# Peat Depth Model: Model Evaluation

| **area** | **run** |
| --- | --- |
| England (eng) | run\_20200823-1202 |

### Import model and data

Model specification

| Table 1a. Model Specification | | | |
| --- | --- | --- | --- |
| model\_name | model | psill | range |
| eng\_run\_20200823-1202 | Nug | 0.7713418 | 0.00 |
| eng\_run\_20200823-1202 | Sph | 1.7405983 | 21104.41 |

Input and predictor summary

| Table 1b. Summary statistics for input and prediction data | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| dataset | n\_points | depth\_med | depth\_min | depth\_max | elev\_min | elev\_max | slope\_min | slope\_max |
| predictors | 14712087272 | NA | NA | NA | -26.81 | 962.96 | 0 | 84.68 |
| observations extract | 10000 | 195.939 | 0 | 560 | -2.00 | 782.24 | 0 | 41.98 |
| England run\_20200823-1202 | | | | | | | | |

### Ten-fold cross validation

This analysis uses the gstat function krige.cv() to perform ten-fold cross validation

#### Cross validation of spatial model

## [1] "cross validation using 10 clusters"

## Spatial model cross-validation metrics (not back-transformed, eng\_run\_20200823-1202):

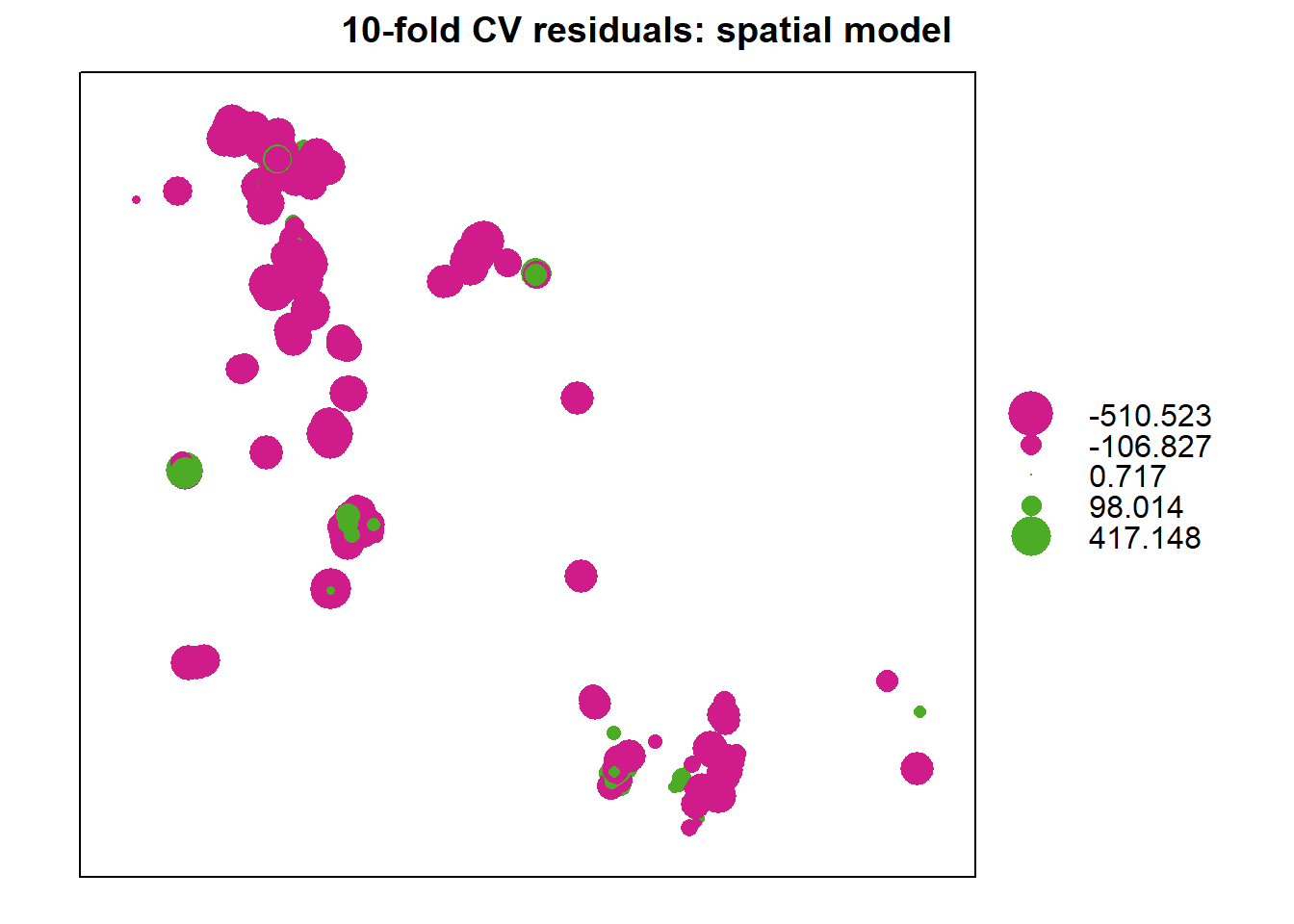
## mean error = -0.001, MSPE = 0.413, mean square norm. error = 0.468,

