Extending Met Input Data

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Objective

Ed uses meterological data (met data) as a driver. From PECAN we have results from 19179 to 2019 for the UMBS forest. However we need ED to run from 1900 to 1979 (when the UMBS was clear cut). We decided that the easiest thing to do would be to take the earliest decade of the the data we do have (1979-1989) and loop through it to generate the missing data. The prupose of this markdown is to take a look at the meterological results when we do that, evaluate how it looks. Does it look like there is anything alarming in the data? And to check out ED results, does LAI in 2017 finally look reasonable?

Met Data List Name

- dlwrf — downward long wave radiation (W m-2)
- nbdsf — near infrared beam downward solar radiation (W m-2)
- nddsf — near IR diffuse downward solar radiation (W m-2)
- vbdsf — visible beam downward solar radiation (W m-2)
- vddsf — visible diffuse downward solar radiation (W m-2)
- prate — precipitation rate (kgH2O m-2 s-1)
- pres — atmospheric pressure (Pa)
- hgt — geopotential height (m)
- ugrd — zonal wind (m s-1)
- vgrd — meridional wind (m s-1)
- sh — specific humidity (kgH2O kgAir-1)
- tmp — air temperature (K)

Evlatuate Met Dat

```
met_data <- as.data.table(read.csv(file.path(BASE_DIR, 'PIC results', 'NARR-ED2_long.csv')))
met_data$date <- ymd(paste(met_data$year, met_data$month, '01', sep = '/'))
```

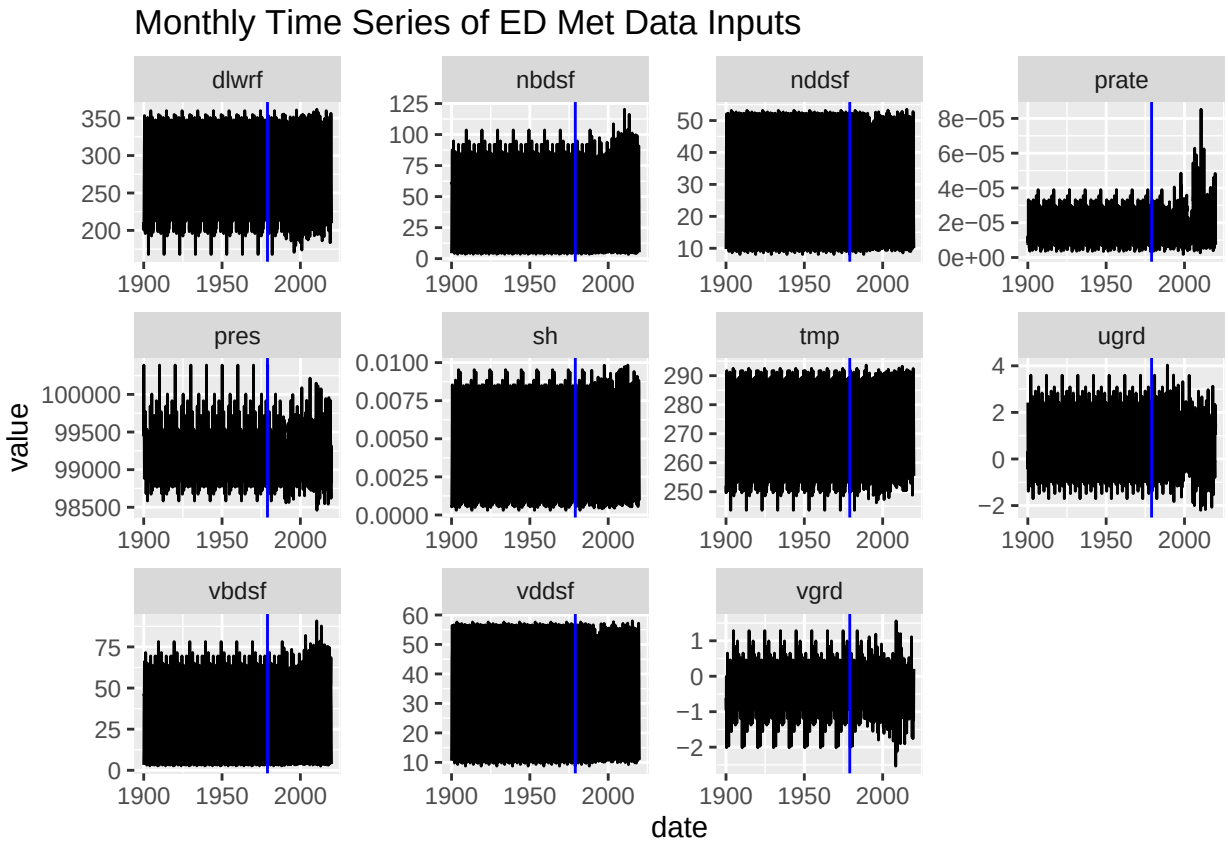
Plot the monthly time series of the input data. Because there is

```
long_met_data <- melt(met_data, measure.vars = c("nbdsf", "nddsf", "vbdsf", "vddsf", "prate", "dlwrf",
                              "pres", "hgt", "ugrd", "vgrd", "sh", "tmp"),
                      variable.name = 'variable',
                      value.name = 'value')
long_met_data <- long_met_data[, list(date, variable, value, year)]

var_info <- data.table(
  variable = c('dlwrf', 'nbdsf', 'nddsf', 'vbdsf', 'vddsf', 'prate', 'pres',
               'hgt', 'ugrd', 'vgrd', 'sh', 'tmp'),
  description = c('downward long wave radiation', 'near infrared beam downward solar radiation',
                  'near IR diffuse downward solar radiation', 'visible beam downward solar radiation',
```

