Error checks

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File and directory names

```r
print(i)
```

```
## [1] "../../data - submitted/03/UNINA"
```

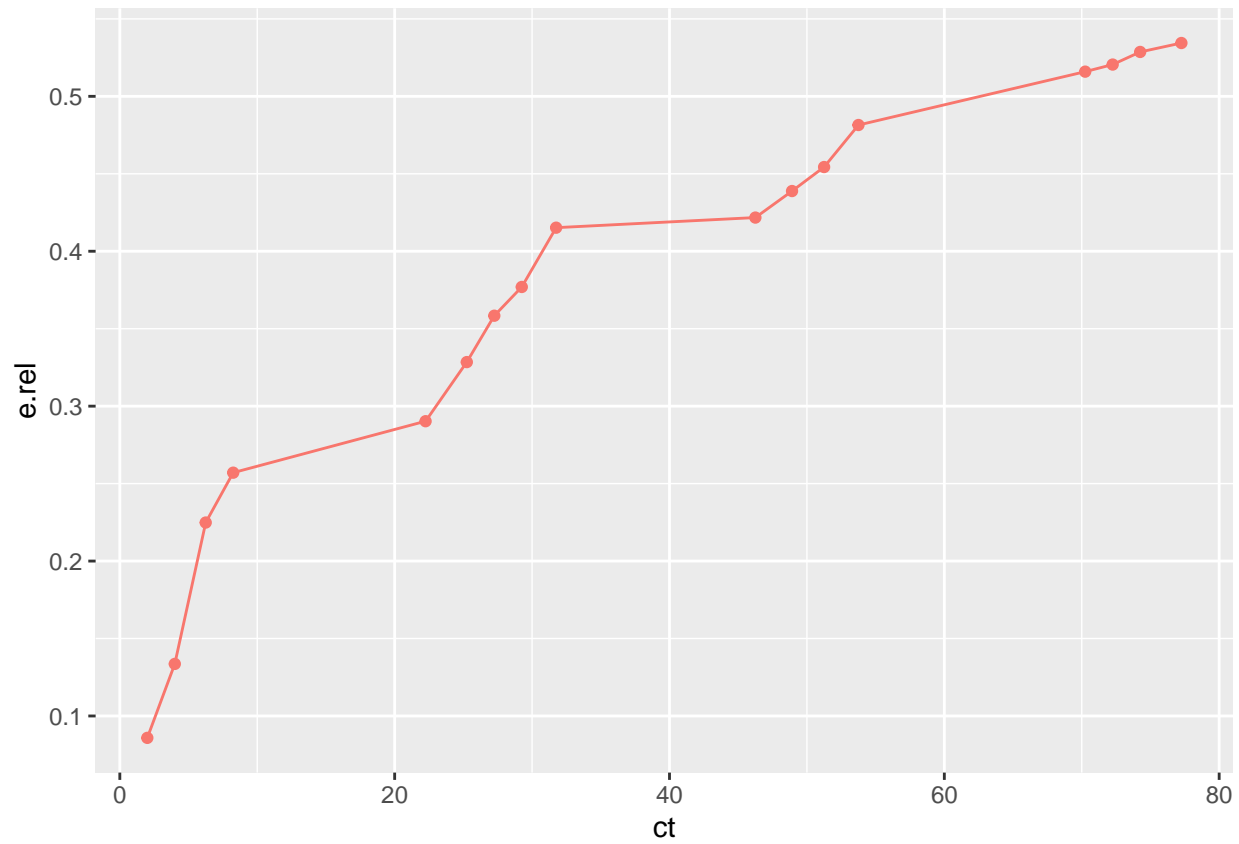```r
print(j)
```

```
[1] "../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx"
```
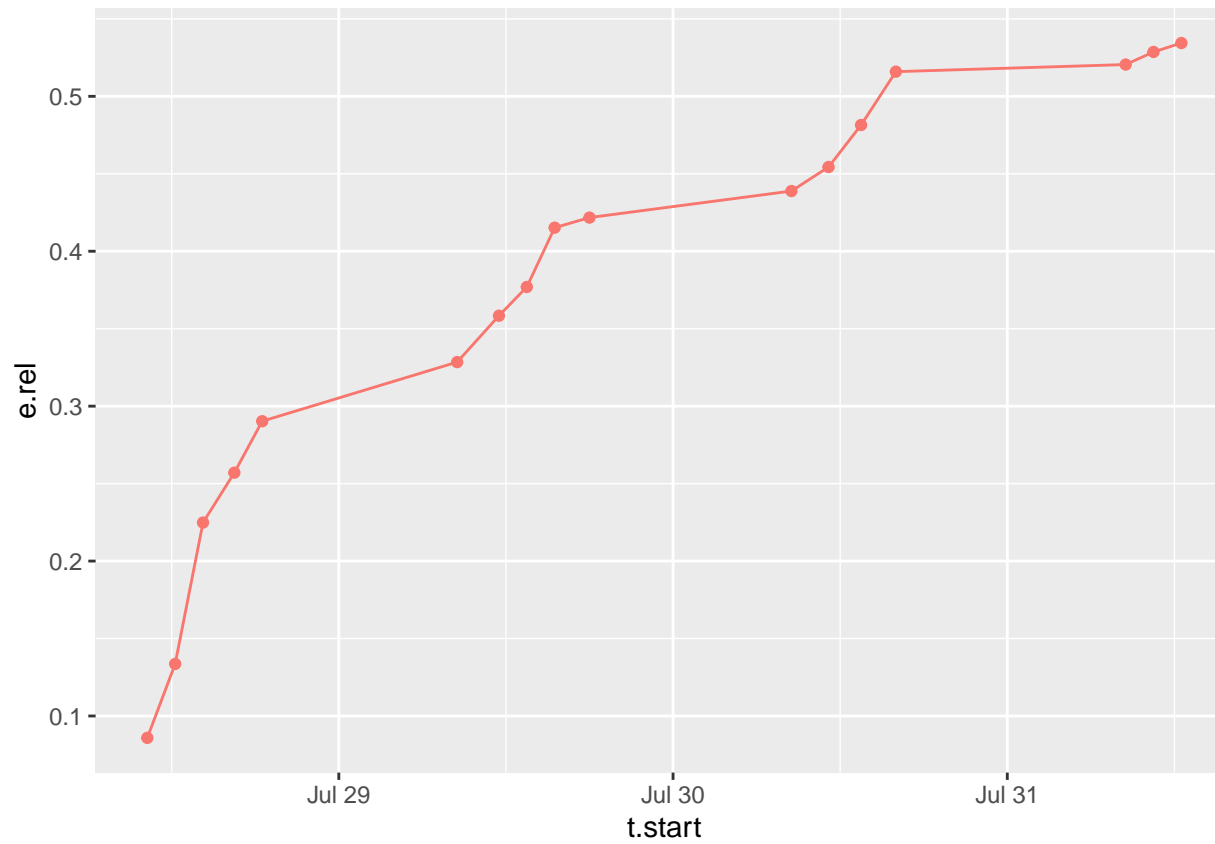
## Emission `emis` check

