# Padul Data: MI and Precip. corrections

## Calculate daily temperature (modern)

CRU TS 4.04 daily interpolations from monthly data:

```r
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`)

```r
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

```r
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
```

```r
(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)
```

## Obtain modern CO2 from (Bereiter et al. 2015)

```
modern_co2 <- tibble::tibble(age = 1950 - c(1961:1990),
                             co2 = purrr::map_dbl(age, codos::past_co2)) %>%
  .$co2 %>%
  median()
```

## Assemble the Padul data

```
padul2 <- tibble::tibble(age_calBP = padul$age_cal_yr_BP,
                         past_temp = padul_tmp,
                         past_co2 = past_co2,
                         modern_co2 = modern_co2, # 340,
                         present_t = padul_tmp, # modern_tmp,
                         recon_mi = padul$MI)
```

## Find the corrected `MI`

```
padul2$corr_mi <- codos::corrected_mi(padul2$present_t,
                                      padul2$past_temp,
                                      padul2$recon_mi,
                                      padul2$modern_co2,
                                      padul2$past_co2)
```

| age cal yr BP | past temp | past co2 | modern co2 | present temp | recon. MI | corr. MI | corr. MI (20th) |
|---|---|---|---|---|---|---|---|
| -62 | 13.15918 | 368.020 | 332.165 | 13.15918 | 0.425809 | 0.3760503 | 0.3431377 |
| -56 | 12.86272 | 368.020 | 332.165 | 12.86272 | 0.471798 | 0.4221168 | 0.3892587 |
| -50 | 11.88472 | 364.900 | 332.165 | 11.88472 | 0.506921 | 0.4618002 | 0.4293762 |
| -43 | 13.09339 | 353.835 | 332.165 | 13.09339 | 0.566461 | 0.5349605 | 0.5017009 |
| -38 | 12.20387 | 346.520 | 332.165 | 12.20387 | 0.528049 | 0.5071343 | 0.4744323 |

Check out and download the entire dataset in Appendix A5.

## Find the corrected Annual Precipitation, `P_ann`

Approximated as the ratio

$$\mathrm{MI_{ratio}} = \frac{\text{corrected}}{\text{reconstructed}}$$

multiplied by reconstructed `P_ann`.

```
mi_ratio <- padul2$corr_mi / padul2$recon_mi
padul2$corr_P_ann <- padul$P_ann * mi_ratio
```

```
padul2 %>%
  write.csv(file = "padul-with-corrected-mi.csv",
            row.names = FALSE)

# Small subset
knitr::kable(head(padul2, 13),
             col.names = c("age cal yr BP",
                           "past temp",
                           "past co2",
                           "modern co2",
                           "present temp",
                           "recon. MI",
                           "corr. MI",
                           "corr. MI (20th)",
                           "corr. Pann",
                           "corr. Pann (20th)"))
```

| age cal yr BP | past temp | past co2 | modern co2 | present temp | recon. MI | corr. MI | corr. MI (20th) | corr. Pann | corr. Pann (20th) |
|---:|---:|---:|---:|---:|---:|---:|---:|---:|---:|
| -62 | 13.15918 | 368.020 | 332.165 | 13.15918 | 0.425809 | 0.3760503 | 0.3431377 | 405.1922 | 369.7292 |
| -56 | 12.86272 | 368.020 | 332.165 | 12.86272 | 0.471798 | 0.4221168 | 0.3892587 | 453.2738 | 417.9903 |
| -50 | 11.88472 | 364.900 | 332.165 | 11.88472 | 0.506921 | 0.4618002 | 0.4293762 | 519.7884 | 483.2929 |
| -43 | 13.09339 | 353.835 | 332.165 | 13.09339 | 0.566461 | 0.5349605 | 0.5017009 | 595.1664 | 558.1636 |
| -38 | 12.20387 | 346.520 | 332.165 | 12.20387 | 0.528049 | 0.5071343 | 0.4744323 | 531.4658 | 497.1948 |
| -31 | 11.87980 | 337.155 | 332.165 | 11.87980 | 0.522880 | 0.5154614 | 0.4829125 | 513.9827 | 481.5272 |
| -25 | 11.49567 | 331.960 | 332.165 | 11.49567 | 0.562884 | 0.5631923 | 0.5307318 | 577.1149 | 543.8519 |
| -19 | 12.52563 | 325.080 | 332.165 | 12.52563 | 0.438233 | 0.4491819 | 0.4164441 | 506.4652 | 469.5524 |
| -13 | 12.88969 | 318.840 | 332.165 | 12.88969 | 0.468382 | 0.4895278 | 0.4564923 | 563.6737 | 525.6344 |
| -6 | 13.13016 | 315.340 | 332.165 | 13.13016 | 0.483879 | 0.5109989 | 0.4777764 | 581.0022 | 543.2284 |
| -1 | 12.70126 | 312.000 | 332.165 | 12.70126 | 0.493117 | 0.5257325 | 0.4927145 | 586.4396 | 549.6090 |
| 6 | 12.72497 | 311.290 | 332.165 | 12.72497 | 0.490124 | 0.5239663 | 0.4909395 | 559.4694 | 524.2047 |
| 12 | 11.81530 | 311.730 | 332.165 | 11.81530 | 0.524648 | 0.5573214 | 0.5247072 | 580.8020 | 546.8137 |

Check out and download the entire dataset in Appendix A5.

# Comparison of modern CO2

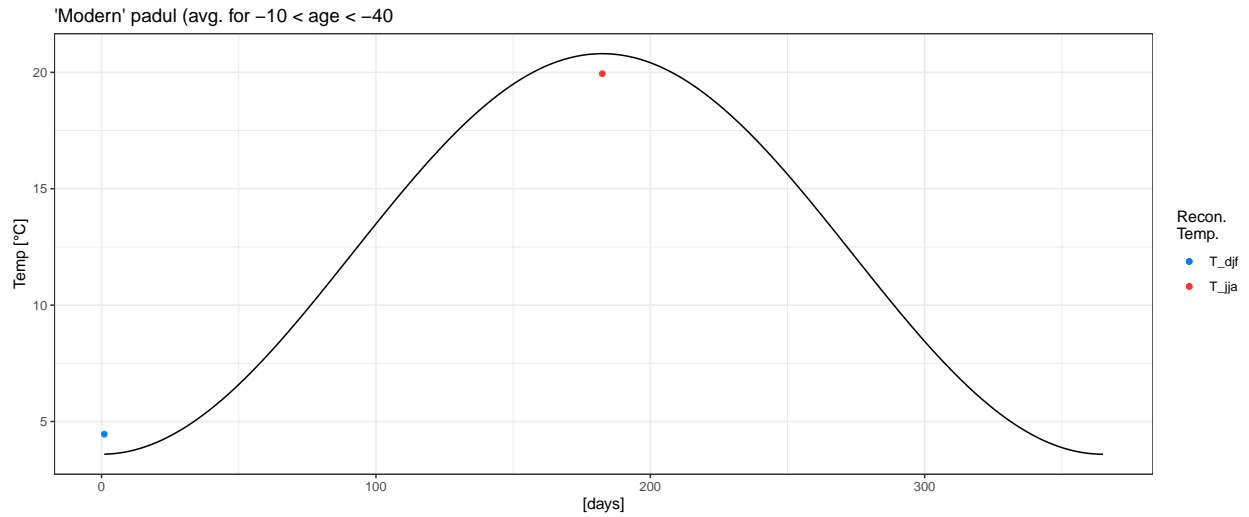| Years       | avg. CO2 |
|-------------|----------|
| 1901 - 2000 | 311.765  |
| 1961 - 1990 | 332.165  |
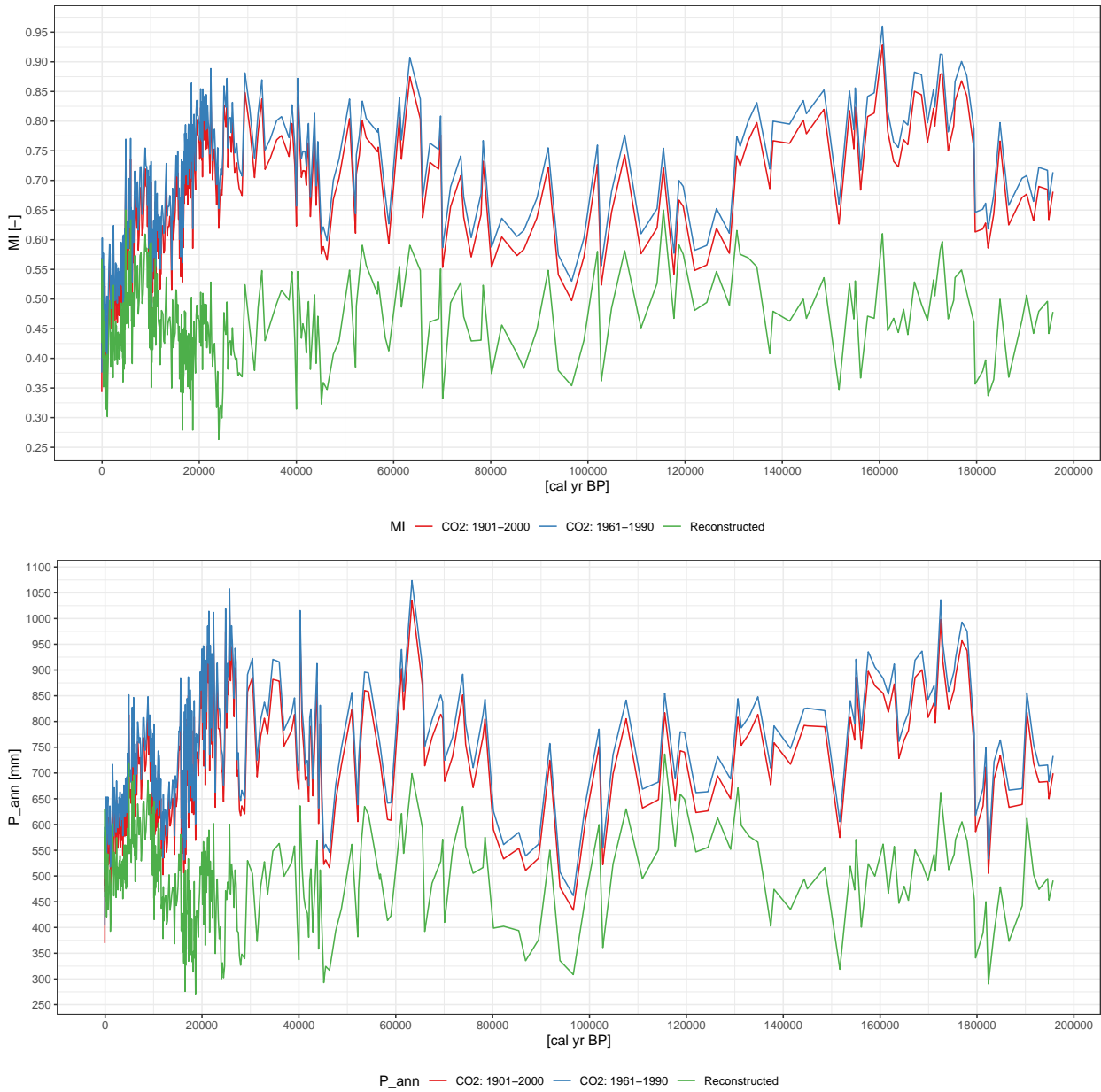
# New corrections

## Calculate temperature anomalies

Using both $T_{djf}$ and $T_{jja}$ for each record, a sinusoidal curve was fitted using the `int_sin` function.

```
padul <- padul %>%
  dplyr::mutate(Tmean = (T_jja + T_djf) / 2) %>%
  dplyr::mutate(Tmax = Tmean + (T_jja - Tmean) / 0.9) %>%
  dplyr::mutate(Tmin = Tmean + (T_djf - Tmean) / 0.9)
```



'Modern' padul (avg. for −10 < age < −40

Rows 5:9 were used as the baseline to calculate the temperature anomalies.

| age_cal_yr_BP | MI | P_ann | T_djf | T_jja | Tmean | Tmax | Tmin |
|---|---|---|---|---|---|---|---|
| -38 | 0.5280490 | 553.3840 | 4.408130 | 19.99960 | 12.20387 | 20.86579 | 3.541937 |
| -31 | 0.5228800 | 521.3800 | 3.954800 | 19.80480 | 11.87980 | 20.68536 | 3.074244 |
| -25 | 0.5628840 | 576.7990 | 3.768040 | 19.22330 | 11.49567 | 20.08193 | 2.909414 |
| -19 | 0.4382330 | 494.1200 | 5.015460 | 20.03580 | 12.52563 | 20.87026 | 4.180997 |
| -13 | 0.4683820 | 539.3250 | 5.126590 | 20.65280 | 12.88969 | 21.51537 | 4.264023 |
| | 0.5040856 | 537.0016 | 4.454604 | 19.94326 | 12.19893 | 20.80374 | 3.594123 |

where

$$T_{mean} = (T_{jja} + T_{djf})/2$$

$$T_{max} = T_{mean} + (T_{jja} - T_{mean})/0.9$$

$$T_{min} = T_{mean} + (T_{djf} - T_{mean})/0.9$$

```
padul_anomalies <- seq_len(nrow(padul)) %>%
  purrr::map(~codos::int_sin(padul$Tmin[.x] - padul_modern$Tmin,
                             padul$Tmax[.x] - padul_modern$Tmax))
```

Padul: Anomaly for age = 11044 cal yr BP
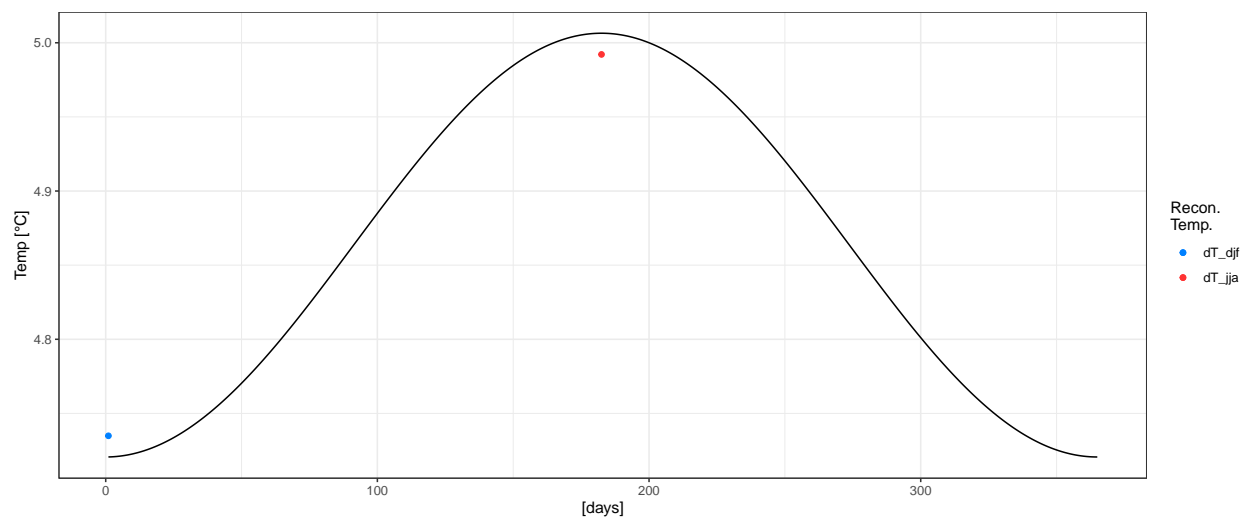


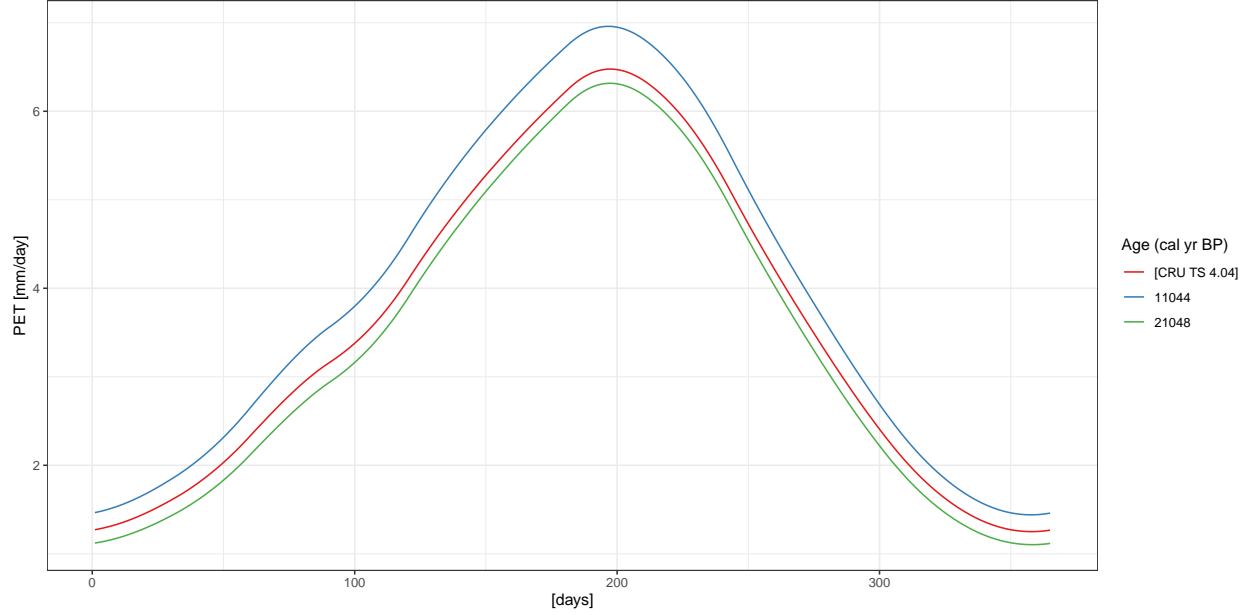Padul: Anomaly for age = 21048 cal yr BP
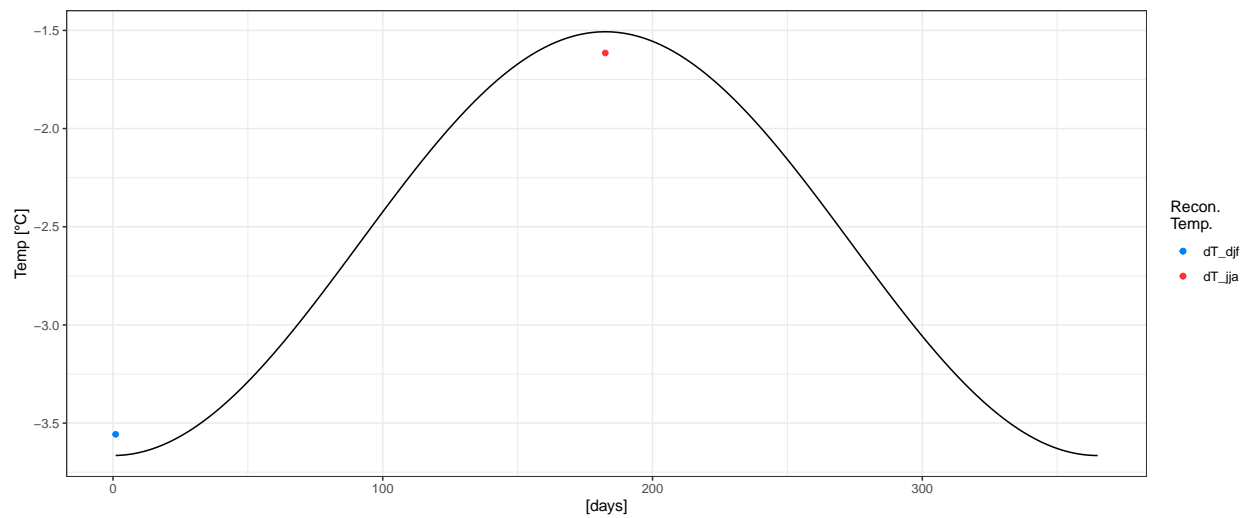
## Calculate potential evapotranspiration (PET)

Padul location: 37.0108, -3.6039

**Params (`splash::calc_daily_evap`)**

- Latitude: `37.0108`
- Elevation: `959`
- Year: `1961`
- Sunshine fraction: [`CRU TS 4.04`]
- Temperature: [`CRU TS 4.04`] $+ T_\text{anomalies}$



## Calculate corrected Precipitation

Using corrected MI and PET (calculated from modern temperature [CRU TS 4.04] and Padul temperature anomalies).

$$\text{corrected P}_\text{ann} = \text{MI} \times \text{PET}_\text{ann}$$

| age_cal_yr_BP | MI | P_ann | corr_mi | corr_P_ann (MI ratio) | corr_P_ann (Tmp anomalies) |
|---|---|---|---|---|---|
| -62 | 0.425809 | 458.807 | 0.3760503 | 405.1922 | 499.9146 |
| -56 | 0.471798 | 506.622 | 0.4221168 | 453.2738 | 557.1390 |
| -50 | 0.506921 | 570.575 | 0.4618002 | 519.7884 | 596.7901 |
| -43 | 0.566461 | 630.212 | 0.5349605 | 595.1664 | 707.7028 |
| -38 | 0.528049 | 553.384 | 0.5071343 | 531.4658 | 660.5909 |
| -31 | 0.522880 | 521.380 | 0.5154614 | 513.9827 | 667.2044 |
| -25 | 0.562884 | 576.799 | 0.5631923 | 577.1149 | 722.1817 |
| -19 | 0.438233 | 494.120 | 0.4491819 | 506.4652 | 588.2986 |

| age_cal_yr_BP | MI | P_ann | corr_mi | corr_P_ann (MI ratio) | corr_P_ann (Tmp anomalies) |
|---|---|---|---|---|---|
| -13 | 0.468382 | 539.325 | 0.4895278 | 563.6737 | 646.8685 |
| -6 | 0.483879 | 550.167 | 0.5109989 | 581.0022 | 678.2997 |
| -1 | 0.493117 | 550.058 | 0.5257325 | 586.4396 | 691.8830 |
| 6 | 0.490124 | 523.334 | 0.5239663 | 559.4694 | 689.9857 |
| 12 | 0.524648 | 546.752 | 0.5573214 | 580.8020 | 720.9460 |
| 18 | 0.528909 | 540.303 | 0.5675918 | 579.8192 | 733.6961 |
| 24 | 0.429877 | 459.993 | 0.4752556 | 508.5506 | 637.3694 |
| 4679 | 0.477212 | 581.116 | 0.5963290 | 726.1685 | 812.2756 |
| 4693 | 0.481918 | 551.825 | 0.6022537 | 689.6166 | 843.0120 |
| 4707 | 0.448255 | 542.514 | 0.5644327 | 683.1216 | 763.6414 |
| 4723 | 0.462332 | 582.651 | 0.5792553 | 730.0029 | 787.7851 |
| 4756 | 0.535625 | 621.786 | 0.6540085 | 759.2128 | 896.3135 |
| 4890 | 0.650277 | 719.723 | 0.7696128 | 851.8032 | 1054.9465 |
| 11499 | 0.513904 | 551.458 | 0.6410910 | 687.9393 | 891.3019 |
| 11594 | 0.462316 | 437.416 | 0.6028760 | 570.4055 | 828.2088 |
| 11888 | 0.445394 | 459.323 | 0.6054028 | 624.3359 | 837.2940 |
| 11954 | 0.389403 | 378.477 | 0.5505321 | 535.0851 | 740.8392 |
| 12022 | 0.465376 | 479.259 | 0.6389381 | 657.9987 | 875.4683 |
| 12091 | 0.417931 | 412.517 | 0.5759768 | 568.5155 | 782.8518 |
| 21433 | 0.490850 | 589.305 | 0.8447231 | 1014.1582 | 1009.5023 |
| 21574 | 0.417916 | 390.909 | 0.7867560 | 735.9135 | 1011.1770 |
| 21716 | 0.460863 | 528.718 | 0.8260434 | 947.6656 | 1042.8897 |
| 21866 | 0.455234 | 449.707 | 0.7973083 | 787.6282 | 963.6708 |
| 22031 | 0.430449 | 511.119 | 0.7847587 | 931.8295 | 991.8708 |
| 22197 | 0.408191 | 417.690 | 0.7445416 | 761.8678 | 911.7025 |
| 184818 | 0.499713 | 478.917 | 0.7973521 | 764.1696 | 933.3177 |
| 186603 | 0.368120 | 373.086 | 0.6578749 | 666.7498 | 855.3995 |
| 189340 | 0.464490 | 442.187 | 0.7035425 | 669.7611 | 891.3955 |
| 190307 | 0.506649 | 612.275 | 0.7081319 | 855.7630 | 850.8067 |
| 191709 | 0.442095 | 502.227 | 0.6644477 | 754.8232 | 832.7711 |
| 192795 | 0.479334 | 474.041 | 0.7219167 | 713.9450 | 898.9505 |
| 194581 | 0.496187 | 495.060 | 0.7171053 | 715.4765 | 897.7241 |
| 194846 | 0.441957 | 453.222 | 0.6665568 | 683.5466 | 856.9878 |
| 195710 | 0.478354 | 491.296 | 0.7138228 | 733.1355 | 918.2233 |