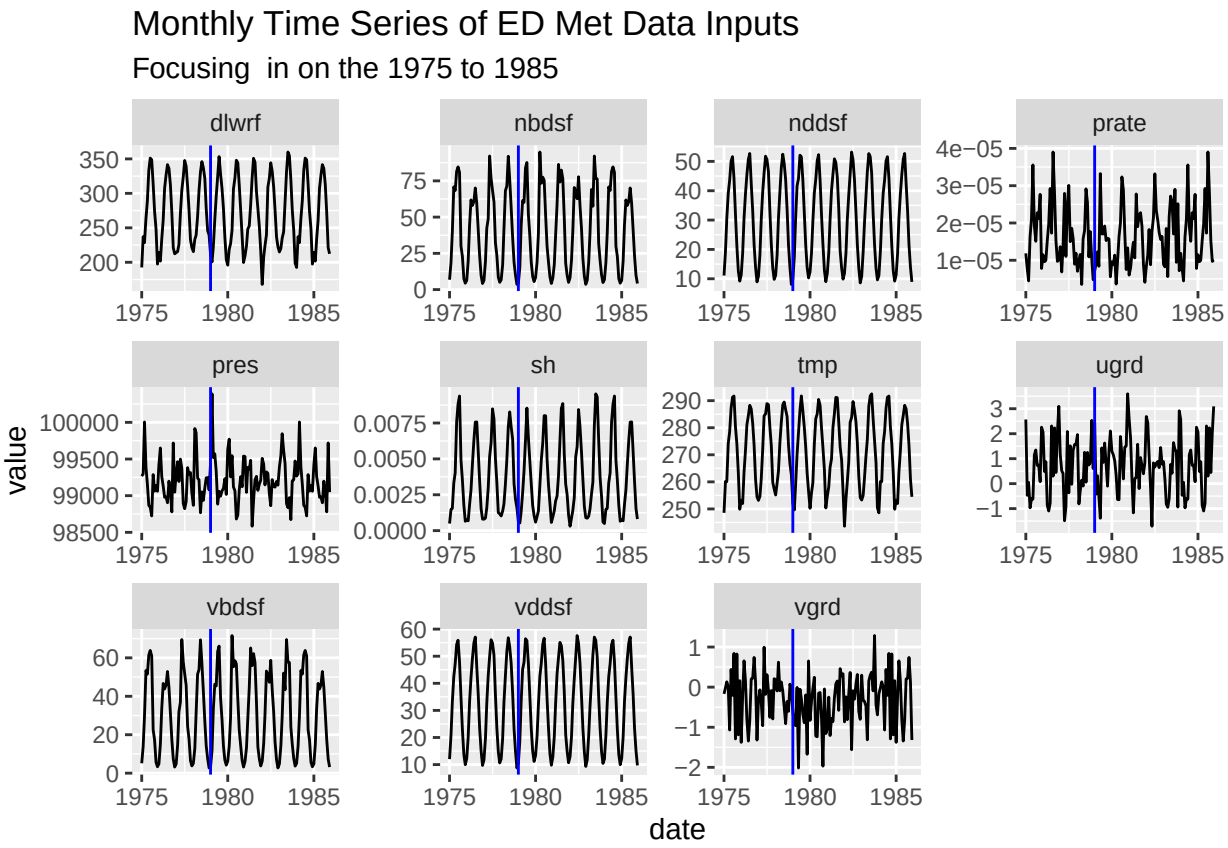
```
                  'visible diffuse downward solar radiation', 'precipitation rate',
                  'atmospheric pressure', 'geopotential height', 'zonal wind',
                  'meridional wind', 'specific humidity', 'air temperature'),
  units = c('W m-2', 'W m-2', 'W m-2', 'W m-2', 'W m-2', 'kgH2O m-2 s-1',  'Pa', 'm', 'm s-1', 'm s-',


long_met_data <- long_met_data[var_info, on = 'variable']
long_met_data <- long_met_data[variable != 'hgt', ] # exclude the geo spatial height on cause it doesn'
```