## cor obs&pred = 0.909, cor pred&resid = 0.058, R2 = 0.827, R2 adj = 0.827

## Spatial model cross-validation metrics (back-transformed, eng\_run\_20200823-1202):

## mean error = -5.07, MSPE = 22337.71,

## cor obs&pred = 0.959, cor pred&resid = 0.697, R2 = 0.919, R2 adj = 0.919



#### Cross validation of linear model

## Linear model cross-validation metrics (not back-transformed, eng\_run\_20200823-1202):

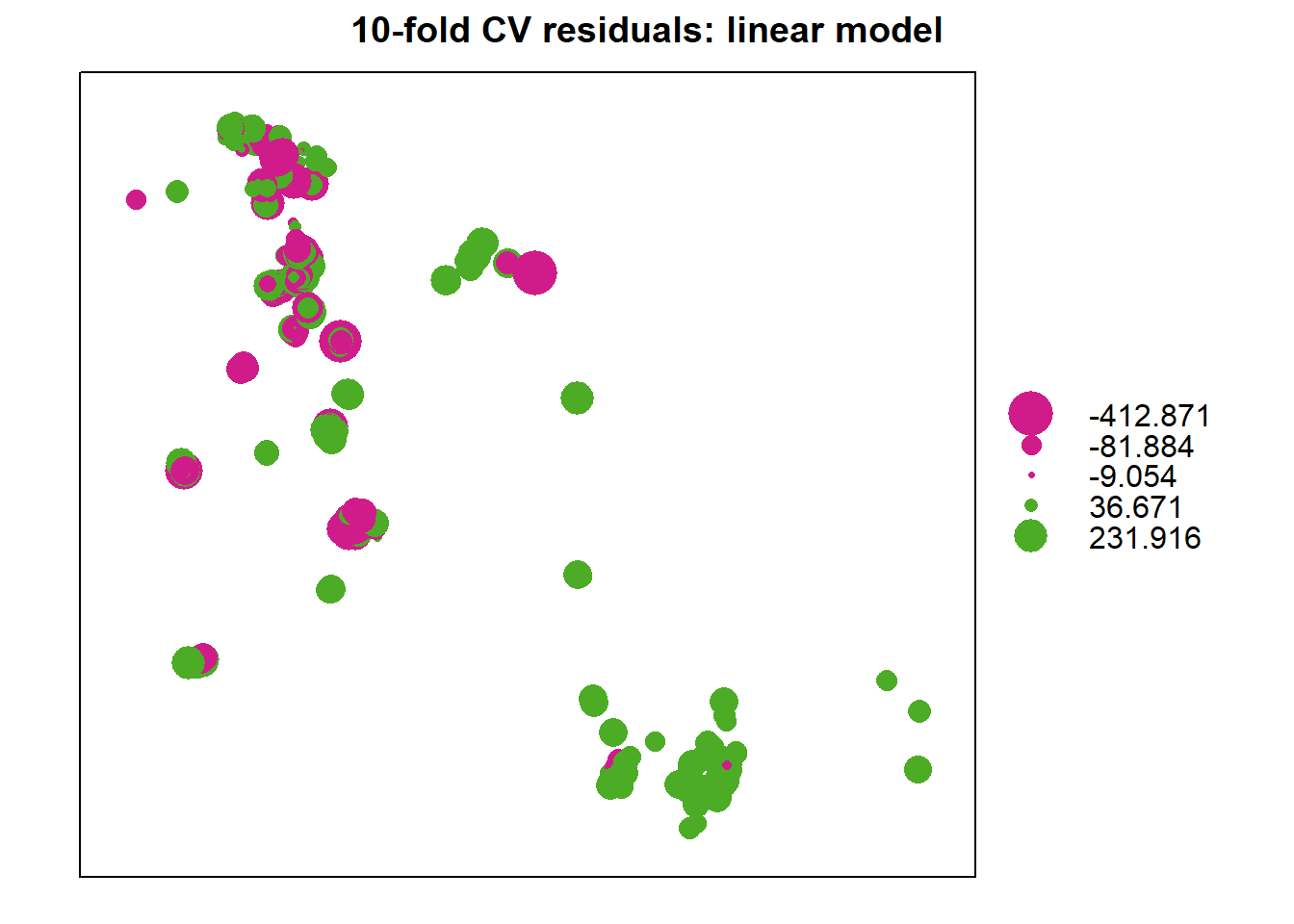
## mean error = 0, MSPE = 1.625, mean square norm. error = 1.001,