## Calculate cloud coverage from corrected MI

```
padul_cld_corr_mi <- padul2$corr_mi %>%
  purrr::map_dbl(codos::cld)
```

Padul: cloud coverage
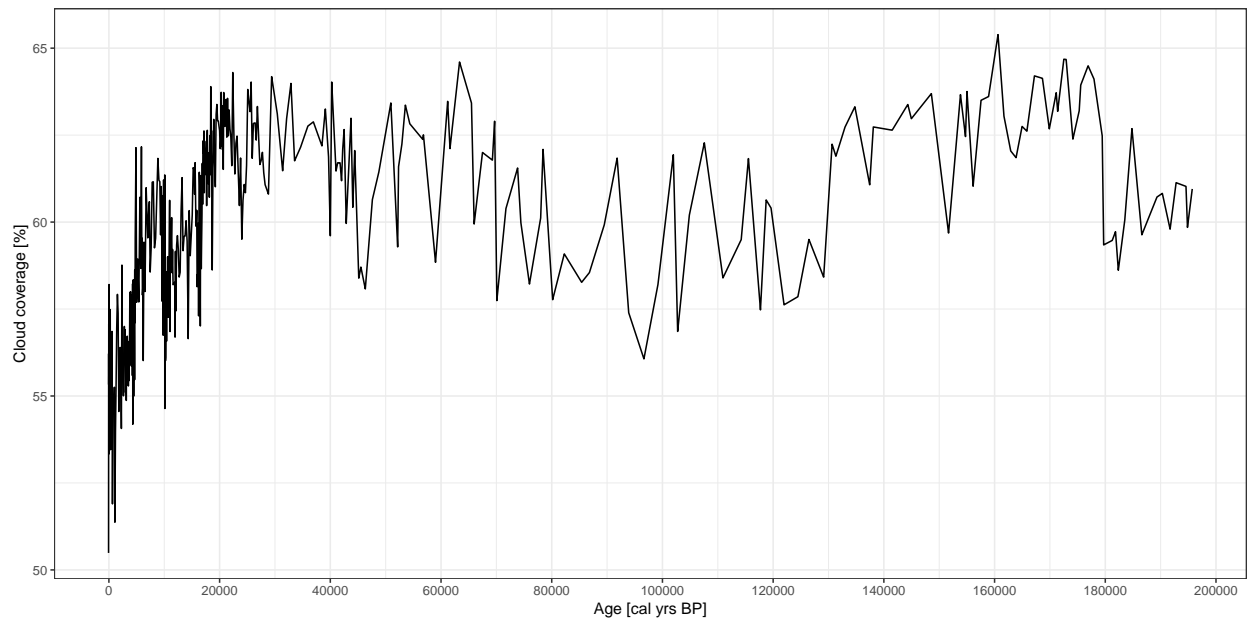


## Calculate cloud coverage anomalies

Rows 5:9 were used as the baseline to calculate the anomalies:

```
padul_cld_anomalies <- seq_len(nrow(padul)) %>%
  purrr::map_dbl(~padul_cld_corr_mi[.x] - ref_pdul_cld_corr_mi)
```
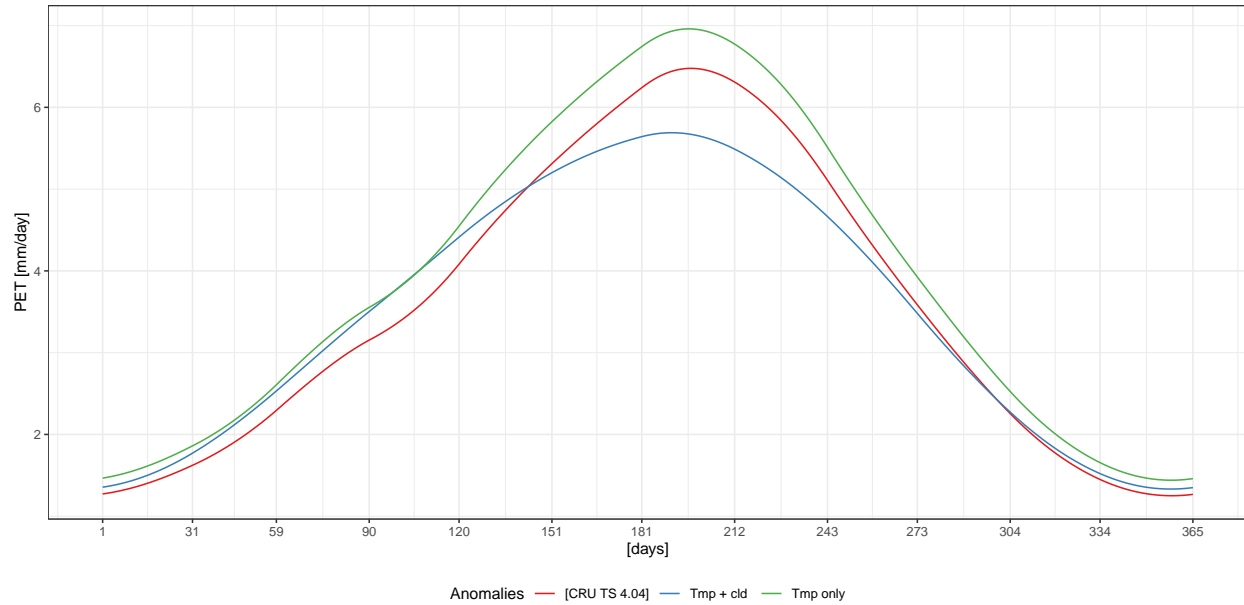
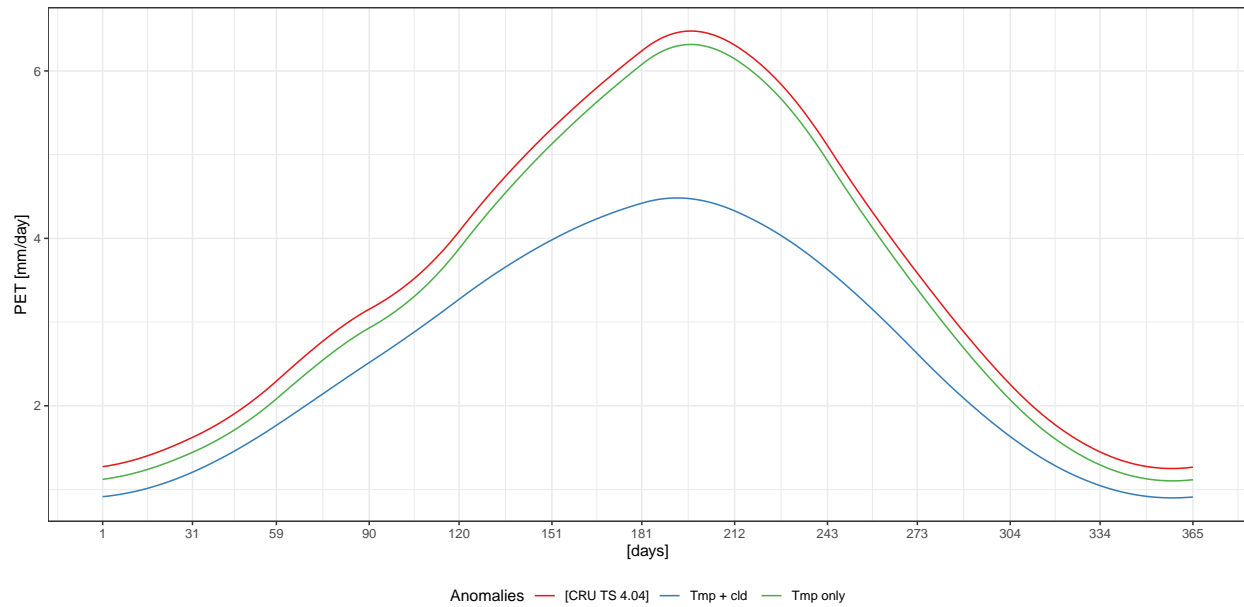Padul: cloud coverage anomalies
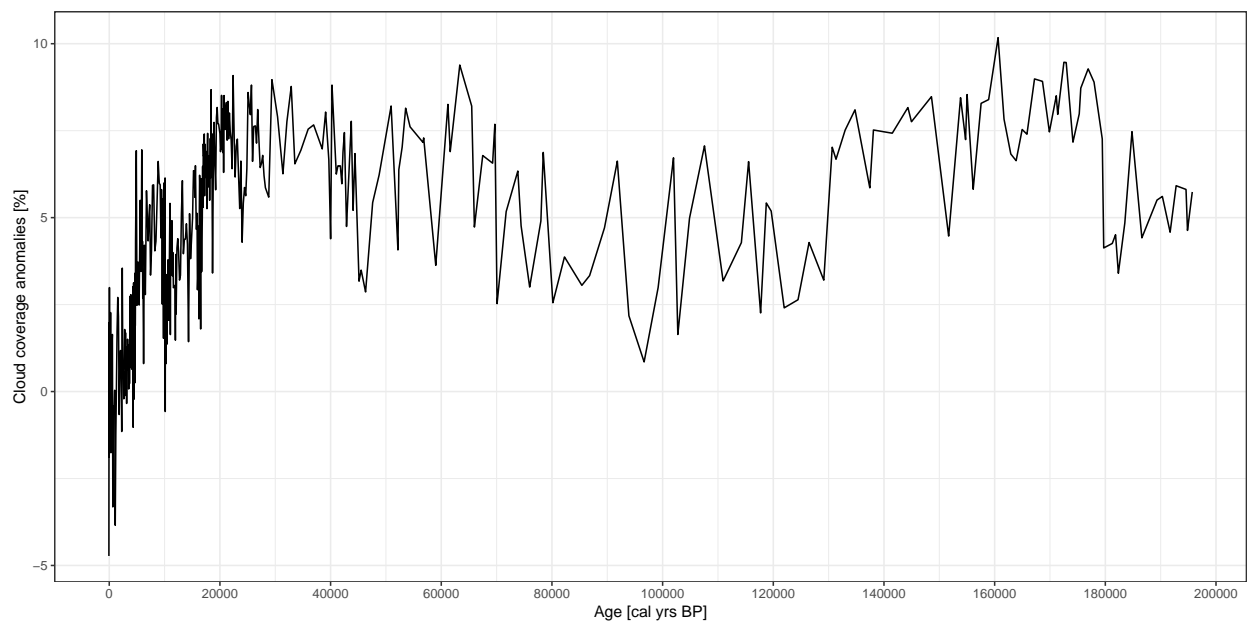
# Re-calculate potential evapotranspiration (PET)

After including temperature and cloud coverage anomalies.

Padul: PET for age = 11044 cal yr BP



Padul: PET for age = 21048 cal yr BP

## Re-calculate corrected precipitation

```
padul_corrected_pr_tmp_cld <- purrr::map_dbl(seq_along(padul_pet_tmp_cld),
                                        ~sum(padul_pet_tmp_cld[.x][[1]], na.rm = TRUE) * padul2$corr_m
```

| age_calBP | past_temp | past_co2 | modern_co2 | present_t | recon_mi | corr_mi | corr_mi_20th | corr_P_ann |
|---:|---:|---:|---:|---:|---:|---:|---:|---:|
| -62 | 13.159180 | 368.020 | 332.165 | 13.159180 | 0.425809 | 0.3760503 | 0.3431377 | 501.7440 |
| -56 | 12.862720 | 368.020 | 332.165 | 12.862720 | 0.471798 | 0.4221168 | 0.3892587 | 540.8058 |
| -50 | 11.884725 | 364.900 | 332.165 | 11.884725 | 0.506921 | 0.4618002 | 0.4293762 | 563.4941 |
| -43 | 13.093390 | 353.835 | 332.165 | 13.093390 | 0.566461 | 0.5349605 | 0.5017009 | 637.6461 |
| -38 | 12.203865 | 346.520 | 332.165 | 12.203865 | 0.528049 | 0.5071343 | 0.4744323 | 605.3804 |
| 10536 | 16.278340 | 267.200 | 332.165 | 16.278340 | 0.464915 | 0.5944398 | 0.5590612 | 729.4027 |
| 10612 | 16.047825 | 267.200 | 332.165 | 16.047825 | 0.503634 | 0.6329369 | 0.5976156 | 757.8803 |
| 10690 | 16.485350 | 266.450 | 332.165 | 16.485350 | 0.448163 | 0.5799109 | 0.5444287 | 720.8101 |
| 10762 | 16.975485 | 266.000 | 332.165 | 16.975485 | 0.435743 | 0.5697970 | 0.5340014 | 719.3037 |
| 10835 | 17.668380 | 265.550 | 332.165 | 17.668380 | 0.473725 | 0.6112194 | 0.5748204 | 762.3534 |
| 10904 | 15.477845 | 266.350 | 332.165 | 15.477845 | 0.524962 | 0.6551124 | 0.6201108 | 766.3145 |
| 10972 | 15.780770 | 266.200 | 332.165 | 15.780770 | 0.567718 | 0.6994033 | 0.6640917 | 805.0895 |
| 11044 | 17.062450 | 266.200 | 332.165 | 17.062450 | 0.422194 | 0.5558514 | 0.5200306 | 708.9038 |
| 11113 | 14.071460 | 264.800 | 332.165 | 14.071460 | 0.541849 | 0.6724900 | 0.6383245 | 758.6485 |
| 11187 | 16.074465 | 265.150 | 332.165 | 16.074465 | 0.490152 | 0.6244483 | 0.5891307 | 750.8110 |
| 11258 | 17.405490 | 264.400 | 332.165 | 17.405490 | 0.513015 | 0.6530975 | 0.6167806 | 793.2736 |
| 21048 | 9.612870 | 189.635 | 332.165 | 9.612870 | 0.481180 | 0.8279965 | 0.7958570 | 791.1298 |
| 21173 | 10.006380 | 189.225 | 332.165 | 10.006380 | 0.491841 | 0.8428854 | 0.8105213 | 805.6655 |
| 21301 | 10.426695 | 188.645 | 332.165 | 10.426695 | 0.430404 | 0.7847575 | 0.7523211 | 776.3929 |
| 21433 | 8.329884 | 186.235 | 332.165 | 8.329884 | 0.490850 | 0.8447231 | 0.8131384 | 775.4738 |
| 21574 | 11.400080 | 186.595 | 332.165 | 11.400080 | 0.417916 | 0.7867560 | 0.7538175 | 796.3104 |
| 21716 | 10.645230 | 186.595 | 332.165 | 10.645230 | 0.460863 | 0.8260434 | 0.7934012 | 807.4676 |
| 21866 | 8.680892 | 189.370 | 332.165 | 8.680892 | 0.455234 | 0.7973083 | 0.7656732 | 755.0654 |
| 22031 | 10.720585 | 189.080 | 332.165 | 10.720585 | 0.430449 | 0.7847587 | 0.7521747 | 781.9255 |
| 22197 | 9.247492 | 191.270 | 332.165 | 9.247492 | 0.408191 | 0.7445416 | 0.7127664 | 731.7950 |

# PET with orbital parameters

## Find orbital parameters

Selected samples and their orbital parameters:

| year | eps | ecc | varpi | epsp |
|-------:|----------:|-----------:|-----------:|----------:|
| -62 | 23.43821 | 0.0166988 | 283.10107 | 0.4211302 |
| -56 | 23.43899 | 0.0167012 | 282.99828 | 0.4211293 |
| -50 | 23.43977 | 0.0167037 | 282.89549 | 0.4211284 |
| -43 | 23.44068 | 0.0167065 | 282.77558 | 0.4211273 |
| 6007 | 24.10588 | 0.0186835 | 180.75324 | 0.4138745 |
| 11044 | 24.19953 | 0.0195329 | 97.68662 | 0.4016794 |
| 21048 | 22.94125 | 0.0189846 | 293.63418 | 0.3900594 |
| 195710 | 22.62131 | 0.0480977 | 129.31171 | 0.4176410 |
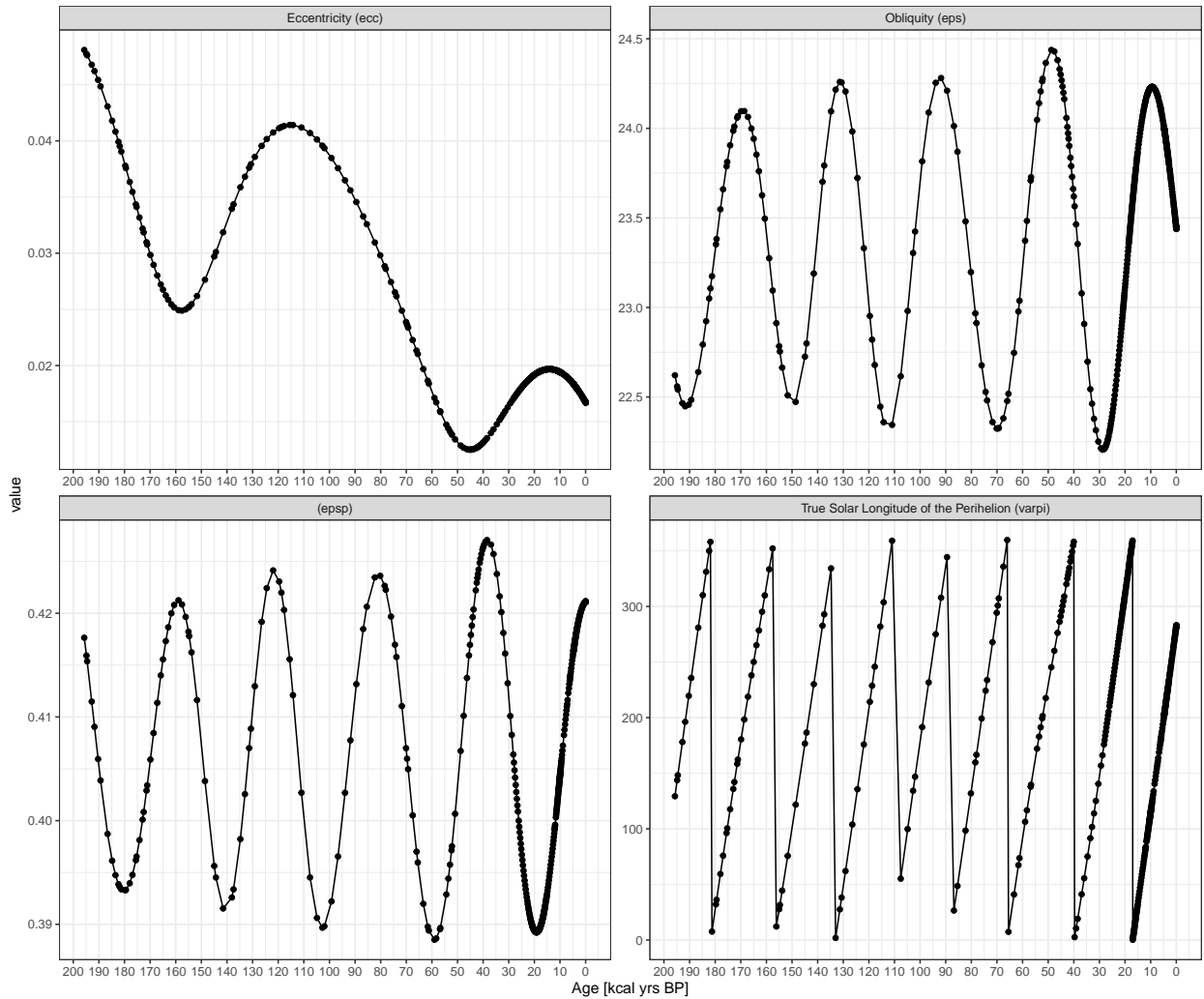
# Plots