Looking at the entire time series and a the subset of the time series focusing on the the time when the met data filling began (1979). The blue line indicates where the filled in historical data begins.

```
long_met_data %>%
ggplot() +
  geom_line(aes(date, value)) +
  facet_wrap("variable", scales = 'free') +
  labs(title = 'Monthly Time Series of ED Met Data Inputs')  +
  geom_vline(xintercept = date('1979-01-01'), color = 'blue')
```



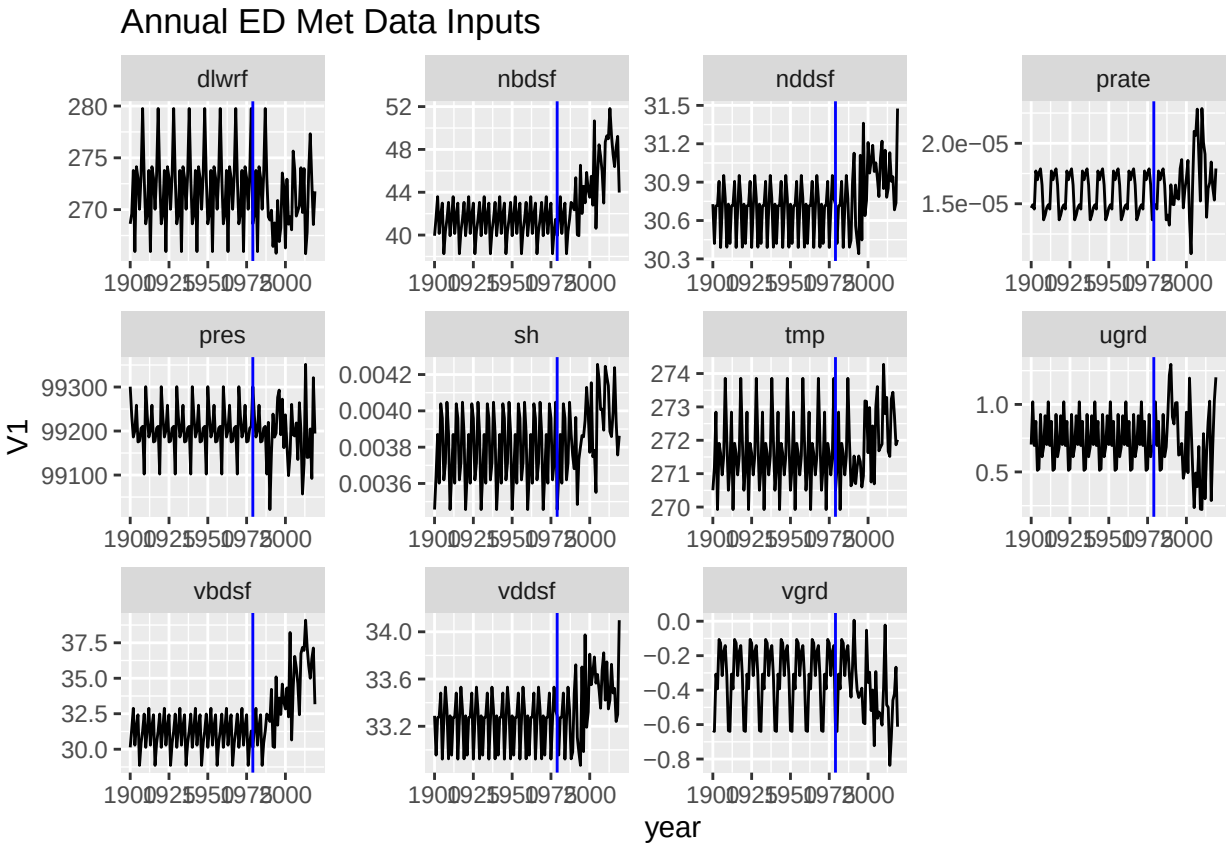

```
long_met_data[ year %in% 1975:1985, ] %>%
ggplot() +
  geom_line(aes(date, value)) +
  facet_wrap("variable", scales = 'free') +
  labs(title = 'Monthly Time Series of ED Met Data Inputs',
       subtitle = 'Focusing  in on the 1975 to 1985') +
  geom_vline(xintercept = date('1979-01-01'), color = 'blue')
```



Finally let's take a quick look at the annual data.

```
# Annual average.
annual_data <- long_met_data[ , mean(value), by = list(year, variable)]
```

```
ggplot(annual_data) +
  geom_line(aes(year, V1)) +
  facet_wrap("variable", scales = 'free') +
  labs(title = 'Annual ED Met Data Inputs') +
  geom_vline(xintercept = 1979, color = 'blue')
```



So in the annual time series it does look like there is a signal in the some of the variable time series that the filled in data fails to capture. I am on the fence about if this is a problem or not. Or even if we care about the climate? Would an idealized climate record with no signal change be better? But would that mean that it wouldn't make much sense to compare with the FoRTE obserbvations then?

