Methanem Comparison

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```
# Load in trailer Methane
Trailer <- readRDS('TrailerProcessed-20240601.rds')

trailer_comps_wind <- Trailer %>% select(time_utc, ch4, co, co2_ppm, nox, benzene, wdr_deg, wsp_ms) %>%
  mutate(day = as.Date(format(as.POSIXct(time_utc), '%Y-%m-%d'))) %>%
  rename('co2' = 'co2_ppm')
```

```
# # Load in VNF data
# vnf <- readRDS('pb-vnf_20230501-20240601.rds')
#
# vnf <- vnf %>%
#   mutate(across(where(is.numeric),  ~ na_if(.x, 999999))) %>% # replace 999999 as missing
#   filter(!(is.na(temp_bb) | is.na(methane_eq))) # keep those not missing temperature
#
# vnf <- vnf %>%
#   filter(temp_bb >= 1600)
#
loving_lonlat <- c(-104.1089, 32.2961)
# distance_km_lov <- function(long, lati){
#   start <- c(long, lati)
#   distGeo(start, loving_lonlat) / 1000
# }
#
# vnf <- vnf %>%
#   mutate(distToLovi = mapply(distance_km_lov, lon, lat))
#
# saveRDS(vnf, 'vnf_cleaned_20230501-20240601.rds')
vnf <- readRDS('vnf_cleaned_20230501-20240601.rds')
```

```
# Preprocessing
vnf_200km <- vnf %>%
  filter(distToLovi <= 200)

radius <- c(5, 10, 20, 50, 100)

trailer_compounds <- c('ch4', 'co', 'co2', 'nox', 'benzene')

# Compute daily average
trailer_daily <- trailer_comps_wind %>%
  select(-time_utc) %>%
  group_by(day) %>%
```

```
  summarise(across(!wdr_deg, ~mean(.x, na.rm=T)),
            wdr_deg = as.numeric(mean(circular(wdr_deg, units = "degrees"), na.rm=T))) %>%
  mutate(wdr_deg = if_else(wdr_deg < 0, wdr_deg+360, wdr_deg))
```

```
## Warning: There were 2 warnings in `summarise()`.
## The first warning was:
## i In argument: `wdr_deg = as.numeric(mean(circular(wdr_deg, units = "degrees"),
##   na.rm = T))`.
## i In group 47: `day = 2023-05-31`.
## Caused by warning in `mean.circular()`:
## ! No observations (at least after removing missing values)
## i Run `dplyr::last_dplyr_warnings()` to see the 1 remaining warning.
```

```
# Compute average measurement from 6pm to 6am
trailer_night_avg <- trailer_comps_wind %>%
  filter(hour(ymd_hms(time_utc)) <= 6 ) %>%
  select(-time_utc) %>%
  group_by(day) %>%
  summarise(across(everything(), ~mean(.x, na.rm=T))) %>%
  mutate(wdr_deg = if_else(wdr_deg < 0, wdr_deg+360, wdr_deg))

# Compute flare angle
angles <- tibble(st_sfc(st_point(loving_lonlat), crs = 4326),
                 vnf_200km[,c('lon', 'lat')] %>%
                   st_as_sf(coords = c('lon', 'lat')) %>%
                   st_set_crs(4326)) %>%
                pivot_longer(cols = everything()) %>%
                pull(value) %>% # extract coordinates only
                st_geod_azimuth() %>%
                set_units('degrees') %>% # convert to degrees
                drop_units()
angles <- angles[c(T, F)] # keep only odd index, valid pairs
angles <- if_else(angles < 0, angles + 360, angles)
vnf_200km$angle <- angles

corr_result <- tibble(radius = numeric(),
                      trailer_compound = character(),
                      flare_count = numeric(),
                      daily_corr = numeric(),
                      nightly_corr = numeric())

vnf_trailer_full <- tibble(date = vnf_200km %>%
    filter(distToLovi <= max(radius)) %>% pull(date) %>% unique()) %>%
    left_join(trailer_daily,
              join_by(date == day)) %>%
    left_join(trailer_night_avg,
              join_by(date == day), suffix = c('.day', '.night'))

for (r in radius) {
  # Filter for flares within radius r
  temp <- vnf_200km %>%
    filter(distToLovi <= r)
```