## Modern PET

Obtained from CRU TS 4.04
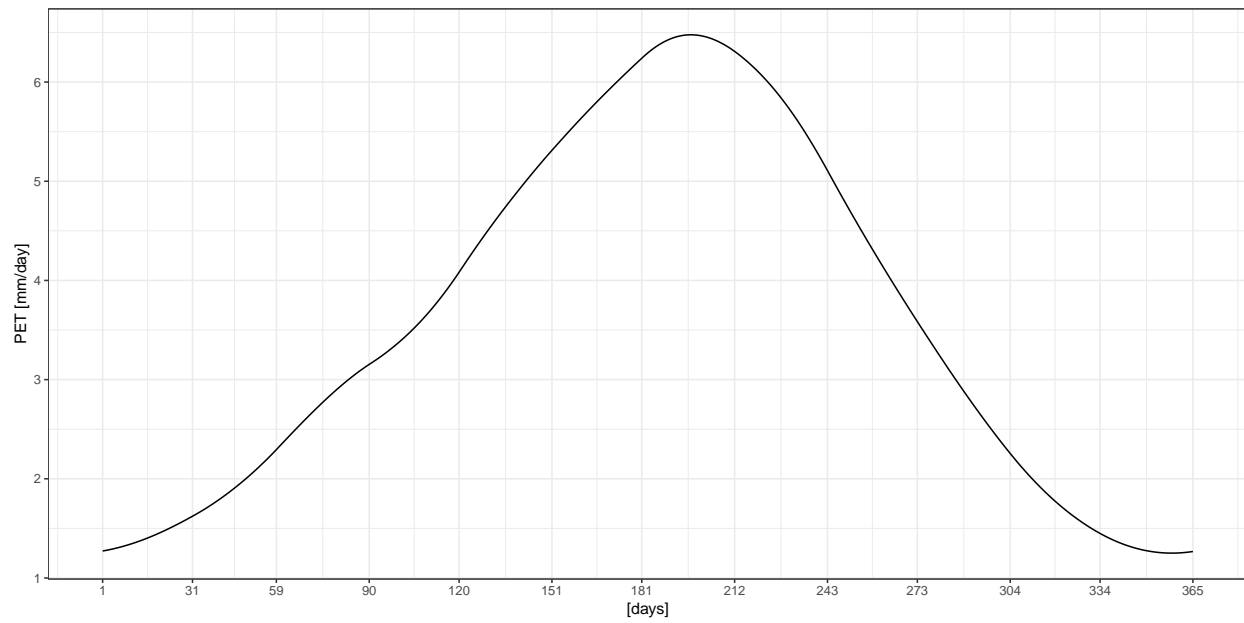


## PET changes

Padul: PET for age = -62 cal yr BP
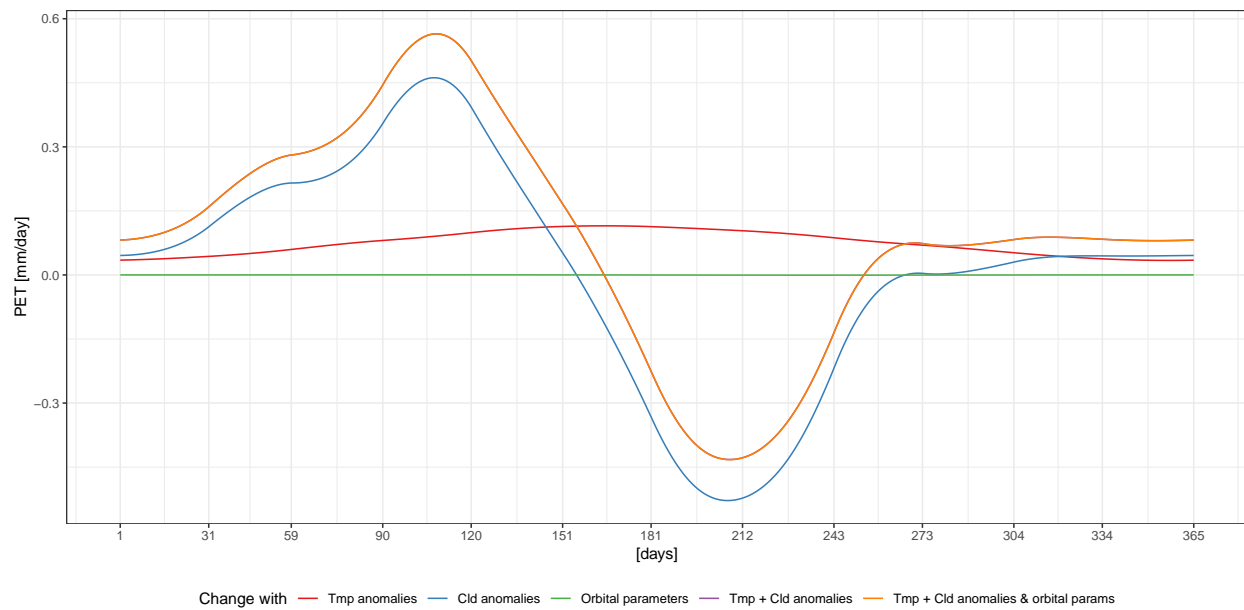
Padul: PET for age = 11044 cal yr BP
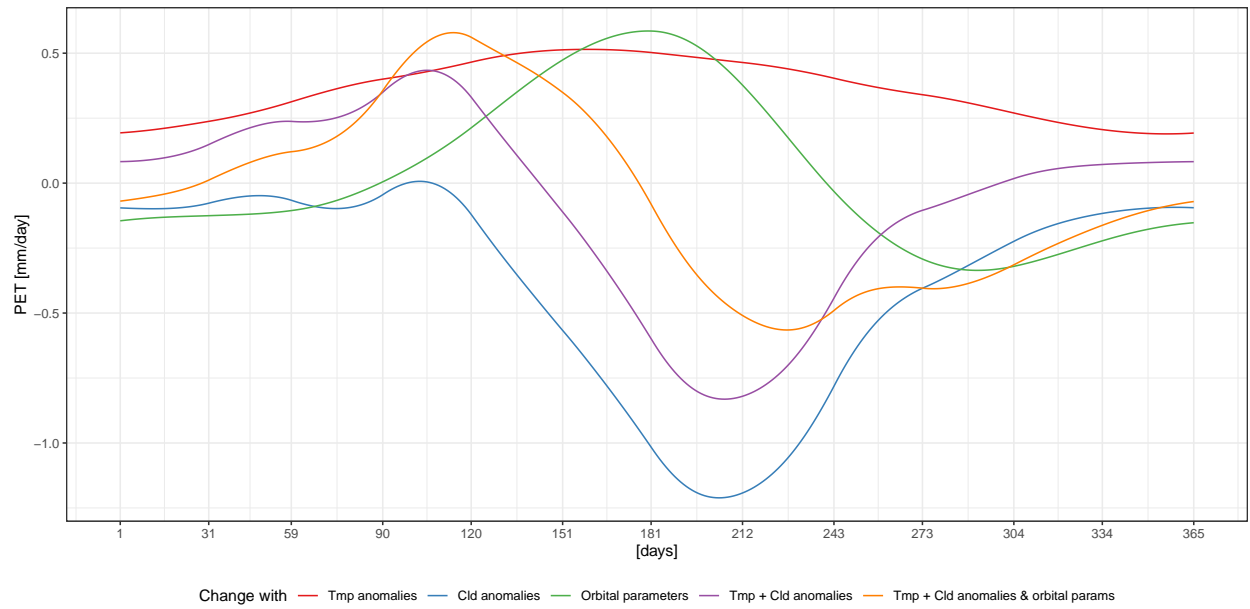


Padul: PET for age = 21048 cal yr BP
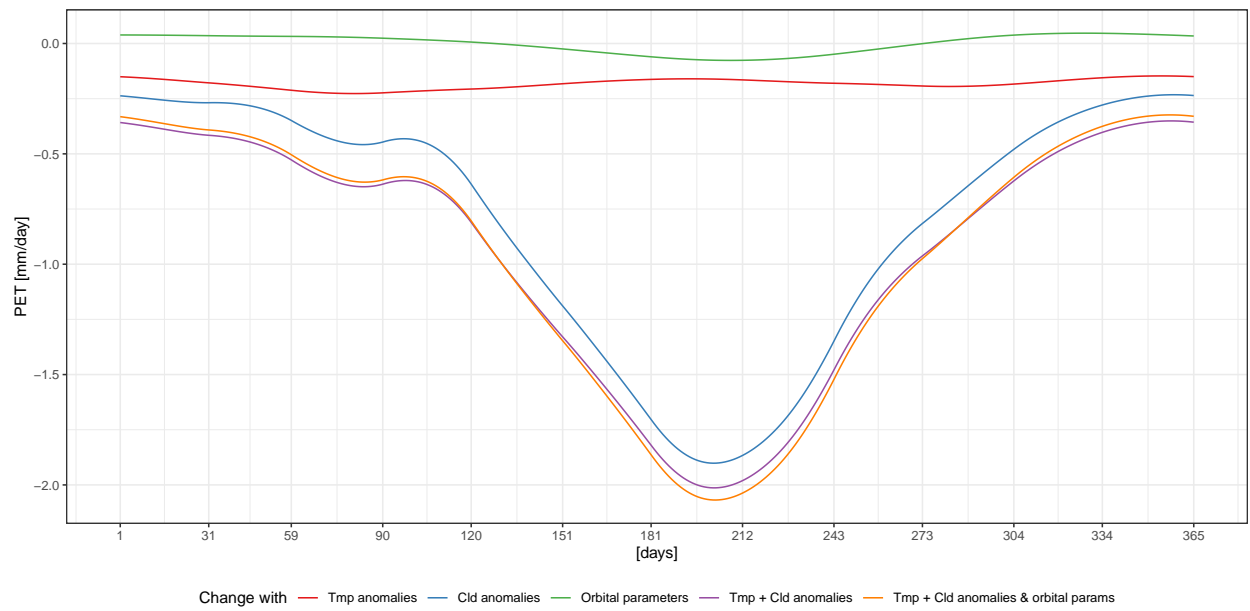
**Reconstructed vs corrected `MI`: Past CO2 calculated using `mean`**
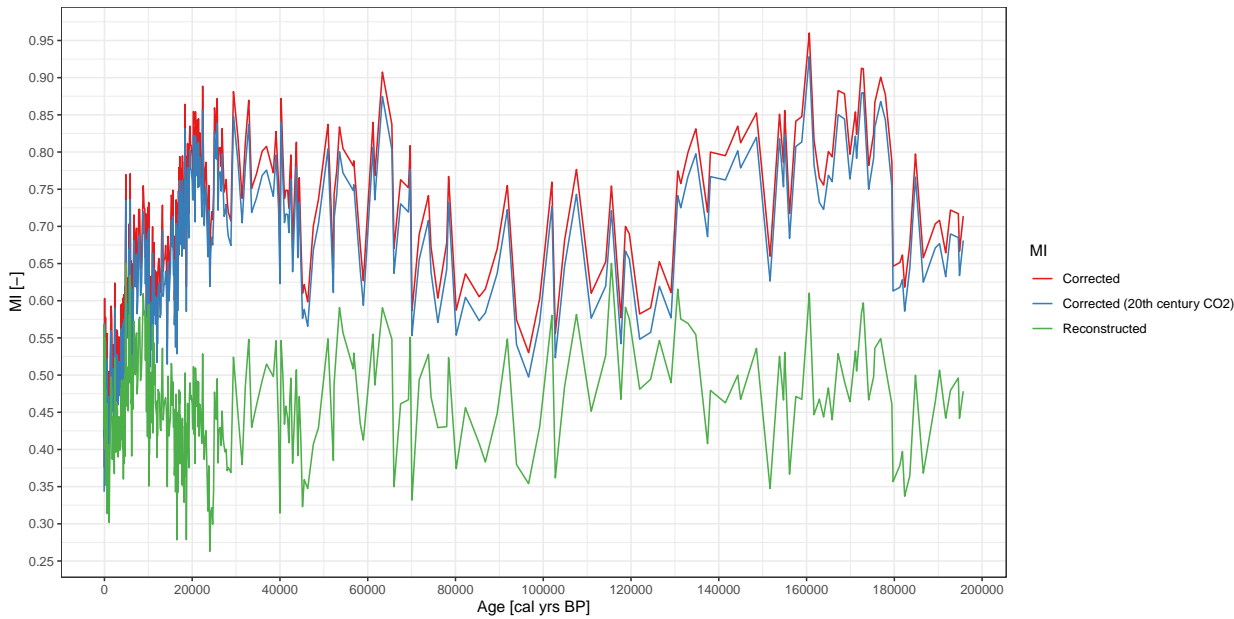


- age < 5k
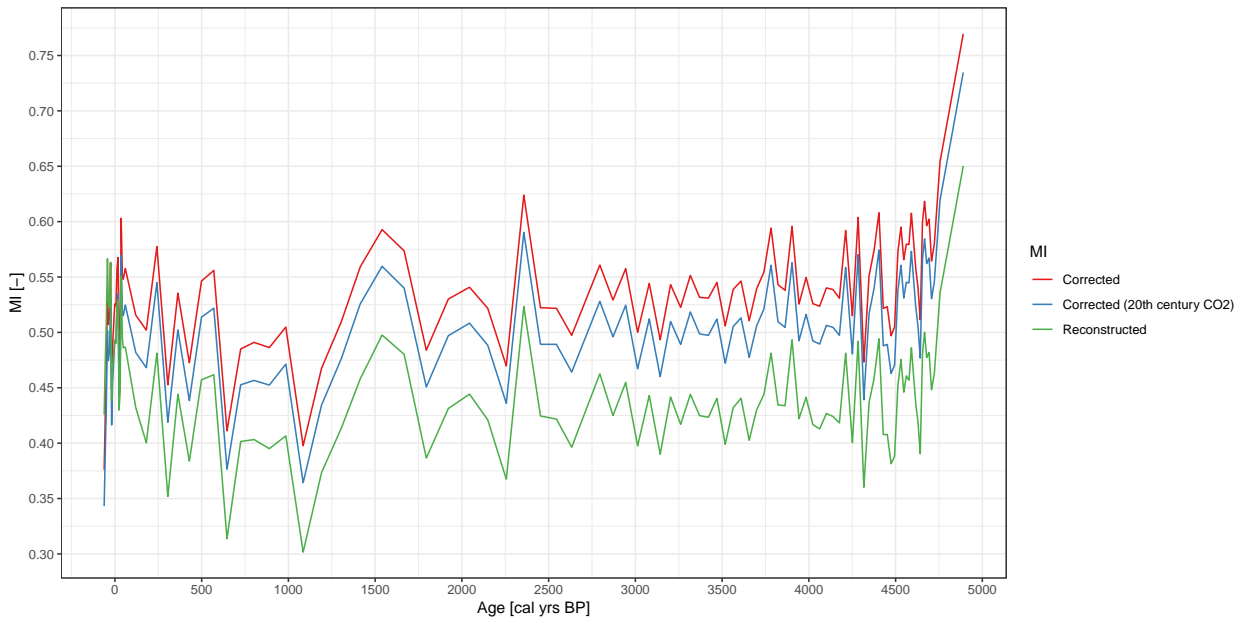
# Include past CO2 and Temperature
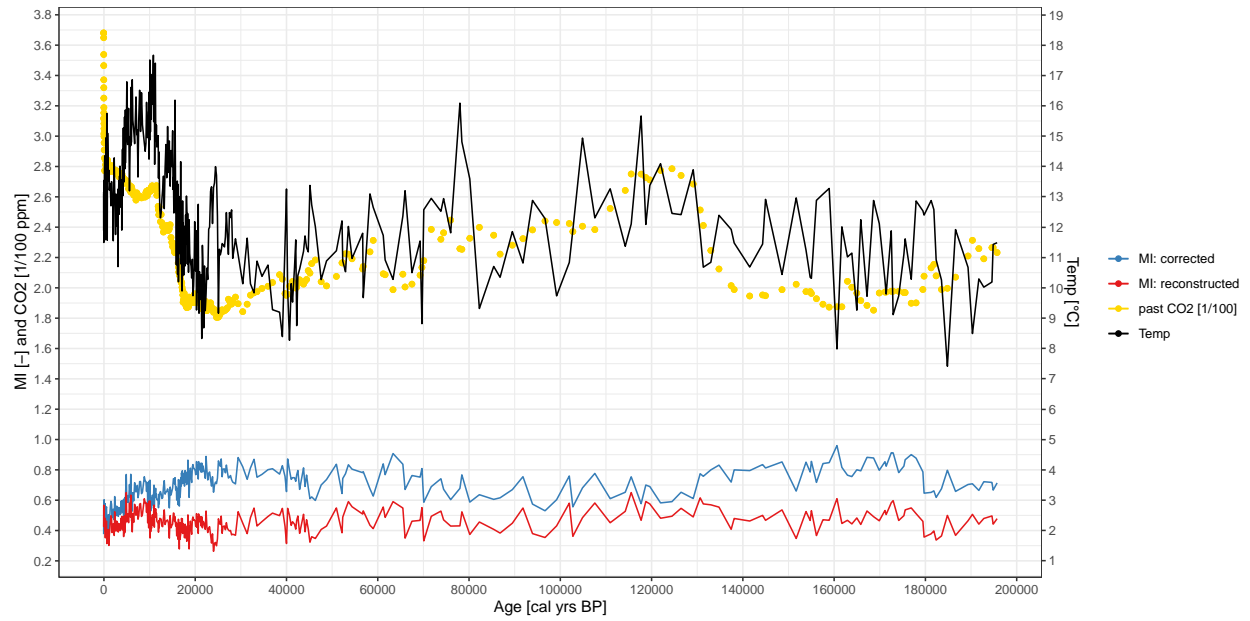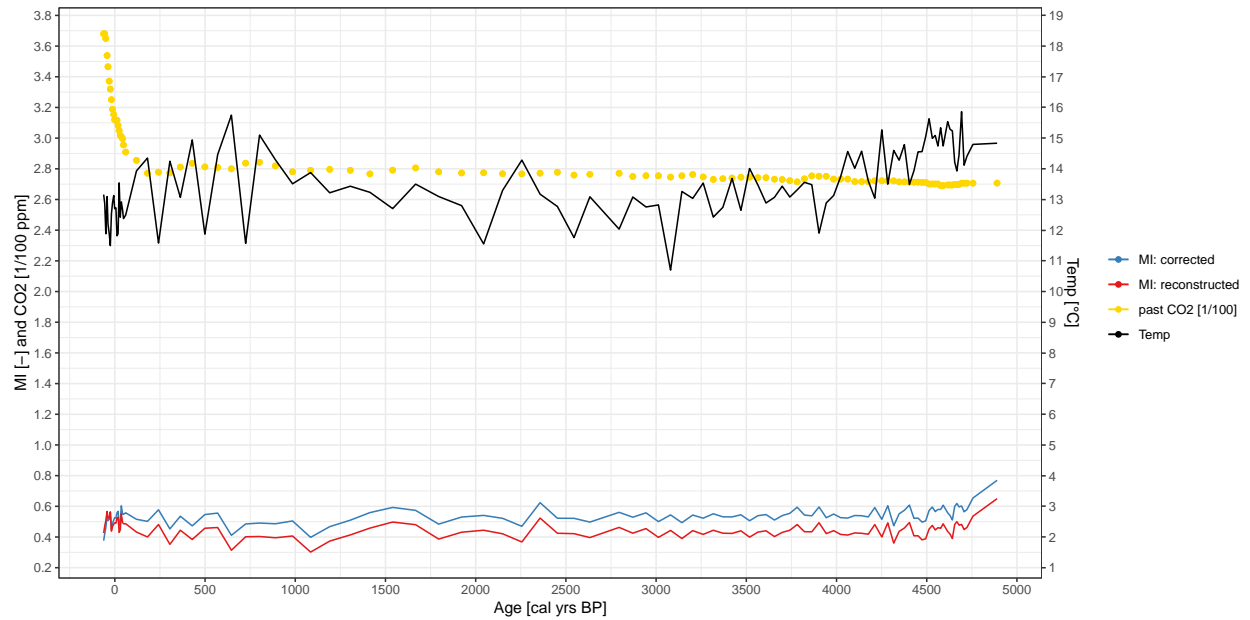


- age < 5k

**Reconstructed vs corrected `P_ann`: Past CO2 calculated using `mean`**

**With MI ratio**
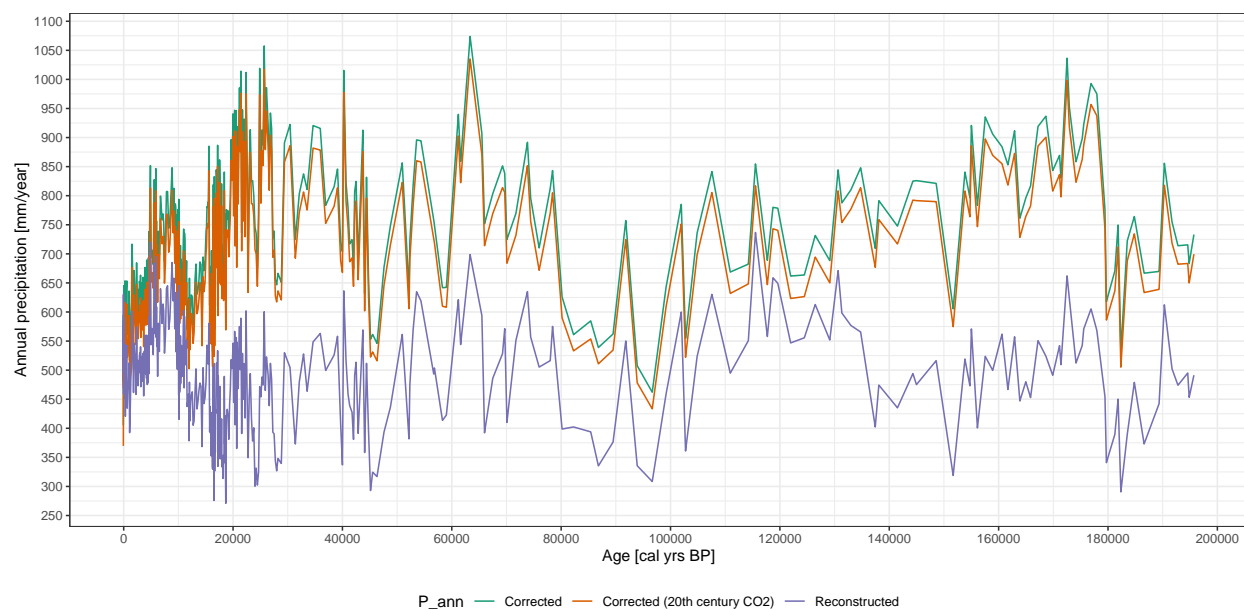


- `age < 5k`
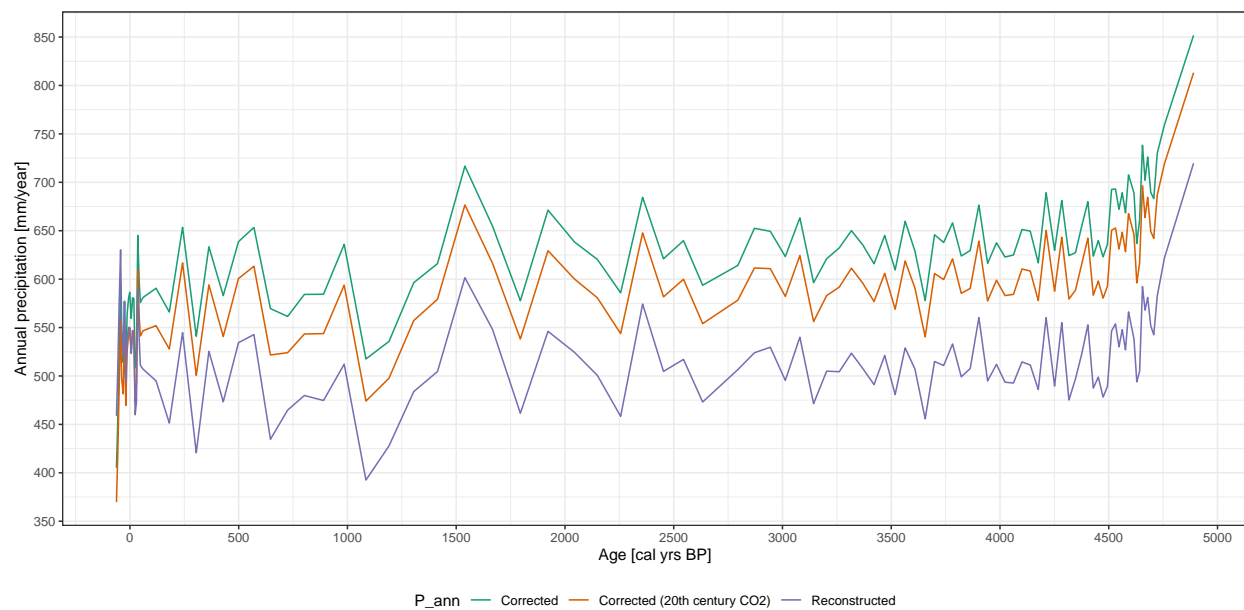
**With temperature anomalies**
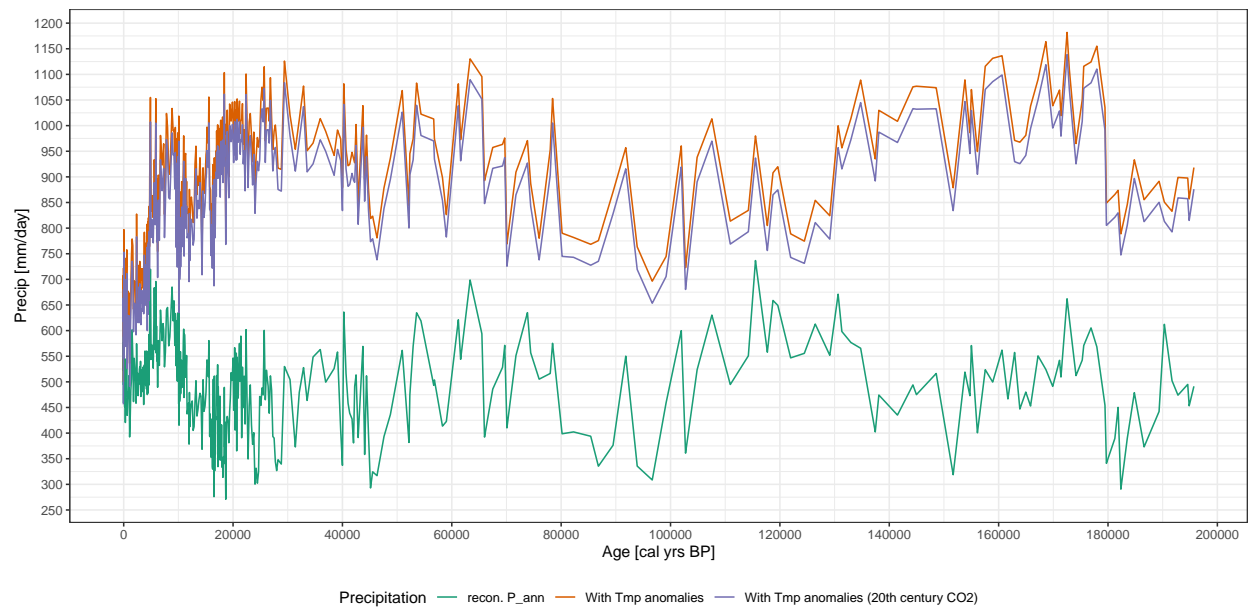