Evlatuate ED Monthly Data

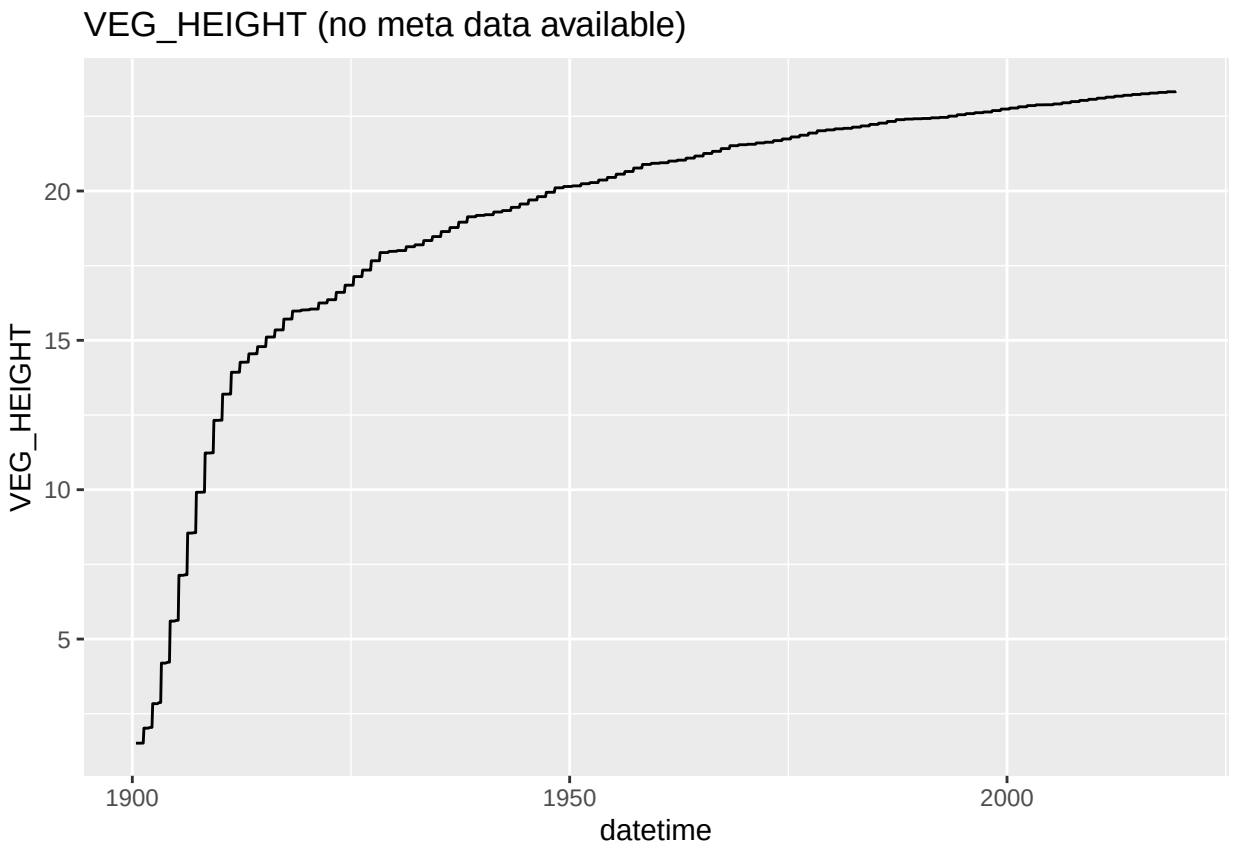
```
monthly_ed <- readRDS(file.path(BASE_DIR, 'PIC results', '001testing_long_met.rds'))

ed_info <- data.table(ed2_variable_info())
```

```
monthly_ed$df_pft %>%
  dplyr::bind_rows() %>%
  dplyr::select(datetime, pft,  'MMEAN_LAI_PY') ->
  LAI_data
```

