Padul Data

Calculate daily temperature (modern)

CRU TS 4.04 daily interpolations from monthly data:

```
path <- "/path/to/CRU/4.04/"
tmin <- file.path(path, "cru_ts4.04.1901.2019.tmn.dat-clim-1961-1990-int.nc")
tmax <- file.path(path, "cru_ts4.04.1901.2019.tmx.dat-clim-1961-1990-int.nc")
output_filename <- file.path(path, "cru_ts4.04-clim-1961-1990-daily.tmp.nc")
codos::daily_temp(tmin = list(filename = tmin, id = "tmn"),
                  tmax = list(filename = tmax, id = "tmx"),
                  output_filename = output_filename)
```

Output file

```
"cru_ts4.04-clim-1961-1990-daily.tmp.nc"
```

Calculate mean growing season for daily temperature (`tmp`)

```
codos::nc_gs("cru_ts4.04-clim-1961-1990-daily.tmp.nc", "tmp", thr = 0, cpus = 10)
```

Output file

```
"cru_ts4.04-clim-1961-1990-daily.tmp-gs.nc"
```

Padul location: 37.0108, -3.6039

```
Tmp <- codos:::nc_var_get(file.path(path, "cru_ts4.04-clim-1961-1990-daily.tmp-gs.nc"),
                          "tmp")
lat <- codos:::nc_var_get(file.path(path, "cru_ts4.04-clim-1961-1990-daily.tmp-gs.nc"),
                          "lat")
lon <- codos:::nc_var_get(file.path(path, "cru_ts4.04-clim-1961-1990-daily.tmp-gs.nc"),
                          "lon")
idx_y <- which.min(abs(lat$data - 37.0108))
idx_x <- which.min(abs(lon$data + 3.6039))

aux <- Tmp$data[c(idx_x, idx_x + 1), c(idx_y - 1, idx_y)]
rownames(aux) <- lat$data[c(idx_y, idx_y - 1)]
colnames(aux) <- lon$data[c(idx_x, idx_x + 1)]
aux
```

```
#>         -3.75    -3.25
#> 37.25 15.9465 14.80801
#> 36.75 15.2319 11.76962
```

```
(modern_tmp <- mean(aux))
```

```
#> [1] 14.43901
```

Reconstruct past temperature from `T_djf` and `T_jja`:

```
padul <- readr::read_csv("/path/to/padul.csv")
```

```
padul_tmp <- rowMeans(padul[, c("T_djf", "T_jja")])
```

Calculate daily mean temperature

Obtain past CO2 from (Bereiter et al. 2015)

```
past_co2 <- purrr::map_dbl(padul$`Age (cal yr BP)`, codos::past_co2)
```

Assemble the Padul data

```
padul2 <- tibble::tibble(age = padul$`Age (cal yr BP)`,
                         past_temp = padul_tmp,
                         past_co2 = past_co2,
                         modern_co2 = 340,
                         present_t = modern_tmp,
                         recon_mi = padul$MI)
```

Find the corrected `MI`

```
padul2$corrected_mi <- codos::corrected_mi(padul2$present_t,
                                           padul2$past_temp,
                                           padul2$recon_mi,
                                           padul2$modern_co2,
                                           padul2$past_co2)
# Small subset
knitr::kable(head(padul2, 10))
```

age	past_temp	past_co2	modern_co2	present_t	recon_mi	corrected_mi
-62	13.15918	368.020	340	14.43901	0.425809	0.1244634
-56	12.86272	368.020	340	14.43901	0.471798	0.1333827
-50	11.88472	364.900	340	14.43901	0.506921	0.0648281
-43	13.09339	353.835	340	14.43901	0.566461	0.3244211
-38	12.20387	346.520	340	14.43901	0.528049	0.2154220
-31	11.87980	337.155	340	14.43901	0.522880	0.2199217
-25	11.49567	331.960	340	14.43901	0.562884	0.2397781
-19	12.52563	325.080	340	14.43901	0.438233	0.2817604
-13	12.88969	318.840	340	14.43901	0.468382	0.3919461
-6	13.13016	315.340	340	14.43901	0.483879	0.4577505

Check out and download the entire dataset in Appendix A5.

Find the corrected Annual Precipitation, `P_ann`

Approximated as the ratio

$$\text{MI}_{\text{ratio}} = \frac{\text{corrected}}{\text{reconstructed}}$$

multiplied by reconstructed `P_ann`.

```
mi_ratio <- padul2$corrected_mi / padul2$recon_mi
padul2$corrected_P_ann <- padul$P_ann * mi_ratio
```

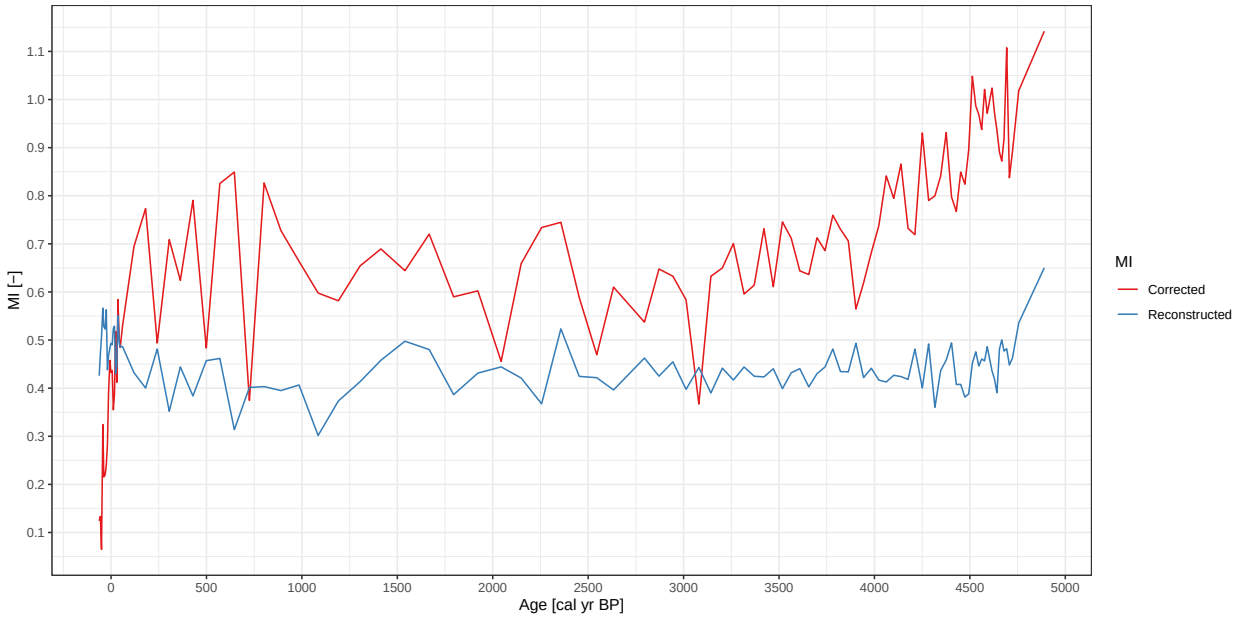
age	past_temp	past_co2	modern_co2	present_t	recon_mi	corrected_mi	corrected_P_ann
-62	13.15918	368.020	340	14.43901	0.425809	0.1244634	134.10868
-56	12.86272	368.020	340	14.43901	0.471798	0.1333827	143.22784
-50	11.88472	364.900	340	14.43901	0.506921	0.0648281	72.96858
-43	13.09339	353.835	340	14.43901	0.566461	0.3244211	360.93231
-38	12.20387	346.520	340	14.43901	0.528049	0.2154220	225.75760
-31	11.87980	337.155	340	14.43901	0.522880	0.2199217	219.29077
-25	11.49567	331.960	340	14.43901	0.562884	0.2397781	245.70561
-19	12.52563	325.080	340	14.43901	0.438233	0.2817604	317.69280
-13	12.88969	318.840	340	14.43901	0.468382	0.3919461	451.31183
-6	13.13016	315.340	340	14.43901	0.483879	0.4577505	520.45909

Check out and download the entire dataset in Appendix A5.