```r
d <- dat[[i]][[j]]$emis
```

Plots

```r
library(ggplot2)
ggplot(d, aes(ct, e.rel, colour = cpmid)) + geom_line() + geom_point() + theme(legend.position = 'none')
```

```
ggplot(d, aes(t.start, e.rel, colour = cpmid)) + geom_line() + geom_point() + theme(legend.position = 'none')
```

Summary and missing values

```
print(summary(d))
```

```
##      proj              exper              field              plot       rep        pub.id             plot.area         lat              lo
##  Length:17          Length:17          Mode:logical   Min.   :1   Min.   :1   Length:17          Min.   :1256   Min.   :40.97   Min.
##  Class :character   Class :character   NA's:17        1st Qu.:1   1st Qu.:1   Class :character   1st Qu.:1256   1st Qu.:40.97   1st Qu.
##  Mode  :character   Mode  :character                  Median :1   Median :1   Mode  :character   Median :1256   Median :40.97   Median
##                                                       Mean   :1   Mean   :1                      Mean   :1256   Mean   :40.97   Mean
##                                                       3rd Qu.:1   3rd Qu.:1                      3rd Qu.:1256   3rd Qu.:40.97   3rd Qu.
##                                                       Max.   :1   Max.   :1                      Max.   :1256   Max.   :40.97   Max.
```

3

```
## 
##         oc       soil.type       soil.water      soil.water.v    soil.moist        soil.ph     soil.dens        crop.res              till
## Min.   :1.7   Mode:logical    Mode:logical     Mode:logical    Mode:logical    Min.   :7.4   Mode:logical    Length:17         Length:17
## 1st Qu.:1.7   NA's:17         NA's:17          NA's:17         NA's:17         1st Qu.:7.4   NA's:17         Class :character  Class :chara
## Median :1.7                                                                   Median :7.4                   Mode  :character  Mode  :chara
## Mean   :1.7                                                                   Mean   :7.4
## 3rd Qu.:1.7                                                                   3rd Qu.:7.4
## Max.   :1.7                                                                   Max.   :7.4
## 
##    man.trt2         man.stor         man.dm          man.vs          man.tkn         man.tan        man.tic          man.ua          man.vfa         m
## Mode:logical    Min.   :90       Min.   :8.335   Min.   :5.74    Min.   :3.2     Min.   :0.7     Mode:logical    Mode:logical    Mode:logical    Mo
## NA's:17         1st Qu.:90       1st Qu.:8.335   1st Qu.:5.74    1st Qu.:3.2     1st Qu.:0.7     NA's:17         NA's:17         NA's:17         NA
##                 Median :90       Median :8.335   Median :5.74    Median :3.2     Median :0.7
##                 Mean   :90       Mean   :8.335   Mean   :5.74    Mean   :3.2     Mean   :0.7
##                 3rd Qu.:90       3rd Qu.:8.335   3rd Qu.:5.74    3rd Qu.:3.2     3rd Qu.:0.7
##                 Max.   :90       Max.   :8.335   Max.   :5.74    Max.   :3.2     Max.   :0.7
## 
##  app.rate.unit      incorp        time.incorp     man.area        dist.inj        furrow.z        furrow.w         crop            cr
## Length:17          Length:17      Mode:logical    Mode:logical    Mode:logical    Mode:logical    Mode:logical    Mode:logical    Min.
## Class :character   Class :character  NA's:17       NA's:17         NA's:17         NA's:17         NA's:17         NA's:17         1st Qu
## Mode  :character   Mode  :character                                                                                               Median
##                                                                                                                                    Mean
##                                                                                                                                    3rd Qu
##                                                                                                                                    Max.
##                                                                                                                                    NA's
##  app.end.orig      tan.app        institute           uptake       treat              interval    t.start                      t.end
## Mode:logical    Min.   :87.5    Length:17        Min.   :3     Length:17          Min.   : 1    Min.   :2016-07-28 10:15:00  Min.   :201
## NA's:17         1st Qu.:87.5    Class :character  1st Qu.:3    Class :character   1st Qu.: 5    1st Qu.:2016-07-28 18:30:00  1st Qu.:201
##                 Median :87.5    Mode  :character  Median :3    Mode  :character   Median : 9    Median :2016-07-29 15:30:00  Median :201
##                 Mean   :87.5                      Mean   :3                       Mean   : 9    Mean   :2016-07-29 19:57:56  Mean   :201
##                 3rd Qu.:87.5                      3rd Qu.:3                       3rd Qu.:13    3rd Qu.:2016-07-30 13:30:00  3rd Qu.:201
##                 Max.   :87.5                      Max.   :3                       Max.   :17    Max.   :2016-07-31 12:30:00  Max.   :201
## 
##    bg.unit           j.NH3          j.NH3.unit         pH.surf         air.temp        air.temp.z soil.temp       soil.temp.z      soi
## Length:17          Min.   :0.03939  Length:17        Min.   :7.138   Min.   :21.06   Min.   :2    Mode:logical    Mode:logical    Mod
## Class :character   1st Qu.:0.20765  Class :character  1st Qu.:7.141   1st Qu.:28.29   1st Qu.:2    NA's:17         NA's:17         NA'
## Mode  :character   Median :0.81218  Mode  :character  Median :7.144   Median :29.24   Median :2
##                    Mean   :1.09554                    Mean   :7.145   Mean   :28.42   Mean   :2
##                    3rd Qu.:1.33922                    3rd Qu.:7.147   3rd Qu.:30.67   3rd Qu.:2
```