**age < 22k**
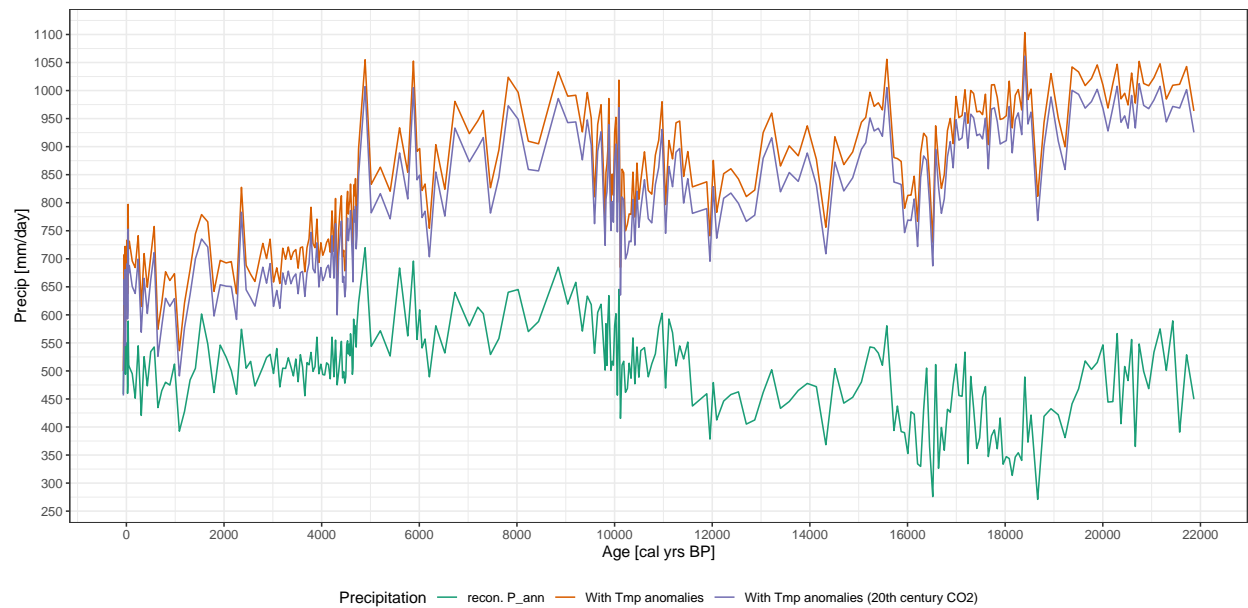
**With cloud coverage anomalies**
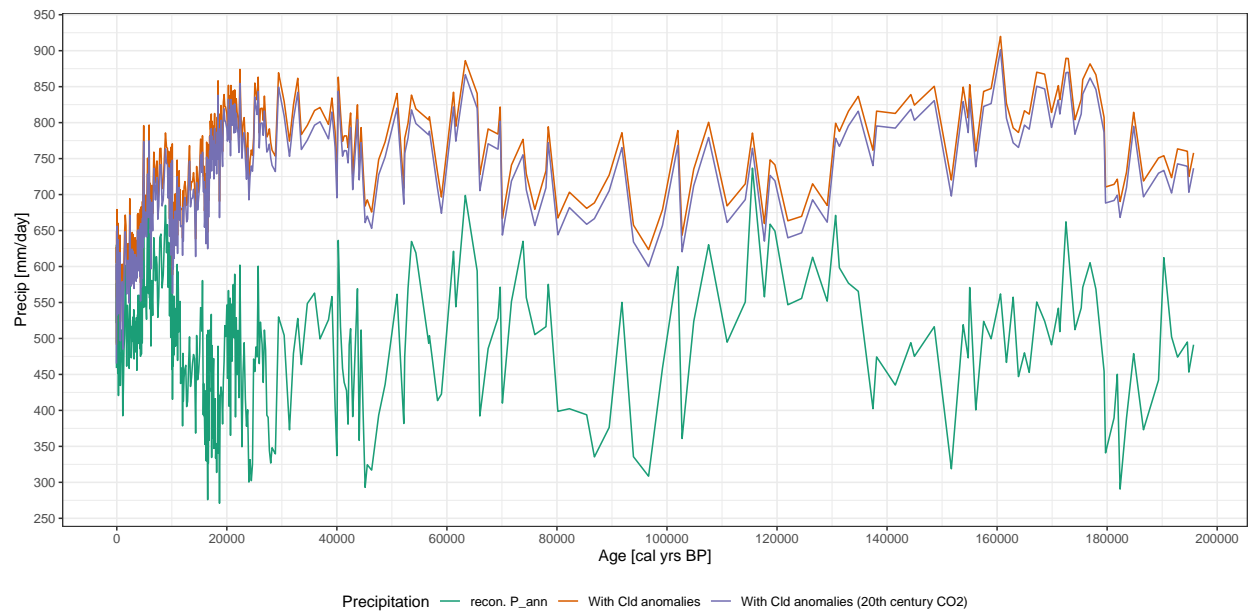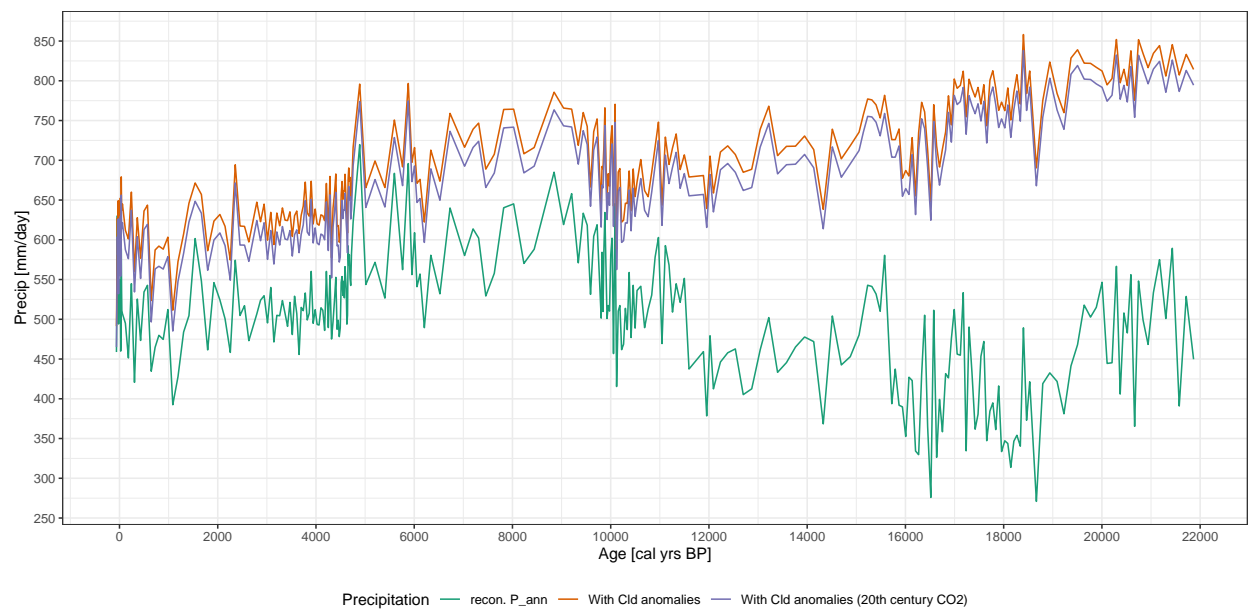


**age < 22k**

## With orbital parameters
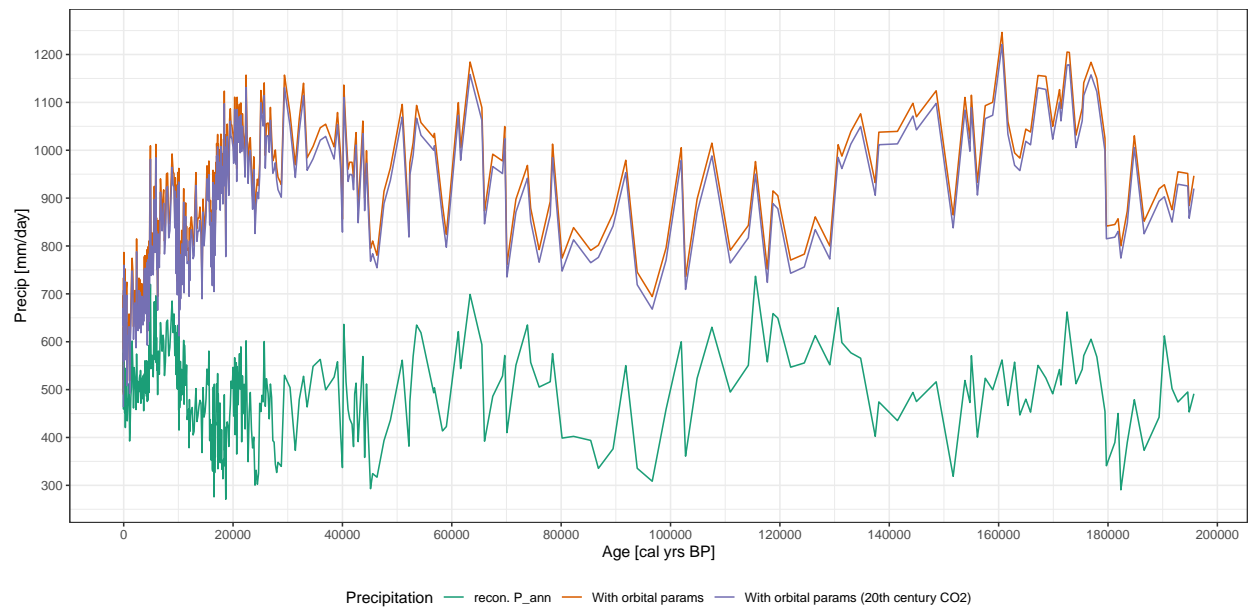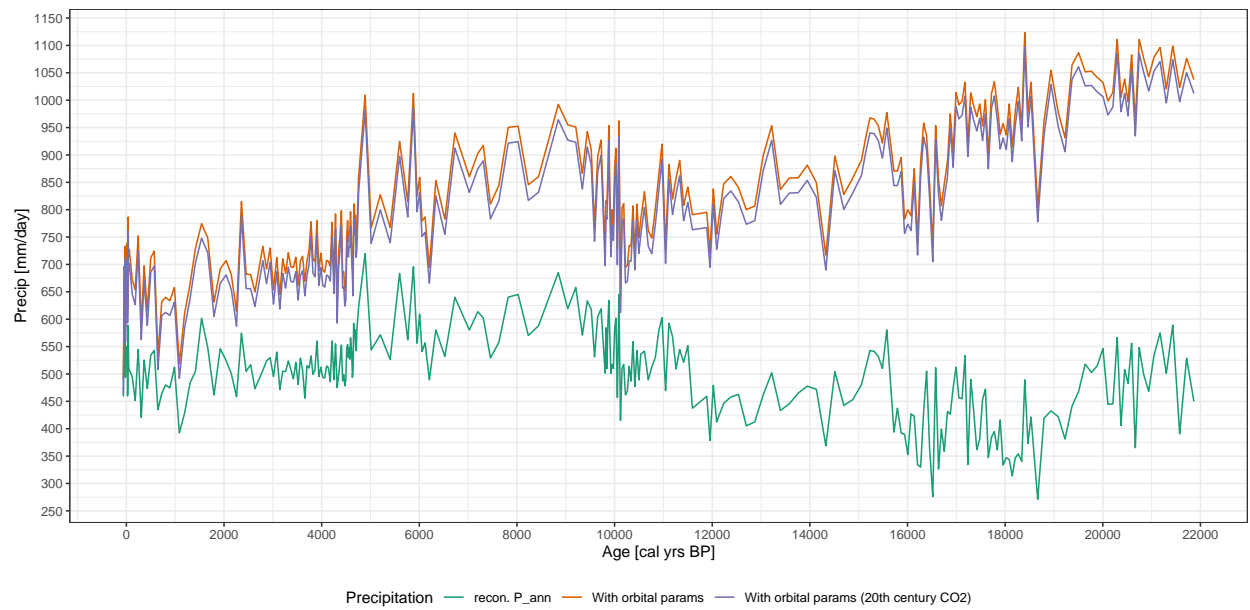


## age < 22k

**With temperature and cloud coverage anomalies**
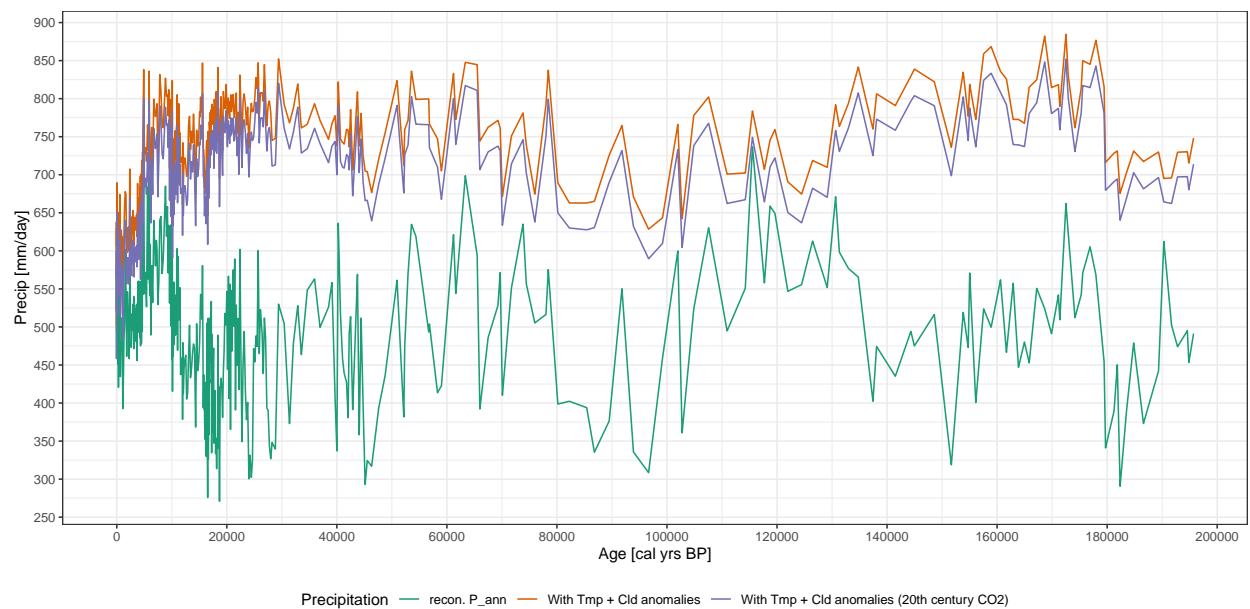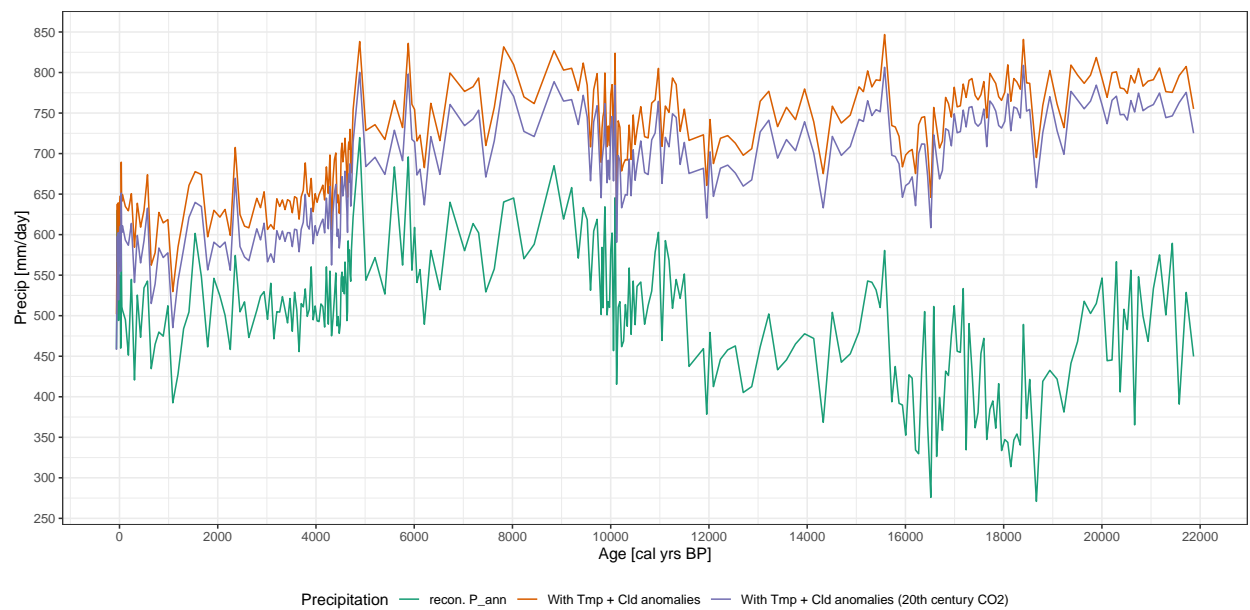


**age < 22k**

**With temperature and cloud coverage anomalies and orbital parameters**
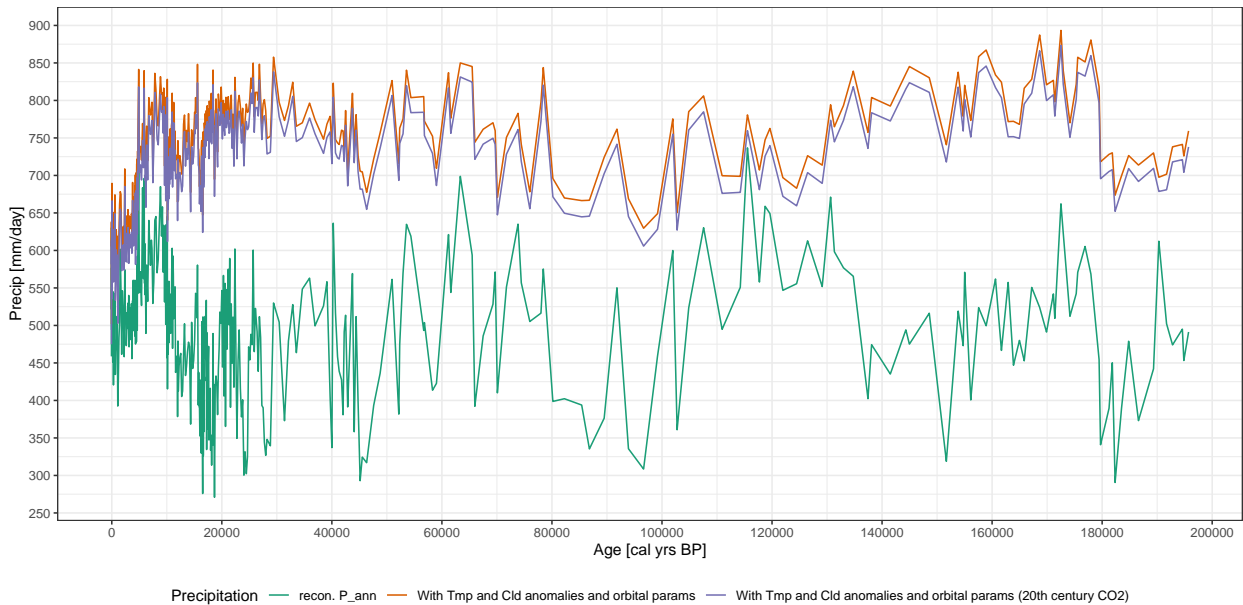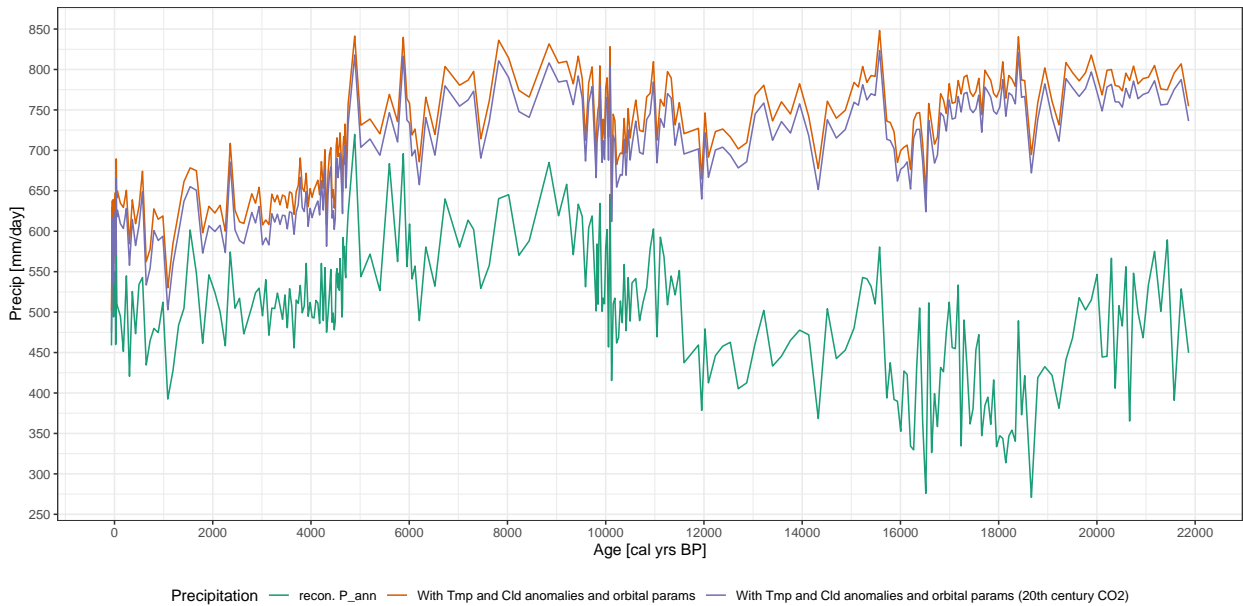