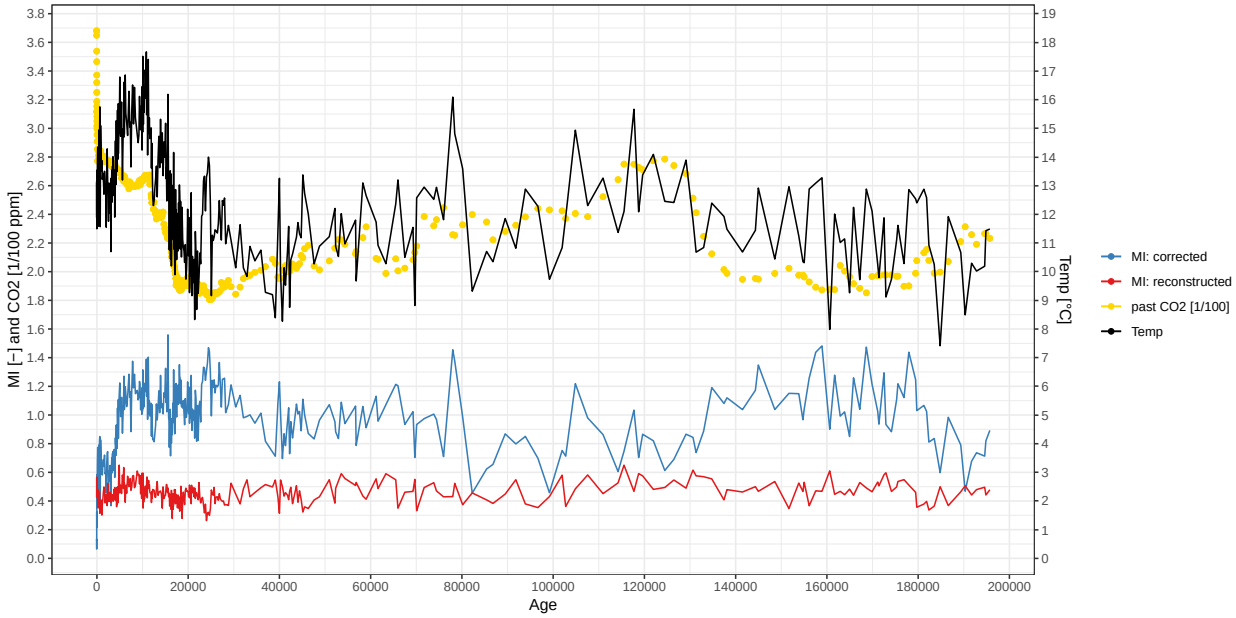
Plots

Reconstructed vs corrected `MI`: Past CO2 calculated using `mean`

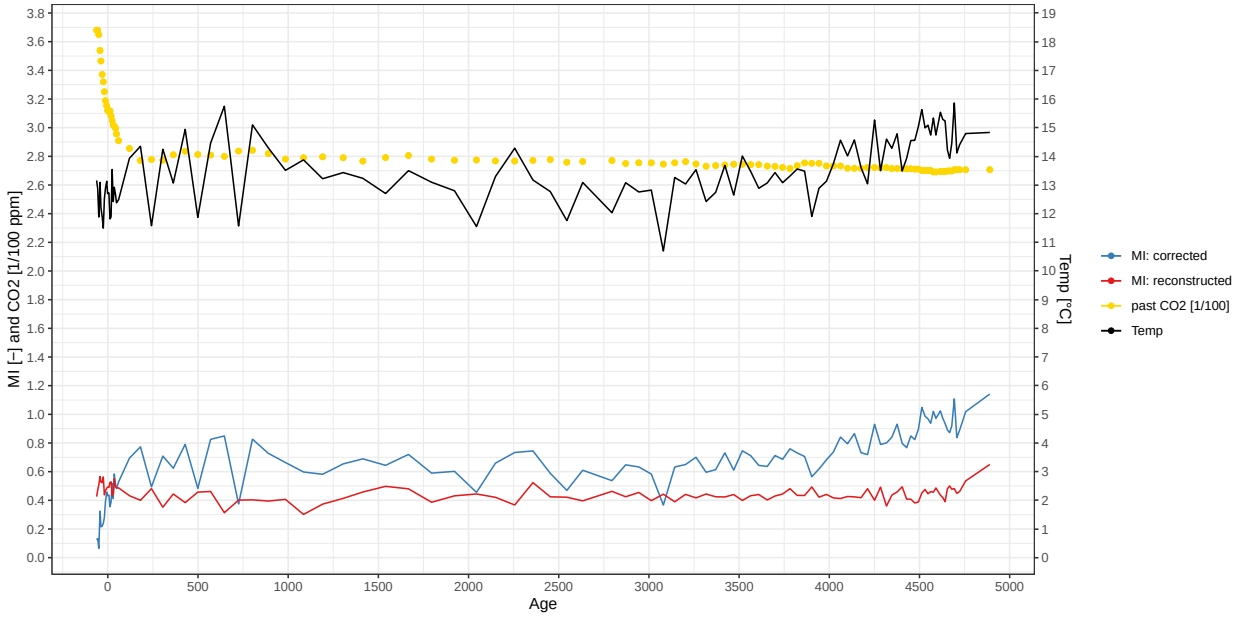
- `age < 5k`



Include past CO2 and Temperature



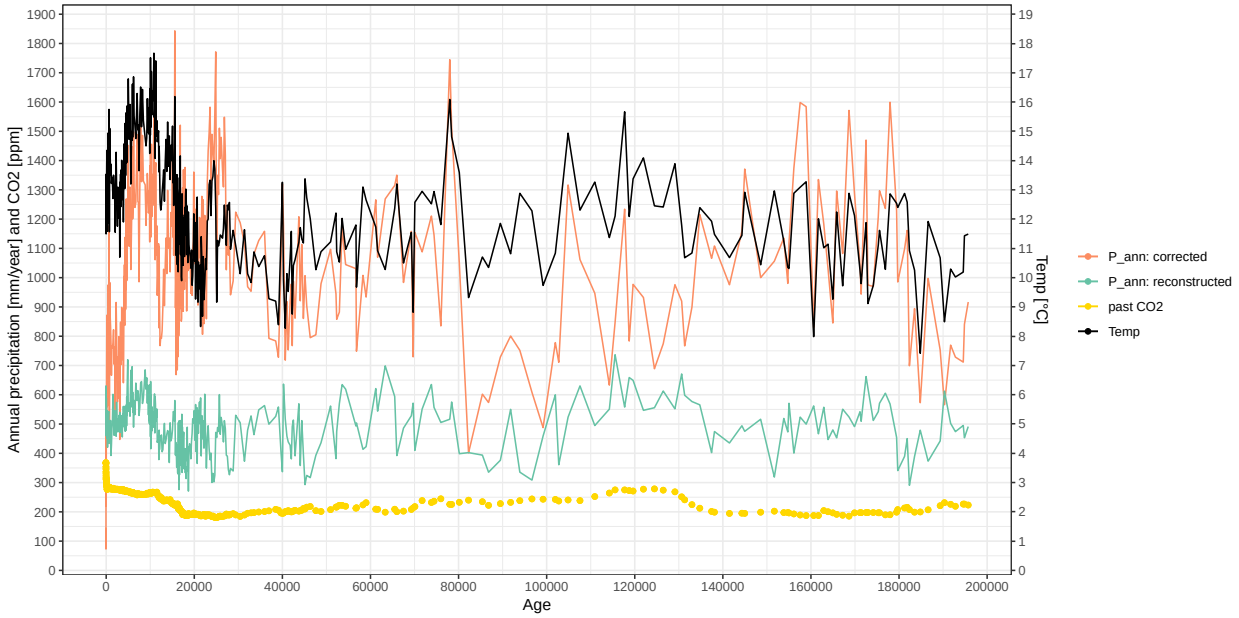
- `age < 5k`



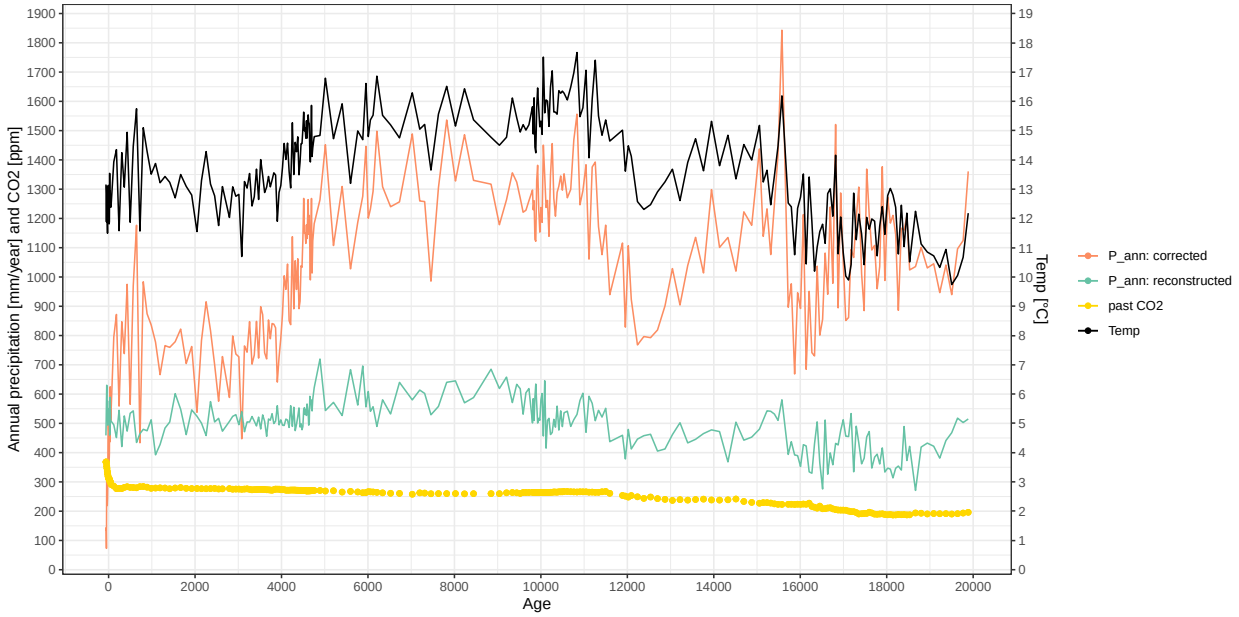
Reconstructed vs corrected P_ann: Past CO2 calculated using mean

- age < 20k

Include past CO2 and Temperature



- `age < 20k`



References

[1] Bereiter, B., Eggleston, S., Schmitt, J., Nehrbass-Ahles, C., Stocker, T. F., Fischer, H., Kipfstuhl, S., and Chappellaz, J. (2015), Revision of the EPICA Dome C CO2 record from 800 to 600 kyr before present, Geophys. Res. Lett., 42, 542– 549, doi:10.1002/2014GL061957.