```
##                        Max.    :3.75702                            Max.    :7.155   Max.    :31.55   Max.    :2
##                                                                    NA's    :13
## air.pres          air.pres.unit        rain          rh             wind.loc          far.loc          notes.emis          row.in.file.int j.NH3.un
## Mode:logical     Mode:logical     Min.    :0    Min.    :46.92   Length:17         Min.    :310     Length:17           Min.    : 5       Length:1
## NA's:17          NA's:17          1st Qu.:0    1st Qu.:52.95    Class :character   1st Qu.:310     Class :character    1st Qu.: 9        Class :c
##                                   Median :0    Median :56.50    Mode  :character   Median :310     Mode  :character    Median :13        Mode  :c
##                                   Mean    :0    Mean    :59.93                      Mean    :310                        Mean    :13
##                                   3rd Qu.:0    3rd Qu.:61.92                        3rd Qu.:310                        3rd Qu.:17
##                                   Max.    :0    Max.    :82.97                      Max.    :310                        Max.    :21
##
##      cpmid              cpid               ceid               ct              e.int              e.cum              cta             e.rel
## Length:17          Length:17          Length:17          Min.    : 2.00   Min.    :0.4015   Min.    : 7.514   Min.    :484.1   Min.    :0.0
## Class :character   Class :character   Class :character   1st Qu.:22.25   1st Qu.:1.3559   1st Qu.:25.400   1st Qu.:504.4   1st Qu.:0.2
## Mode  :character   Mode  :character   Mode  :character   Median :31.75   Median :2.6191   Median :36.331   Median :513.9   Median :0.4
##                                                           Mean    :38.26   Mean    :2.7507   Mean    :32.770   Mean    :520.4   Mean    :0.3
##                                                           3rd Qu.:53.75   3rd Qu.:3.3398   3rd Qu.:42.130   3rd Qu.:535.9   3rd Qu.:0.4
##                                                           Max.    :77.25   Max.    :7.9844   Max.    :46.762   Max.    :559.4   Max.    :0.5
##
```

```r
print(apply(d, 2, function(x) sum(is.na(x))))
```

```
##          proj          exper          field           plot            rep         pub.id      plot.area            lat
##             0              0             17              0              0              0              0              0
##            oc      soil.type     soil.water    soil.water.v     soil.moist        soil.ph       soil.dens      crop.res
##             0             17             17             17             17              0             17              0
##       man.trt2       man.stor         man.dm         man.vs        man.tkn        man.tan        man.tic       man.ua
##            17              0              0              0              0              0             17             17
##  app.rate.unit         incorp    time.incorp       man.area       dist.inj        furrow.z       furrow.w         crop
##             0              0             17             17             17             17             17             17
##  app.end.orig        tan.app      institute         uptake          treat       interval        t.start        t.end
##            17              0              0              0              0              0              0              0
##         j.NH3      j.NH3.unit        pH.surf       air.temp     air.temp.z      soil.temp     soil.temp.z soil.temp.surf
##             0              0             13              0              0             17             17             17
##       air.pres  air.pres.unit           rain             rh       wind.loc        far.loc      notes.emis row.in.file.int
##            17             17              0              0              0              0             16              0
##         cpmid           cpid           ceid             ct          e.int          e.cum            cta         e.rel
##             0              0              0              0              0              0              0              0
```

```r
# Missing incorporation times
table(d$incorp, d$time.incorp, exclude = NULL)
```

```
## 
##         <NA>
##    None    17
```

```r
x <- subset(d, incorp %in% c('deep', 'shallow') & is.na(time.incorp))
unique(as.character(x$file))
```

```
## character(0)
```

```r
x[, c('file','row.in.file.int','institute')]
```

```
## [1] file            row.in.file.int institute
## <0 rows> (or 0-length row.names)
```

```r
# Problems with application start time, was problem in the merge of d1 and d2
# Should be POSIXct/POSIXt
class(d$app.start)
```

```
## [1] "POSIXct" "POSIXt"
```

```r
# Wind heights in wrong units
# Should be in m
# Expected values maybe 0.1 - 10 m
summary(d$wind.z)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max. 
##       2       2       2       2       2       2
```

```r
range(na.omit(d$wind.z))
```

```
## [1] 2 2
```

```r
x <- subset(d, wind.z>15)
nrow(x)
```

```
## [1] 0
```

```r
unique(as.character(x$file))
```

```
## character(0)
```

```r
unique(x[,c('file','row.in.file.int','institute')])
```

```
## [1] file            row.in.file.int institute
## <0 rows> (or 0-length row.names)
```

```r
unique(x[,c('file','institute')])
```

```
## [1] file      institute
## <0 rows> (or 0-length row.names)
# Air temperature heights
# Also in m now
# Expected values perhaps 0.1 - 10 m
summary(d$air.temp.z)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##       2       2       2       2       2       2
range(na.omit(d$air.temp.z))
```

```
## [1] 2 2
x <- subset(d, air.temp.z>10)
nrow(x)
```

```
## [1] 0
unique(as.character(x$file))
```

```
## character(0)
unique(x[,c('file','row.in.file.int','institute')])
```

```
## [1] file            row.in.file.int institute
## <0 rows> (or 0-length row.names)
unique(x[,c('file','institute')])
```

```
## [1] file      institute
## <0 rows> (or 0-length row.names)
# Why are there zeroes?
x <- subset(d, air.temp.z == 0)
nrow(x)
```

```
## [1] 0
unique(as.character(x$file))
```

```
## character(0)
```

```r
unique(x[,c('file', 'row.in.file.int', 'institute', 'air.temp.z', 'air.temp')])
```

```
## [1] file            row.in.file.int institute       air.temp.z      air.temp
## <0 rows> (or 0-length row.names)
```

```r
unique(x[,c('file', 'institute', 'air.temp.z')])
```

```
## [1] file      institute air.temp.z
## <0 rows> (or 0-length row.names)
```

```r
# Not sure, but there they are all in ALFAM1. Leaving as-is

# Measurement techniques
# There should be zero NAs!
as.character(unique(d$meas.tech))
```

```
## [1] "IHF"
```

```r
table(d$meas.tech, exclude = NULL)
```

```
##
## IHF
##  17
```

```r
sum(is.na(d$meas.tech))
```

```
## [1] 0
```

```r
x <- subset(d, is.na(meas.tech))
unique(x[,c('row.in.file.int','institute')])
```