**age < 22k**

# All the approaches
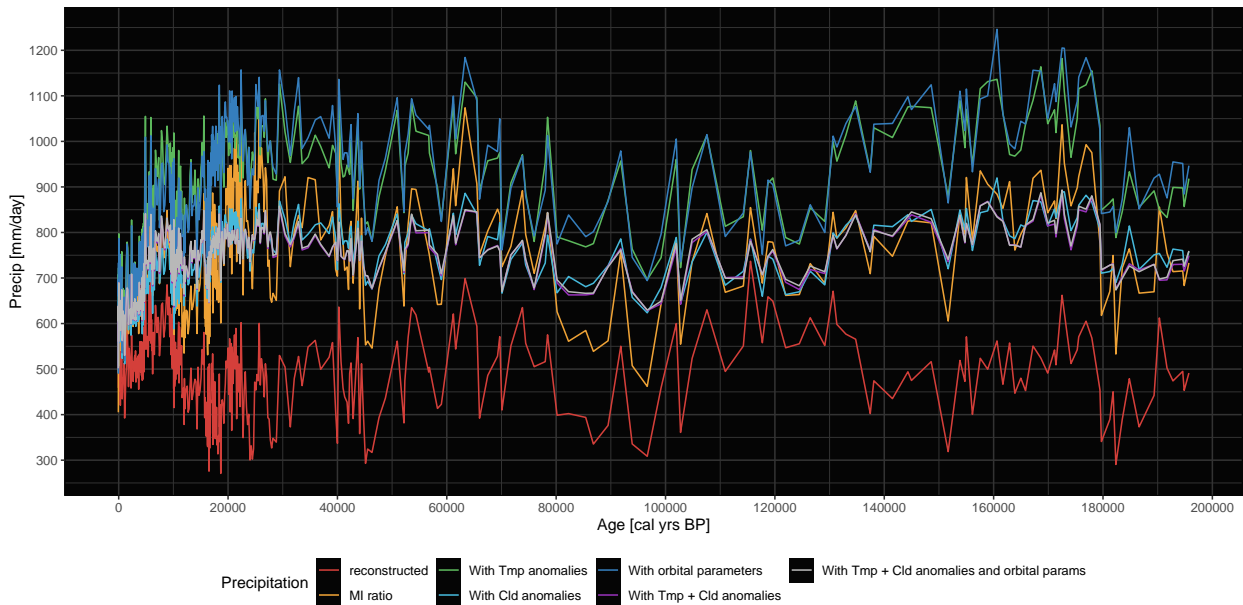


# age < 22k
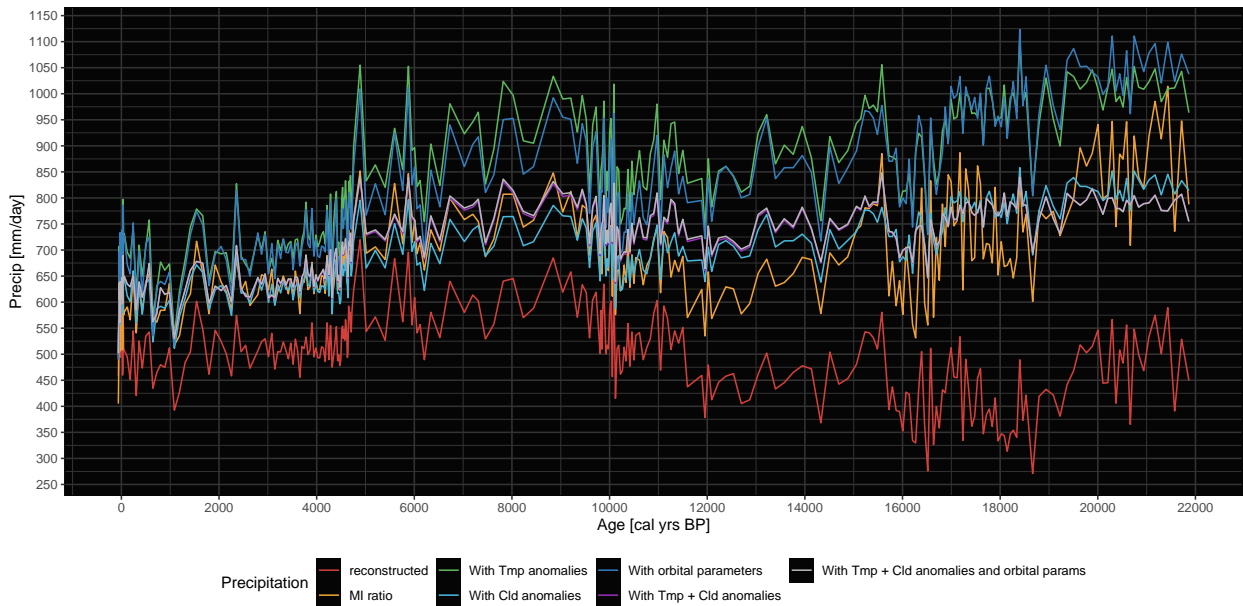
## 20th century CO2
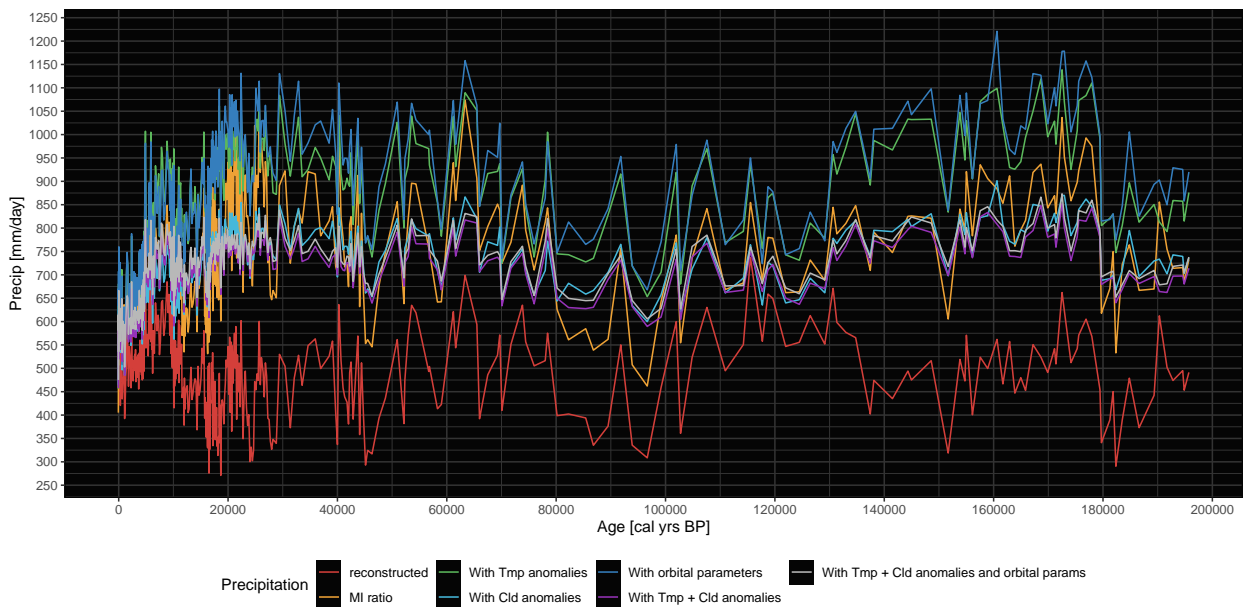


## age < 22k
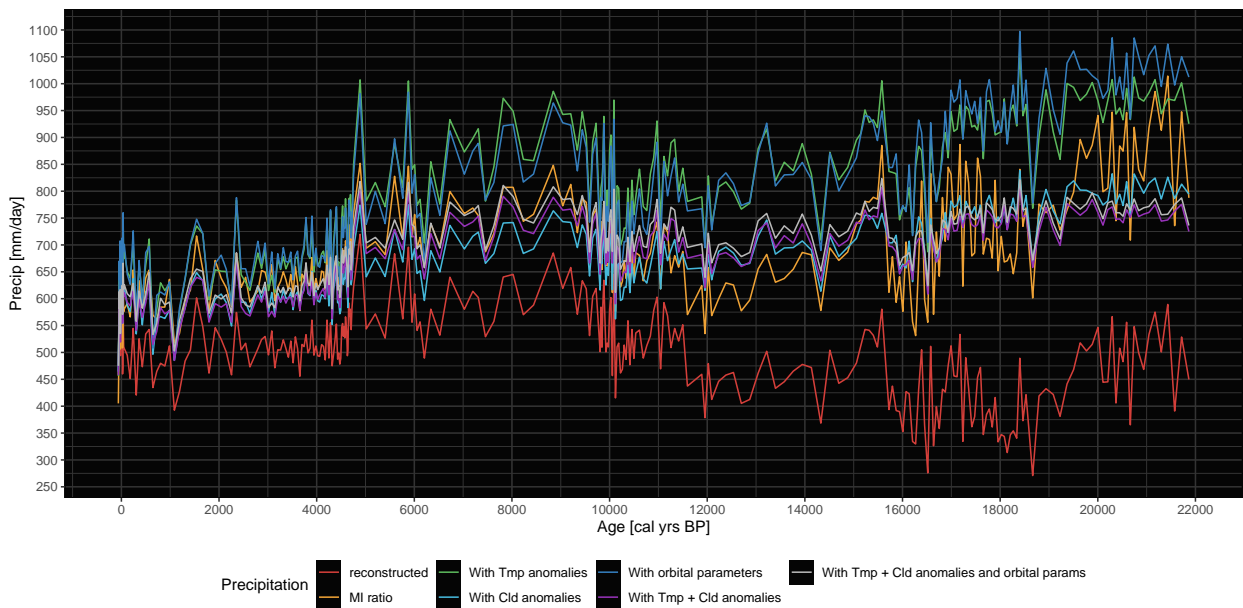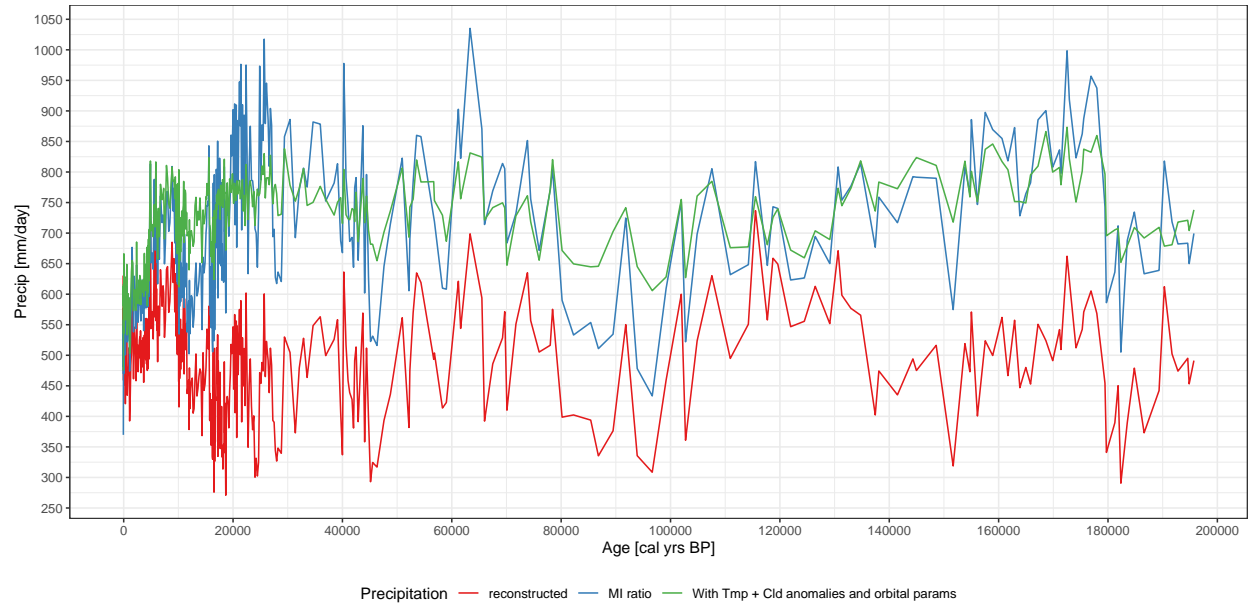
**age < 22k**
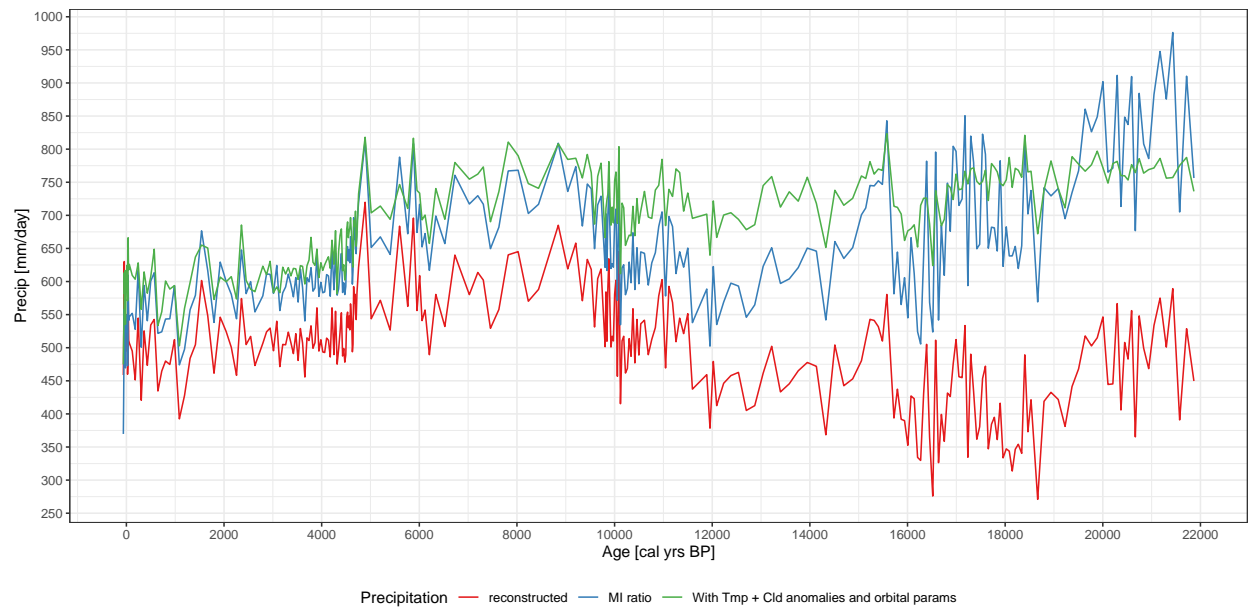


# References

[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`

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

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


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

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

| age_calBP | past_temp | modern_co2 | present_t | recon_mi | corr_mi_20th | corr_P_ann_20th | past_co2_loess |
|---:|---:|---:|---:|---:|---:|---:|---:|
| -62 | 13.15918 | 332.165 | 13.15918 | 0.425809 | 0.3431377 | 369.7292 | 368.0200 |
| -56 | 12.86272 | 332.165 | 12.86272 | 0.471798 | 0.3892587 | 417.9903 | 368.0200 |
| -50 | 11.88472 | 332.165 | 11.88472 | 0.506921 | 0.4293762 | 483.2929 | 348.5771 |
| -43 | 13.09339 | 332.165 | 13.09339 | 0.566461 | 0.5017009 | 558.1636 | 343.4588 |
| -38 | 12.20387 | 332.165 | 12.20387 | 0.528049 | 0.4744323 | 497.1948 | 339.9523 |
| -31 | 11.87980 | 332.165 | 11.87980 | 0.522880 | 0.4829125 | 481.5272 | 335.2524 |
| -25 | 11.49567 | 332.165 | 11.49567 | 0.562884 | 0.5307318 | 543.8519 | 331.4182 |
| -19 | 12.52563 | 332.165 | 12.52563 | 0.438233 | 0.4164441 | 469.5524 | 327.7633 |
| -13 | 12.88969 | 332.165 | 12.88969 | 0.468382 | 0.4564923 | 525.6344 | 324.2577 |
| -6 | 13.13016 | 332.165 | 13.13016 | 0.483879 | 0.4777764 | 543.2284 | 320.3318 |

# A2. Plot reconstructed vs corrected `MI` both approaches
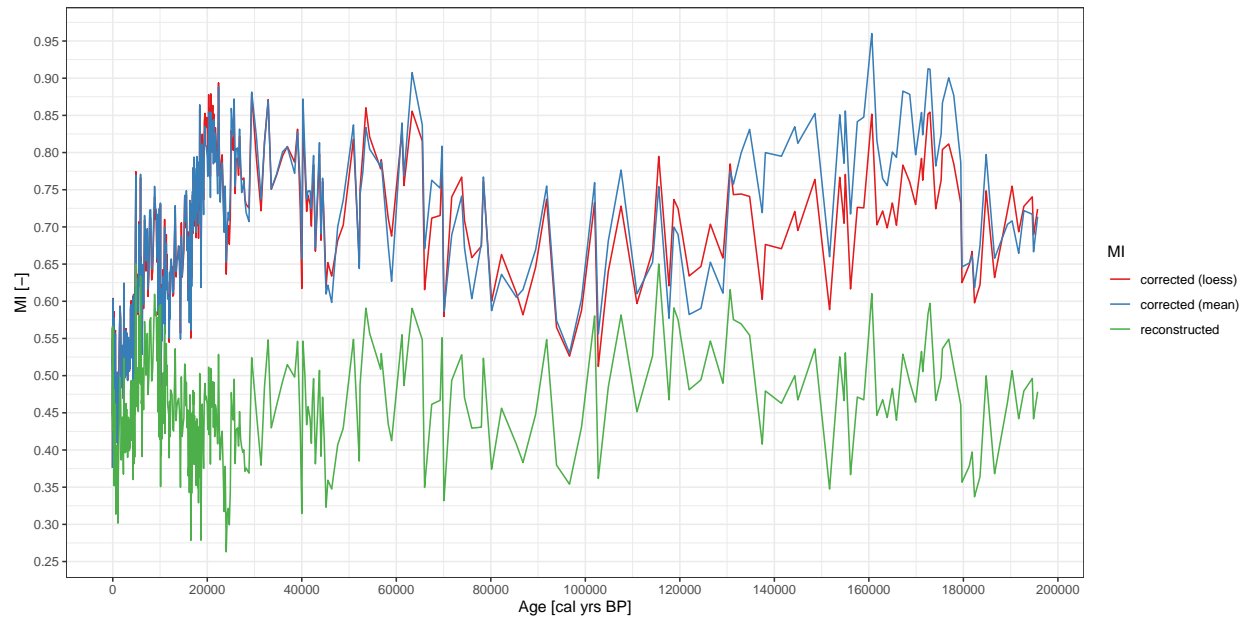


- `age < 5k`

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

**Include past CO2 and Temperature**
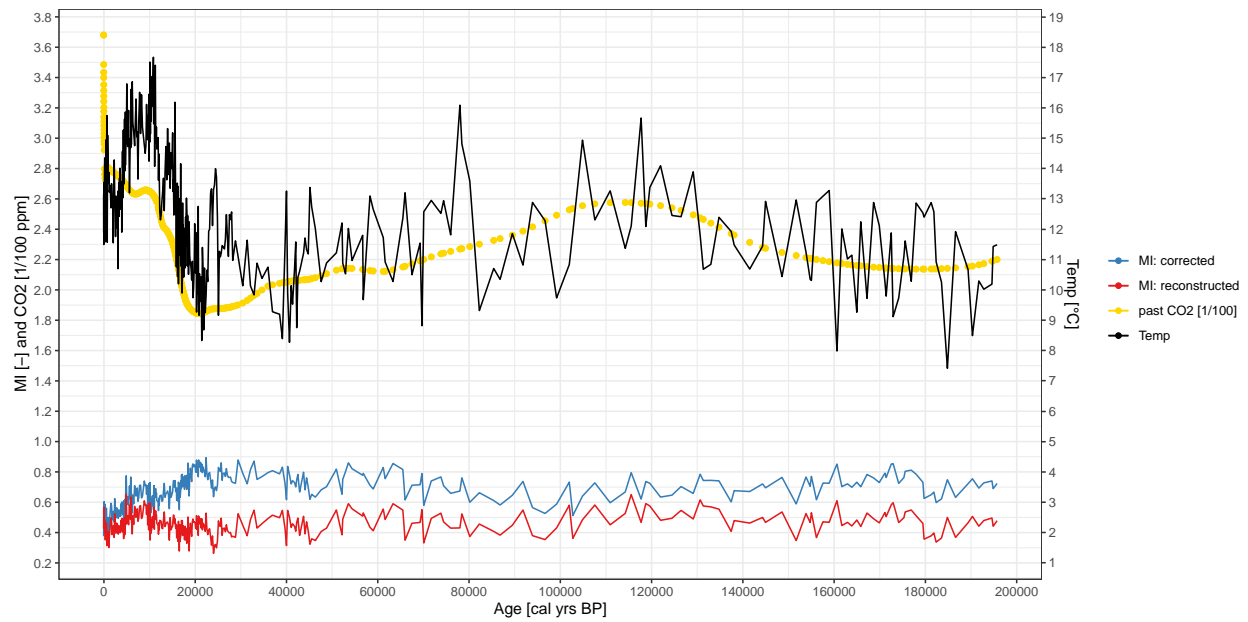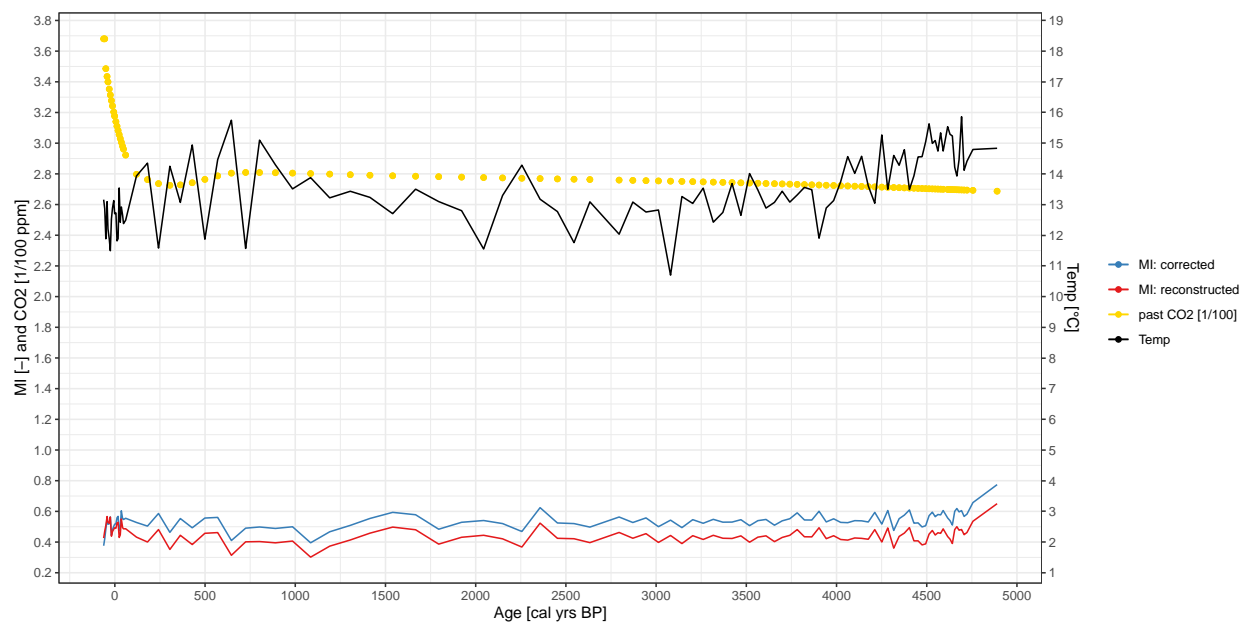


- `age < 5k`

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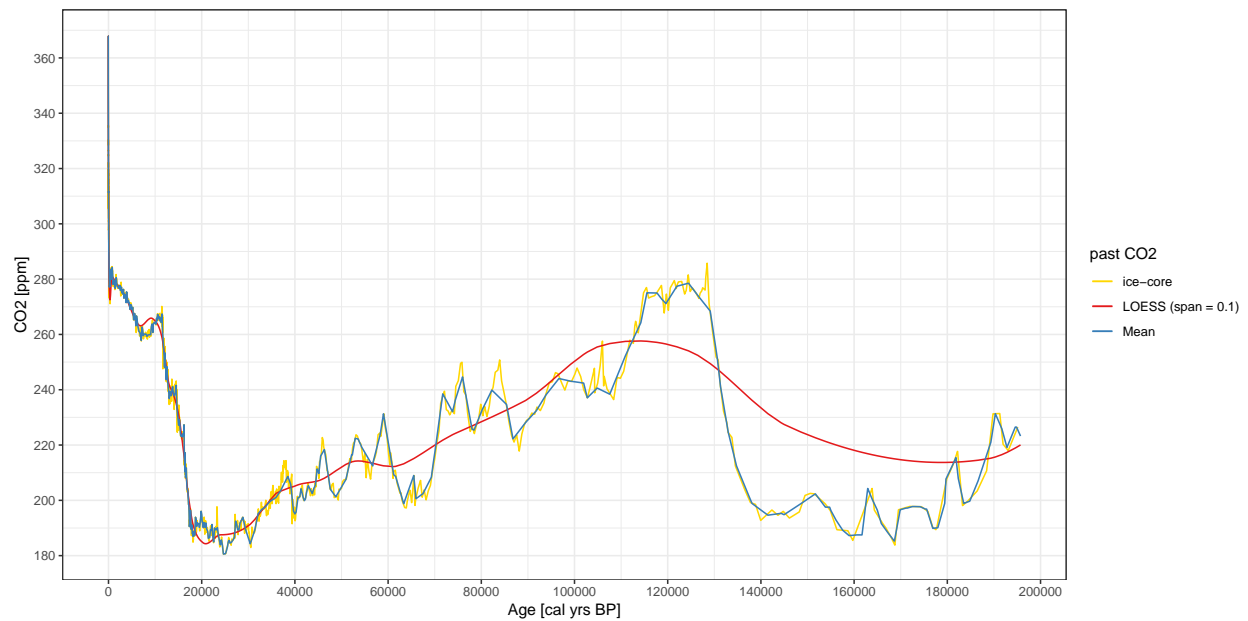


