-0.0135
652	714.225	2999.218	-0.0041
654	714.352	2992.895	-0.0146
657	714.820	3001.128	-0.0149
659	714.946	2994.804	-0.0181
660	715.072	2988.481	-0.4051
662	715.414	3003.037	-0.0086
664	715.540	2996.714	-0.0075
666	715.667	2990.391	-0.0102
670	716.135	2998.624	-0.0070
672	716.261	2992.300	-0.0137
675	716.729	3000.533	-0.0105
677	716.856	2994.210	-0.0154
678	716.982	2987.887	-0.4152
680	717.324	3002.443	-0.0102
682	717.450	2996.119	-0.0131
684	717.577	2989.796	-0.0071
688	718.044	2998.029	-0.0126
690	718.171	2991.706	-0.0158
693	718.639	2999.939	-0.0181
695	718.765	2993.615	-0.0187
696	718.892	2987.292	-0.4252
698	719.233	3001.848	-0.0049
700	719.360	2995.525	-0.0184
702	719.486	2989.202	-0.0239
706	719.954	2997.435	-0.0079
708	720.081	2991.111	-0.0081
711	720.549	2999.344	-0.0114
713	720.675	2993.021	-0.0174
714	720.801	2986.698	-0.3999
716	721.143	3001.254	-0.0136
718	721.269	2994.931	-0.0094
720	721.396	2988.607	0.0096
724	721.864	2996.840	-0.0082
726	721.990	2990.517	-0.0065
729	722.458	2998.750	-0.0145
731	722.585	2992.427	-0.0131
732	722.711	2986.103	-0.4004
734	723.053	3000.659	-0.0092
736	723.179	2994.336	-0.0088

738	723.305	2988.013	0.0009
742	723.773	2996.246	-0.0089
744	723.900	2989.923	-0.0094
747	724.368	2998.155	-0.0114
749	724.494	2991.832	-0.0164
750	724.620	2985.509	-0.3811
752	724.962	3000.065	-0.0658
754	725.089	2993.742	-0.0122
756	725.215	2987.418	0.0019
760	725.683	2995.651	-0.0125
762	725.809	2989.328	-0.0162
765	726.277	2997.561	-0.0158
767	726.404	2991.238	-0.0142
768	726.530	2984.914	-0.3971
770	726.872	2999.471	-0.0107
772	726.998	2993.147	-0.0158
774	727.125	2986.824	-0.0182
778	727.593	2995.057	-0.0128
780	727.719	2988.734	-0.0095
783	728.187	2996.967	-0.0113
785	728.313	2990.643	-0.0167
786	728.440	2984.320	-0.4522
788	728.782	2998.876	-0.0128
790	728.908	2992.553	-0.0091
792	729.034	2986.230	0.0005
796	729.502	2994.463	-0.0087
798	729.629	2988.139	-0.0093
801	730.097	2996.372	-0.0083
803	730.223	2990.049	-0.0140
804	730.349	2983.726	-0.5097
806	730.691	2998.282	-0.0116
808	730.818	2991.958	-0.0108
810	730.944	2985.635	0.0079
814	731.412	2993.868	-0.0090
816	731.538	2987.545	-0.0078
819	732.006	2995.778	-0.0154
821	732.133	2989.454	-0.0102
822	732.259	2983.131	-0.5673
824	732.601	2997.687	-0.0074
826	732.727	2991.364	-0.0155
828	732.853	2985.041	0.0098
832	733.322	2993.274	-0.0026
834	733.448	2986.950	-0.0153
837	733.916	2995.183	-0.0112
839	734.042	2988.860	-0.0130
840	734.169	2982.537	-0.6313
842	734.510	2997.093	-0.0079
844	734.637	2990.770	-0.0157
846	734.763	2984.446	-0.0161
850	735.231	2992.679	-0.0042
852	735.357	2986.356	-0.0130
855	735.826	2994.589	-0.0152
857	735.952	2988.266	-0.0132
858	736.078	2981.942	-0.5766
860	736.420	2996.499	-0.0106
862	736.546	2990.175	-0.0091
864	736.673	2983.852	-0.0886
868	737.141	2992.085	-0.0059
870	737.267	2985.762	-0.0075
873	737.735	2993.994	-0.0104
875	737.861	2987.671	-0.0168
876	737.988	2981.348	-0.4162
878	738.330	2995.904	-0.0156
880	738.456	2989.581	-0.0103
881	738.582	2983.258	-0.0009
885	739.050	2991.490	-0.0080
886	739.177	2985.167	-0.0079
889	739.645	2993.400	-0.0147
890	739.771	2987.077	-0.0163
891	739.898	2980.753	-0.3941
893	740.239	2995.310	-0.0090
894	740.366	2988.986	-0.0122
895	740.492	2982.663	-0.1449
898	740.960	2990.896	-0.0063
899	741.086	2984.573	-0.0121
901	741.554	2992.806	-0.0178

902	741.681	2986.482	-0.0156
903	741.807	2980.159	-0.4739
904	742.149	2994.715	-0.0131
905	742.275	2988.392	-0.0133
906	742.402	2982.069	-0.0268
908	742.870	2990.302	-0.0050
909	742.996	2983.978	-0.0139
910	743.464	2992.211	-0.0134
911	743.590	2985.888	-0.0156
912	743.717	2979.565	-0.6144
913	744.058	2994.121	-0.0120
914	744.185	2987.798	-0.0123
915	744.311	2981.474	-0.1520
917	744.779	2989.707	-0.0051
918	744.906	2983.384	-0.0080
919	745.374	2991.617	-0.0135
920	745.500	2985.293	-0.0174
921	745.626	2978.970	-0.5052
922	745.968	2993.526	-0.0140
923	746.094	2987.203	-0.0016
924	746.221	2980.880	-0.0458
926	746.689	2989.113	-0.0033
927	746.815	2982.789	-0.0102
928	747.283	2991.022	-0.0077
929	747.410	2984.699	-0.0148
930	747.536	2978.376	-0.4887
931	747.878	2992.932	-0.0118
932	748.004	2986.609	-0.0112
933	748.130	2980.285	-0.0273
935	748.598	2988.518	-0.0049
936	748.725	2982.195	-0.0173
937	749.193	2990.428	-0.0048
938	749.319	2984.105	-0.0159
939	749.446	2977.781	-0.4785
940	749.787	2992.338	-0.0134
941	749.914	2986.014	-0.0112
942	750.040	2979.691	-0.2758
944	750.508	2987.924	-0.0041
945	750.635	2981.601	-0.0184
946	751.102	2989.833	-0.0107
947	751.229	2983.510	-0.0214
949	751.697	2991.743	-0.0136
950	751.823	2985.420	-0.0221
951	751.950	2979.097	-0.0875
953	752.418	2987.329	-0.0130
954	752.544	2981.006	-0.0164
955	753.012	2989.239	-0.0100
956	753.139	2982.916	-0.0207
958	753.607	2991.149	-0.0124
959	753.733	2984.825	-0.0234
960	753.859	2978.502	-0.3979
962	754.327	2986.735	-0.0200
963	754.454	2980.412	-0.0171
964	754.922	2988.645	-0.0148
965	755.048	2982.321	-0.0279