```
## [1] row.in.file.int institute
## <0 rows> (or 0-length row.names)
```

```r
# Blank method
x <- unique(d[,c('file','institute','meas.tech','row.in.file.int')])
subset(x,meas.tech=='')
```

```
## [1] file            institute       meas.tech       row.in.file.int
## <0 rows> (or 0-length row.names)
```

```r
# Emission measurements before application time (app.start)
x <- subset(d,t.start < app.start)
```

```r
x <- x[order(x$file, x$row.in.file.int),]
dim(x)
```

```
## [1]    0 106
```

```r
x[,c('file','row.in.file.int', 't.start', 't.end', 'app.start', 'ct', 'field','plot', 'tan.app', 'j.NH3')]
```

```
##  [1] file           row.in.file.int t.start         t.end           app.start       ct              field           plot            ta
## <0 rows> (or 0-length row.names)
```

```r
# These are cases where emission was measured before application
# As long as emission is clearly low and ct < 0, there is no indication of a problem
# For Swiss data at end, application occurred within the first interval
# Similar for SDU--apparently application was after the passive samplers were set out

# Negative interval duration dt
x <- subset(d, dt < 0)
dim(x)
```

```
## [1]    0 106
```

```r
x[,c('file','row.in.file.int', 't.start', 't.end', 'app.start', 'dt', 'ct', 'field','plot', 'tan.app', 'j.NH3')]
```

```
##  [1] file           row.in.file.int t.start         t.end           app.start       dt              ct              field           pl
## <0 rows> (or 0-length row.names)
```

```r
# Negative cta
x <- subset(d, cta < 0)
head(x[,c('file','row.in.file.int', 't.start', 't.end', 'app.start', 'dt', 'ct', 'field','plot', 'tan.app', 'j.NH3')])
```

```
##  [1] file           row.in.file.int t.start         t.end           app.start       dt              ct              field           pl
## <0 rows> (or 0-length row.names)
```

```r
unique(x$plot)
```

```
## numeric(0)
```

```r
# Gaps, missing measurement intervals
d$dcta <- c(0, diff(d$cta))
d$dcta[d$interval == 1] <- d$dcta
```

```
## Warning in d$dcta[d$interval == 1] <- d$dcta: number of items to replace is not a multiple of replacement length
```

```r
x <- d[signif(d$dcta, 3) != signif(d$dt, 3), ]
x[, c('file','row.in.file.int', 'interval', 'dt', 'ct', 'dcta', 'field','plot')]
```

```
##                                                file row.in.file.int interval dt ct dcta field plot
## 1 ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx               5        1 2  2    0    NA    1
```

```r
x <- d[abs(log10(signif(d$dcta, 3)/signif(d$dt, 3))) > 0.2, ]
x[, c('file','row.in.file.int', 'interval', 'dt', 'ct', 'dcta', 'field','plot')]
```

```
##                                                file row.in.file.int interval dt ct dcta field plot
## 1 ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx               5        1 2  2    0    NA    1
```

```r
# Duplicated shifts
# Should be none
s <- ddply(d, 'cpmid', summarise, n.int.duplicates = sum(duplicated(interval)))
x <- subset(s, n.int.duplicates > 1)
x
```

```
## [1] cpmid            n.int.duplicates
## <0 rows> (or 0-length row.names)
```

```r
y <- subset(d, cpmid == x$cpmid)
y[, c('file', 'institute', 'row.in.file.int', 'plot', 'rep')]
```

```
## [1] file             institute        row.in.file.int plot             rep
## <0 rows> (or 0-length row.names)
```

```r
hist(d$dt - d$dt.calc, xlim = c(-0.5, 0.5), breaks = 1000)
```

Histogram of d$dt − d$dt.calc
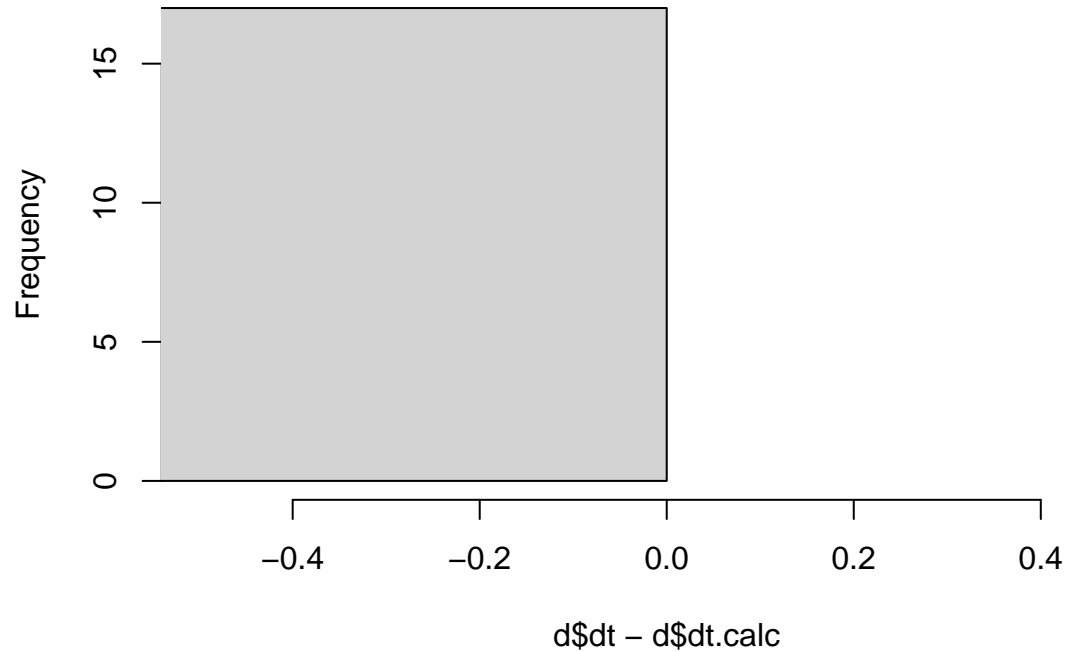