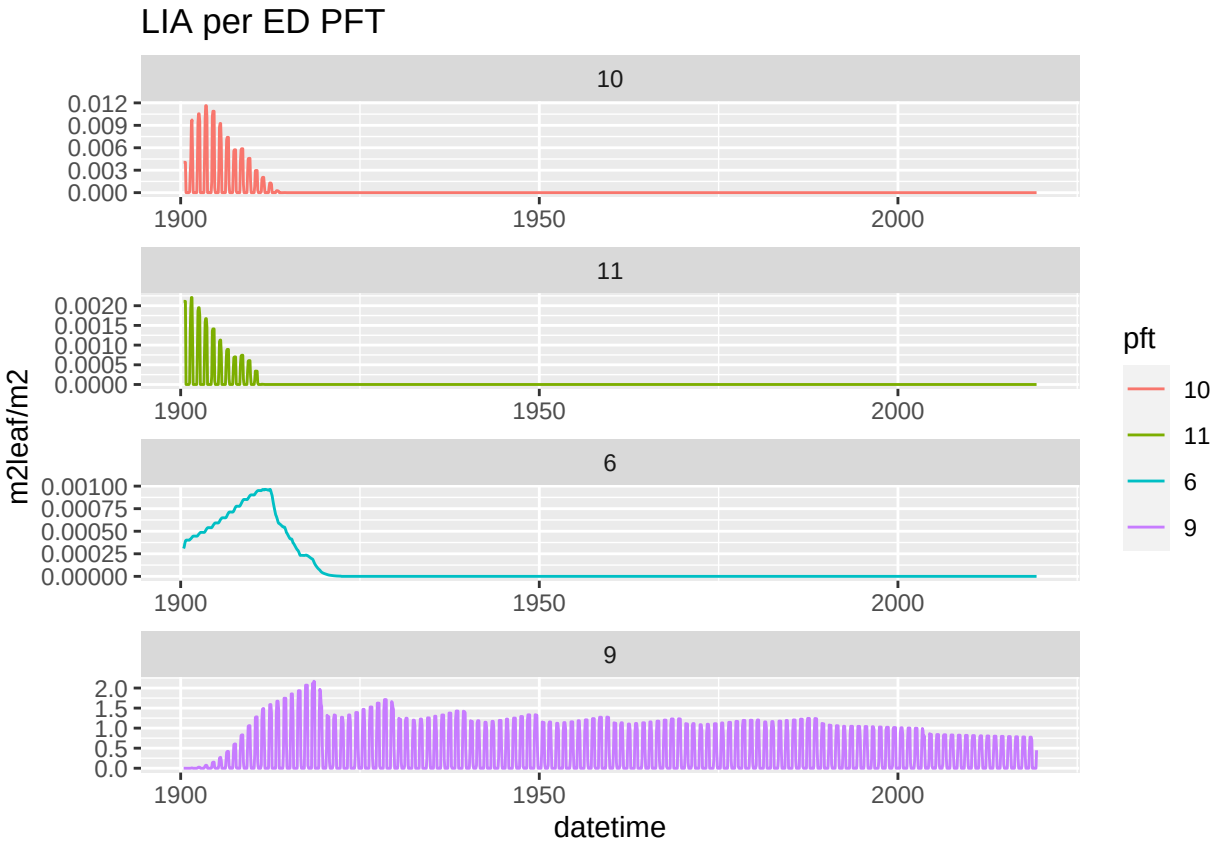
```
ed_info[variable == 'VEG_HEIGHT', ]
```

```
##      variable           description unit dimensions    code_variable in_history
## 1: VEG_HEIGHT No metadata available <NA>   npatches csite%veg_height       TRUE
##    in_analysis in_daily in_monthly in_diurnal in_yearly in_tower
## 1:        TRUE     TRUE       TRUE       TRUE     FALSE    FALSE
##            glob_id                              info_string df_scalar df_cohort
## 1: csite%paglob_id VEG_HEIGHT :31:hist:anal:dail:mont:dcyc      TRUE     FALSE
##    df_soil df_pft
## 1:   FALSE  FALSE
```

```
monthly_ed$df_scalar %>%
  dplyr::bind_rows() %>%
  dplyr::select(datetime, VEG_HEIGHT) %>%
    ggplot() +
  geom_line(aes(datetime, VEG_HEIGHT)) +
  labs(title = 'VEG_HEIGHT (no meta data available)')
```