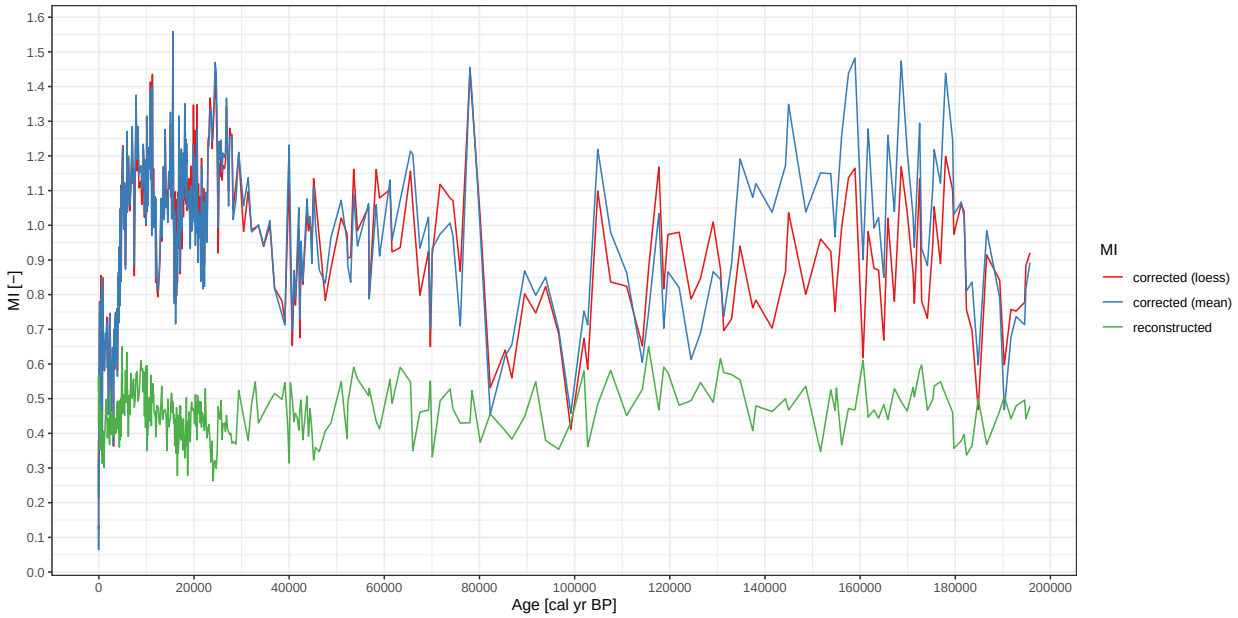
Appendix

A1. Find reconstructed MI using loess

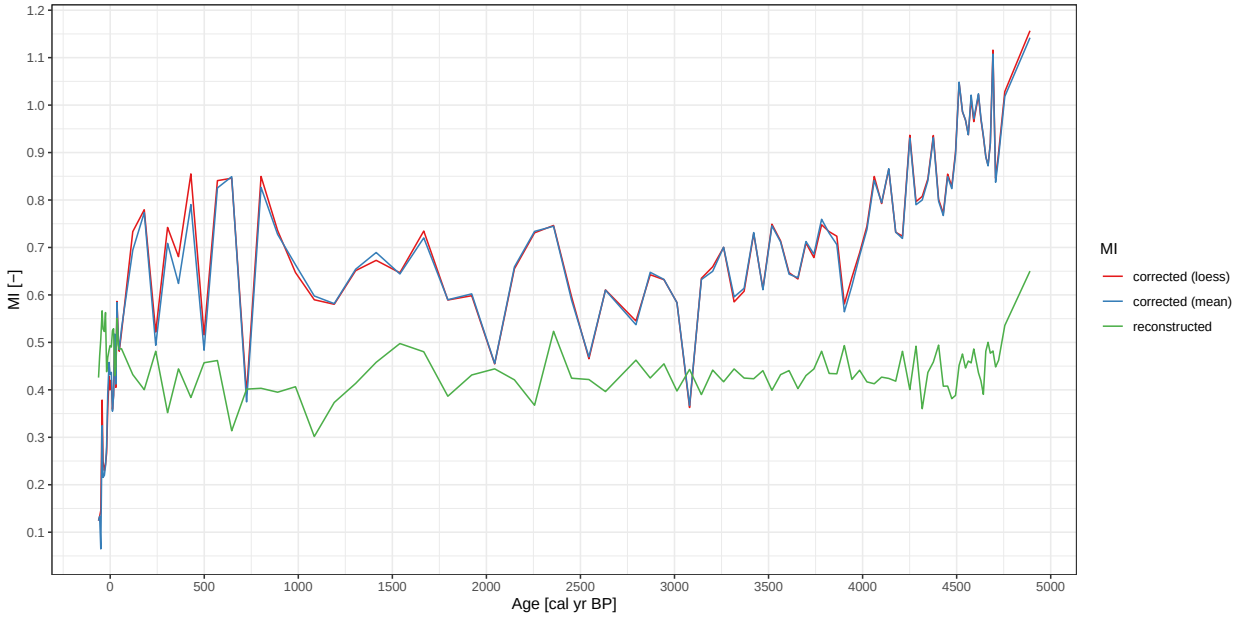
```
past_co2_loess <- function(age, ref = codos::ice_core) {
  # Extract the reference age and co2
  ref_age <- purrr::pluck(ref, 1)
  ref_co2 <- purrr::pluck(ref, 2)
  if (age < min(ref_age))
    return(ref_co2[which.min(ref_age)])

  if (age > max(ref_age))
    return(ref_co2[which.max(ref_age)])
  loessMod10 <- loess(co2 ~ age,
                      tibble::tibble(age = ref_age,
                                     co2 = ref_co2), span = 0.1)
  return(predict(loessMod10, age))
}

padul2$past_co2_loess <- purrr::map_dbl(padul2$age,
                                        past_co2_loess)
padul2$corrected_mi_loess <- codos::corrected_mi(padul2$present_t,
                                                 padul2$past_temp,
                                                 padul2$recon_mi,
                                                 padul2$modern_co2,
                                                 padul2$past_co2_loess)

head(padul2, 10) %>%
  dplyr::select(-c(past_co2, corrected_mi, corrected_P_ann)) %>%
  knitr::kable() %>%
  kableExtra::kable_styling()
```

age	past_temp	modern_co2	present_t	recon_mi	past_co2_loess	corrected_mi_loess
-62	13.15918	340	14.43901	0.425809	368.0200	0.1244634
-56	12.86272	340	14.43901	0.471798	368.0200	0.1333827
-50	11.88472	340	14.43901	0.506921	348.5771	0.1456776
-43	13.09339	340	14.43901	0.566461	343.4588	0.3784316
-38	12.20387	340	14.43901	0.528049	339.9523	0.2496976
-31	11.87980	340	14.43901	0.522880	335.2524	0.2300474
-25	11.49567	340	14.43901	0.562884	331.4182	0.2427002
-19	12.52563	340	14.43901	0.438233	327.7633	0.2669096
-13	12.88969	340	14.43901	0.468382	324.2577	0.3611721
-6	13.13016	340	14.43901	0.483879	320.3318	0.4288539