- `age < 5k`
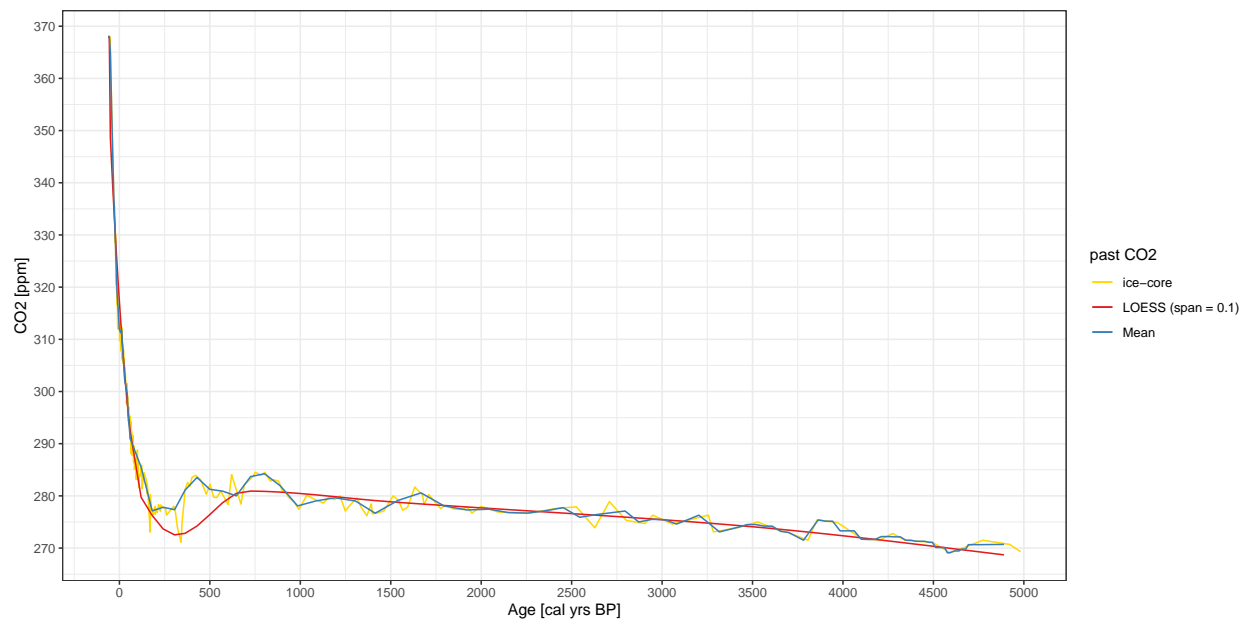
- `age < 500`
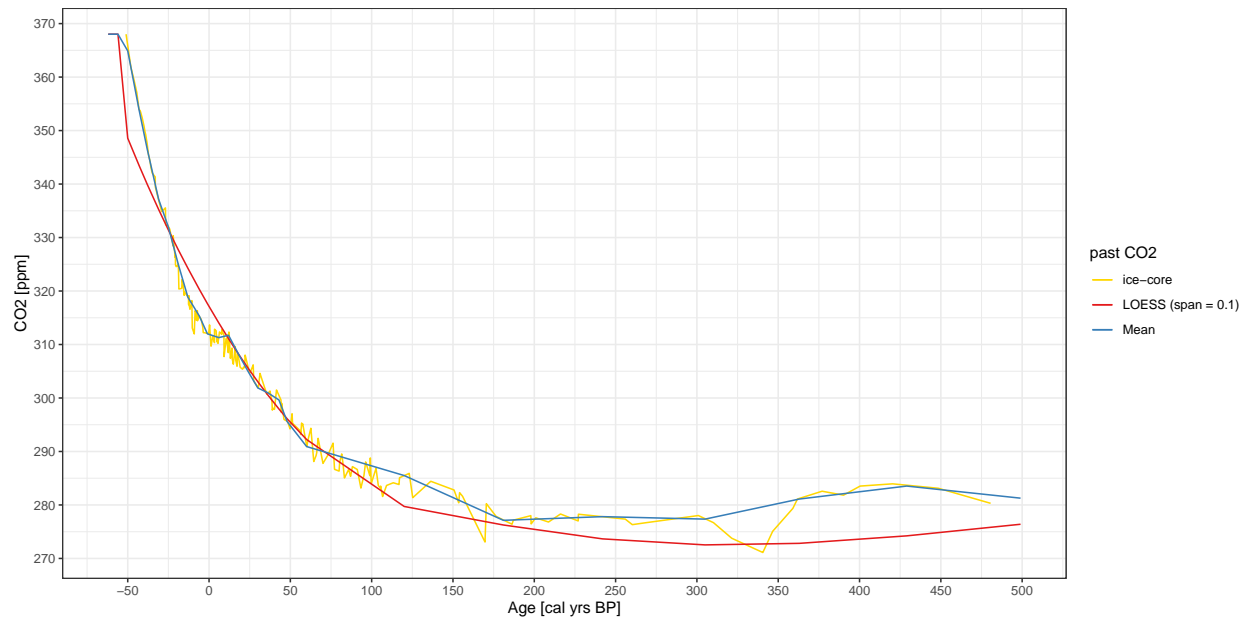
## A5. Padul Data

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

| age_calBP | past_temp | past_co2 | modern_co2 | present_t | recon_mi | corr_mi | corr_mi_20th | corr_P_ann |
|---|---|---|---|---|---|---|---|---|
| -62 | 13.159180 | 368.020 | 332.165 | 13.159180 | 0.425809 | 0.3760503 | 0.3431377 | 405.1922 |
| -56 | 12.862720 | 368.020 | 332.165 | 12.862720 | 0.471798 | 0.4221168 | 0.3892587 | 453.2738 |
| -50 | 11.884725 | 364.900 | 332.165 | 11.884725 | 0.506921 | 0.4618002 | 0.4293762 | 519.7884 |
| -43 | 13.093390 | 353.835 | 332.165 | 13.093390 | 0.566461 | 0.5349605 | 0.5017009 | 595.1664 |
| -38 | 12.203865 | 346.520 | 332.165 | 12.203865 | 0.528049 | 0.5071343 | 0.4744323 | 531.4658 |
| -31 | 11.879800 | 337.155 | 332.165 | 11.879800 | 0.522880 | 0.5154614 | 0.4829125 | 513.9827 |
| -25 | 11.495670 | 331.960 | 332.165 | 11.495670 | 0.562884 | 0.5631923 | 0.5307318 | 577.1149 |
| -19 | 12.525630 | 325.080 | 332.165 | 12.525630 | 0.438233 | 0.4491819 | 0.4164441 | 506.4652 |
| -13 | 12.889695 | 318.840 | 332.165 | 12.889695 | 0.468382 | 0.4895278 | 0.4564923 | 563.6737 |
| -6 | 13.130160 | 315.340 | 332.165 | 13.130160 | 0.483879 | 0.5109989 | 0.4777764 | 581.0022 |
| -1 | 12.701260 | 312.000 | 332.165 | 12.701260 | 0.493117 | 0.5257325 | 0.4927145 | 586.4396 |
| 6 | 12.724970 | 311.290 | 332.165 | 12.724970 | 0.490124 | 0.5239663 | 0.4909395 | 559.4694 |
| 12 | 11.815300 | 311.730 | 332.165 | 11.815300 | 0.524648 | 0.5573214 | 0.5247072 | 580.8020 |
| 18 | 11.888230 | 308.260 | 332.165 | 11.888230 | 0.528909 | 0.5675918 | 0.5349146 | 579.8192 |
| 24 | 13.540305 | 304.970 | 332.165 | 13.540305 | 0.429877 | 0.4752556 | 0.4418854 | 508.5506 |
| 30 | 12.423860 | 301.880 | 332.165 | 12.423860 | 0.446556 | 0.4966752 | 0.4638791 | 526.5220 |
| 36 | 12.921615 | 301.000 | 332.165 | 12.921615 | 0.550525 | 0.6030754 | 0.5697481 | 645.1945 |
| 43 | 12.653010 | 299.630 | 332.165 | 12.653010 | 0.494339 | 0.5489607 | 0.5159135 | 595.4071 |
| 48 | 12.378860 | 295.610 | 332.165 | 12.378860 | 0.486138 | 0.5479682 | 0.5150739 | 575.9370 |
| 60 | 12.490615 | 290.920 | 332.165 | 12.490615 | 0.486739 | 0.5576914 | 0.5247127 | 581.0536 |
| 120 | 13.932820 | 285.500 | 332.165 | 13.932820 | 0.432149 | 0.5155913 | 0.4818933 | 590.5923 |
| 181 | 14.350570 | 277.130 | 332.165 | 14.350570 | 0.400314 | 0.5020436 | 0.4681291 | 566.0741 |
| 242 | 11.581430 | 277.815 | 332.165 | 11.581430 | 0.481347 | 0.5774559 | 0.5449170 | 653.5340 |
| 305 | 14.247445 | 277.355 | 332.165 | 14.247445 | 0.351935 | 0.4526236 | 0.4188929 | 541.0353 |
| 363 | 13.068665 | 281.110 | 332.165 | 13.068665 | 0.444194 | 0.5355065 | 0.5022595 | 633.4060 |
| 429 | 14.941955 | 283.535 | 332.165 | 14.941955 | 0.383781 | 0.4726124 | 0.4384079 | 582.9602 |
| 499 | 11.871105 | 281.270 | 332.165 | 11.871105 | 0.457146 | 0.5463811 | 0.5137634 | 638.7019 |
| 570 | 14.464090 | 280.910 | 332.165 | 14.464090 | 0.461804 | 0.5559625 | 0.5218460 | 653.3875 |
| 646 | 15.748480 | 280.005 | 332.165 | 15.748480 | 0.313710 | 0.4111004 | 0.3765371 | 569.5819 |
| 725 | 11.569615 | 283.690 | 332.165 | 11.569615 | 0.401503 | 0.4850587 | 0.4527444 | 561.4558 |
| 802 | 15.099470 | 284.240 | 332.165 | 15.099470 | 0.403256 | 0.4909761 | 0.4566272 | 584.2218 |
| 890 | 14.293475 | 281.905 | 332.165 | 14.293475 | 0.395018 | 0.4863099 | 0.4524686 | 584.3985 |

| 985 | 13.511010 | 278.075 | 332.165 | 13.511010 | 0.406559 | 0.5047773 | 0.4713522 | 635.9519 |
|------|-----------|---------|---------|-----------|----------|-----------|-----------|----------|
| 1085 | 13.877625 | 279.020 | 332.165 | 13.877625 | 0.301657 | 0.3977379 | 0.3643607 | 517.5456 |
| 1191 | 13.218835 | 279.640 | 332.165 | 13.218835 | 0.373369 | 0.4675299 | 0.4343624 | 535.6742 |
| 1305 | 13.432900 | 279.020 | 332.165 | 13.432900 | 0.413576 | 0.5096888 | 0.4762967 | 596.3927 |
| 1414 | 13.233040 | 276.675 | 332.165 | 13.233040 | 0.458016 | 0.5591412 | 0.5257437 | 616.0337 |
| 1540 | 12.702920 | 279.130 | 332.165 | 12.702920 | 0.497576 | 0.5928311 | 0.5596509 | 716.7204 |
| 1667 | 13.501385 | 280.575 | 332.165 | 13.501385 | 0.480201 | 0.5735822 | 0.5399952 | 654.6958 |
| 1795 | 13.096470 | 278.070 | 332.165 | 13.096470 | 0.386541 | 0.4839159 | 0.4507779 | 577.7605 |
| 1922 | 12.799950 | 277.300 | 332.165 | 12.799950 | 0.431293 | 0.5301282 | 0.4970448 | 671.2812 |
| 2044 | 11.551290 | 277.450 | 332.165 | 11.551290 | 0.444219 | 0.5407810 | 0.5083445 | 638.3621 |
| 2149 | 13.294700 | 276.800 | 332.165 | 13.294700 | 0.421076 | 0.5217671 | 0.4884249 | 620.3298 |
| 2256 | 14.283885 | 276.700 | 332.165 | 14.283885 | 0.367480 | 0.4697830 | 0.4359882 | 585.9043 |
| 2357 | 13.174110 | 277.150 | 332.165 | 13.174110 | 0.523369 | 0.6238425 | 0.5903218 | 684.5306 |
| 2453 | 12.771775 | 277.750 | 332.165 | 12.771775 | 0.424511 | 0.5222909 | 0.4892421 | 621.0315 |
| 2545 | 11.757505 | 275.900 | 332.165 | 11.757505 | 0.421738 | 0.5217299 | 0.4892306 | 639.7290 |
| 2633 | 13.088010 | 276.400 | 332.165 | 13.088010 | 0.396330 | 0.4973366 | 0.4641710 | 593.6718 |
| 2795 | 12.033940 | 277.100 | 332.165 | 12.033940 | 0.462588 | 0.5607947 | 0.5280560 | 614.2147 |
| 2871 | 13.081115 | 275.000 | 332.165 | 13.081115 | 0.424956 | 0.5291980 | 0.4959593 | 652.4915 |
| 2944 | 12.756910 | 275.500 | 332.165 | 12.756910 | 0.454794 | 0.5575963 | 0.5244708 | 649.4342 |
| 3013 | 12.822585 | 275.450 | 332.165 | 12.822585 | 0.397566 | 0.5001615 | 0.4671378 | 623.3167 |
| 3080 | 10.699305 | 274.600 | 332.165 | 10.699305 | 0.443022 | 0.5441841 | 0.5121733 | 663.3422 |
| 3143 | 13.261510 | 275.450 | 332.165 | 13.261510 | 0.390003 | 0.4933269 | 0.4600726 | 596.3732 |
| 3203 | 13.035830 | 276.300 | 332.165 | 13.035830 | 0.441610 | 0.5430765 | 0.5098298 | 621.0276 |
| 3261 | 13.535495 | 274.700 | 332.165 | 13.535495 | 0.416972 | 0.5226467 | 0.4891640 | 632.2307 |
| 3317 | 12.425060 | 273.100 | 332.165 | 12.425060 | 0.444067 | 0.5514078 | 0.5184801 | 650.0850 |
| 3370 | 12.743310 | 273.550 | 332.165 | 12.743310 | 0.424860 | 0.5316493 | 0.4985937 | 635.0459 |
| 3421 | 13.684420 | 274.000 | 332.165 | 13.684420 | 0.423377 | 0.5309297 | 0.4973401 | 615.8504 |
| 3470 | 12.647450 | 274.500 | 332.165 | 12.647450 | 0.440416 | 0.5450816 | 0.5120469 | 645.1111 |
| 3518 | 14.010410 | 274.500 | 332.165 | 14.010410 | 0.399001 | 0.5058797 | 0.4721596 | 609.5823 |
| 3564 | 13.475130 | 274.200 | 332.165 | 13.475130 | 0.432065 | 0.5388454 | 0.5053581 | 659.7231 |
| 3609 | 12.885270 | 274.200 | 332.165 | 12.885270 | 0.440593 | 0.5463440 | 0.5131740 | 628.9008 |
| 3656 | 13.071425 | 273.200 | 332.165 | 13.071425 | 0.402640 | 0.5106322 | 0.4774438 | 577.9615 |
| 3699 | 13.434470 | 273.000 | 332.165 | 13.434470 | 0.430108 | 0.5394536 | 0.5059883 | 645.8761 |
| 3741 | 13.080005 | 272.250 | 332.165 | 13.080005 | 0.444006 | 0.5544472 | 0.5211480 | 637.8629 |

| 3782 | 13.312910 | 271.500 | 332.165 | 13.312910 | 0.481336 | 0.5942146 | 0.5606862 | 658.0746 |
|------|-----------|---------|---------|-----------|----------|-----------|-----------|----------|
| 3822 | 13.559430 | 273.450 | 332.165 | 13.559430 | 0.434527 | 0.5431486 | 0.5096020 | 623.9096 |
| 3863 | 13.483015 | 275.400 | 332.165 | 13.483015 | 0.433829 | 0.5379996 | 0.5045098 | 629.5464 |
| 3903 | 11.902960 | 275.150 | 332.165 | 11.902960 | 0.493315 | 0.5956784 | 0.5629266 | 676.4735 |
| 3943 | 12.888460 | 275.150 | 332.165 | 12.888460 | 0.422033 | 0.5255796 | 0.4924579 | 616.3471 |
| 3984 | 13.129820 | 273.300 | 332.165 | 13.129820 | 0.441372 | 0.5495606 | 0.5162450 | 637.5333 |
| 4023 | 13.747505 | 273.300 | 332.165 | 13.747505 | 0.416761 | 0.5259395 | 0.4923252 | 622.8348 |
| 4062 | 14.563010 | 273.300 | 332.165 | 14.563010 | 0.412826 | 0.5236002 | 0.4895032 | 624.9690 |
| 4101 | 14.015225 | 271.700 | 332.165 | 14.015225 | 0.426782 | 0.5401745 | 0.5063674 | 651.2352 |
| 4139 | 14.572930 | 271.650 | 332.165 | 14.572930 | 0.424069 | 0.5387138 | 0.5045734 | 649.6073 |
| 4176 | 13.604615 | 271.650 | 332.165 | 13.604615 | 0.418275 | 0.5308782 | 0.4973352 | 616.8099 |
| 4212 | 13.041955 | 272.200 | 332.165 | 13.041955 | 0.481193 | 0.5919728 | 0.5586044 | 689.2057 |
| 4251 | 15.268020 | 272.200 | 332.165 | 15.268020 | 0.400423 | 0.5150937 | 0.4805779 | 629.7829 |
| 4284 | 13.499280 | 272.150 | 332.165 | 13.499280 | 0.491962 | 0.6038350 | 0.5701756 | 681.2215 |
| 4317 | 14.600530 | 272.150 | 332.165 | 14.600530 | 0.360241 | 0.4732703 | 0.4392750 | 624.2937 |
| 4347 | 14.278675 | 271.500 | 332.165 | 14.278675 | 0.436612 | 0.5510864 | 0.5170945 | 627.3074 |
| 4376 | 14.787685 | 271.500 | 332.165 | 14.787685 | 0.458481 | 0.5742183 | 0.5398572 | 654.9703 |
| 4404 | 13.491295 | 271.300 | 332.165 | 13.491295 | 0.494253 | 0.6080464 | 0.5743814 | 680.0077 |
| 4429 | 13.935795 | 271.300 | 332.165 | 13.935795 | 0.407680 | 0.5216574 | 0.4879428 | 623.7548 |
| 4452 | 14.553305 | 271.300 | 332.165 | 14.553305 | 0.407926 | 0.5231958 | 0.4891058 | 639.7627 |
| 4474 | 14.558790 | 271.100 | 332.165 | 14.558790 | 0.381470 | 0.4969865 | 0.4629580 | 623.0083 |
| 4494 | 15.045370 | 271.100 | 332.165 | 15.045370 | 0.388216 | 0.5048414 | 0.4704919 | 636.0103 |
| 4513 | 15.631435 | 270.100 | 332.165 | 15.631435 | 0.451673 | 0.5725120 | 0.5376181 | 692.6833 |
| 4531 | 14.992585 | 270.100 | 332.165 | 14.992585 | 0.475532 | 0.5951224 | 0.5605811 | 693.0425 |
| 4547 | 15.086240 | 270.100 | 332.165 | 15.086240 | 0.446055 | 0.5655991 | 0.5310723 | 672.1417 |
| 4562 | 14.741750 | 270.100 | 332.165 | 14.741750 | 0.460775 | 0.5796790 | 0.5453329 | 689.2012 |
| 4577 | 15.337330 | 269.100 | 332.165 | 15.337330 | 0.456752 | 0.5793233 | 0.5446023 | 668.3744 |
| 4591 | 14.744645 | 269.100 | 332.165 | 14.744645 | 0.486113 | 0.6075855 | 0.5731684 | 707.6838 |
| 4616 | 15.537315 | 269.450 | 332.165 | 15.537315 | 0.435921 | 0.5579427 | 0.5231466 | 688.9704 |
| 4629 | 15.289300 | 269.450 | 332.165 | 15.289300 | 0.418996 | 0.5402924 | 0.5057000 | 636.8742 |
| 4642 | 15.236480 | 269.450 | 332.165 | 15.236480 | 0.390457 | 0.5113796 | 0.4768931 | 661.3658 |
| 4655 | 14.217500 | 269.800 | 332.165 | 14.217500 | 0.481282 | 0.5999146 | 0.5658395 | 738.2953 |
| 4667 | 13.929305 | 269.800 | 332.165 | 13.929305 | 0.500180 | 0.6183572 | 0.5844095 | 702.1404 |
| 4679 | 14.456340 | 269.800 | 332.165 | 14.456340 | 0.477212 | 0.5963290 | 0.5621175 | 726.1685 |

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|---|---|---|---|---|---|---|---|---|
| 4693 | 15.862295 | 270.650 | 332.165 | 15.862295 | 0.481918 | 0.6022537 | 0.5671334 | 689.6166 |
| 4707 | 14.117130 | 270.650 | 332.165 | 14.117130 | 0.448255 | 0.5644327 | 0.5305052 | 683.1216 |
| 4723 | 14.411470 | 270.650 | 332.165 | 14.411470 | 0.462332 | 0.5792553 | 0.5451134 | 730.0029 |
| 4756 | 14.795020 | 270.650 | 332.165 | 14.795020 | 0.535625 | 0.6540085 | 0.6194448 | 759.2128 |
| 4890 | 14.834370 | 270.700 | 332.165 | 14.834370 | 0.650277 | 0.7696128 | 0.7347375 | 851.8032 |
| 5015 | 16.790890 | 268.950 | 332.165 | 16.790890 | 0.458337 | 0.5848183 | 0.5491130 | 693.7914 |
| 5202 | 14.724575 | 269.800 | 332.165 | 14.724575 | 0.510507 | 0.6305058 | 0.5960443 | 706.0729 |
| 5403 | 15.916575 | 265.300 | 332.165 | 15.916575 | 0.451895 | 0.5850365 | 0.5499238 | 681.8049 |
| 5596 | 13.197670 | 267.600 | 332.165 | 13.197670 | 0.580824 | 0.7032332 | 0.6695068 | 827.6391 |
| 5763 | 14.989795 | 265.700 | 332.165 | 14.989795 | 0.490060 | 0.6202548 | 0.5856527 | 711.8730 |
| 5879 | 14.690215 | 263.100 | 332.165 | 14.690215 | 0.633639 | 0.7708372 | 0.7360496 | 846.5488 |
| 5953 | 16.610490 | 263.700 | 332.165 | 16.610490 | 0.488720 | 0.6280917 | 0.5924005 | 714.7859 |
| 6007 | 14.797680 | 266.700 | 332.165 | 14.797680 | 0.526236 | 0.6538954 | 0.6193303 | 756.6240 |
| 6056 | 15.365505 | 266.100 | 332.165 | 15.365505 | 0.462299 | 0.5921872 | 0.5574160 | 692.9720 |
| 6118 | 15.526410 | 265.500 | 332.165 | 15.526410 | 0.467143 | 0.5989413 | 0.5640493 | 714.0708 |
| 6206 | 16.861230 | 264.350 | 332.165 | 16.861230 | 0.391183 | 0.5286278 | 0.4930179 | 661.4162 |
| 6338 | 15.520625 | 262.700 | 332.165 | 15.520625 | 0.510261 | 0.6493941 | 0.6143791 | 738.8311 |
| 6523 | 15.196245 | 261.150 | 332.165 | 15.196245 | 0.454215 | 0.5957861 | 0.5611141 | 697.8861 |
| 6729 | 14.751830 | 260.750 | 332.165 | 14.751830 | 0.572781 | 0.7153865 | 0.6806975 | 799.3348 |
| 7025 | 16.292160 | 257.850 | 332.165 | 16.292160 | 0.500633 | 0.6543141 | 0.6187738 | 758.3348 |
| 7198 | 15.048425 | 262.650 | 332.165 | 15.048425 | 0.548170 | 0.6865608 | 0.6517564 | 768.6583 |
| 7311 | 15.212085 | 261.850 | 332.165 | 15.212085 | 0.556734 | 0.6976429 | 0.6627064 | 754.6289 |
| 7457 | 13.652665 | 259.550 | 332.165 | 13.652665 | 0.474606 | 0.6163186 | 0.5825392 | 687.3527 |
| 7630 | 15.563800 | 260.100 | 332.165 | 15.563800 | 0.496452 | 0.6421277 | 0.6071028 | 721.4294 |
| 7821 | 16.512985 | 260.050 | 332.165 | 16.512985 | 0.573211 | 0.7225810 | 0.6867157 | 807.1422 |
| 8024 | 15.154520 | 260.200 | 332.165 | 15.154520 | 0.577937 | 0.7230766 | 0.6881135 | 807.2078 |
| 8233 | 16.430325 | 259.300 | 332.165 | 16.430325 | 0.492751 | 0.6429634 | 0.6073579 | 744.0210 |
| 8442 | 15.368730 | 259.800 | 332.165 | 15.368730 | 0.507928 | 0.6539428 | 0.6190148 | 757.1465 |
| 8847 | 14.772840 | 259.950 | 332.165 | 14.772840 | 0.609482 | 0.7545422 | 0.7197430 | 848.0735 |
| 9040 | 14.501085 | 259.850 | 332.165 | 14.501085 | 0.580817 | 0.7250987 | 0.6905417 | 772.9279 |
| 9205 | 14.772915 | 262.850 | 332.165 | 14.772915 | 0.585610 | 0.7231640 | 0.6884426 | 812.6231 |
| 9340 | 16.114460 | 263.750 | 332.165 | 16.114460 | 0.519646 | 0.6578384 | 0.6224092 | 722.8708 |
| 9441 | 15.439775 | 262.900 | 332.165 | 15.439775 | 0.577847 | 0.7169430 | 0.6818112 | 785.9044 |
| 9522 | 14.951680 | 260.750 | 332.165 | 14.951680 | 0.548766 | 0.6916589 | 0.6569032 | 779.3266 |

