

Methane 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 or methane_eq
#
# 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, 30, 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_wd_night_', 'flare_count_'), r)))

temp <- temp %>%
  select(date, methane_eq, angle) %>%
  group_by(date) %>%
  summarise(avg_methane_eq = mean(methane_eq, na.rm=T)) %>%
  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 = 2, col.names = c("Buffer", "Compound", "Flare Count", "Correlation Day", "Correlation Night"))

```

Buffer	Compound	Flare Count	Correlation Day	Correlation Night
5	benzene	12	0.32	0.66
10	benzene	95	0.12	0.11
20	benzene	370	-0.06	-0.02
30	benzene	570	0.02	0.06

Buffer	Compound	Flare Count	Correlation Day	Correlation Night
50	benzene	2746	-0.03	0.02
100	benzene	8842	0.04	0.06
5	ch4	12	0.59	0.67
10	ch4	95	0.16	0.21
20	ch4	370	-0.02	0.02
30	ch4	570	0.06	0.07
50	ch4	2746	0.00	0.00
100	ch4	8842	0.07	0.04
5	co	12	0.40	0.43
10	co	95	0.07	0.08
20	co	370	-0.03	-0.08
30	co	570	0.06	0.04
50	co	2746	-0.06	-0.06
100	co	8842	-0.03	-0.06
5	co2	12	0.37	0.45
10	co2	95	0.11	0.14
20	co2	370	0.02	0.03
30	co2	570	0.10	0.09
50	co2	2746	0.05	0.05
100	co2	8842	0.00	0.01
5	nox	12	0.56	0.56
10	nox	95	0.08	0.04
20	nox	370	-0.11	-0.10
30	nox	570	-0.04	-0.06
50	nox	2746	-0.01	0.00
100	nox	8842	0.04	0.06

Merge with NMF results to get factors

```
normalized_daily_data_5c_less_o3 <-
  readRDS('../Model/result_rfiles/normalized_daily_data_5c_less_o3.rds')
```

*# Notice that the NMF results dataset has a slightly different daily measurement
Since it filtered for complete rows on a larger group.*

```
vnf_trailer_full <- vnf_trailer_full %>%
  left_join(normalized_daily_data_5c_less_o3, join_by(date == day))
```

```
ch4_nox_5km <- lm(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)
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 + w
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 + w
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 + wdr_deg.night + wsp_ms.night + flare_wd_night_50 + flare_count_50, data = vnf_trailer_full)
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

# 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, '-----\n')
    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

```