A2. Plot reconstructed vs corrected `MI` both approaches

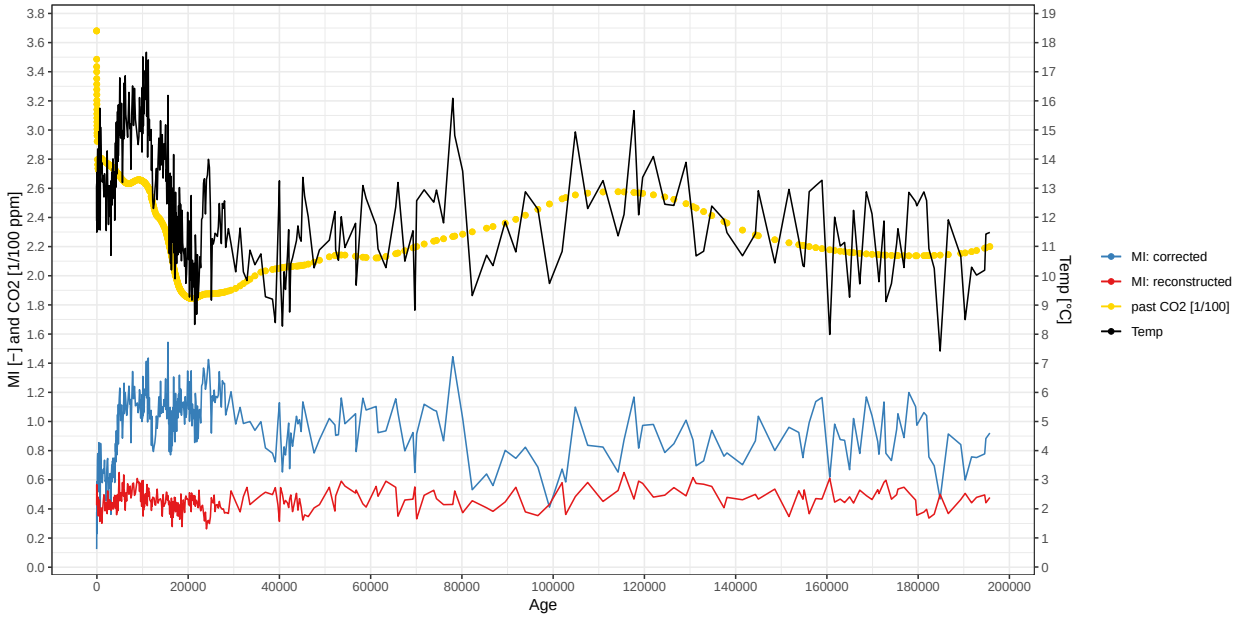


- `age < 5k`

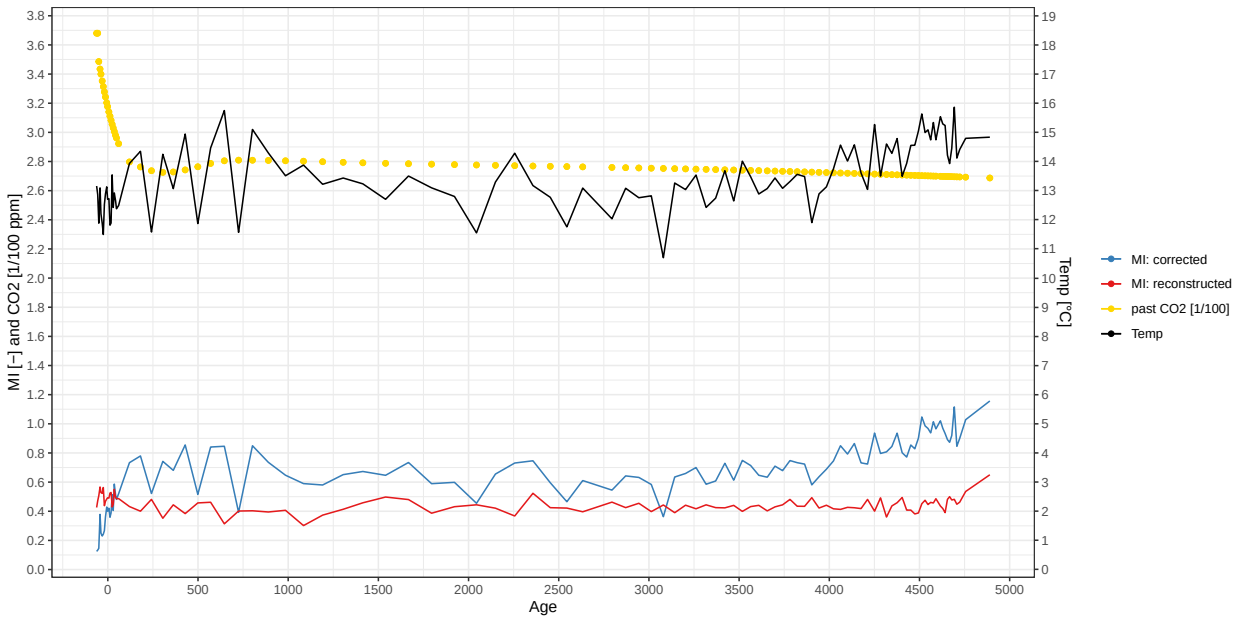


A3. Reconstructed vs corrected `MI`: Past CO2 calculated using `loess`

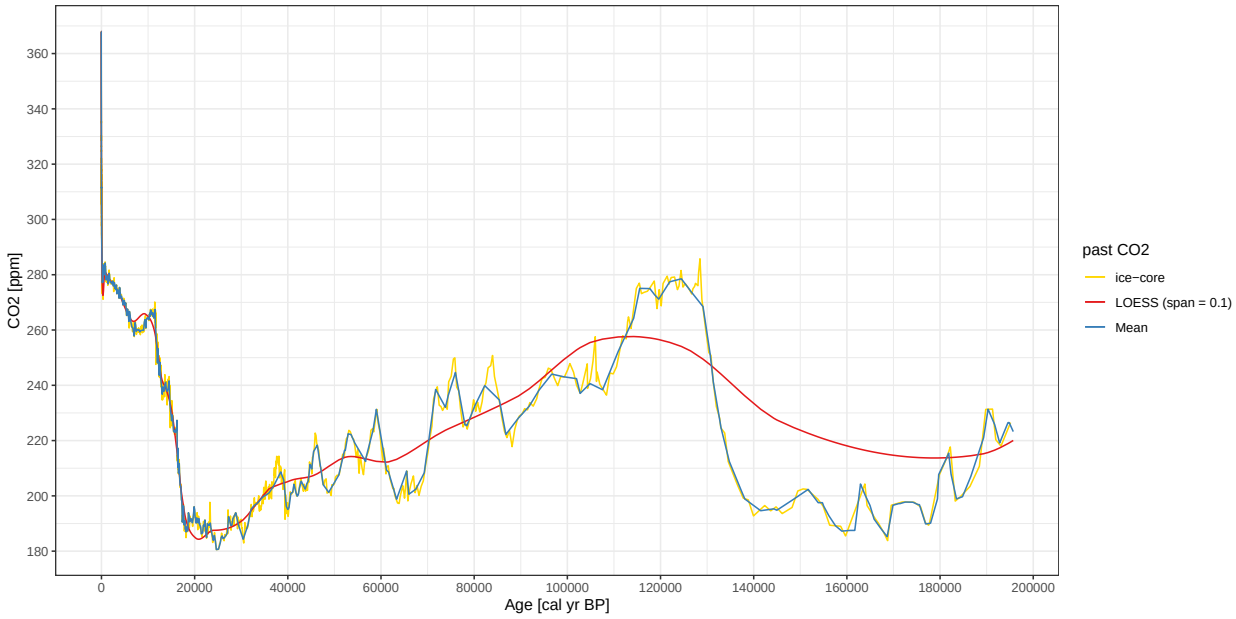
Include past CO2 and Temperature



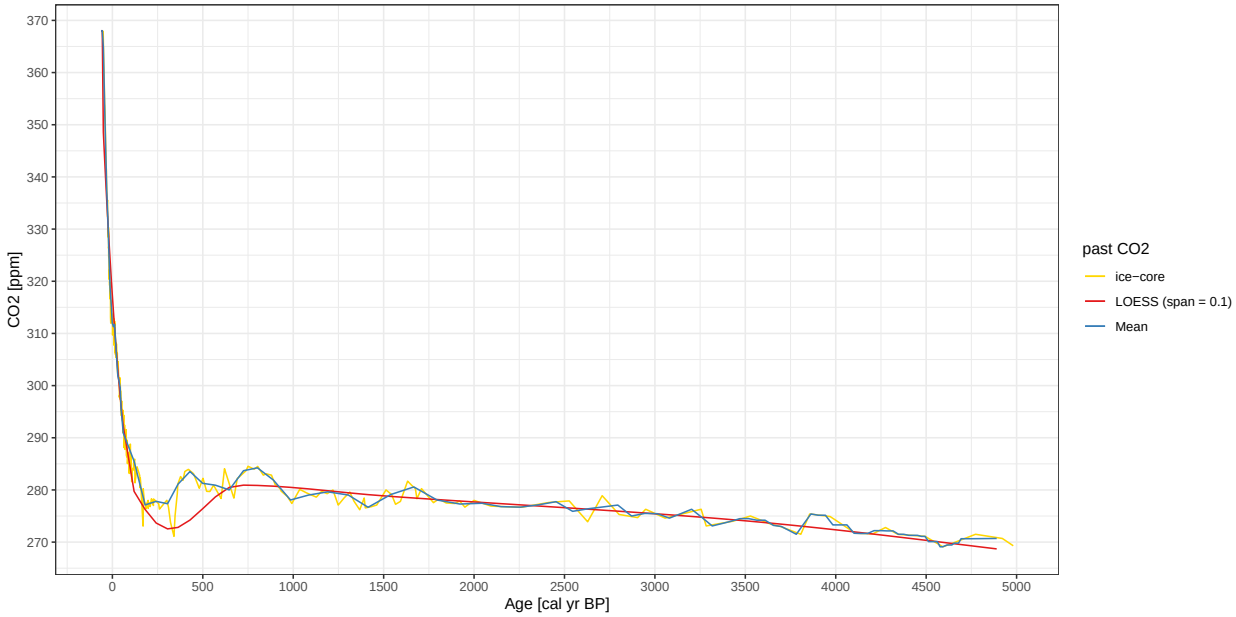
- `age < 5k`



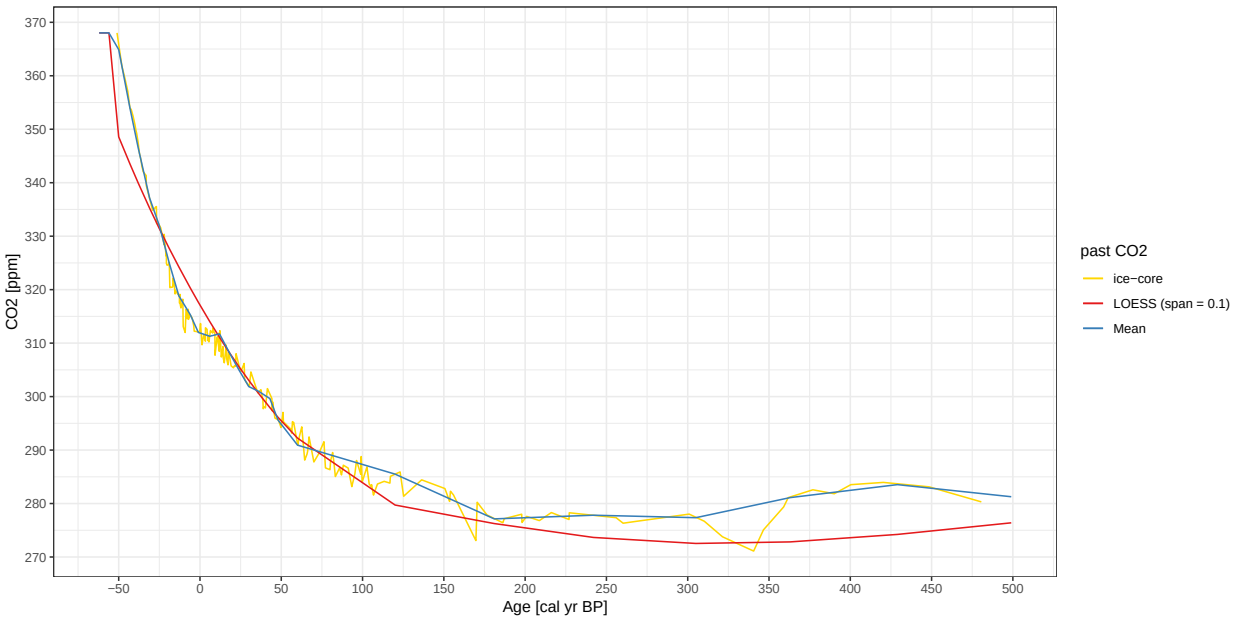
A4. Compare `codos::ice_core` vs past CO2 calculate using `mean` and `loess`