## cor obs&pred = 0.562, cor pred&resid = -0.001, R2 = 0.315, R2 adj = 0.315

## Linear model cross-validation metrics (back-transformed, eng\_run\_20200823-1202):

## mean error = -21.973, MSPE = 7970.987,

## cor obs&pred = 0.59, cor pred&resid = -0.032, R2 = 0.348, R2 adj = 0.347



#### Estimate null model

Linear regression with no spatial component

##

## Call:

## lm(formula = depth ~ elev + slope, data = dat\_sp)

##

## Residuals:

## Min 1Q Median 3Q Max

## -247.59 -58.96 -11.95 61.44 706.45

##

## Coefficients:

## Estimate Std. Error t value Pr(>|t|)

## (Intercept) 247.543008 1.512902 163.62 <2e-16 \*\*\*

## elev -0.049745 0.003228 -15.41 <2e-16 \*\*\*

## slope -18.870578 0.330246 -57.14 <2e-16 \*\*\*

## ---

## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

##

## Residual standard error: 89.18 on 9997 degrees of freedom

## Multiple R-squared: 0.3066, Adjusted R-squared: 0.3065

## F-statistic: 2210 on 2 and 9997 DF, p-value: < 2.2e-16

## Linear null-model metrics (eng\_run\_20200823-1202):

## R2 = 0.307, R2 adj = 0.306, RMSE = 89.169 cm

##

##

## Model equation

## depth = 247.54300762 - 0.04974453 \* elev - 18.87057779 \* slope

#### Estimate best linear model from the literature

## Exponential model by Parry, metrics (eng\_run\_20200823-1202):

## R2 = 0, R2 adj = 0, RMSE = 223.279 cm

##

##

## Model equation

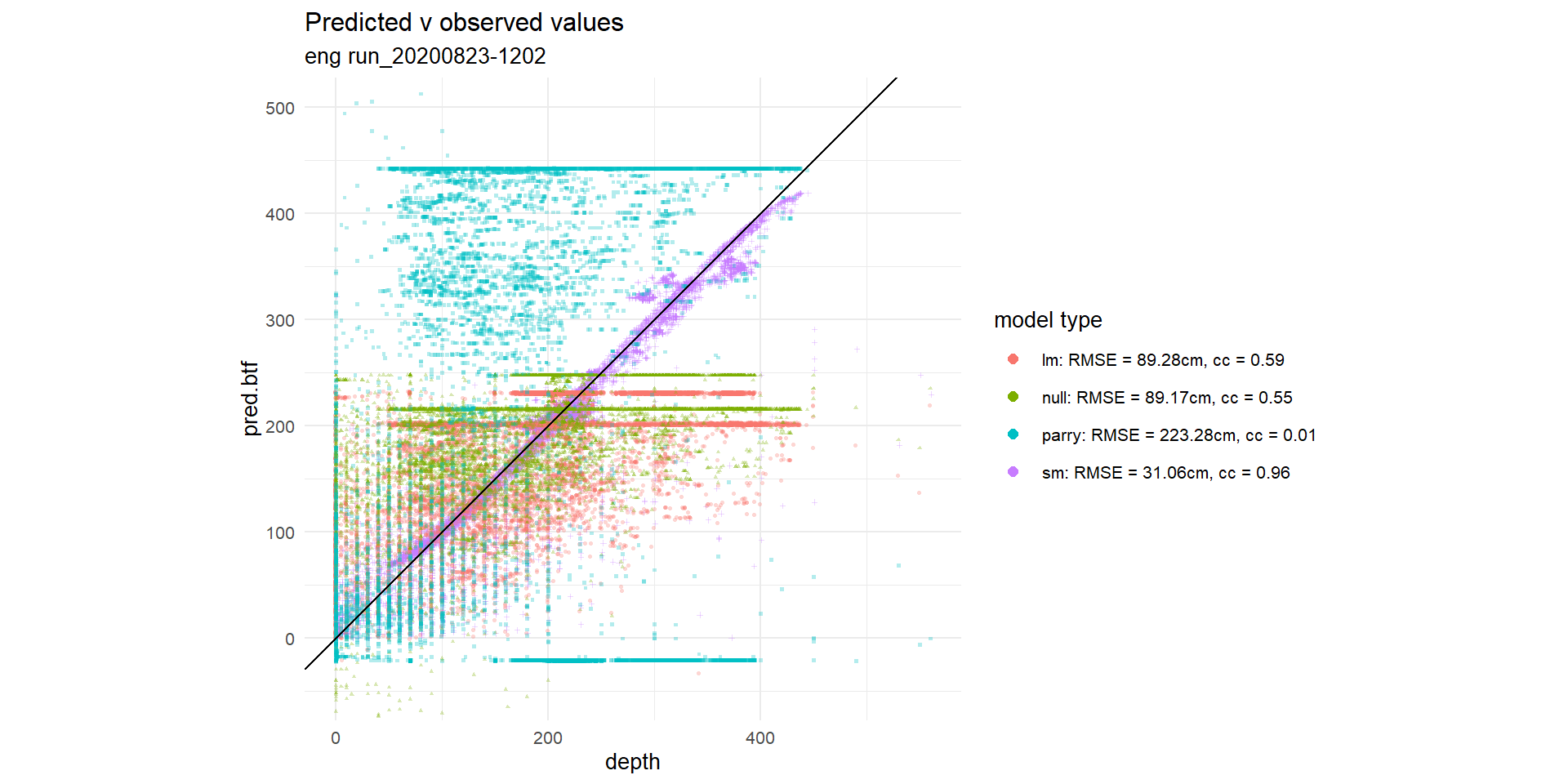