```
  # For those flares, get average methane_eq then join with trailer data
  # NOTE: since we have a n-to-1 mapping between flares and trailer,
  # it is difficult to get a single wind difference value for each day.
  # Instead, I will check if there exists a flare in a similar direction as wind
  flare_is_from_wd <- temp %>%
    left_join(trailer_daily,
              join_by(date == day)) %>%
    left_join(trailer_night_avg,
              join_by(date == day), suffix = c('.day', '.night')) %>%
    group_by(date) %>%
    summarise(flare_wd_day = sum(abs(angle - wdr_deg.day) <= 30),
              flare_wd_night = sum(abs(angle - wdr_deg.night) <= 30),
              flare_count = length(unique(vnf_id))) %>%
    rename(setNames(c('flare_wd_day', 'flare_wd_night', 'flare_count'), paste0(c('flare_wd_day_', 'flare

  temp <- temp %>%
    select(date, methane_eq, angle) %>%
    group_by(date) %>%
    summarise(avg_methane_eq = mean(methane_eq)) %>%
    rename(setNames('avg_methane_eq', paste0('avg_methane_eq_', r)))

  merged <- temp %>%
    left_join(trailer_daily,
              join_by(date == day)) %>%
    left_join(trailer_night_avg,
              join_by(date == day), suffix = c('.day', '.night')) %>%
    left_join(flare_is_from_wd, join_by(date)) %>%
    rename(setNames(paste0('avg_methane_eq_', r), 'ch4_vnf'))

  vnf_trailer_full <- vnf_trailer_full %>%
    left_join(temp, join_by(date)) %>%
    left_join(flare_is_from_wd, join_by(date))

  corr <- tibble(radius = r,
                 trailer_compound = trailer_compounds,
                 flare_count = merged %>%
                   pull(paste0('flare_count_', r)) %>%
                   sum(),
                 daily_corr = sapply(paste0(trailer_compounds, '.day'),
                                     function(x) cor(merged$ch4_vnf, merged[[x]],
                                                     use = 'complete')),
                 nightly_corr = sapply(paste0(trailer_compounds, '.night'),
                                       function(x) cor(merged$ch4_vnf, merged[[x]],
                                                       use = 'complete')))

  corr_result <- rbind(corr_result, corr)
}

knitr::kable(corr_result %>% arrange(trailer_compound, radius), digits = 3)
```

radius	trailer_compound	flare_count	daily_corr	nightly_corr
5	benzene	12	0.321	0.663

radius	trailer_compound	flare_count	daily_corr	nightly_corr
10	benzene	95	0.124	0.108
20	benzene	370	-0.056	-0.025
50	benzene	2746	-0.025	0.021
100	benzene	8842	0.039	0.060
5	ch4	12	0.586	0.670
10	ch4	95	0.158	0.212
20	ch4	370	-0.022	0.025
50	ch4	2746	0.002	0.000
100	ch4	8842	0.070	0.041
5	co	12	0.400	0.427
10	co	95	0.065	0.079
20	co	370	-0.027	-0.077
50	co	2746	-0.055	-0.062
100	co	8842	-0.032	-0.058
5	co2	12	0.373	0.455
10	co2	95	0.106	0.144
20	co2	370	0.020	0.032
50	co2	2746	0.045	0.048
100	co2	8842	-0.004	0.006
5	nox	12	0.564	0.561
10	nox	95	0.078	0.039
20	nox	370	-0.107	-0.098
50	nox	2746	-0.009	0.003
100	nox	8842	0.041	0.057

```
ch4_nox_5km <- lm(avg_methane_eq_5 ~ ch4.night + co.night + co2.night + nox.night + benzene.night + wsp
summary(ch4_nox_5km)
```