- `age < 5k`



- age < 500


CO2 [ppm]
370
360
350
340
330
320
310
300
290
280
270
−50
0
50
100
150
200
250
300
350
400
450
500
Age [cal yr BP]
past CO2
ice−core
LOESS (span = 0.1)
Mean

A5. Padul Data

Download the CSV file: padul-with-corrected-mi.csv

age	past_temp	past_co2	modern_co2	present_t	recon_mi	corrected_mi	corrected_P_ann
-62	13.159180	368.020	340	14.43901	0.425809	0.1244634	134.10868
-56	12.862720	368.020	340	14.43901	0.471798	0.1333827	143.22784
-50	11.884725	364.900	340	14.43901	0.506921	0.0648281	72.96858
-43	13.093390	353.835	340	14.43901	0.566461	0.3244211	360.93231
-38	12.203865	346.520	340	14.43901	0.528049	0.2154220	225.75760
-31	11.879800	337.155	340	14.43901	0.522880	0.2199217	219.29077
-25	11.495670	331.960	340	14.43901	0.562884	0.2397781	245.70561
-19	12.525630	325.080	340	14.43901	0.438233	0.2817604	317.69280
-13	12.889695	318.840	340	14.43901	0.468382	0.3919461	451.31183
-6	13.130160	315.340	340	14.43901	0.483879	0.4577505	520.45909
-1	12.701260	312.000	340	14.43901	0.493117	0.4326490	482.60767
6	12.724970	311.290	340	14.43901	0.490124	0.4368359	466.43518
12	11.815300	311.730	340	14.43901	0.524648	0.3550007	369.95725
18	11.888230	308.260	340	14.43901	0.528909	0.3885984	396.96976
24	13.540305	304.970	340	14.43901	0.429877	0.5175579	553.81655
30	12.423860	301.880	340	14.43901	0.446556	0.4122079	436.97883
36	12.921615	301.000	340	14.43901	0.550525	0.5840660	624.85748
43	12.653010	299.630	340	14.43901	0.494339	0.5023616	544.86541
48	12.378860	295.610	340	14.43901	0.486138	0.4845519	509.28397
60	12.490615	290.920	340	14.43901	0.486739	0.5288997	551.05585
120	13.932820	285.500	340	14.43901	0.432149	0.6944068	795.41939
181	14.350570	277.130	340	14.43901	0.400314	0.7734029	872.04257
242	11.581430	277.815	340	14.43901	0.481347	0.4939256	558.99883
305	14.247445	277.355	340	14.43901	0.351935	0.7086556	847.07837
363	13.068665	281.110	340	14.43901	0.444194	0.6241322	738.23384
429	14.941955	283.535	340	14.43901	0.383781	0.7903749	974.91536
499	11.871105	281.270	340	14.43901	0.457146	0.4835148	565.21330
570	14.464090	280.910	340	14.43901	0.461804	0.8254257	970.07053
646	15.748480	280.005	340	14.43901	0.313710	0.8492377	1176.62368
725	11.569615	283.690	340	14.43901	0.401503	0.3746569	433.66564
802	15.099470	284.240	340	14.43901	0.403256	0.8265192	983.49099
890	14.293475	281.905	340	14.43901	0.395018	0.7277152	874.49507

985	13.511010	278.075	340	14.43901	0.406559	0.6636209	836.07365
1085	13.877625	279.020	340	14.43901	0.301657	0.5977625	777.82228
1191	13.218835	279.640	340	14.43901	0.373369	0.5816580	666.43689
1305	13.432900	279.020	340	14.43901	0.413576	0.6542092	765.49771
1414	13.233040	276.675	340	14.43901	0.458016	0.6894065	759.55345
1540	12.702920	279.130	340	14.43901	0.497576	0.6442149	778.84234
1667	13.501385	280.575	340	14.43901	0.480201	0.7202114	822.06065
1795	13.096470	278.070	340	14.43901	0.386541	0.5898649	704.25609
1922	12.799950	277.300	340	14.43901	0.431293	0.6022332	762.58514
2044	11.551290	277.450	340	14.43901	0.444219	0.4556202	537.83454
2149	13.294700	276.800	340	14.43901	0.421076	0.6590583	783.55553
2256	14.283885	276.700	340	14.43901	0.367480	0.7339070	915.31466
2357	13.174110	277.150	340	14.43901	0.523369	0.7447476	817.19757
2453	12.771775	277.750	340	14.43901	0.424511	0.5887351	700.03712
2545	11.757505	275.900	340	14.43901	0.421738	0.4695062	575.69382
2633	13.088010	276.400	340	14.43901	0.396330	0.6100237	728.18665
2795	12.033940	277.100	340	14.43901	0.462588	0.5372427	588.41917
2871	13.081115	275.000	340	14.43901	0.424956	0.6477162	798.62228
2944	12.756910	275.500	340	14.43901	0.454794	0.6326667	736.86889
3013	12.822585	275.450	340	14.43901	0.397566	0.5836535	727.36701
3080	10.699305	274.600	340	14.43901	0.443022	0.3669812	447.33786
3143	13.261510	275.450	340	14.43901	0.390003	0.6324706	764.58132
3203	13.035830	276.300	340	14.43901	0.441610	0.6498272	743.10089
3261	13.535495	274.700	340	14.43901	0.416972	0.7005937	847.48798
3317	12.425060	273.100	340	14.43901	0.444067	0.5956837	702.28429
3370	12.743310	273.550	340	14.43901	0.424860	0.6140574	733.48111
3421	13.684420	274.000	340	14.43901	0.423377	0.7314145	848.40231
3470	12.647450	274.500	340	14.43901	0.440416	0.6109269	723.03978
3518	14.010410	274.500	340	14.43901	0.399001	0.7456695	898.52761
3564	13.475130	274.200	340	14.43901	0.432065	0.7115749	871.20056
3609	12.885270	274.200	340	14.43901	0.440593	0.6437703	741.04901
3656	13.071425	273.200	340	14.43901	0.402640	0.6362472	720.13937
3699	13.434470	273.000	340	14.43901	0.430108	0.7126369	853.22469
3741	13.080005	272.250	340	14.43901	0.444006	0.6859167	789.11182

3782	13.312910	271.500	340	14.43901	0.481336	0.7594392	841.05584
3822	13.559430	273.450	340	14.43901	0.434527	0.7302996	838.88812
3863	13.483015	275.400	340	14.43901	0.433829	0.7060858	826.23443
3903	11.902960	275.150	340	14.43901	0.493315	0.5644705	641.03270
3943	12.888460	275.150	340	14.43901	0.422033	0.6188914	725.77380
3984	13.129820	273.300	340	14.43901	0.441372	0.6824046	791.64268
4023	13.747505	273.300	340	14.43901	0.416761	0.7377937	873.71942
4062	14.563010	273.300	340	14.43901	0.412826	0.8412284	1004.09003
4101	14.015225	271.700	340	14.43901	0.426782	0.7944727	957.81741
4139	14.572930	271.650	340	14.43901	0.424069	0.8658994	1044.14355
4176	13.604615	271.650	340	14.43901	0.418275	0.7322279	850.75163
4212	13.041955	272.200	340	14.43901	0.481193	0.7190535	837.15958
4251	15.268020	272.200	340	14.43901	0.400423	0.9304329	1137.60030
4284	13.499280	272.150	340	14.43901	0.491962	0.7901063	891.36497
4317	14.600530	272.150	340	14.43901	0.360241	0.8000912	1055.40493
4347	14.278675	271.500	340	14.43901	0.436612	0.8408143	957.10773
4376	14.787685	271.500	340	14.43901	0.458481	0.9312388	1062.19854
4404	13.491295	271.300	340	14.43901	0.494253	0.7973917	891.76168
4429	13.935795	271.300	340	14.43901	0.407680	0.7672609	917.42710
4452	14.553305	271.300	340	14.43901	0.407926	0.8491241	1038.30703
4474	14.558790	271.100	340	14.43901	0.381470	0.8239639	1032.89780
4494	15.045370	271.100	340	14.43901	0.388216	0.8957954	1128.54259
4513	15.631435	270.100	340	14.43901	0.451673	1.0483645	1268.41813
4531	14.992585	270.100	340	14.43901	0.475532	0.9866089	1148.94344
4547	15.086240	270.100	340	14.43901	0.446055	0.9686186	1151.07869
4562	14.741750	270.100	340	14.43901	0.460775	0.9375628	1114.70214
4577	15.337330	269.100	340	14.43901	0.456752	1.0210282	1177.97636
4591	14.744645	269.100	340	14.43901	0.486113	0.9714567	1131.50192
4616	15.537315	269.450	340	14.43901	0.435921	1.0238657	1264.31104
4629	15.289300	269.450	340	14.43901	0.418996	0.9725987	1146.45872
4642	15.236480	269.450	340	14.43901	0.390457	0.9357423	1210.19299
4655	14.217500	269.800	340	14.43901	0.481282	0.8908392	1096.32663
4667	13.929305	269.800	340	14.43901	0.500180	0.8719585	990.10292
4679	14.456340	269.800	340	14.43901	0.477212	0.9185062	1118.49382