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| 9589 | 15.205050 | 263.800 | 332.165 | 15.205050 | 0.450967 | 0.5859564 | 0.5513035 | 690.4345 |
| 9654 | 15.017930 | 263.800 | 332.165 | 15.017930 | 0.546659 | 0.6821093 | 0.6473353 | 754.1535 |
| 9723 | 15.199465 | 263.800 | 332.165 | 15.199465 | 0.569147 | 0.7052838 | 0.6703363 | 766.9585 |
| 9806 | 15.815015 | 264.400 | 332.165 | 15.815015 | 0.417580 | 0.5523430 | 0.5173799 | 663.3221 |
| 9823 | 14.884225 | 264.400 | 332.165 | 14.884225 | 0.487888 | 0.6209583 | 0.5864207 | 743.6346 |
| 9843 | 16.120400 | 264.400 | 332.165 | 16.120400 | 0.480904 | 0.6170986 | 0.5817688 | 654.1756 |
| 9862 | 14.437820 | 264.400 | 332.165 | 14.437820 | 0.524941 | 0.6572672 | 0.6229166 | 737.8360 |
| 9882 | 14.242735 | 264.400 | 332.165 | 14.242735 | 0.593003 | 0.7255073 | 0.6911079 | 776.0528 |
| 9903 | 15.793380 | 264.300 | 332.165 | 15.793380 | 0.493796 | 0.6294995 | 0.5943559 | 722.7702 |
| 9925 | 16.457260 | 264.300 | 332.165 | 16.457260 | 0.428127 | 0.5649567 | 0.5295318 | 661.1147 |
| 9951 | 15.717115 | 264.300 | 332.165 | 15.717115 | 0.473277 | 0.6085786 | 0.5735379 | 665.2050 |
| 9975 | 15.131305 | 264.300 | 332.165 | 15.131305 | 0.453730 | 0.5873335 | 0.5527239 | 660.5427 |
| 10001 | 15.323460 | 264.200 | 332.165 | 15.323460 | 0.532910 | 0.6680219 | 0.6330878 | 728.1653 |
| 10028 | 14.871245 | 264.100 | 332.165 | 14.871245 | 0.558392 | 0.6928471 | 0.6581391 | 746.9642 |
| 10057 | 17.511240 | 264.100 | 332.165 | 17.511240 | 0.414236 | 0.5543920 | 0.5182550 | 611.4431 |
| 10089 | 15.605590 | 264.100 | 332.165 | 15.605590 | 0.595404 | 0.7321112 | 0.6968329 | 793.5987 |
| 10120 | 16.048725 | 264.000 | 332.165 | 16.048725 | 0.350761 | 0.4864695 | 0.4515187 | 576.1199 |
| 10153 | 16.008700 | 263.700 | 332.165 | 16.008700 | 0.473838 | 0.6114125 | 0.5761718 | 658.5370 |
| 10187 | 15.144115 | 263.700 | 332.165 | 15.144115 | 0.481948 | 0.6173318 | 0.5826393 | 662.6005 |
| 10222 | 16.486195 | 264.550 | 332.165 | 16.486195 | 0.392532 | 0.5284612 | 0.4931097 | 621.6687 |
| 10262 | 17.041910 | 264.550 | 332.165 | 17.041910 | 0.394061 | 0.5315330 | 0.4957894 | 632.1269 |
| 10299 | 15.637060 | 265.700 | 332.165 | 15.637060 | 0.427851 | 0.5590644 | 0.5242007 | 671.2939 |
| 10337 | 15.631225 | 265.300 | 332.165 | 15.631225 | 0.426451 | 0.5586135 | 0.5237547 | 637.9457 |
| 10376 | 15.559980 | 264.900 | 332.165 | 15.559980 | 0.479709 | 0.6131854 | 0.5782357 | 714.3840 |
| 10415 | 16.365245 | 266.200 | 332.165 | 16.365245 | 0.414970 | 0.5467033 | 0.5113874 | 628.4934 |
| 10458 | 16.276965 | 266.200 | 332.165 | 16.276965 | 0.484494 | 0.6166639 | 0.5812297 | 690.7803 |
| 10497 | 16.349345 | 266.200 | 332.165 | 16.349345 | 0.438019 | 0.5699320 | 0.5345677 | 636.1558 |
| 10536 | 16.278340 | 267.200 | 332.165 | 16.278340 | 0.464915 | 0.5944398 | 0.5590612 | 685.5451 |
| 10612 | 16.047825 | 267.200 | 332.165 | 16.047825 | 0.503634 | 0.6329369 | 0.5976156 | 680.6176 |
| 10690 | 16.485350 | 266.450 | 332.165 | 16.485350 | 0.448163 | 0.5799109 | 0.5444287 | 633.3650 |
| 10762 | 16.975485 | 266.000 | 332.165 | 16.975485 | 0.435743 | 0.5697970 | 0.5340014 | 670.3405 |
| 10835 | 17.668380 | 265.550 | 332.165 | 17.668380 | 0.473725 | 0.6112194 | 0.5748204 | 684.3864 |
| 10904 | 15.477845 | 266.350 | 332.165 | 15.477845 | 0.524962 | 0.6551124 | 0.6201108 | 721.5456 |
| 10972 | 15.780770 | 266.200 | 332.165 | 15.780770 | 0.567718 | 0.6994033 | 0.6640917 | 742.7176 |

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| 11044 | 17.062450 | 266.200 | 332.165 | 17.062450 | 0.422194 | 0.5558514 | 0.5200306 | 618.0624 |
| 11113 | 14.071460 | 264.800 | 332.165 | 14.071460 | 0.541849 | 0.6724900 | 0.6383245 | 735.5442 |
| 11187 | 16.074465 | 265.150 | 332.165 | 16.074465 | 0.490152 | 0.6244483 | 0.5891307 | 723.9876 |
| 11258 | 17.405490 | 264.400 | 332.165 | 17.405490 | 0.513015 | 0.6530975 | 0.6167806 | 648.0638 |
| 11333 | 15.502385 | 264.455 | 332.165 | 15.502385 | 0.543125 | 0.6781680 | 0.6430926 | 680.1121 |
| 11414 | 14.840655 | 266.320 | 332.165 | 14.840655 | 0.487248 | 0.6155602 | 0.5810634 | 658.5833 |
| 11499 | 15.364930 | 267.415 | 332.165 | 15.364930 | 0.513904 | 0.6410910 | 0.6061976 | 687.9393 |
| 11594 | 14.643270 | 261.000 | 332.165 | 14.643270 | 0.462316 | 0.6028760 | 0.5685334 | 570.4055 |
| 11888 | 15.016305 | 253.730 | 332.165 | 15.016305 | 0.445394 | 0.6054028 | 0.5708210 | 624.3359 |
| 11954 | 13.614930 | 251.455 | 332.165 | 13.614930 | 0.389403 | 0.5505321 | 0.5169353 | 535.0851 |
| 12022 | 14.482675 | 248.130 | 332.165 | 14.482675 | 0.465376 | 0.6389381 | 0.6046052 | 657.9987 |
| 12091 | 14.124780 | 253.345 | 332.165 | 14.124780 | 0.417931 | 0.5759768 | 0.5420163 | 568.5155 |
| 12234 | 12.575605 | 249.090 | 332.165 | 12.575605 | 0.480760 | 0.6461285 | 0.6128908 | 599.7547 |
| 12382 | 12.307820 | 243.655 | 332.165 | 12.307820 | 0.477946 | 0.6569149 | 0.6237987 | 629.3062 |
| 12537 | 12.471630 | 248.330 | 332.165 | 12.471630 | 0.474711 | 0.6416920 | 0.6085223 | 625.4804 |
| 12698 | 12.908245 | 242.915 | 332.165 | 12.908245 | 0.428726 | 0.6109540 | 0.5776153 | 577.4612 |
| 12871 | 13.249050 | 240.295 | 332.165 | 13.249050 | 0.425493 | 0.6160835 | 0.5825388 | 597.3068 |
| 13043 | 13.682535 | 236.770 | 332.165 | 13.682535 | 0.483385 | 0.6864737 | 0.6525057 | 655.4494 |
| 13218 | 12.610745 | 239.410 | 332.165 | 12.610745 | 0.536082 | 0.7285436 | 0.6950886 | 682.4526 |
| 13397 | 13.914370 | 237.830 | 332.165 | 13.914370 | 0.439547 | 0.6397563 | 0.6057651 | 630.6158 |
| 13578 | 14.723270 | 239.845 | 332.165 | 14.723270 | 0.458435 | 0.6560675 | 0.6215434 | 637.5548 |
| 13762 | 13.627845 | 241.110 | 332.165 | 13.627845 | 0.466207 | 0.6563712 | 0.6225087 | 654.8521 |
| 13947 | 15.317390 | 238.245 | 332.165 | 15.317390 | 0.469603 | 0.6744173 | 0.6394711 | 686.0701 |
| 14133 | 13.802605 | 237.820 | 332.165 | 13.802605 | 0.450253 | 0.6502360 | 0.6162855 | 681.5468 |
| 14327 | 14.841775 | 238.940 | 332.165 | 14.841775 | 0.349928 | 0.5490719 | 0.5147396 | 578.1363 |
| 14512 | 13.351390 | 241.600 | 332.165 | 13.351390 | 0.498382 | 0.6866640 | 0.6528890 | 694.6069 |
| 14695 | 14.525705 | 233.200 | 332.165 | 14.525705 | 0.418140 | 0.6341923 | 0.5998447 | 671.2392 |
| 14877 | 13.996235 | 230.035 | 332.165 | 13.996235 | 0.433336 | 0.6571723 | 0.6230895 | 686.9314 |
| 15056 | 15.177935 | 227.185 | 332.165 | 15.177935 | 0.443005 | 0.6812646 | 0.6463909 | 738.6348 |
| 15144 | 13.245490 | 229.240 | 332.165 | 13.245490 | 0.489104 | 0.7132202 | 0.6794420 | 746.4704 |
| 15231 | 13.647995 | 229.225 | 332.165 | 13.647995 | 0.515634 | 0.7418868 | 0.7078041 | 781.0304 |
| 15317 | 12.467560 | 227.640 | 332.165 | 12.467560 | 0.513872 | 0.7402031 | 0.7067997 | 779.6597 |
| 15402 | 13.452520 | 225.065 | 332.165 | 13.452520 | 0.492902 | 0.7310910 | 0.6971494 | 788.7845 |
| 15486 | 14.472345 | 223.400 | 332.165 | 14.472345 | 0.459350 | 0.7070082 | 0.6725136 | 785.0923 |

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| 15576 | 16.186575 | 223.145 | 332.165 | 16.186575 | 0.491031 | 0.7486788 | 0.7129707 | 885.0624 |
| 15722 | 12.524460 | 223.510 | 332.165 | 12.524460 | 0.429873 | 0.6679443 | 0.6346826 | 611.8904 |
| 15793 | 12.398135 | 223.610 | 332.165 | 12.398135 | 0.430739 | 0.6679773 | 0.6347852 | 678.2171 |
| 15870 | 10.760215 | 222.935 | 332.165 | 10.760215 | 0.453890 | 0.6870568 | 0.6546814 | 593.1736 |
| 15939 | 12.350730 | 223.770 | 332.165 | 12.350730 | 0.365376 | 0.6007761 | 0.5677707 | 641.0606 |
| 16006 | 12.724970 | 223.400 | 332.165 | 12.724970 | 0.375637 | 0.6139589 | 0.5807156 | 576.3372 |
| 16072 | 13.518925 | 224.360 | 332.165 | 13.518925 | 0.366020 | 0.6045449 | 0.5708724 | 705.4984 |
| 16137 | 10.445880 | 223.635 | 332.165 | 10.445880 | 0.441893 | 0.6715047 | 0.6393225 | 642.6686 |
| 16206 | 13.415415 | 227.320 | 332.165 | 13.415415 | 0.342865 | 0.5712063 | 0.5376748 | 556.9188 |
| 16269 | 11.893750 | 216.390 | 332.165 | 11.893750 | 0.422392 | 0.6807448 | 0.6477957 | 531.3584 |
| 16330 | 10.199119 | 213.515 | 332.165 | 10.199119 | 0.474221 | 0.7357019 | 0.7034919 | 667.8984 |
| 16391 | 11.017990 | 210.360 | 332.165 | 11.017990 | 0.442874 | 0.7180931 | 0.6855141 | 818.9693 |
| 16452 | 11.550620 | 217.190 | 332.165 | 11.550620 | 0.395824 | 0.6495110 | 0.6168177 | 598.4869 |
| 16517 | 11.802705 | 208.300 | 332.165 | 11.802705 | 0.278469 | 0.5612737 | 0.5286568 | 556.0836 |
| 16576 | 11.148750 | 208.555 | 332.165 | 11.148750 | 0.448982 | 0.7312501 | 0.6985730 | 832.8426 |
| 16635 | 12.849935 | 210.805 | 332.165 | 12.849935 | 0.375400 | 0.6566239 | 0.6232079 | 570.8570 |
| 16694 | 13.012700 | 211.700 | 332.165 | 13.012700 | 0.341791 | 0.6199859 | 0.5865664 | 724.1347 |
| 16753 | 12.077215 | 207.890 | 332.165 | 12.077215 | 0.363719 | 0.6511590 | 0.6181817 | 641.8638 |
| 16818 | 14.158905 | 205.360 | 332.165 | 14.158905 | 0.373298 | 0.6817721 | 0.6475311 | 788.2482 |
| 16876 | 10.790900 | 204.060 | 332.165 | 10.790900 | 0.451034 | 0.7477069 | 0.7151741 | 706.6724 |
| 16935 | 12.048430 | 203.625 | 332.165 | 12.048430 | 0.390956 | 0.6944435 | 0.6613787 | 844.5526 |
| 16994 | 10.837725 | 203.625 | 332.165 | 10.837725 | 0.480079 | 0.7792150 | 0.7465846 | 831.4884 |
| 17053 | 10.031810 | 203.210 | 332.165 | 10.031810 | 0.465448 | 0.7617816 | 0.7295929 | 746.5295 |
| 17118 | 9.895848 | 200.365 | 332.165 | 9.895848 | 0.461283 | 0.7672979 | 0.7351624 | 756.5424 |
| 17177 | 10.426055 | 198.460 | 332.165 | 10.426055 | 0.477632 | 0.7939271 | 0.7614697 | 886.7585 |
| 17236 | 12.864705 | 198.290 | 332.165 | 12.864705 | 0.380516 | 0.7089965 | 0.6754460 | 623.3131 |
| 17295 | 11.274705 | 195.265 | 332.165 | 11.274705 | 0.446154 | 0.7788716 | 0.7460172 | 855.8032 |
| 17354 | 12.146745 | 190.500 | 332.165 | 12.146745 | 0.404584 | 0.7611678 | 0.7278907 | 815.4563 |
| 17419 | 11.463015 | 191.325 | 332.165 | 11.463015 | 0.396909 | 0.7455343 | 0.7126600 | 679.4859 |
| 17478 | 10.420725 | 192.240 | 332.165 | 10.420725 | 0.424005 | 0.7633979 | 0.7310141 | 685.2099 |
| 17537 | 12.035565 | 192.495 | 332.165 | 12.035565 | 0.385468 | 0.7324979 | 0.6993494 | 861.5955 |
| 17596 | 11.631775 | 196.375 | 332.165 | 11.631775 | 0.438248 | 0.7684239 | 0.7354064 | 827.7782 |
| 17655 | 11.983090 | 193.795 | 332.165 | 11.983090 | 0.352284 | 0.6928103 | 0.6597846 | 682.9477 |
| 17720 | 11.907815 | 189.965 | 332.165 | 11.907815 | 0.419211 | 0.7769087 | 0.7437236 | 712.5448 |

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| 17779 | 10.722560 | 189.475 | 332.165 | 10.722560 | 0.441874 | 0.7948424 | 0.7622339 | 710.2773 |
| 17838 | 11.743250 | 190.365 | 332.165 | 11.743250 | 0.407721 | 0.7623798 | 0.7293174 | 675.4221 |
| 17898 | 12.404180 | 190.990 | 332.165 | 12.404180 | 0.365678 | 0.7208364 | 0.6875144 | 820.3304 |
| 17957 | 11.455935 | 188.600 | 332.165 | 11.455935 | 0.376603 | 0.7360852 | 0.7032369 | 652.0380 |
| 18023 | 12.783990 | 187.790 | 332.165 | 12.783990 | 0.349292 | 0.7203357 | 0.6868034 | 715.9472 |
| 18084 | 13.026125 | 188.615 | 332.165 | 13.026125 | 0.392178 | 0.7624505 | 0.7286793 | 668.3053 |
| 18145 | 12.796495 | 186.945 | 332.165 | 12.796495 | 0.328991 | 0.7032848 | 0.6697865 | 670.6015 |
| 18207 | 12.380540 | 187.265 | 332.165 | 12.380540 | 0.382299 | 0.7537789 | 0.7203911 | 683.3616 |
| 18269 | 10.786970 | 188.775 | 332.165 | 10.786970 | 0.431274 | 0.7872889 | 0.7546654 | 646.4573 |
| 18339 | 12.451600 | 187.925 | 332.165 | 12.451600 | 0.363905 | 0.7324814 | 0.6991054 | 685.1274 |
| 18402 | 11.038440 | 188.340 | 332.165 | 11.038440 | 0.502894 | 0.8641927 | 0.8312604 | 840.6638 |
| 18466 | 12.180700 | 187.270 | 332.165 | 12.180700 | 0.381802 | 0.7518922 | 0.7186187 | 734.6350 |
| 18530 | 10.514090 | 187.670 | 332.165 | 10.514090 | 0.435265 | 0.7943740 | 0.7618715 | 768.9549 |
| 18666 | 12.243875 | 193.900 | 332.165 | 12.243875 | 0.278691 | 0.6185362 | 0.5855465 | 601.3156 |
| 18796 | 11.128360 | 192.970 | 332.165 | 11.128360 | 0.398897 | 0.7388196 | 0.7061352 | 776.1294 |
| 18939 | 10.852120 | 190.605 | 332.165 | 10.852120 | 0.461861 | 0.8114278 | 0.7787147 | 760.0113 |
| 19087 | 10.722190 | 191.900 | 332.165 | 10.722190 | 0.409936 | 0.7520962 | 0.7195879 | 773.9178 |
| 19227 | 10.324510 | 191.335 | 332.165 | 10.324510 | 0.375349 | 0.7166252 | 0.6843980 | 727.6510 |
| 19370 | 10.942980 | 191.550 | 332.165 | 10.942980 | 0.472478 | 0.8189576 | 0.7861805 | 764.9941 |
| 19504 | 9.740445 | 190.235 | 332.165 | 9.740445 | 0.489560 | 0.8348616 | 0.8026450 | 798.1629 |
| 19639 | 10.050925 | 191.420 | 332.165 | 10.050925 | 0.467545 | 0.8092355 | 0.7769276 | 896.2732 |
| 19768 | 10.674020 | 193.600 | 332.165 | 10.674020 | 0.472280 | 0.8088485 | 0.7762318 | 861.0105 |
| 19886 | 12.180290 | 196.060 | 332.165 | 12.180290 | 0.465912 | 0.8012734 | 0.7678823 | 885.7153 |
| 20003 | 10.977170 | 194.890 | 332.165 | 10.977170 | 0.461431 | 0.7943062 | 0.7615692 | 940.7351 |
| 20106 | 10.556615 | 192.095 | 332.165 | 10.556615 | 0.427358 | 0.7682028 | 0.7357401 | 798.9915 |
| 20206 | 11.882545 | 192.095 | 332.165 | 11.882545 | 0.431126 | 0.7800290 | 0.7468500 | 805.6864 |
| 20295 | 9.269087 | 190.230 | 332.165 | 9.269087 | 0.511353 | 0.8545827 | 0.8225450 | 946.9443 |
| 20372 | 11.081285 | 190.230 | 332.165 | 11.081285 | 0.420676 | 0.7721264 | 0.7393880 | 745.0830 |
| 20448 | 10.071010 | 191.960 | 332.165 | 10.071010 | 0.458223 | 0.7976119 | 0.7653210 | 884.1786 |
| 20517 | 10.921845 | 191.960 | 332.165 | 10.921845 | 0.423512 | 0.7669440 | 0.7342995 | 874.4018 |
| 20590 | 9.857285 | 190.845 | 332.165 | 9.857285 | 0.489315 | 0.8327883 | 0.8005200 | 946.3643 |
| 20666 | 12.753365 | 190.845 | 332.165 | 12.753365 | 0.381058 | 0.7395295 | 0.7059682 | 709.0038 |
| 20745 | 9.532400 | 190.210 | 332.165 | 9.532400 | 0.509561 | 0.8542958 | 0.8221341 | 918.9077 |
| 20837 | 9.162833 | 191.765 | 332.165 | 9.162833 | 0.491845 | 0.8278405 | 0.7959138 | 840.3579 |