## exp(0.875 + 0.00758 \* elev - 0.0903 \* slope) - 25 + (0.5 \* exp(0.875 + 0.00758 \* elev - 0.0903 \* slope))

##

##

### Results summary

| Table 2. Performance metrics for spatial and linear models | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| modeltype | rmse | r2 | r2adj | cc | coverage | bias | interv |
| sm | 31.06 | 0.919 | 0.919 | 0.96 | 0.97 | -5.07 | 43.09 |
| lm | 89.28 | 0.348 | 0.347 | 0.59 | 0.95 | -21.97 | 124.72 |
| null | 89.17 | 0.307 | 0.306 | 0.55 | NA | 0.00 | NA |
| parry | 223.28 | 0.000 | 0.000 | 0.01 | NA | -7.09 | NA |
| England run\_20200823-1202 | | | | | | | |



### Parameters and environment

Run at 2020-08-26 13:27:05 for \*\*\*\* (\*\*) with the following parameters:

## $area\_name

## [1] "England"

##

## $area\_abbr

## [1] "eng"

##

## $pred\_bound

## [1] "../data/peaty\_soils/Peaty\_Soils\_buff\_200m.shp"

##

## $NP

## [1] "NA"

##

## $raster\_source

## [1] "TerrainTiles"

##

## $terrain\_raster\_file

## [1] "../data/terr\_eng\_12.tif"

##

## $cell\_size

## [1] 5

##

## $obs\_path

## [1] "../data/peat\_depth\_data/Combined\_Peat\_Depth\_Survey\_Data\_NOV2012\_ALLDATA.shp"

##

## $projection

## [1] "+proj=tmerc +lat\_0=49 +lon\_0=-2 +k=0.9996012717 +x\_0=400000 +y\_0=-100000 +ellps=airy +datum=OSGB36 +units=m +no\_defs"