4693	15.862295	270.650	340	14.43901	0.481918	1.1075377	1268.19705
4707	14.117130	270.650	340	14.43901	0.448255	0.8374506	1013.54965
4723	14.411470	270.650	340	14.43901	0.462332	0.8910427	1122.93101
4756	14.795020	270.650	340	14.43901	0.535625	1.0182480	1182.04406
4890	14.834370	270.700	340	14.43901	0.650277	1.1419800	1263.93717
5015	16.790890	268.950	340	14.43901	0.458337	1.2237428	1451.77102
5202	14.724575	269.800	340	14.43901	0.510507	0.9889183	1107.44159
5403	15.916575	265.300	340	14.43901	0.451895	1.1233898	1309.20488
5596	13.197670	267.600	340	14.43901	0.580824	0.8733490	1027.84932
5763	14.989795	265.700	340	14.43901	0.490060	1.0337093	1186.39906
5879	14.690215	263.100	340	14.43901	0.633639	1.1616237	1275.71830
5953	16.610490	263.700	340	14.43901	0.488720	1.2708240	1446.23322
6007	14.797680	266.700	340	14.43901	0.526236	1.0378402	1200.88753
6056	15.365505	266.100	340	14.43901	0.462299	1.0528545	1232.04055
6118	15.526410	265.500	340	14.43901	0.467143	1.0843688	1292.80801
6206	16.861230	264.350	340	14.43901	0.391183	1.1972338	1497.97234
6338	15.520625	262.700	340	14.43901	0.510261	1.1499268	1308.29885
6523	15.196245	261.150	340	14.43901	0.454215	1.0586200	1240.03616
6729	14.751830	260.750	340	14.43901	0.572781	1.1246572	1256.63204
7025	16.292160	257.850	340	14.43901	0.500633	1.2845689	1488.78549
7198	15.048425	262.650	340	14.43901	0.548170	1.1251386	1259.68022
7311	15.212085	261.850	340	14.43901	0.556734	1.1626206	1257.58757
7457	13.652665	259.550	340	14.43901	0.474606	0.8840089	985.89590
7630	15.563800	260.100	340	14.43901	0.496452	1.1613261	1304.74790
7821	16.512985	260.050	340	14.43901	0.573211	1.3752667	1536.20966
8024	15.154520	260.200	340	14.43901	0.577937	1.1895168	1327.91919
8233	16.430325	259.300	340	14.43901	0.492751	1.2841437	1485.97868
8442	15.368730	259.800	340	14.43901	0.507928	1.1488114	1330.11416
8847	14.772840	259.950	340	14.43901	0.609482	1.1718501	1317.10995
9040	14.501085	259.850	340	14.43901	0.580817	1.1056564	1178.58799
9205	14.772915	262.850	340	14.43901	0.585610	1.1249307	1264.09044
9340	16.114460	263.750	340	14.43901	0.519646	1.2339293	1355.91274
9441	15.439775	262.900	340	14.43901	0.577847	1.2080714	1324.27348
9522	14.951680	260.750	340	14.43901	0.548766	1.1269806	1269.82519

9589	15.205050	263.800	340	14.43901	0.450967	1.0363949	1221.18774
9654	15.017930	263.800	340	14.43901	0.546659	1.1106978	1228.00948
9723	15.199465	263.800	340	14.43901	0.569147	1.1590199	1260.37236
9806	15.815015	264.400	340	14.43901	0.417580	1.0801589	1297.18919
9823	14.884225	264.400	340	14.43901	0.487888	1.0268246	1229.68374
9843	16.120400	264.400	340	14.43901	0.480904	1.1889174	1260.35073
9862	14.437820	264.400	340	14.43901	0.524941	1.0049116	1128.09502
9882	14.242735	264.400	340	14.43901	0.593003	1.0489168	1121.99396
9903	15.793380	264.300	340	14.43901	0.493796	1.1580449	1329.62830
9925	16.457260	264.300	340	14.43901	0.428127	1.1806275	1381.57520
9951	15.717115	264.300	340	14.43901	0.473277	1.1259913	1230.76145
9975	15.131305	264.300	340	14.43901	0.453730	1.0255102	1153.33678
10001	15.323460	264.200	340	14.43901	0.532910	1.1351612	1237.36216
10028	14.871245	264.100	340	14.43901	0.558392	1.1006302	1186.59848
10057	17.511240	264.100	340	14.43901	0.414236	1.3150574	1450.38671
10089	15.605590	264.100	340	14.43901	0.595404	1.2402576	1344.42271
10120	16.048725	264.000	340	14.43901	0.350761	1.0448496	1237.40275
10153	16.008700	263.700	340	14.43901	0.473838	1.1713459	1261.62728
10187	15.144115	263.700	340	14.43901	0.481948	1.0611930	1139.00969
10222	16.486195	264.550	340	14.43901	0.392532	1.1450345	1346.99050
10262	17.041910	264.550	340	14.43901	0.394061	1.2239935	1455.63719
10299	15.637060	265.700	340	14.43901	0.427851	1.0568240	1268.97624
10337	15.631225	265.300	340	14.43901	0.426451	1.0575570	1207.74740
10376	15.559980	264.900	340	14.43901	0.479709	1.1066371	1289.27373
10415	16.365245	266.200	340	14.43901	0.414970	1.1395218	1310.00115
10458	16.276965	266.200	340	14.43901	0.484494	1.2007272	1345.04179
10497	16.349345	266.200	340	14.43901	0.438019	1.1616778	1296.65998
10536	16.278340	267.200	340	14.43901	0.464915	1.1726936	1352.42345
10612	16.047825	267.200	340	14.43901	0.503634	1.1816001	1270.61296
10690	16.485350	266.450	340	14.43901	0.448163	1.1893624	1298.99340
10762	16.975485	266.000	340	14.43901	0.435743	1.2479542	1468.16190
10835	17.668380	265.550	340	14.43901	0.473725	1.3898399	1556.21285
10904	15.477845	266.350	340	14.43901	0.524962	1.1318503	1246.62819
10972	15.780770	266.200	340	14.43901	0.567718	1.2195355	1295.06178

11044	17.062450	266.200	340	14.43901	0.422194	1.2441767	1383.42515
11113	14.071460	264.800	340	14.43901	0.541849	0.9701376	1061.09987
11187	16.074465	265.150	340	14.43901	0.490152	1.1865949	1375.74244
11258	17.405490	264.400	340	14.43901	0.513015	1.4034897	1392.67245
11333	15.502385	264.455	340	14.43901	0.543125	1.1685138	1171.86362
11414	14.840655	266.320	340	14.43901	0.487248	1.0059930	1076.30445
11499	15.364930	267.415	340	14.43901	0.513904	1.0968806	1177.03611
11594	14.643270	261.000	340	14.43901	0.462316	0.9931629	939.67186
11888	15.016305	253.730	340	14.43901	0.445394	1.0821720	1116.01527
11954	13.614930	251.455	340	14.43901	0.389403	0.8527229	828.79687
12022	14.482675	248.130	340	14.43901	0.465376	1.0746082	1106.66568
12091	14.124780	253.345	340	14.43901	0.417931	0.9357393	923.61746
12234	12.575605	249.090	340	14.43901	0.480760	0.8272564	767.88270
12382	12.307820	243.655	340	14.43901	0.477946	0.8315672	796.61830
12537	12.471630	248.330	340	14.43901	0.474711	0.8132702	792.72388
12698	12.908245	242.915	340	14.43901	0.428726	0.8664245	818.92664
12871	13.249050	240.295	340	14.43901	0.425493	0.9296653	901.33136
13043	13.682535	236.770	340	14.43901	0.483385	1.0774400	1028.74644
13218	12.610745	239.410	340	14.43901	0.536082	0.9654153	904.33872
13397	13.914370	237.830	340	14.43901	0.439547	1.0544383	1039.37313
13578	14.723270	239.845	340	14.43901	0.458435	1.1683042	1135.33729
13762	13.627845	241.110	340	14.43901	0.466207	1.0161941	1013.84217
13947	15.317390	238.245	340	14.43901	0.469603	1.2763143	1298.36699
14133	13.802605	237.820	340	14.43901	0.450253	1.0504799	1101.06360
14327	14.841775	238.940	340	14.43901	0.349928	1.0779464	1135.00610
14512	13.351390	241.600	340	14.43901	0.498382	1.0082009	1019.86321
14695	14.525705	233.200	340	14.43901	0.418140	1.1551562	1222.63561
14877	13.996235	230.035	340	14.43901	0.433336	1.1256267	1176.59914
15056	15.177935	227.185	340	14.43901	0.443005	1.3257691	1437.41378
15144	13.245490	229.240	340	14.43901	0.489104	1.0880562	1138.78129
15231	13.647995	229.225	340	14.43901	0.515634	1.1710054	1232.79024
15317	12.467560	227.640	340	14.43901	0.513872	1.0221039	1076.58721
15402	13.452520	225.065	340	14.43901	0.492902	1.1570599	1248.36839
15486	14.472345	223.400	340	14.43901	0.459350	1.2783238	1419.50570