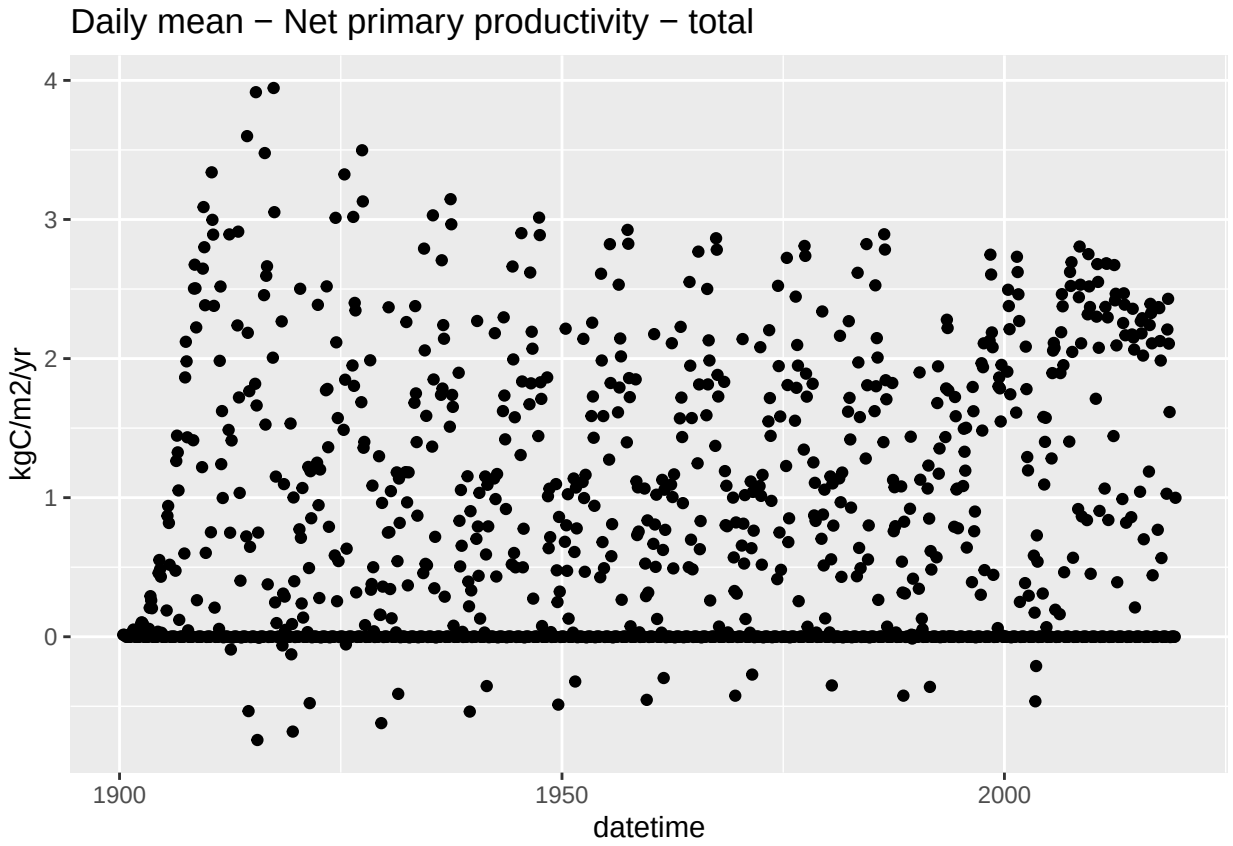



```
LAI_data %>%
  dplyr::filter(pft %in% c(6,9,10,11)) %>%
  dplyr::mutate(pft = as.character(pft)) %>%
  ggplot() +
  geom_line(aes(datetime, MMEAN_LAI_PY, color = pft)) +
  facet_wrap("pft", ncol = 1, scales = 'free') +
  labs(title = 'LIA per ED PFT',
       y = 'm2leaf/m2')
```



Ugh I think that this still seems somewhat lower than what we were expecting no? I might have too look into conversions or something.

```
monthly_ed$df_scalar %>%
  dplyr::bind_rows() %>%
  dplyr::select(datetime, MMEAN_NPPDAILY_PY) %>%
    ggplot() +
  geom_point(aes(datetime, MMEAN_NPPDAILY_PY)) +
  labs(title = 'Daily mean - Net primary productivity - total',
       y = 'kgC/m2/yr')
```



So it is still not clear to me which NPP values we want to be working with and the data processing that is necessary. I am going to poke around in the GCB paper code to see what Alexey plotted and how he processed those files.