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| 20940 | 10.531110 | 191.765 | 332.165 | 10.531110 | 0.457853 | 0.8006572 | 0.7681316 | 819.0520 |
| 21048 | 9.612870 | 189.635 | 332.165 | 9.612870 | 0.481180 | 0.8279965 | 0.7958570 | 918.0286 |
| 21173 | 10.006380 | 189.225 | 332.165 | 10.006380 | 0.491841 | 0.8428854 | 0.8105213 | 985.4151 |
| 21301 | 10.426695 | 188.645 | 332.165 | 10.426695 | 0.430404 | 0.7847575 | 0.7523211 | 913.3752 |
| 21433 | 8.329884 | 186.235 | 332.165 | 8.329884 | 0.490850 | 0.8447231 | 0.8131384 | 1014.1582 |
| 21574 | 11.400080 | 186.595 | 332.165 | 11.400080 | 0.417916 | 0.7867560 | 0.7538175 | 735.9135 |
| 21716 | 10.645230 | 186.595 | 332.165 | 10.645230 | 0.460863 | 0.8260434 | 0.7934012 | 947.6656 |
| 21866 | 8.680892 | 189.370 | 332.165 | 8.680892 | 0.455234 | 0.7973083 | 0.7656732 | 787.6282 |
| 22031 | 10.720585 | 189.080 | 332.165 | 10.720585 | 0.430449 | 0.7847587 | 0.7521747 | 931.8295 |
| 22197 | 9.247492 | 191.270 | 332.165 | 9.247492 | 0.408191 | 0.7445416 | 0.7127664 | 761.8678 |
| 22379 | 9.802635 | 187.020 | 332.165 | 9.802635 | 0.528548 | 0.8885749 | 0.8562043 | 1011.9436 |
| 22560 | 10.650660 | 184.945 | 332.165 | 10.650660 | 0.425217 | 0.7965957 | 0.7640194 | 866.9994 |
| 22748 | 10.275895 | 190.010 | 332.165 | 10.275895 | 0.386687 | 0.7333677 | 0.7011255 | 662.7292 |
| 22952 | 11.933450 | 189.400 | 332.165 | 11.933450 | 0.415948 | 0.7761284 | 0.7429313 | 846.0596 |
| 23152 | 12.001330 | 189.340 | 332.165 | 12.001330 | 0.425240 | 0.7863635 | 0.7531054 | 913.5549 |
| 23368 | 13.181340 | 190.155 | 332.165 | 13.181340 | 0.371450 | 0.7355231 | 0.7017279 | 824.1126 |
| 23577 | 13.330280 | 187.385 | 332.165 | 13.330280 | 0.317124 | 0.6929146 | 0.6591367 | 826.0180 |
| 23788 | 12.119755 | 185.560 | 332.165 | 12.119755 | 0.377940 | 0.7550355 | 0.7217877 | 800.7085 |
| 24012 | 13.303990 | 183.905 | 332.165 | 13.303990 | 0.263031 | 0.6528070 | 0.6191416 | 745.5021 |
| 24226 | 13.457145 | 185.705 | 332.165 | 13.457145 | 0.315264 | 0.6994662 | 0.6655987 | 735.4352 |
| 24450 | 13.995055 | 183.650 | 332.165 | 13.995055 | 0.321666 | 0.7196081 | 0.6853731 | 676.3398 |
| 24662 | 13.712425 | 180.570 | 332.165 | 13.712425 | 0.299384 | 0.7090268 | 0.6749862 | 769.4773 |
| 24871 | 12.357000 | 180.630 | 332.165 | 12.357000 | 0.344610 | 0.7448870 | 0.7115335 | 1018.9784 |
| 25088 | 9.163590 | 180.690 | 332.165 | 9.163590 | 0.477244 | 0.8593895 | 0.8273903 | 817.5999 |
| 25291 | 11.272245 | 181.675 | 332.165 | 11.272245 | 0.449034 | 0.8397693 | 0.8067728 | 912.9508 |
| 25501 | 11.086455 | 183.020 | 332.165 | 11.086455 | 0.440271 | 0.8234156 | 0.7905541 | 887.1705 |
| 25699 | 11.214125 | 184.960 | 332.165 | 11.214125 | 0.495095 | 0.8719874 | 0.8389456 | 1057.5442 |
| 25896 | 11.459530 | 185.530 | 332.165 | 11.459530 | 0.381754 | 0.7546397 | 0.7217457 | 919.3224 |
| 26104 | 11.427615 | 184.545 | 332.165 | 11.427615 | 0.426935 | 0.8051990 | 0.7722025 | 985.8513 |
| 26412 | 11.348065 | 184.890 | 332.165 | 11.348065 | 0.429776 | 0.8060614 | 0.7731046 | 922.0747 |
| 26614 | 11.676505 | 185.475 | 332.165 | 11.676505 | 0.405258 | 0.7804782 | 0.7474084 | 845.1954 |
| 26829 | 12.480595 | 185.935 | 332.165 | 12.480595 | 0.451586 | 0.8315608 | 0.7979315 | 942.1346 |
| 27049 | 11.751265 | 186.830 | 332.165 | 11.751265 | 0.415035 | 0.7850813 | 0.7519608 | 915.3579 |
| 27274 | 11.103970 | 192.495 | 332.165 | 11.103970 | 0.404285 | 0.7461282 | 0.7134391 | 725.9655 |

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| 27506 | 12.480025 | 191.380 | 332.165 | 12.480025 | 0.396843 | 0.7516607 | 0.7182230 | 739.1994 |
| 27733 | 12.317240 | 189.300 | 332.165 | 12.317240 | 0.400278 | 0.7629827 | 0.7296078 | 656.2698 |
| 27974 | 12.569895 | 189.290 | 332.165 | 12.569895 | 0.371344 | 0.7350019 | 0.7015541 | 646.7824 |
| 28219 | 10.972120 | 191.705 | 332.165 | 10.972120 | 0.375762 | 0.7193234 | 0.6867650 | 666.4427 |
| 28821 | 11.616680 | 193.890 | 332.165 | 11.616680 | 0.368870 | 0.7072137 | 0.6743491 | 650.9694 |
| 29398 | 11.096930 | 189.520 | 332.165 | 11.096930 | 0.524119 | 0.8813315 | 0.8483287 | 891.1265 |
| 30419 | 10.134460 | 184.300 | 332.165 | 10.134460 | 0.448462 | 0.8200201 | 0.7876462 | 922.4115 |
| 31388 | 11.638685 | 189.215 | 332.165 | 11.638685 | 0.379583 | 0.7376965 | 0.7047480 | 724.9125 |
| 32106 | 10.132605 | 195.165 | 332.165 | 10.132605 | 0.484969 | 0.8126153 | 0.7802595 | 803.0811 |
| 32889 | 9.834265 | 196.700 | 332.165 | 9.834265 | 0.548047 | 0.8696230 | 0.8372809 | 837.4942 |
| 33545 | 10.880855 | 197.465 | 332.165 | 10.880855 | 0.429742 | 0.7511951 | 0.7186084 | 810.5979 |
| 34631 | 10.377045 | 199.590 | 332.165 | 10.377045 | 0.458898 | 0.7702142 | 0.7378363 | 920.6106 |
| 35945 | 10.751385 | 201.045 | 332.165 | 10.751385 | 0.492588 | 0.8011422 | 0.7685044 | 915.7998 |
| 36937 | 9.278780 | 203.510 | 332.165 | 9.278780 | 0.514820 | 0.8075576 | 0.7756231 | 783.4055 |
| 38485 | 9.198735 | 208.655 | 332.165 | 9.198735 | 0.498090 | 0.7721180 | 0.7403023 | 815.5721 |
| 39103 | 8.392639 | 205.800 | 332.165 | 8.392639 | 0.546192 | 0.8275469 | 0.7959731 | 845.8071 |
| 39681 | 11.449825 | 196.185 | 332.165 | 11.449825 | 0.427039 | 0.7566439 | 0.7237503 | 718.4413 |
| 40002 | 13.257680 | 195.075 | 332.165 | 13.257680 | 0.314463 | 0.6567855 | 0.6231371 | 704.0525 |
| 40253 | 9.932895 | 195.795 | 332.165 | 9.932895 | 0.546388 | 0.8719616 | 0.8395661 | 1015.4155 |
| 40657 | 8.272382 | 200.975 | 332.165 | 8.272382 | 0.500606 | 0.7975122 | 0.7660602 | 823.0925 |
| 41029 | 10.137130 | 201.250 | 332.165 | 10.137130 | 0.433944 | 0.7372765 | 0.7050933 | 778.8225 |
| 41327 | 9.530069 | 204.190 | 332.165 | 9.530069 | 0.458241 | 0.7485065 | 0.7165894 | 716.9845 |
| 41758 | 10.671990 | 201.120 | 332.165 | 10.671990 | 0.441728 | 0.7484400 | 0.7159655 | 724.3939 |
| 42029 | 11.580640 | 199.890 | 332.165 | 11.580640 | 0.409008 | 0.7244821 | 0.6915956 | 674.7063 |
| 42240 | 8.755353 | 200.395 | 332.165 | 8.755353 | 0.467121 | 0.7676238 | 0.7360225 | 807.2078 |
| 42495 | 10.413640 | 202.865 | 332.165 | 10.413640 | 0.495868 | 0.7960092 | 0.7635531 | 824.4340 |
| 42877 | 10.613855 | 205.305 | 332.165 | 10.613855 | 0.381419 | 0.6712183 | 0.6389533 | 688.6737 |
| 43740 | 11.207270 | 202.435 | 332.165 | 11.207270 | 0.507078 | 0.8131325 | 0.7802325 | 912.6369 |
| 44062 | 11.711450 | 204.310 | 332.165 | 11.711450 | 0.391607 | 0.6907774 | 0.6579016 | 632.0200 |
| 44404 | 11.324645 | 205.525 | 332.165 | 11.324645 | 0.471039 | 0.7654980 | 0.7326490 | 831.6049 |
| 44764 | 11.184635 | 211.365 | 332.165 | 11.184635 | 0.411543 | 0.6834419 | 0.6508587 | 660.8898 |
| 45138 | 13.376115 | 209.720 | 332.165 | 13.376115 | 0.323035 | 0.6097951 | 0.5761925 | 553.0960 |
| 45525 | 12.733005 | 216.005 | 332.165 | 12.733005 | 0.359366 | 0.6216738 | 0.5884075 | 561.3689 |
| 46322 | 12.018120 | 218.350 | 332.165 | 12.018120 | 0.347459 | 0.5984916 | 0.5656716 | 545.9594 |

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| 47601 | 10.271700 | 204.025 | 332.165 | 10.271700 | 0.407037 | 0.7003206 | 0.6681573 | 676.7700 |
| 48772 | 10.887380 | 201.280 | 332.165 | 10.887380 | 0.429229 | 0.7361799 | 0.7036251 | 748.1600 |
| 50937 | 11.221780 | 207.525 | 332.165 | 11.221780 | 0.548830 | 0.8372029 | 0.8042388 | 856.4157 |
| 52168 | 12.206855 | 216.450 | 332.165 | 12.206855 | 0.385159 | 0.6440224 | 0.6109921 | 638.3958 |
| 52330 | 10.884445 | 216.450 | 332.165 | 10.884445 | 0.488210 | 0.7431811 | 0.7106113 | 722.2759 |
| 52933 | 10.531495 | 222.435 | 332.165 | 10.531495 | 0.539465 | 0.7747710 | 0.7423055 | 818.1768 |
| 53562 | 12.023970 | 222.200 | 332.165 | 12.023970 | 0.590746 | 0.8337171 | 0.8003341 | 895.9369 |
| 54360 | 10.969175 | 219.165 | 332.165 | 10.969175 | 0.556933 | 0.8046761 | 0.7719190 | 894.4191 |
| 56695 | 11.799285 | 212.440 | 332.165 | 11.799285 | 0.508502 | 0.7815149 | 0.7483771 | 758.2186 |
| 56821 | 9.676870 | 214.070 | 332.165 | 9.676870 | 0.529626 | 0.7881327 | 0.7560543 | 749.6804 |
| 58294 | 13.096980 | 223.750 | 332.165 | 13.096980 | 0.434754 | 0.6745966 | 0.6409971 | 641.7771 |
| 59004 | 12.654425 | 231.290 | 332.165 | 12.654425 | 0.412567 | 0.6269132 | 0.5936780 | 642.2636 |
| 61201 | 11.728895 | 209.260 | 332.165 | 11.728895 | 0.554980 | 0.8397785 | 0.8065404 | 939.8731 |
| 61618 | 10.919690 | 208.640 | 332.165 | 10.919690 | 0.486621 | 0.7682727 | 0.7356262 | 858.8621 |
| 63345 | 10.277420 | 198.775 | 332.165 | 10.277420 | 0.590586 | 0.9075057 | 0.8748583 | 1073.7710 |
| 65500 | 12.364315 | 208.980 | 332.165 | 12.364315 | 0.548204 | 0.8370809 | 0.8035031 | 906.7817 |
| 65984 | 13.201235 | 200.590 | 332.165 | 13.201235 | 0.349848 | 0.6705403 | 0.6368910 | 751.7876 |
| 67492 | 10.500190 | 202.450 | 332.165 | 10.500190 | 0.461421 | 0.7627627 | 0.7303409 | 803.3011 |
| 69280 | 11.543625 | 208.340 | 332.165 | 11.543625 | 0.466809 | 0.7521357 | 0.7192034 | 851.3084 |
| 69681 | 8.818884 | 213.405 | 332.165 | 8.818884 | 0.550936 | 0.8085462 | 0.7768226 | 838.4013 |
| 70083 | 12.575910 | 217.940 | 332.165 | 12.575910 | 0.331883 | 0.5864653 | 0.5533706 | 724.7573 |
| 71728 | 12.949905 | 238.510 | 332.165 | 12.949905 | 0.493640 | 0.6892157 | 0.6556646 | 769.5316 |
| 73834 | 12.521990 | 232.035 | 332.165 | 12.521990 | 0.527963 | 0.7413912 | 0.7079547 | 891.7651 |
| 74427 | 12.942090 | 236.285 | 332.165 | 12.942090 | 0.470405 | 0.6720093 | 0.6385041 | 795.4811 |
| 75975 | 11.813955 | 244.640 | 332.165 | 11.813955 | 0.429378 | 0.6035891 | 0.5708658 | 710.2587 |
| 78001 | 16.088725 | 225.785 | 332.165 | 16.088725 | 0.430684 | 0.6777472 | 0.6422849 | 812.5951 |
| 78428 | 14.814645 | 225.395 | 332.165 | 14.814645 | 0.523328 | 0.7671534 | 0.7322967 | 843.2358 |
| 80167 | 13.590870 | 232.670 | 332.165 | 13.590870 | 0.374170 | 0.5873913 | 0.5537187 | 625.9014 |
| 82264 | 9.319097 | 239.880 | 332.165 | 9.319097 | 0.456190 | 0.6361924 | 0.6046325 | 561.0331 |
| 85406 | 10.705515 | 234.690 | 332.165 | 10.705515 | 0.407783 | 0.6053911 | 0.5732341 | 584.7330 |
| 86807 | 10.347030 | 222.220 | 332.165 | 10.347030 | 0.383166 | 0.6157447 | 0.5837411 | 538.9241 |
| 89490 | 11.854085 | 228.130 | 332.165 | 11.854085 | 0.448199 | 0.6695678 | 0.6366665 | 562.1334 |
| 91816 | 10.817200 | 232.430 | 332.165 | 10.817200 | 0.548471 | 0.7549666 | 0.7224035 | 757.2943 |
| 93907 | 12.882770 | 238.210 | 332.165 | 12.882770 | 0.379700 | 0.5742670 | 0.5410311 | 507.5994 |

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| 96656 | 12.281340 | 244.055 | 332.165 | 12.281340 | 0.353974 | 0.5301700 | 0.4973712 | 462.0576 |
| 99188 | 9.735085 | 243.085 | 332.165 | 9.735085 | 0.430647 | 0.6030782 | 0.5713991 | 642.8187 |
| 101967 | 10.836270 | 242.415 | 332.165 | 10.836270 | 0.580318 | 0.7595369 | 0.7269533 | 785.1310 |
| 102747 | 11.904570 | 237.070 | 332.165 | 11.904570 | 0.361761 | 0.5559666 | 0.5233083 | 554.6910 |
| 104861 | 14.935930 | 240.620 | 332.165 | 14.935930 | 0.484685 | 0.6812357 | 0.6465157 | 735.8571 |
| 107565 | 12.305630 | 238.385 | 332.165 | 12.305630 | 0.581557 | 0.7765294 | 0.7431285 | 841.6019 |
| 110928 | 13.266150 | 252.310 | 332.165 | 13.266150 | 0.451387 | 0.6100327 | 0.5764928 | 668.6916 |
| 114230 | 11.368895 | 264.240 | 332.165 | 11.368895 | 0.526497 | 0.6523217 | 0.6197166 | 682.3708 |
| 115535 | 12.103225 | 275.060 | 332.165 | 12.103225 | 0.650182 | 0.7542617 | 0.7210246 | 854.6652 |
| 117705 | 15.665745 | 274.980 | 332.165 | 15.665745 | 0.467457 | 0.5771259 | 0.5421980 | 688.7579 |
| 118737 | 12.090160 | 272.730 | 332.165 | 12.090160 | 0.591169 | 0.6998693 | 0.6667689 | 780.0163 |
| 119619 | 13.376815 | 271.165 | 332.165 | 13.376815 | 0.575280 | 0.6898210 | 0.6560236 | 778.4911 |
| 121968 | 14.092390 | 277.430 | 332.165 | 14.092390 | 0.481000 | 0.5821946 | 0.5482382 | 661.8524 |
| 124468 | 12.453005 | 278.530 | 332.165 | 12.453005 | 0.494356 | 0.5904503 | 0.5574137 | 663.6397 |
| 126463 | 12.412600 | 274.085 | 332.165 | 12.412600 | 0.546565 | 0.6525294 | 0.6193663 | 731.6617 |
| 129122 | 13.892880 | 268.440 | 332.165 | 13.892880 | 0.489728 | 0.6108842 | 0.5769765 | 688.3250 |
| 130648 | 11.791140 | 251.340 | 332.165 | 11.791140 | 0.615587 | 0.7745645 | 0.7414475 | 844.3812 |
| 131332 | 10.680325 | 241.130 | 332.165 | 10.680325 | 0.575380 | 0.7575305 | 0.7250306 | 787.6603 |
| 132984 | 10.841310 | 224.630 | 332.165 | 10.841310 | 0.569515 | 0.7997157 | 0.7670355 | 810.0015 |
| 134767 | 12.392455 | 212.430 | 332.165 | 12.392455 | 0.554306 | 0.8311426 | 0.7975633 | 848.0322 |
| 137439 | 11.926565 | 201.460 | 332.165 | 11.926565 | 0.407824 | 0.7191856 | 0.6861275 | 709.5095 |
| 138097 | 11.480050 | 198.865 | 332.165 | 11.480050 | 0.479383 | 0.7998953 | 0.7668837 | 791.4739 |
| 141499 | 10.685910 | 194.630 | 332.165 | 10.685910 | 0.462746 | 0.7950330 | 0.7624426 | 747.6862 |
| 144323 | 11.442350 | 195.305 | 332.165 | 11.442350 | 0.499911 | 0.8347591 | 0.8016852 | 825.0859 |
| 144967 | 12.916365 | 194.805 | 332.165 | 12.916365 | 0.467325 | 0.8124309 | 0.7786019 | 825.8902 |
| 148580 | 10.440630 | 198.795 | 332.165 | 10.440630 | 0.536004 | 0.8524483 | 0.8198473 | 821.1417 |
| 151686 | 12.964835 | 202.350 | 332.165 | 12.964835 | 0.347492 | 0.6599235 | 0.6264346 | 605.4743 |
| 153838 | 11.242885 | 197.540 | 332.165 | 11.242885 | 0.525301 | 0.8507400 | 0.8177331 | 840.6504 |
| 154746 | 10.348605 | 197.540 | 332.165 | 10.348605 | 0.466467 | 0.7856161 | 0.7532164 | 796.6727 |
| 155018 | 10.313355 | 196.300 | 332.165 | 10.313355 | 0.530626 | 0.8559058 | 0.8233603 | 920.7714 |
| 156122 | 12.884660 | 192.840 | 332.165 | 12.884660 | 0.366830 | 0.7173585 | 0.6837765 | 783.4878 |
| 157554 | 13.089500 | 189.190 | 332.165 | 13.089500 | 0.471197 | 0.8415285 | 0.8075301 | 935.3884 |
| 158915 | 13.276425 | 187.250 | 332.165 | 13.276425 | 0.467446 | 0.8476240 | 0.8135026 | 905.9128 |
| 160619 | 7.985918 | 187.500 | 332.165 | 7.985918 | 0.610210 | 0.9600787 | 0.9283861 | 884.0839 |

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| 161695 | 12.010360 | 187.500 | 332.165 | 12.010360 | 0.446639 | 0.8163450 | 0.7830107 | 853.0225 |
| 162919 | 11.019520 | 204.300 | 332.165 | 11.019520 | 0.467616 | 0.7649254 | 0.7322357 | 911.6958 |
| 163882 | 11.145145 | 200.400 | 332.165 | 11.145145 | 0.443579 | 0.7555355 | 0.7228031 | 761.2994 |
| 164970 | 9.264389 | 196.500 | 332.165 | 9.264389 | 0.482802 | 0.8006646 | 0.7687527 | 796.1240 |
| 165836 | 12.244175 | 191.600 | 332.165 | 12.244175 | 0.440028 | 0.7935180 | 0.7601104 | 816.5971 |
| 167203 | 9.721515 | 188.400 | 332.165 | 9.721515 | 0.528851 | 0.8826170 | 0.8502994 | 919.0582 |
| 168643 | 12.880855 | 185.250 | 332.165 | 12.880855 | 0.491368 | 0.8784050 | 0.8444376 | 936.7528 |
| 169889 | 12.119125 | 196.600 | 332.165 | 12.119125 | 0.464273 | 0.7970545 | 0.7637069 | 843.2359 |
| 171139 | 10.251235 | 197.200 | 332.165 | 10.251235 | 0.532404 | 0.8538927 | 0.8213826 | 869.3297 |
| 171398 | 9.795615 | 197.200 | 332.165 | 9.795615 | 0.505406 | 0.8238574 | 0.7916396 | 830.4592 |
| 172514 | 11.878105 | 197.750 | 332.165 | 11.878105 | 0.582990 | 0.9126179 | 0.8791270 | 1036.4621 |
| 172930 | 9.116090 | 197.750 | 332.165 | 9.116090 | 0.597110 | 0.9121225 | 0.8800248 | 952.0774 |
| 174149 | 9.733125 | 197.700 | 332.165 | 9.733125 | 0.466567 | 0.7818844 | 0.7497935 | 858.3606 |
| 175288 | 11.109840 | 196.850 | 332.165 | 11.109840 | 0.497959 | 0.8247088 | 0.7918321 | 898.2530 |
| 175565 | 11.614275 | 196.850 | 332.165 | 11.614275 | 0.536219 | 0.8667717 | 0.8335311 | 922.8545 |
| 176896 | 10.283620 | 189.850 | 332.165 | 10.283620 | 0.549047 | 0.9005981 | 0.8679636 | 992.8810 |
| 177960 | 12.862945 | 190.100 | 332.165 | 12.862945 | 0.511227 | 0.8770947 | 0.8431407 | 975.2085 |
| 179446 | 12.538305 | 198.900 | 332.165 | 12.538305 | 0.460554 | 0.7865782 | 0.7530244 | 775.9448 |
| 179707 | 12.398400 | 207.700 | 332.165 | 12.398400 | 0.356645 | 0.6462695 | 0.6131292 | 617.8289 |
| 181254 | 12.878315 | 213.200 | 332.165 | 12.878315 | 0.378381 | 0.6513895 | 0.6179701 | 670.5810 |
| 181849 | 12.580135 | 215.450 | 332.165 | 12.580135 | 0.397286 | 0.6614870 | 0.6282100 | 749.5114 |
| 182354 | 10.924135 | 207.900 | 332.165 | 10.924135 | 0.337109 | 0.6182801 | 0.5859830 | 533.0327 |
| 183523 | 10.255550 | 198.900 | 332.165 | 10.255550 | 0.364258 | 0.6753709 | 0.6432735 | 722.3501 |
| 184818 | 7.416540 | 199.700 | 332.165 | 7.416540 | 0.499713 | 0.7973521 | 0.7662723 | 764.1696 |
| 186603 | 11.920440 | 207.050 | 332.165 | 11.920440 | 0.368120 | 0.6578749 | 0.6249659 | 666.7498 |
| 189340 | 10.674150 | 221.000 | 332.165 | 10.674150 | 0.464490 | 0.7035425 | 0.6711718 | 669.7611 |
| 190307 | 8.493256 | 231.350 | 332.165 | 8.493256 | 0.506649 | 0.7081319 | 0.6767842 | 855.7630 |
| 191709 | 10.294565 | 225.850 | 332.165 | 10.294565 | 0.442095 | 0.6644477 | 0.6323565 | 754.8232 |
| 192795 | 10.022120 | 219.150 | 332.165 | 10.022120 | 0.479334 | 0.7219167 | 0.6898251 | 713.9450 |
| 194581 | 10.191110 | 226.500 | 332.165 | 10.191110 | 0.496187 | 0.7171053 | 0.6849425 | 715.4765 |
| 194846 | 11.431140 | 226.500 | 332.165 | 11.431140 | 0.441957 | 0.6665568 | 0.6338857 | 683.5466 |
| 195710 | 11.487825 | 223.250 | 332.165 | 11.487825 | 0.478354 | 0.7138228 | 0.6810104 | 733.1355 |