15576	16.186575	223.145	340	14.43901	0.491031	1.5590693	1843.07826
15722	12.524460	223.510	340	14.43901	0.429873	0.9789055	896.75563
15793	12.398135	223.610	340	14.43901	0.430739	0.9619328	976.67870
15870	10.760215	222.935	340	14.43901	0.453890	0.7745133	668.67957
15939	12.350730	223.770	340	14.43901	0.365376	0.8865914	946.04113
16006	12.724970	223.400	340	14.43901	0.375637	0.9506051	892.35464
16072	13.518925	224.360	340	14.43901	0.366020	1.0396127	1213.21849
16137	10.445880	223.635	340	14.43901	0.441893	0.7154609	684.73716
16206	13.415415	227.320	340	14.43901	0.342865	0.9753391	950.94318
16269	11.893750	216.390	340	14.43901	0.422392	0.9499673	741.50127
16330	10.199119	213.515	340	14.43901	0.474221	0.8044036	730.26843
16391	11.017990	210.360	340	14.43901	0.442874	0.9092557	1036.98603
16452	11.550620	217.190	340	14.43901	0.395824	0.8695904	801.27742
16517	11.802705	208.300	340	14.43901	0.278469	0.8633396	855.35632
16576	11.148750	208.555	340	14.43901	0.448982	0.9497979	1081.75316
16635	12.849935	210.805	340	14.43901	0.375400	1.0823799	941.00158
16694	13.012700	211.700	340	14.43901	0.341791	1.0609277	1239.14834
16753	12.077215	207.890	340	14.43901	0.363719	0.9927049	978.53424
16818	14.158905	205.360	340	14.43901	0.373298	1.3154213	1520.85789
16876	10.790900	204.060	340	14.43901	0.451034	0.9466467	894.69419
16935	12.048430	203.625	340	14.43901	0.390956	1.0583186	1287.08192
16994	10.837725	203.625	340	14.43901	0.480079	0.9869808	1053.19216
17053	10.031810	203.210	340	14.43901	0.465448	0.8686592	851.26729
17118	9.895848	200.365	340	14.43901	0.461283	0.8736996	861.45256
17177	10.426055	198.460	340	14.43901	0.477632	0.9796065	1094.14877
17236	12.864705	198.290	340	14.43901	0.380516	1.2132160	1066.59677
17295	11.274705	195.265	340	14.43901	0.446154	1.0938512	1201.89424
17354	12.146745	190.500	340	14.43901	0.404584	1.2201404	1307.16403
17419	11.463015	191.325	340	14.43901	0.396909	1.1089446	1010.70088
17478	10.420725	192.240	340	14.43901	0.424005	0.9861307	885.13024
17537	12.035565	192.495	340	14.43901	0.385468	1.1634905	1368.54743
17596	11.631775	196.375	340	14.43901	0.438248	1.1231126	1209.86370
17655	11.983090	193.795	340	14.43901	0.352284	1.1078283	1092.05766
17720	11.907815	189.965	340	14.43901	0.419211	1.2080521	1107.96972

17779	10.722560	189.475	340	14.43901	0.441874	1.0740927	959.81752
17838	11.743250	190.365	340	14.43901	0.407721	1.1689401	1035.60982
17898	12.404180	190.990	340	14.43901	0.365678	1.2096703	1376.63598
17957	11.455935	188.600	340	14.43901	0.376603	1.1154760	988.10960
18023	12.783990	187.790	340	14.43901	0.349292	1.2800188	1272.22048
18084	13.026125	188.615	340	14.43901	0.392178	1.3508884	1184.08465
18145	12.796495	186.945	340	14.43901	0.328991	1.2694306	1210.43716
18207	12.380540	187.265	340	14.43901	0.382299	1.2641512	1146.05542
18269	10.786970	188.775	340	14.43901	0.431274	1.0792051	886.15511
18339	12.451600	187.925	340	14.43901	0.363905	1.2474079	1166.76456
18402	11.038440	188.340	340	14.43901	0.502894	1.1928373	1160.36063
18466	12.180700	187.270	340	14.43901	0.381802	1.2356154	1207.25591
18530	10.514090	187.670	340	14.43901	0.435265	1.0579165	1024.06433
18666	12.243875	193.900	340	14.43901	0.278691	1.0651507	1035.49595
18796	11.128360	192.970	340	14.43901	0.398897	1.0482738	1101.21089
18939	10.852120	190.605	340	14.43901	0.461861	1.1006655	1030.92144
19087	10.722190	191.900	340	14.43901	0.409936	1.0157091	1045.17918
19227	10.324510	191.335	340	14.43901	0.375349	0.9322504	946.59367
19370	10.942980	191.550	340	14.43901	0.472478	1.1142403	1040.81962
19504	9.740445	190.235	340	14.43901	0.489560	0.9828962	939.69024
19639	10.050925	191.420	340	14.43901	0.467545	0.9897259	1096.17624
19768	10.674020	193.600	340	14.43901	0.472280	1.0563100	1124.43072
19886	12.180290	196.060	340	14.43901	0.465912	1.2309956	1360.72369
20003	10.977170	194.890	340	14.43901	0.461431	1.0730378	1270.85047
20106	10.556615	192.095	340	14.43901	0.427358	1.0093855	1049.84051
20206	11.882545	192.095	340	14.43901	0.431126	1.1945111	1233.80210
20295	9.269087	190.230	340	14.43901	0.511353	0.9423602	1044.20862
20372	11.081285	190.230	340	14.43901	0.420676	1.0930079	1054.72573
20448	10.071010	191.960	340	14.43901	0.458223	0.9773053	1083.37454
20517	10.921845	191.960	340	14.43901	0.423512	1.0562290	1204.21905
20590	9.857285	190.845	340	14.43901	0.489315	0.9920288	1127.32214
20666	12.753365	190.845	340	14.43901	0.381058	1.2763541	1223.66984
20745	9.532400	190.210	340	14.43901	0.509561	0.9758270	1049.63052
20837	9.162833	191.765	340	14.43901	0.491845	0.8928038	906.30351

20940	10.531110	191.765	340	14.43901	0.457853	1.0408769	1064.79063
21048	9.612870	189.635	340	14.43901	0.481180	0.9634177	1068.17471
21173	10.006380	189.225	340	14.43901	0.491841	1.0314168	1205.82662
21301	10.426695	188.645	340	14.43901	0.430404	1.0307766	1199.71560
21433	8.329884	186.235	340	14.43901	0.490850	0.8385203	1006.71119
21574	11.400080	186.595	340	14.43901	0.417916	1.1725910	1096.81462
21716	10.645230	186.595	340	14.43901	0.460863	1.1137786	1277.76542
21866	8.680892	189.370	340	14.43901	0.455234	0.8163867	806.47489
22031	10.720585	189.080	340	14.43901	0.430449	1.0661064	1265.90429
22197	9.247492	191.270	340	14.43901	0.408191	0.8237212	842.89000
22379	9.802635	187.020	340	14.43901	0.528548	1.0648246	1212.66358
22560	10.650660	184.945	340	14.43901	0.425217	1.0951568	1191.94757
22748	10.275895	190.010	340	14.43901	0.386687	0.9510655	859.45814
22952	11.933450	189.400	340	14.43901	0.415948	1.2142155	1323.61952
23152	12.001330	189.340	340	14.43901	0.425240	1.2340864	1433.69534
23368	13.181340	190.155	340	14.43901	0.371450	1.3339487	1494.61511
23577	13.330280	187.385	340	14.43901	0.317124	1.3273544	1582.32857
23788	12.119755	185.560	340	14.43901	0.377940	1.2417291	1316.84266
24012	13.303990	183.905	340	14.43901	0.263031	1.3044794	1489.70854
24226	13.457145	185.705	340	14.43901	0.315264	1.3621385	1432.18448
24450	13.995055	183.650	340	14.43901	0.321666	1.4697088	1381.33879
24662	13.712425	180.570	340	14.43901	0.299384	1.4404382	1563.24760
24871	12.357000	180.630	340	14.43901	0.344610	1.2948711	1771.33673
25088	9.163590	180.690	340	14.43901	0.477244	0.9938112	945.48502
25291	11.272245	181.675	340	14.43901	0.449034	1.2416144	1349.81465
25501	11.086455	183.020	340	14.43901	0.440271	1.1917260	1283.99819
25699	11.214125	184.960	340	14.43901	0.495095	1.2455259	1510.57075
25896	11.459530	185.530	340	14.43901	0.381754	1.1543903	1406.30932
26104	11.427615	184.545	340	14.43901	0.426935	1.2081896	1479.25577
26412	11.348065	184.890	340	14.43901	0.429776	1.1963735	1368.56295
26614	11.676505	185.475	340	14.43901	0.405258	1.2097442	1310.05617
26829	12.480595	185.935	340	14.43901	0.451586	1.3664134	1548.10725
27049	11.751265	186.830	340	14.43901	0.415035	1.2156567	1417.38302
27274	11.103970	192.495	340	14.43901	0.404285	1.0554618	1026.94002

27506	12.480025	191.380	340	14.43901	0.396843	1.2490597	1228.35234
27733	12.317240	189.300	340	14.43901	0.400278	1.2522379	1077.09644
27974	12.569895	189.290	340	14.43901	0.371344	1.2570634	1106.18288
28219	10.972120	191.705	340	14.43901	0.375762	1.0160613	941.36591
28821	11.616680	193.890	340	14.43901	0.368870	1.0740180	988.60199
29398	11.096930	189.520	340	14.43901	0.524119	1.2104700	1223.92300
30419	10.134460	184.300	340	14.43901	0.448462	1.0560246	1187.88458
31388	11.638685	189.215	340	14.43901	0.379583	1.1371907	1117.48374
32106	10.132605	195.165	340	14.43901	0.484969	0.9806153	969.10998
32889	9.834265	196.700	340	14.43901	0.548047	0.9900191	953.44212
33545	10.880855	197.465	340	14.43901	0.429742	1.0012233	1080.39776
34631	10.377045	199.590	340	14.43901	0.458898	0.9427017	1126.77896
35945	10.751385	201.045	340	14.43901	0.492588	1.0132943	1158.31456
36937	9.278780	203.510	340	14.43901	0.514820	0.8170054	792.57082
38485	9.198735	208.655	340	14.43901	0.498090	0.7421294	783.89565
39103	8.392639	205.800	340	14.43901	0.546192	0.7123635	728.08216
39681	11.449825	196.185	340	14.43901	0.427039	1.0884728	1033.51631
40002	13.257680	195.075	340	14.43901	0.314463	1.2313925	1320.01226
40253	9.932895	195.795	340	14.43901	0.546388	1.0105404	1176.79306
40657	8.272382	200.975	340	14.43901	0.500606	0.6959996	718.32385
41029	10.137130	201.250	340	14.43901	0.433944	0.8691467	918.12367
41327	9.530069	204.190	340	14.43901	0.458241	0.7861804	753.07178
41758	10.671990	201.120	340	14.43901	0.441728	0.9495426	919.03538
42029	11.580640	199.890	340	14.43901	0.409008	1.0502846	978.12449
42240	8.755353	200.395	340	14.43901	0.467121	0.7301482	767.79969
42495	10.413640	202.865	340	14.43901	0.495868	0.9537573	987.81510
42877	10.613855	205.305	340	14.43901	0.381419	0.8397854	861.62451
43740	11.207270	202.435	340	14.43901	0.507078	1.0762569	1207.96035
44062	11.711450	204.310	340	14.43901	0.391607	1.0065838	920.96400
44404	11.324645	205.525	340	14.43901	0.471039	1.0249351	1113.44649
44764	11.184635	211.365	340	14.43901	0.411543	0.8899612	860.59442
45138	13.376115	209.720	340	14.43901	0.323035	1.1099436	1006.74034
45525	12.733005	216.005	340	14.43901	0.359366	1.0011825	904.06367
46322	12.018120	218.350	340	14.43901	0.347459	0.8715410	795.04202