```
##
## Call:
## lm(formula = avg_methane_eq_5 ~ ch4.night + co.night + co2.night +
##     nox.night + benzene.night + wsp_ms.night + flare_wd_night_5 +
##     flare_count_5, data = vnf_trailer_full)
##
## Residuals:
##         8        50        55        81       181       183       221       259
##  0.019435 -0.005276  0.001591 -0.006968 -0.007752 -0.001109 -0.003215  0.010966
##       272       302       317       362
##  0.001335 -0.013823 -0.004850  0.009665
##
## Coefficients: (1 not defined because of singularities)
##                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)       5.543e-01  1.546e+00   0.359    0.738
## ch4.night        -4.207e-06  1.928e-05  -0.218    0.838
## co.night          5.829e-05  3.121e-04   0.187    0.861
## co2.night        -1.188e-03  3.668e-03  -0.324    0.762
## nox.night         1.463e-04  1.673e-04   0.874    0.431
## benzene.night     2.204e-02  3.805e-02   0.579    0.594
## wsp_ms.night     -2.328e-03  9.297e-03  -0.250    0.815
## flare_wd_night_5 -5.467e-04  2.231e-02  -0.024    0.982
## flare_count_5            NA         NA      NA       NA
```

```
##
## Residual standard error: 0.01548 on 4 degrees of freedom
##   (358 observations deleted due to missingness)
## Multiple R-squared:  0.5813, Adjusted R-squared:  -0.1513
## F-statistic: 0.7934 on 7 and 4 DF,  p-value: 0.6307
```

```
ch4_nox_10km <- lm(avg_methane_eq_10 ~ ch4.night + co.night + co2.night + nox.night + benzene.night + ws
summary(ch4_nox_10km)
```

```
##
## Call:
## lm(formula = avg_methane_eq_10 ~ ch4.night + co.night + co2.night +
##     nox.night + benzene.night + wsp_ms.night + flare_wd_night_10 +
##     flare_count_10, data = vnf_trailer_full)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.036735 -0.021280 -0.009354  0.010693  0.170610
##
## Coefficients:
##                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)       -1.121e-01  6.560e-01  -0.171    0.865
## ch4.night          2.128e-05  1.381e-05   1.541    0.128
## co.night          -3.306e-05  1.225e-04  -0.270    0.788
## co2.night          3.623e-04  1.565e-03   0.231    0.818
## nox.night         -1.737e-04  2.346e-04  -0.740    0.462
## benzene.night     -2.012e-02  1.898e-02  -1.060    0.293
## wsp_ms.night      -5.468e-03  4.187e-03  -1.306    0.196
## flare_wd_night_10  6.318e-04  1.013e-02   0.062    0.950
## flare_count_10     5.083e-03  6.879e-03   0.739    0.463
##
## Residual standard error: 0.03782 on 66 degrees of freedom
##   (295 observations deleted due to missingness)
## Multiple R-squared:  0.0881, Adjusted R-squared:  -0.02243
## F-statistic: 0.7971 on 8 and 66 DF,  p-value: 0.6072
```

```
ch4_nox_20km <- lm(avg_methane_eq_20 ~ ch4.night + co.night + co2.night + nox.night + benzene.night + wd
summary(ch4_nox_20km)
```

```
##
## Call:
## lm(formula = avg_methane_eq_20 ~ ch4.night + co.night + co2.night +
##     nox.night + benzene.night + wdr_deg.night + wsp_ms.night +
##     flare_wd_night_20 + flare_count_20, data = vnf_trailer_full)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.05508 -0.02882 -0.01084  0.01154  0.30197
##
## Coefficients:
##                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)       -5.235e-01  5.368e-01  -0.975   0.3307
## ch4.night          1.489e-05  1.010e-05   1.474   0.1422
```

```
## co.night          -2.064e-04  1.151e-04  -1.793   0.0745 .
## co2.night          1.480e-03  1.273e-03   1.163   0.2462
## nox.night         -2.926e-04  2.158e-04  -1.356   0.1766
## benzene.night     -9.661e-03  1.568e-02  -0.616   0.5385
## wdr_deg.night     -1.572e-04  7.772e-05  -2.022   0.0445 *
## wsp_ms.night       5.069e-04  2.963e-03   0.171   0.8644
## flare_wd_night_20 -8.752e-03  6.606e-03  -1.325   0.1867
## flare_count_20     4.709e-03  3.266e-03   1.442   0.1510
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.05089 on 194 degrees of freedom
##   (166 observations deleted due to missingness)
## Multiple R-squared:  0.06007,    Adjusted R-squared:  0.01647
## F-statistic: 1.378 on 9 and 194 DF,  p-value: 0.2005
```