```
quantile(d$dt - d$dt.calc)
```

```
##   0%  25%  50%  75% 100%
##    0    0    0    0    0
```

```
# Shift time mismatches
# Should be none
y <- d[order(d$cpmid, d$interval), ]
# Problem when one shift ends after the next begins
y$problem <- c(y$cpmid[-nrow(y)] == y$cpmid[-1] & y$t.end[-nrow(y)] > y$t.start[-1], NA)
y$overlap <- c(as.numeric(difftime(y$t.end[-nrow(y)], y$t.start[-1], units = 'hours')), NA)
x <- subset(y, problem)
x[, c('file', 'institute', 'row.in.file.int', 'plot', 't.start', 't.end', 'interval', 'j.NH3', 'overlap')]
```

```
## [1] file            institute       row.in.file.int plot            t.start         t.end           interval        j.NH3           ove
```

```
## <0 rows> (or 0-length row.names)
```

```
## Very short sets
#x <- subset(ds, n.ints < 4)
#dim(x)
#y <- subset(d, cpmid %in% x$cpmid)
#y <- y[order(y$institute, y$row.in.file.int), ]
#dim(y)
#y[, c('file', 'inst', 'institute', 'row.in.file.int', 'plot', 'cpmid', 't.start', 't.end', 'ct', 'interval', 'j.NH3')]
#
## High relative emission
#x <- subset(ds, e.rel.final>1)
#dim(x)
#x[, c('file', 'inst', 'institute', 'first.row.in.file.int', 'plot', 'cpmid', 'tan.app', 'e.rel.final', 'e.rel.48')]

# Problems with incorporation
# In make_database.R NAs are set to 'None',  so problems will not show up here. Need to check this
y <- subset(d, is.na(incorp) | incorp=='')
dim(y)
```

```
## [1]   0 107
```

```
y <- y[order(y$institute, y$row.in.file.int), ]
y <- rounddf(y)
y
```

```
##   [1] proj              exper             field             plot              rep               pub.id            plot.area         lat
##  [14] sand              oc                soil.type         soil.water        soil.water.v      soil.moist        soil.ph           soil.dens
##  [27] man.con           man.trt1          man.trt2          man.stor          man.dm            man.vs            man.tkn           man.tan
##  [40] app.end           app.method        app.rate          app.rate.unit     incorp            time.incorp       man.area          dist.inj
##  [53] lai               notes             row.in.file.plot  app.start.orig    app.end.orig      tan.app           institute         uptake
##  [66] meas.tech         meas.tech.det     bg.dl             bg.val            bg.unit           j.NH3             j.NH3.unit        pH.surf
##  [79] rad               wind              wind.z            MOL               ustar             rl                air.pres          air.pres.u
##  [92] row.in.file.int   j.NH3.unit.orig   j.NH3.orig        j.NH3.conv.fact   dt.calc           dt.diff           file              cpmid
## [105] cta               e.rel             dcta
## <0 rows> (or 0-length row.names)
```

```
# Missing locations
x <- subset(d, is.na(d$lat)|is.na(d$long))
x <- data.frame(file=unique(x$file))
x
```

```
## [1] file
## <0 rows> (or 0-length row.names)
# Missing slurry type
x <- subset(d, is.na(man.source))
unique(x$institute)

## character(0)
unique(x[, c('institute', 'man.source')])

## [1] institute  man.source
## <0 rows> (or 0-length row.names)
x

##    [1] proj            exper           field           plot            rep             pub.id          plot.area       lat
##   [14] sand            oc              soil.type       soil.water      soil.water.v    soil.moist      soil.ph         soil.dens
##   [27] man.con         man.trt1        man.trt2        man.stor        man.dm          man.vs          man.tkn         man.tan
##   [40] app.end         app.method      app.rate        app.rate.unit   incorp          time.incorp     man.area        dist.inj
##   [53] lai             notes           row.in.file.plot app.start.orig  app.end.orig    tan.app         institute       uptake
##   [66] meas.tech       meas.tech.det   bg.dl           bg.val          bg.unit         j.NH3           j.NH3.unit      pH.surf
##   [79] rad             wind            wind.z          MOL             ustar           rl              air.pres        air.pres.u
##   [92] row.in.file.int j.NH3.unit.orig j.NH3.orig      j.NH3.conv.fact dt.calc         dt.diff         file            cpmid
##  [105] cta             e.rel           dcta
## <0 rows> (or 0-length row.names)
# These all are probably measurements made with no application or prior to application
# Need to remove from database if the latter
# Missing application method
x <- subset(d, is.na(app.method))
unique(x$institute)

## character(0)
x <- subset(d, is.na(app.method) & man.source != 'none')
names(x)

##    [1] "proj"            "exper"           "field"           "plot"            "rep"             "pub.id"          "plot.area"
##   [13] "silt"            "sand"            "oc"              "soil.type"       "soil.water"      "soil.water.v"    "soil.moist"
##   [25] "man.source.det"  "man.bed"         "man.con"         "man.trt1"        "man.trt2"        "man.stor"        "man.dm"
##   [37] "man.vfa"         "man.ph"          "app.start"       "app.end"         "app.method"      "app.rate"        "app.rate.unit"
##   [49] "furrow.w"        "crop"            "crop.z"          "crop.area"       "lai"             "notes"           "row.in.file.pl
```

```
## [61] "treat"           "interval"       "t.start"        "t.end"          "dt"             "meas.tech"      "meas.tech.det"
## [73] "pH.surf"         "air.temp"       "air.temp.z"     "soil.temp"      "soil.temp.z"    "soil.temp.surf" "rad"
## [85] "air.pres"        "air.pres.unit"  "rain"           "rh"             "wind.loc"       "far.loc"        "notes.emis"
## [97] "dt.diff"         "file"           "cpmid"          "cpid"           "ceid"           "ct"             "e.int"
```

```r
x[, c('institute', 'file', 'row.in.file.int', 'app.method', 'app.rate', 'man.source')]
```

```
## [1] institute       file            row.in.file.int app.method      app.rate        man.source
## <0 rows> (or 0-length row.names)
```