47601	10.271700	204.025	340	14.43901	0.407037	0.8329317	804.92158
48772	10.887380	201.280	340	14.43901	0.429229	0.9639570	979.64380
50937	11.221780	207.525	340	14.43901	0.548830	1.0722365	1096.84310
52168	12.206855	216.450	340	14.43901	0.385159	0.9529253	944.59994
52330	10.884445	216.450	340	14.43901	0.488210	0.8825828	857.75639
52933	10.531495	222.435	340	14.43901	0.539465	0.8356859	882.50442
53562	12.023970	222.200	340	14.43901	0.590746	1.0891391	1170.42085
54360	10.969175	219.165	340	14.43901	0.556933	0.9398226	1044.63806
56695	11.799285	212.440	340	14.43901	0.508502	1.0625309	1030.85779
56821	9.676870	214.070	340	14.43901	0.529626	0.7873055	748.89352
58294	13.096980	223.750	340	14.43901	0.434754	1.0593759	1007.83672
59004	12.654425	231.290	340	14.43901	0.412567	0.9113933	933.70939
61201	11.728895	209.260	340	14.43901	0.554980	1.1309926	1265.79748
61618	10.919690	208.640	340	14.43901	0.486621	0.9570727	1069.92410
63345	10.277420	198.775	340	14.43901	0.590586	1.0725250	1269.02368
65500	12.364315	208.980	340	14.43901	0.548204	1.2138134	1314.88335
65984	13.201235	200.590	340	14.43901	0.349848	1.2041782	1350.08470
67492	10.500190	202.450	340	14.43901	0.461421	0.9339681	983.60538
69280	11.543625	208.340	340	14.43901	0.466809	1.0233011	1158.22822
69681	8.818884	213.405	340	14.43901	0.550936	0.7035689	729.54777
70083	12.575910	217.940	340	14.43901	0.331883	0.9337339	1153.91399
71728	12.949905	238.510	340	14.43901	0.493640	0.9745422	1088.10784
73834	12.521990	232.035	340	14.43901	0.527963	1.0063935	1210.51693
74427	12.942090	236.285	340	14.43901	0.470405	0.9678704	1145.70240
75975	11.813955	244.640	340	14.43901	0.429378	0.7097746	835.20979
78001	16.088725	225.785	340	14.43901	0.430684	1.4551184	1744.63588
78428	14.814645	225.395	340	14.43901	0.523328	1.3761464	1512.62562
80167	13.590870	232.670	340	14.43901	0.374170	0.9857723	1050.40065
82264	9.319097	239.880	340	14.43901	0.456190	0.4553177	401.52679
85406	10.705515	234.690	340	14.43901	0.407783	0.6233156	602.04585
86807	10.347030	222.220	340	14.43901	0.383166	0.6553019	573.54605
89490	11.854085	228.130	340	14.43901	0.448199	0.8683141	728.99027
91816	10.817200	232.430	340	14.43901	0.548471	0.7981009	800.56150
93907	12.882770	238.210	340	14.43901	0.379700	0.8505018	751.76561

96656	12.281340	244.055	340	14.43901	0.353974	0.6983776	608.65514
99188	9.735085	243.085	340	14.43901	0.430647	0.4576982	487.85882
101967	10.836270	242.415	340	14.43901	0.580318	0.7526819	778.04504
102747	11.904570	237.070	340	14.43901	0.361761	0.7126299	710.99492
104861	14.935930	240.620	340	14.43901	0.484685	1.2188987	1316.62988
107565	12.305630	238.385	340	14.43901	0.581557	0.9796222	1061.71379
110928	13.266150	252.310	340	14.43901	0.451387	0.8636616	946.70862
114230	11.368895	264.240	340	14.43901	0.526497	0.6050567	632.92855
115535	12.103225	275.060	340	14.43901	0.650182	0.7478191	847.36505
117705	15.665745	274.980	340	14.43901	0.467457	1.0340333	1234.04370
118737	12.090160	272.730	340	14.43901	0.591169	0.7030177	783.52527
119619	13.376815	271.165	340	14.43901	0.575280	0.8658704	977.17015
121968	14.092390	277.430	340	14.43901	0.481000	0.8200428	932.24372
124468	12.453005	278.530	340	14.43901	0.494356	0.6129286	688.90432
126463	12.412600	274.085	340	14.43901	0.546565	0.6904759	774.21003
129122	13.892880	268.440	340	14.43901	0.489728	0.8661820	975.98644
130648	11.791140	251.340	340	14.43901	0.615587	0.8438747	919.93876
131332	10.680325	241.130	340	14.43901	0.575380	0.7375895	766.92622
132984	10.841310	224.630	340	14.43901	0.569515	0.8880536	899.47557
134767	12.392455	212.430	340	14.43901	0.554306	1.1911694	1215.37504
137439	11.926565	201.460	340	14.43901	0.407824	1.0806030	1066.06423
138097	11.480050	198.865	340	14.43901	0.479383	1.1200391	1108.24716
141499	10.685910	194.630	340	14.43901	0.462746	1.0375670	975.77660
144323	11.442350	195.305	340	14.43901	0.499911	1.1723872	1158.80147
144967	12.916365	194.805	340	14.43901	0.467325	1.3486605	1371.00321
148580	10.440630	198.795	340	14.43901	0.536004	1.0382669	1000.13605
151686	12.964835	202.350	340	14.43901	0.347492	1.1511333	1056.15519
153838	11.242885	197.540	340	14.43901	0.525301	1.1486726	1135.04950
154746	10.348605	197.540	340	14.43901	0.466467	0.9668519	980.45923
155018	10.313355	196.300	340	14.43901	0.530626	1.0404380	1119.28858
156122	12.884660	192.840	340	14.43901	0.366830	1.2583671	1374.36892
157554	13.089500	189.190	340	14.43901	0.471197	1.4378884	1598.26341
158915	13.276425	187.250	340	14.43901	0.467446	1.4821770	1584.10237
160619	7.985918	187.500	340	14.43901	0.610210	0.9009443	829.63032

161695	12.010360	187.500	340	14.43901	0.446639	1.2778008	1335.21101
162919	11.019520	204.300	340	14.43901	0.467616	0.9920629	1182.41541
163882	11.145145	200.400	340	14.43901	0.443579	1.0221089	1029.90645
164970	9.264389	196.500	340	14.43901	0.482802	0.8499361	845.11607
165836	12.244175	191.600	340	14.43901	0.440028	1.2593918	1296.02057
167203	9.721515	188.400	340	14.43901	0.528851	1.0397114	1082.63860
168643	12.880855	185.250	340	14.43901	0.491368	1.4734429	1571.31594
169889	12.119125	196.600	340	14.43901	0.464273	1.2152201	1285.63006
171139	10.251235	197.200	340	14.43901	0.532404	1.0249130	1043.44177
171398	9.795615	197.200	340	14.43901	0.505406	0.9363387	943.84188
172514	11.878105	197.750	340	14.43901	0.582990	1.2943135	1469.95459
172930	9.116090	197.750	340	14.43901	0.597110	0.9341293	975.04816
174149	9.733125	197.700	340	14.43901	0.466567	0.8834797	969.89296
175288	11.109840	196.850	340	14.43901	0.497959	1.1090981	1208.00304
175565	11.614275	196.850	340	14.43901	0.536219	1.2181040	1296.91905
176896	10.283620	189.850	340	14.43901	0.549047	1.1214380	1236.35002
177960	12.862945	190.100	340	14.43901	0.511227	1.4382347	1599.11884
179446	12.538305	198.900	340	14.43901	0.460554	1.2459739	1229.13020
179707	12.398400	207.700	340	14.43901	0.356645	1.0307099	985.35111
181254	12.878315	213.200	340	14.43901	0.378381	1.0668182	1098.24922
181849	12.580135	215.450	340	14.43901	0.397286	1.0250871	1161.49578
182354	10.924135	207.900	340	14.43901	0.337109	0.8109953	699.17664
183523	10.255550	198.900	340	14.43901	0.364258	0.8361643	894.32833
184818	7.416540	199.700	340	14.43901	0.499713	0.5977437	572.86809
186603	11.920440	207.050	340	14.43901	0.368120	0.9840941	997.36971
189340	10.674150	221.000	340	14.43901	0.464490	0.7907072	752.74055
190307	8.493256	231.350	340	14.43901	0.506649	0.4683552	565.99772
191709	10.294565	225.850	340	14.43901	0.442095	0.6774229	769.56328
192795	10.022120	219.150	340	14.43901	0.479334	0.7368090	728.67281
194581	10.191110	226.500	340	14.43901	0.496187	0.7131366	711.51686
194846	11.431140	226.500	340	14.43901	0.441957	0.8199139	840.81258
195710	11.487825	223.250	340	14.43901	0.478354	0.8925498	916.69802