```
ch4_nox_50km <- lm(avg_methane_eq_50 ~ ch4.night + co.night + co2.night + nox.night + benzene.night + w
summary(ch4_nox_50km)
```

```
##
## Call:
## lm(formula = avg_methane_eq_50 ~ ch4.night + co.night + co2.night +
##     nox.night + benzene.night + wdr_deg.night + wsp_ms.night +
##     flare_wd_night_50 + flare_count_50, data = vnf_trailer_full)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.042946 -0.016265 -0.004685  0.010797  0.121250
##
## Coefficients:
##                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)       -1.844e-01  1.576e-01  -1.170   0.2430
## ch4.night         -8.374e-07  3.490e-06  -0.240   0.8105
## co.night          -4.932e-05  2.772e-05  -1.779   0.0762 .
## co2.night          6.295e-04  3.755e-04   1.676   0.0946 .
## nox.night         -7.454e-06  8.673e-05  -0.086   0.9316
## benzene.night      1.828e-03  5.798e-03   0.315   0.7527
## wdr_deg.night     -3.474e-05  3.181e-05  -1.092   0.2756
## wsp_ms.night       8.400e-04  1.071e-03   0.784   0.4335
## flare_wd_night_50 -3.015e-05  8.257e-04  -0.037   0.9709
## flare_count_50     5.611e-04  3.626e-04   1.548   0.1227
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02325 on 323 degrees of freedom
##   (37 observations deleted due to missingness)
## Multiple R-squared:  0.02962,    Adjusted R-squared:  0.002581
## F-statistic: 1.095 on 9 and 323 DF,  p-value: 0.3656
```

```
ch4_nox_100km <- lm(avg_methane_eq_100 ~ ch4.night + co.night + co2.night + nox.night + benzene.night +
summary(ch4_nox_100km)
```

```
##
```

```
## Call:
## lm(formula = avg_methane_eq_100 ~ ch4.night + co.night + co2.night +
##     nox.night + benzene.night + wsp_ms.night + flare_wd_night_100 +
##     flare_count_100, data = vnf_trailer_full)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.039011 -0.013483 -0.003297  0.007836  0.155490
##
## Coefficients:
##                       Estimate Std. Error t value Pr(>|t|)
## (Intercept)          8.512e-02  1.450e-01   0.587   0.5575
## ch4.night           -2.826e-07  3.244e-06  -0.087   0.9306
## co.night            -4.034e-05  2.521e-05  -1.600   0.1104
## co2.night           -3.261e-05  3.447e-04  -0.095   0.9247
## nox.night            6.806e-05  8.204e-05   0.830   0.4073
## benzene.night        7.135e-03  5.247e-03   1.360   0.1747
## wsp_ms.night         9.815e-04  9.892e-04   0.992   0.3218
## flare_wd_night_100   2.758e-04  1.899e-04   1.452   0.1473
## flare_count_100      2.123e-04  1.056e-04   2.010   0.0451 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.02217 on 350 degrees of freedom
##   (11 observations deleted due to missingness)
## Multiple R-squared:  0.04554,    Adjusted R-squared:  0.02372
## F-statistic: 2.087 on 8 and 350 DF,  p-value: 0.03635
```

```r
# Variables for the model
response <- c('ch4', 'benzene', 'co', 'co2')
predictors_fixed <- c('wdr_deg.night', 'wsp_ms.night')
predictors_dist_var <- c('flare_wd_night', 'flare_count')
distances <- c(10, 20)

# Tibble to store the result
compound_flare_lm_result <- tibble(Compound = character(),
                                   Radius = numeric(),
                                   'Adj R-sq' = numeric())
for (trailer_compound in response) {
  for (distance in distances) {
    predictors_dist_var_temp <- paste0(predictors_dist_var, paste0('_', distance))
    formula_feature_str <- paste(c(predictors_fixed, predictors_dist_var_temp), collapse = ' + ')
    formula_str <- paste(paste0(trailer_compound, '.night'), formula_feature_str, sep = ' ~ ')
    formula <- as.formula(formula_str)

    model <- lm(formula, data = vnf_trailer_full)
    assign(paste0(trailer_compound, '_count_', distance, 'km'), model)
    summary <- summary(model)

    compound_flare_lm_result <- compound_flare_lm_result %>%
      add_row(Compound = trailer_compound,
              Radius = distance,
              'Adj R-sq' = summary$adj.r.squared)
  }
```