```r
x
```

```
##    [1] proj            exper           field           plot            rep             pub.id          plot.area       lat
##   [14] sand            oc              soil.type       soil.water      soil.water.v    soil.moist      soil.ph         soil.dens
##   [27] man.con         man.trt1        man.trt2        man.stor        man.dm          man.vs          man.tkn         man.tan
##   [40] app.end         app.method      app.rate        app.rate.unit   incorp          time.incorp     man.area        dist.inj
##   [53] lai             notes           row.in.file.plot app.start.orig app.end.orig    tan.app         institute       uptake
##   [66] meas.tech       meas.tech.det   bg.dl           bg.val          bg.unit         j.NH3           j.NH3.unit      pH.surf
##   [79] rad             wind            wind.z          MOL             ustar           rl              air.pres        air.pres.u
##   [92] row.in.file.int j.NH3.unit.orig j.NH3.orig      j.NH3.conv.fact dt.calc         dt.diff         file            cpmid
##  [105] cta             e.rel           dcta
## <0 rows> (or 0-length row.names)
```

```r
# Missing soil type
x <- subset(d, is.na(soil.type))
unique(x$institute)
```

```
## [1] "UNINA"
```

```r
unique(x[, c('institute', 'soil.type')])
```

```
##   institute soil.type
## 1     UNINA        NA
```

```r
x
```

```
##         proj     exper field plot rep pub.id plot.area      lat     long country topo   clay  silt   sand  oc soil.type soil.water soil
## 1  BRM_JUL16 2-BRM_IHF    NA    1   1  AFM19      1256 40.96597 14.42636   Italy Flat 15.125 27.25 57.625 1.7        NA         NA
## 2  BRM_JUL16 2-BRM_IHF    NA    1   1  AFM19      1256 40.96597 14.42636   Italy Flat 15.125 27.25 57.625 1.7        NA         NA
## 3  BRM_JUL16 2-BRM_IHF    NA    1   1  AFM19      1256 40.96597 14.42636   Italy Flat 15.125 27.25 57.625 1.7        NA         NA
## 4  BRM_JUL16 2-BRM_IHF    NA    1   1  AFM19      1256 40.96597 14.42636   Italy Flat 15.125 27.25 57.625 1.7        NA         NA
## 5  BRM_JUL16 2-BRM_IHF    NA    1   1  AFM19      1256 40.96597 14.42636   Italy Flat 15.125 27.25 57.625 1.7        NA         NA
## 6  BRM_JUL16 2-BRM_IHF    NA    1   1  AFM19      1256 40.96597 14.42636   Italy Flat 15.125 27.25 57.625 1.7        NA         NA
```

```
## 7  BRM_JUL16 2-BRM_IHF   NA  1  1 AFM19    1256 40.96597 14.42636   Italy Flat 15.125 27.25 57.625 1.7       NA       NA
## 8  BRM_JUL16 2-BRM_IHF   NA  1  1 AFM19    1256 40.96597 14.42636   Italy Flat 15.125 27.25 57.625 1.7       NA       NA
## 9  BRM_JUL16 2-BRM_IHF   NA  1  1 AFM19    1256 40.96597 14.42636   Italy Flat 15.125 27.25 57.625 1.7       NA       NA
## 10 BRM_JUL16 2-BRM_IHF   NA  1  1 AFM19    1256 40.96597 14.42636   Italy Flat 15.125 27.25 57.625 1.7       NA       NA
## 11 BRM_JUL16 2-BRM_IHF   NA  1  1 AFM19    1256 40.96597 14.42636   Italy Flat 15.125 27.25 57.625 1.7       NA       NA
## 12 BRM_JUL16 2-BRM_IHF   NA  1  1 AFM19    1256 40.96597 14.42636   Italy Flat 15.125 27.25 57.625 1.7       NA       NA
## 13 BRM_JUL16 2-BRM_IHF   NA  1  1 AFM19    1256 40.96597 14.42636   Italy Flat 15.125 27.25 57.625 1.7       NA       NA
## 14 BRM_JUL16 2-BRM_IHF   NA  1  1 AFM19    1256 40.96597 14.42636   Italy Flat 15.125 27.25 57.625 1.7       NA       NA
## 15 BRM_JUL16 2-BRM_IHF   NA  1  1 AFM19    1256 40.96597 14.42636   Italy Flat 15.125 27.25 57.625 1.7       NA       NA
## 16 BRM_JUL16 2-BRM_IHF   NA  1  1 AFM19    1256 40.96597 14.42636   Italy Flat 15.125 27.25 57.625 1.7       NA       NA
## 17 BRM_JUL16 2-BRM_IHF   NA  1  1 AFM19    1256 40.96597 14.42636   Italy Flat 15.125 27.25 57.625 1.7       NA       NA
##    man.trt2 man.stor man.dm man.vs man.tkn man.tan man.tic man.ua man.vfa man.ph          app.start app.end app.method app.rate app.ra
## 1       NA       90  8.335   5.74     3.2     0.7      NA     NA      NA     NA 2016-07-08 08:07:00    <NA>  Broadcast      125
## 2       NA       90  8.335   5.74     3.2     0.7      NA     NA      NA     NA 2016-07-08 08:07:00    <NA>  Broadcast      125
## 3       NA       90  8.335   5.74     3.2     0.7      NA     NA      NA     NA 2016-07-08 08:07:00    <NA>  Broadcast      125
## 4       NA       90  8.335   5.74     3.2     0.7      NA     NA      NA     NA 2016-07-08 08:07:00    <NA>  Broadcast      125
## 5       NA       90  8.335   5.74     3.2     0.7      NA     NA      NA     NA 2016-07-08 08:07:00    <NA>  Broadcast      125
## 6       NA       90  8.335   5.74     3.2     0.7      NA     NA      NA     NA 2016-07-08 08:07:00    <NA>  Broadcast      125
## 7       NA       90  8.335   5.74     3.2     0.7      NA     NA      NA     NA 2016-07-08 08:07:00    <NA>  Broadcast      125
## 8       NA       90  8.335   5.74     3.2     0.7      NA     NA      NA     NA 2016-07-08 08:07:00    <NA>  Broadcast      125
## 9       NA       90  8.335   5.74     3.2     0.7      NA     NA      NA     NA 2016-07-08 08:07:00    <NA>  Broadcast      125
## 10      NA       90  8.335   5.74     3.2     0.7      NA     NA      NA     NA 2016-07-08 08:07:00    <NA>  Broadcast      125
## 11      NA       90  8.335   5.74     3.2     0.7      NA     NA      NA     NA 2016-07-08 08:07:00    <NA>  Broadcast      125
## 12      NA       90  8.335   5.74     3.2     0.7      NA     NA      NA     NA 2016-07-08 08:07:00    <NA>  Broadcast      125
## 13      NA       90  8.335   5.74     3.2     0.7      NA     NA      NA     NA 2016-07-08 08:07:00    <NA>  Broadcast      125
## 14      NA       90  8.335   5.74     3.2     0.7      NA     NA      NA     NA 2016-07-08 08:07:00    <NA>  Broadcast      125
## 15      NA       90  8.335   5.74     3.2     0.7      NA     NA      NA     NA 2016-07-08 08:07:00    <NA>  Broadcast      125
## 16      NA       90  8.335   5.74     3.2     0.7      NA     NA      NA     NA 2016-07-08 08:07:00    <NA>  Broadcast      125
## 17      NA       90  8.335   5.74     3.2     0.7      NA     NA      NA     NA 2016-07-08 08:07:00    <NA>  Broadcast      125
##    row.in.file.plot   app.start.orig app.end.orig tan.app institute uptake treat interval            t.start               t.end
## 1                 5 08-07-2016 08:07           NA    87.5     UNINA      3 2-BRM        1 2016-07-28 10:15:00 2016-07-28 12:15:00  2.00
## 2                 5 08-07-2016 08:07           NA    87.5     UNINA      3 2-BRM        2 2016-07-28 12:15:00 2016-07-28 14:15:00  2.00
## 3                 5 08-07-2016 08:07           NA    87.5     UNINA      3 2-BRM        3 2016-07-28 14:15:00 2016-07-28 16:30:00  2.25
## 4                 5 08-07-2016 08:07           NA    87.5     UNINA      3 2-BRM        4 2016-07-28 16:30:00 2016-07-28 18:30:00  2.00
## 5                 5 08-07-2016 08:07           NA    87.5     UNINA      3 2-BRM        5 2016-07-28 18:30:00 2016-07-29 08:30:00 14.00
## 6                 5 08-07-2016 08:07           NA    87.5     UNINA      3 2-BRM        6 2016-07-29 08:30:00 2016-07-29 11:30:00  3.00
## 7                 5 08-07-2016 08:07           NA    87.5     UNINA      3 2-BRM        7 2016-07-29 11:30:00 2016-07-29 13:30:00  2.00
## 8                 5 08-07-2016 08:07           NA    87.5     UNINA      3 2-BRM        8 2016-07-29 13:30:00 2016-07-29 15:30:00  2.00
## 9                 5 08-07-2016 08:07           NA    87.5     UNINA      3 2-BRM        9 2016-07-29 15:30:00 2016-07-29 18:00:00  2.50
```