##

## $field\_depth

## [1] "PEAT\_DEPTH"

##

## $input\_data.sp.fn

## [1] "../data/input.data\_eng\_5m.rds"

##

## $elev\_raster\_fn

## [1] "../data/elev\_eng\_5m.tif"

##

## $slope\_raster\_fn

## [1] "../data/slope\_eng\_5m.tif"

##

## $input\_data\_prep.sp.fn

## [1] "../data/input.data\_eng\_5m.rds"

##

## $rundate

## [1] "run\_20200823-1202"

##

## $tf

## [1] "cbrt"

##

## $params\_fn

## [1] "../data/parameters\_eng.rds"

##

## $model\_fn

## [1] "../outputs/model.geo\_eng\_run\_20200823-1202.rds"

##

## $inputs\_fn

## [1] "../outputs/input.data.gs\_eng\_run\_20200823-1202.rds"

##

## $parallel

## [1] TRUE

##

## $subset

## [1] TRUE

## R version 3.6.1 (2019-07-05)

## Platform: x86\_64-w64-mingw32/x64 (64-bit)

## Running under: Windows 10 x64 (build 19041)

##

## Matrix products: default

## locale:

## [1] LC\_COLLATE=English\_United Kingdom.1252

## [2] LC\_CTYPE=English\_United Kingdom.1252

## [3] LC\_MONETARY=English\_United Kingdom.1252

## [4] LC\_NUMERIC=C

## [5] LC\_TIME=English\_United Kingdom.1252

## attached base packages:

## [1] parallel stats graphics grDevices utils datasets methods

## [8] base

##

## other attached packages:

## [1] doParallel\_1.0.15 iterators\_1.0.12 foreach\_1.4.7 flextable\_0.5.10

## [5] stars\_0.4-1 abind\_1.4-5 gstat\_2.0-5 geoR\_1.8-1

## [9] elevatr\_0.2.0 sf\_0.9-3 rgdal\_1.4-7 raster\_3.1-5

## [13] sp\_1.4-2 forcats\_0.4.0 stringr\_1.4.0 dplyr\_0.8.3

## [17] purrr\_0.3.3 readr\_1.3.1 tidyr\_1.0.0 tibble\_3.0.1

## [21] ggplot2\_3.3.2 tidyverse\_1.3.0

##

## loaded via a namespace (and not attached):

## [1] RandomFieldsUtils\_0.5.3 nlme\_3.1-140 fs\_1.4.1

## [4] xts\_0.12-0 lubridate\_1.7.8 httr\_1.4.1

## [7] tools\_3.6.1 backports\_1.1.5 R6\_2.4.1

## [10] KernSmooth\_2.23-15 DBI\_1.1.0 colorspace\_1.4-1

## [13] withr\_2.1.2 tidyselect\_1.1.0 splancs\_2.01-40

## [16] compiler\_3.6.1 RandomFields\_3.3.8 cli\_2.0.2

## [19] rvest\_0.3.5 xml2\_1.3.1 officer\_0.3.12

## [22] labeling\_0.3 scales\_1.1.0 classInt\_0.4-3

## [25] systemfonts\_0.2.3 digest\_0.6.25 rmarkdown\_2.1

## [28] base64enc\_0.1-3 pkgconfig\_2.0.3 htmltools\_0.4.0

## [31] dbplyr\_1.4.3 rlang\_0.4.7 readxl\_1.3.1

## [34] rstudioapi\_0.11 FNN\_1.1.3 farver\_2.0.1

## [37] generics\_0.0.2 zoo\_1.8-6 jsonlite\_1.6.1

## [40] zip\_2.0.4 magrittr\_1.5 Rcpp\_1.0.4.6

## [43] munsell\_0.5.0 fansi\_0.4.0 gdtools\_0.2.2

## [46] lifecycle\_0.2.0 stringi\_1.4.3 yaml\_2.2.0

## [49] MASS\_7.3-51.4 grid\_3.6.1 crayon\_1.3.4

## [52] lattice\_0.20-38 haven\_2.2.0 hms\_0.5.2

## [55] knitr\_1.26 pillar\_1.4.4 uuid\_0.1-4

## [58] tcltk\_3.6.1 spacetime\_1.2-3 codetools\_0.2-16

## [61] reprex\_0.3.0 glue\_1.4.0 evaluate\_0.14

## [64] data.table\_1.12.6 modelr\_0.1.8 vctrs\_0.3.0

## [67] cellranger\_1.1.0 gtable\_0.3.0 assertthat\_0.2.1

## [70] xfun\_0.11 lwgeom\_0.2-4 broom\_0.5.6

## [73] e1071\_1.7-3 class\_7.3-15 intervals\_0.15.2

## [76] units\_0.6-6 ellipsis\_0.3.1