```
}
compound_flare_lm_result
```

```
## # A tibble: 8 x 3
##   Compound Radius `Adj R-sq`
##   <chr>     <dbl>      <dbl>
## 1 ch4          10      0.353
## 2 ch4          20      0.370
## 3 benzene      10      0.403
## 4 benzene      20      0.451
## 5 co           10      0.224
## 6 co           20      0.334
## 7 co2          10      0.255
## 8 co2          20      0.294
```

```
# Look at the models specifically
for (trailer_compound in response) {
  for (distance in distances) {
    cat('--------------Compound: ', toupper(trailer_compound), ', Radius: ', distance, '---------------
    print(summary(get(paste0(trailer_compound, '_count_', distance, 'km'))))
  }
}
```

```
## --------------Compound: CH4, Radius: 10---------------
## Call:
## lm(formula = formula, data = vnf_trailer_full)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -824.94 -246.39  -85.22  112.04 1694.37
##
## Coefficients:
##                   Estimate Std. Error t value Pr(>|t|)
## (Intercept)       3729.282    244.457  15.255  < 2e-16 ***
## wdr_deg.night       -2.416      1.056  -2.289   0.0251 *
## wsp_ms.night      -211.407     37.611  -5.621 3.49e-07 ***
## flare_wd_night_10   -6.312    116.909  -0.054   0.9571
## flare_count_10      53.590     81.629   0.657   0.5136
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 444.1 on 71 degrees of freedom
##   (294 observations deleted due to missingness)
## Multiple R-squared:  0.3878, Adjusted R-squared:  0.3533
## F-statistic: 11.24 on 4 and 71 DF,  p-value: 4.027e-07
##
## --------------Compound: CH4, Radius: 20---------------
## Call:
## lm(formula = formula, data = vnf_trailer_full)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -775.79 -242.93  -96.54  123.05 3157.71
```