```
## 10               5 08-07-2016 08:07            NA   87.5    UNINA   3 2-BRM       10 2016-07-29 18:00:00 2016-07-30 08:30:00 14.50
## 11               5 08-07-2016 08:07            NA   87.5    UNINA   3 2-BRM       11 2016-07-30 08:30:00 2016-07-30 11:10:00  2.66
## 12               5 08-07-2016 08:07            NA   87.5    UNINA   3 2-BRM       12 2016-07-30 11:10:00 2016-07-30 13:30:00  2.33
## 13               5 08-07-2016 08:07            NA   87.5    UNINA   3 2-BRM       13 2016-07-30 13:30:00 2016-07-30 16:00:00  2.50
## 14               5 08-07-2016 08:07            NA   87.5    UNINA   3 2-BRM       14 2016-07-30 16:00:00 2016-07-31 08:30:00 16.50
## 15               5 08-07-2016 08:07            NA   87.5    UNINA   3 2-BRM       15 2016-07-31 08:30:00 2016-07-31 10:30:00  2.00
## 16               5 08-07-2016 08:07            NA   87.5    UNINA   3 2-BRM       16 2016-07-31 10:30:00 2016-07-31 12:30:00  2.00
## 17               5 08-07-2016 08:07            NA   87.5    UNINA   3 2-BRM       17 2016-07-31 12:30:00 2016-07-31 15:30:00  3.00
##    soil.temp soil.temp.z soil.temp.surf rad  wind wind.z MOL ustar rl air.pres air.pres.unit rain    rh       wind.loc far.loc notes.e
## 1         NA          NA             NA  NA 1.085      2  NA    NA NA       NA            NA    0 63.46 Nearest station     310
## 2         NA          NA             NA  NA 2.415      2  NA    NA NA       NA            NA    0 60.92 Nearest station     310       <
## 3         NA          NA             NA  NA 2.592      2  NA    NA NA       NA            NA    0 56.29 Nearest station     310       <
## 4         NA          NA             NA  NA 2.123      2  NA    NA NA       NA            NA    0 55.54 Nearest station     310       <
## 5         NA          NA             NA  NA 0.513      2  NA    NA NA       NA            NA    0 82.97 Nearest station     310       <
## 6         NA          NA             NA  NA 0.937      2  NA    NA NA       NA            NA    0 58.84 Nearest station     310       <
## 7         NA          NA             NA  NA 1.754      2  NA    NA NA       NA            NA    0 46.92 Nearest station     310       <
## 8         NA          NA             NA  NA 2.785      2  NA    NA NA       NA            NA    0 49.69 Nearest station     310       <
## 9         NA          NA             NA  NA 2.875      2  NA    NA NA       NA            NA    0 50.06 Nearest station     310       <
## 10        NA          NA             NA  NA 0.495      2  NA    NA NA       NA            NA    0 81.88 Nearest station     310       <
## 11        NA          NA             NA  NA 0.929      2  NA    NA NA       NA            NA    0 51.53 Nearest station     310       <
## 12        NA          NA             NA  NA 2.060      2  NA    NA NA       NA            NA    0 53.07 Nearest station     310       <
## 13        NA          NA             NA  NA 2.513      2  NA    NA NA       NA            NA    0 56.50 Nearest station     310       <
## 14        NA          NA             NA  NA 0.876      2  NA    NA NA       NA            NA    0 78.46 Nearest station     310       <
## 15        NA          NA             NA  NA 1.100      2  NA    NA NA       NA            NA    0 61.92 Nearest station     310       <
## 16        NA          NA             NA  NA 1.900      2  NA    NA NA       NA            NA    0 57.77 Nearest station     310       <
## 17        NA          NA             NA  NA 2.453      2  NA    NA NA       NA            NA    0 52.95 Nearest station     310       <
##                                                                   file
## 1  ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF.F:NA.P:1.T:2-BRM.R:1.R2:.T:2016-07-08 0
## 2  ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF.F:NA.P:1.T:2-BRM.R:1.R2:.T:2016-07-08 0
## 3  ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF.F:NA.P:1.T:2-BRM.R:1.R2:.T:2016-07-08 0
## 4  ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF.F:NA.P:1.T:2-BRM.R:1.R2:.T:2016-07-08 0
## 5  ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF.F:NA.P:1.T:2-BRM.R:1.R2:.T:2016-07-08 0
## 6  ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF.F:NA.P:1.T:2-BRM.R:1.R2:.T:2016-07-08 0
## 7  ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF.F:NA.P:1.T:2-BRM.R:1.R2:.T:2016-07-08 0
## 8  ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF.F:NA.P:1.T:2-BRM.R:1.R2:.T:2016-07-08 0
## 9  ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF.F:NA.P:1.T:2-BRM.R:1.R2:.T:2016-07-08 0
## 10 ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF.F:NA.P:1.T:2-BRM.R:1.R2:.T:2016-07-08 0
## 11 ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF.F:NA.P:1.T:2-BRM.R:1.R2:.T:2016-07-08 0
## 12 ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF.F:NA.P:1.T:2-BRM.R:1.R2:.T:2016-07-08 0
```

```
## 13 ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF.F:NA.P:1.T:2-BRM.R:1.R2:.T:2016-07-08 0
## 14 ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF.F:NA.P:1.T:2-BRM.R:1.R2:.T:2016-07-08 0
## 15 ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF.F:NA.P:1.T:2-BRM.R:1.R2:.T:2016-07-08 0
## 16 ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF.F:NA.P:1.T:2-BRM.R:1.R2:.T:2016-07-08 0
## 17 ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF.F:NA.P:1.T:2-BRM.R:1.R2:.T:2016-07-08 0
##                              ceid       ct      e.int     e.cum      cta      e.rel        dcta
## 1  D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF  2.00000 7.5140465  7.514046 484.1333 0.08587482  0.000000
## 2  D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF  4.00000 4.1768446 11.690891 486.1333 0.13361018  2.000000
## 3  D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF  6.25000 7.9843854 19.675276 488.3833 0.22486030  2.250000
## 4  D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF  8.25000 2.8175713 22.492848 490.3833 0.25706112  2.000000
## 5  D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF 22.25000 2.9071108 25.399959 504.3833 0.29028524 14.000000
## 6  D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF 25.25000 3.3398045 28.739763 507.3833 0.32845443  3.000000
## 7  D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF 27.25000 2.6190592 31.358822 509.3833 0.35838654  2.000000
## 8  D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF 29.25000 1.6243624 32.983185 511.3833 0.37695068  2.000000
## 9  D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF 31.75000 3.3480592 36.331244 513.8833 0.41521422  2.500000
## 10 D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF 46.25000 0.5711713 36.902415 528.3833 0.42174189 14.500000
## 11 D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF 48.91667 1.4984025 38.400818 531.0500 0.43886649  2.666667
## 12 D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF 51.25000 1.3558720 39.756690 533.3833 0.45436217  2.333333
## 13 D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF 53.75000 2.3735713 42.130261 535.8833 0.48148870  2.500000
## 14 D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF 70.25000 3.0138898 45.144151 552.3833 0.51593315 16.500000
## 15 D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF 72.25000 0.4015376 45.545689 554.3833 0.52052215  2.000000
## 16 D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF 74.25000 0.7119631 46.257652 556.3833 0.52865888  2.000000
## 17 D:1.I:UNINA.Pr:BRM_JUL16.E:2-BRM_IHF 77.25000 0.5046287 46.762280 559.3833 0.53442606  3.000000
```

```r
# Missing crop
# Only with no manure for INRA, plus many for SDU
x <- subset(d, is.na(crop))
unique(x$institute)
```

```
## [1] "UNINA"
```

```r
unique(x[, c('institute', 'crop', 'man.source')])
```

```
##    institute crop man.source
## 1     UNINA    NA     Cattle
```

```r
x[, c('institute', 'file', 'row.in.file.int', 'crop')]
```

```
##    institute                                                  file row.in.file.int crop
## 1      UNINA ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx               5   NA
## 2      UNINA ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx               6   NA
```

```
## 3      UNINA ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx       7   NA
## 4      UNINA ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx       8   NA
## 5      UNINA ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx       9   NA
## 6      UNINA ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx      10   NA
## 7      UNINA ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx      11   NA
## 8      UNINA ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx      12   NA
## 9      UNINA ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx      13   NA
## 10     UNINA ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx      14   NA
## 11     UNINA ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx      15   NA
## 12     UNINA ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx      16   NA
## 13     UNINA ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx      17   NA
## 14     UNINA ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx      18   NA
## 15     UNINA ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx      19   NA
## 16     UNINA ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx      20   NA
## 17     UNINA ../../data - submitted/03/UNINA/ALFAM2_UNINA_5_6_1.xlsx      21   NA
```

```r
x <- subsetd(d, dt == 0)
dim(x)
```

```
## [1]   0 107
```

```r
# Rel humidity and air.temp zero too often, are they missing values?
x <- subsetd(d, air.temp == 0)
dim(x)
```

```
## [1]   0 107
```

```r
# Some heights seem to be a mix of cm and m
names(d)[grepl('\\.z', names(d))]
```

```
## [1] "furrow.z"   "crop.z"     "air.temp.z"  "soil.temp.z" "wind.z"
```

```r
# Everything should be in m now
sort(unique(d$air.temp.z))
```

```
## [1] 2
```

```r
sort(unique(d$soil.temp.z))
```

```
## logical(0)
```

```r
sort(unique(d$wind.z))
```

```
## [1] 2
```

```r
# Except crop height
sort(unique(d$crop.z))
```

```
## numeric(0)
```