```
##
## Coefficients:
##                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)       3373.7595   137.1194  24.605   <2e-16 ***
## wdr_deg.night       -1.3716     0.6067  -2.261   0.0248 *
## wsp_ms.night      -174.4919    17.8219  -9.791   <2e-16 ***
## flare_wd_night_20  114.4799    52.7115   2.172   0.0310 *
## flare_count_20      31.5666    26.4048   1.195   0.2333
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 425.3 on 205 degrees of freedom
##   (160 observations deleted due to missingness)
## Multiple R-squared:  0.3816, Adjusted R-squared:  0.3696
## F-statistic: 31.63 on 4 and 205 DF,  p-value: < 2.2e-16
##
## --------------Compound: BENZENE, Radius: 10---------------
## Call:
## lm(formula = formula, data = vnf_trailer_full)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.66425 -0.23924 -0.06079  0.12976  0.88378
##
## Coefficients:
##                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)        1.3705302  0.1767966   7.752 4.82e-11 ***
## wdr_deg.night     -0.0014246  0.0007634  -1.866   0.0662 .
## wsp_ms.night      -0.1695494  0.0272011  -6.233 2.89e-08 ***
## flare_wd_night_10  0.0235688  0.0845514   0.279   0.7812
## flare_count_10     0.0102123  0.0590357   0.173   0.8632
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.3212 on 71 degrees of freedom
##   (294 observations deleted due to missingness)
## Multiple R-squared:  0.4345, Adjusted R-squared:  0.4026
## F-statistic: 13.64 on 4 and 71 DF,  p-value: 2.677e-08
##
## --------------Compound: BENZENE, Radius: 20---------------
## Call:
## lm(formula = formula, data = vnf_trailer_full)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.63930 -0.19088 -0.05765  0.15160  0.95451
##
## Coefficients:
##                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)        1.1332508  0.0898176  12.617  < 2e-16 ***
## wdr_deg.night     -0.0012480  0.0003968  -3.145  0.00191 **
## wsp_ms.night      -0.1322361  0.0116736 -11.328  < 2e-16 ***
## flare_wd_night_20  0.0849643  0.0342975   2.477  0.01406 *
## flare_count_20     0.0378353  0.0172192   2.197  0.02913 *
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2763 on 203 degrees of freedom
##   (162 observations deleted due to missingness)
## Multiple R-squared:  0.4618, Adjusted R-squared:  0.4512
## F-statistic: 43.55 on 4 and 203 DF,  p-value: < 2.2e-16
##
## --------------Compound: CO, Radius: 10---------------
## Call:
## lm(formula = formula, data = vnf_trailer_full)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -67.100 -31.076  -0.319  17.068 180.289
##
## Coefficients:
##                   Estimate Std. Error t value Pr(>|t|)
## (Intercept)       230.7932    23.4228   9.853 7.36e-15 ***
## wdr_deg.night      -0.1598     0.1017  -1.571  0.12059
## wsp_ms.night      -13.1794     3.5914  -3.670  0.00047 ***
## flare_wd_night_10  15.0766    11.1250   1.355  0.17971
## flare_count_10      6.9855     7.7558   0.901  0.37085
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 42.19 on 70 degrees of freedom
##   (295 observations deleted due to missingness)
## Multiple R-squared:  0.2655, Adjusted R-squared:  0.2236
## F-statistic: 6.327 on 4 and 70 DF,  p-value: 0.0002098
##
## --------------Compound: CO, Radius: 20---------------
## Call:
## lm(formula = formula, data = vnf_trailer_full)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -65.379 -24.650  -5.806  19.218 186.137
##
## Coefficients:
##                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)       233.52829   11.62580  20.087  < 2e-16 ***
## wdr_deg.night      -0.20231    0.05144  -3.933 0.000115 ***
## wsp_ms.night      -12.13082    1.50043  -8.085 5.64e-14 ***
## flare_wd_night_20   7.33451    4.45439   1.647 0.101199
## flare_count_20      3.84362    2.22087   1.731 0.085036 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 35.73 on 202 degrees of freedom
##   (163 observations deleted due to missingness)
## Multiple R-squared:  0.3472, Adjusted R-squared:  0.3343
## F-statistic: 26.86 on 4 and 202 DF,  p-value: < 2.2e-16
##
```

```
## --------------Compound: CO2, Radius: 10---------------
## Call:
## lm(formula = formula, data = vnf_trailer_full)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -6.700 -2.308 -0.789  1.961 11.535
##
## Coefficients:
##                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)       433.73412    1.82258 237.978  < 2e-16 ***
## wdr_deg.night      -0.01668    0.00787  -2.119   0.0376 *
## wsp_ms.night       -1.32434    0.28041  -4.723 1.14e-05 ***
## flare_wd_night_10  -0.48210    0.87163  -0.553   0.5819
## flare_count_10      1.26842    0.60859   2.084   0.0407 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.311 on 71 degrees of freedom
##   (294 observations deleted due to missingness)
## Multiple R-squared:  0.2943, Adjusted R-squared:  0.2546
## F-statistic: 7.403 on 4 and 71 DF,  p-value: 4.837e-05
##
## --------------Compound: CO2, Radius: 20---------------
## Call:
## lm(formula = formula, data = vnf_trailer_full)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -7.3613 -2.2349 -0.4434  2.0602  9.6017
##
## Coefficients:
##                      Estimate Std. Error t value Pr(>|t|)
## (Intercept)       431.868800   1.041500 414.660  < 2e-16 ***
## wdr_deg.night      -0.012061   0.004608  -2.617  0.00952 **
## wsp_ms.night       -1.041823   0.135368  -7.696 5.81e-13 ***
## flare_wd_night_20   0.790537   0.400374   1.974  0.04967 *
## flare_count_20      0.515588   0.200560   2.571  0.01086 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.231 on 205 degrees of freedom
##   (160 observations deleted due to missingness)
## Multiple R-squared:  0.308,  Adjusted R-squared:  0.2945
## F-statistic: 22.81 on 4 and 205 DF,  p-value: 1.332e-15
```