Comparing SilviMetric and FUSION outputs for small test area

Robert J. McGaughey

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Load packages

```r
library(terra)
library(sf)
library(mapview)
```

Setup

```r
SilviMetricFolder <- "C:/Users/bmcgaughey/SilviMetricTesting/TestOutput/PlumasSmallArea_vrt_tifs/"
FUSIONfolder <- "H:/FUSIONTestMetrics/SmallArea/Products_SilviMetricTesting_2025-04-11/FINAL_SilviMetri

SMfile <- "m_Z_max.tif"
FUSIONfile <- "elev_max_2plus_30METERS.img"
```

Read raster data and display extent and summary info

```
## FUSION raster:    ncol= 12    nrow= 18    cells= 216
## HAGVRT raster:    ncol= 11    nrow= 16    cells= 176
## FUSION raster:    SpatExtent : 635505, 635865, 4402305, 4402845 (xmin, xmax, ymin, ymax)
## HAGVRT raster:    SpatExtent : 635535, 635865, 4402335, 4402815 (xmin, xmax, ymin, ymax)
```

Adjust extent

The rasters produced when using PDAL's hag_nn are different from those produced using other hag filters. I don't know for sure why but suspect it has to do with the extent of ground points compared to the extent of non-ground points.

The HAGNN raster requires an extra operation to make it match the other rasters.

FUSION rasters are assigned a srs using an ESRI's projection file. The format of these files differs from the format used for the srs in the point cloud files so SilviMetric's srs doesn't exactly match FUSION's. To overcome this, I forced the srs for FUSION rasters to match those from SilviMetric.

```
## adjusted FUSION raster:    SpatExtent : 635535, 635865, 4402335, 4402815 (xmin, xmax, ymin, ymax)
## adjusted HAGVRT raster:    SpatExtent : 635535, 635865, 4402335, 4402815 (xmin, xmax, ymin, ymax)
```

Extent and summary information for adjusted rasters

```
## FUSION output:     ncol= 11    nrow= 16    cells= 176
## HAGVRT output:     ncol= 11    nrow= 16    cells= 176
## FUSION raster:
##      Layer_1
##  Min.   :25.73
##  1st Qu.:40.69
##  Median :42.95
##  Mean   :42.66
##  3rd Qu.:44.96
##  Max.   :54.73
##  NA's   :14
## HAGVRT raster:
##      m_Z_max
##  Min.   :25.74
##  1st Qu.:40.78
##  Median :42.99
##  Mean   :42.71
##  3rd Qu.:44.96
##  Max.   :55.08
##  NA's   :14
```

## Compare raster values for maximum height

This metric (maximum HAG) doesn't involve any calculation so it basically tests that FUSION and Silvi-Metric are using the same HAG values and same point for the cells.

This is a plot of the FUSION output for maximum height.

FUSION -- maxHt
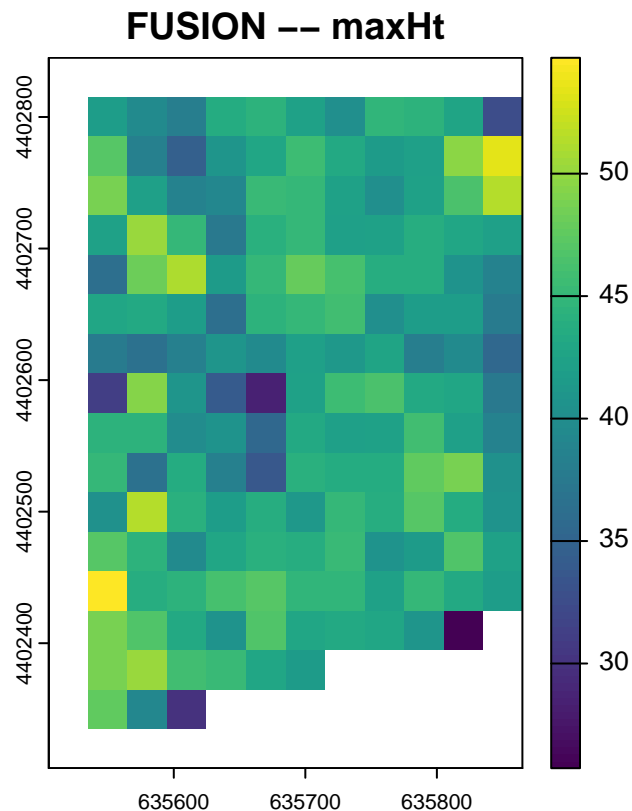
The first test uses HAG computed using the VRT with PDAL's hag_dem filter. The interpolation problem with PDAL mentioned above leads to small differences between HAG compute by FUSION and using the VRT. In general, these differences are largest at the edge of the coverage area but there are patterns related to topogrphic features visible in the difference raster.

FUSION minus SilviMetric –– maxHt

Frequency

HAG computed using VRT

FUSION minus SilviMetric -- maxHt
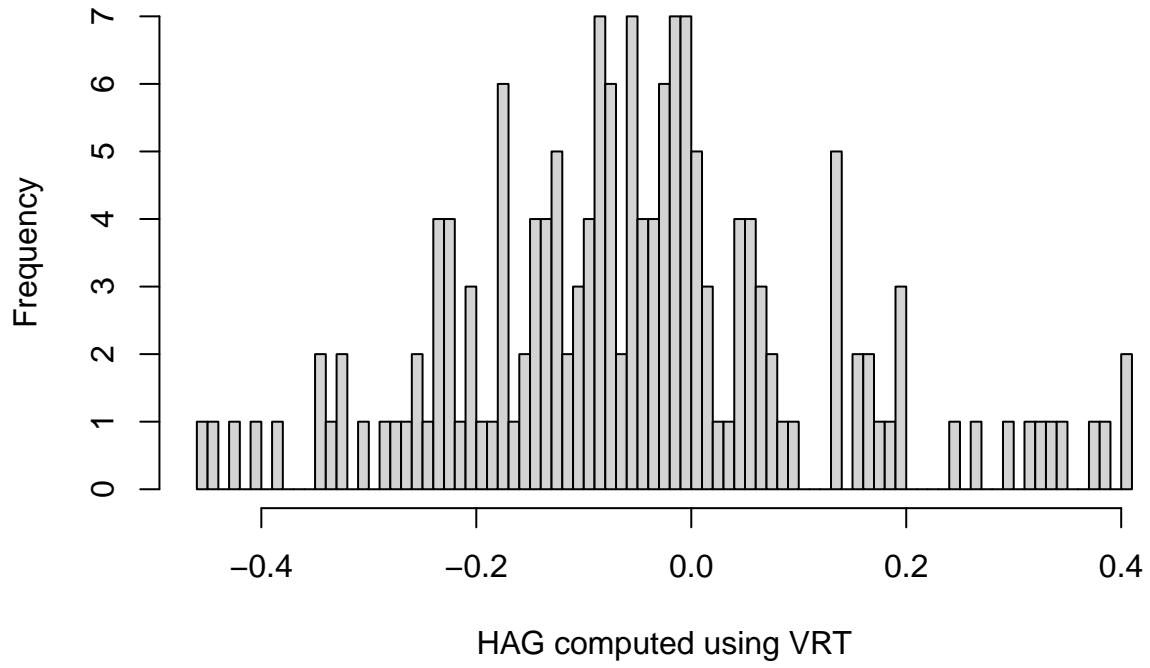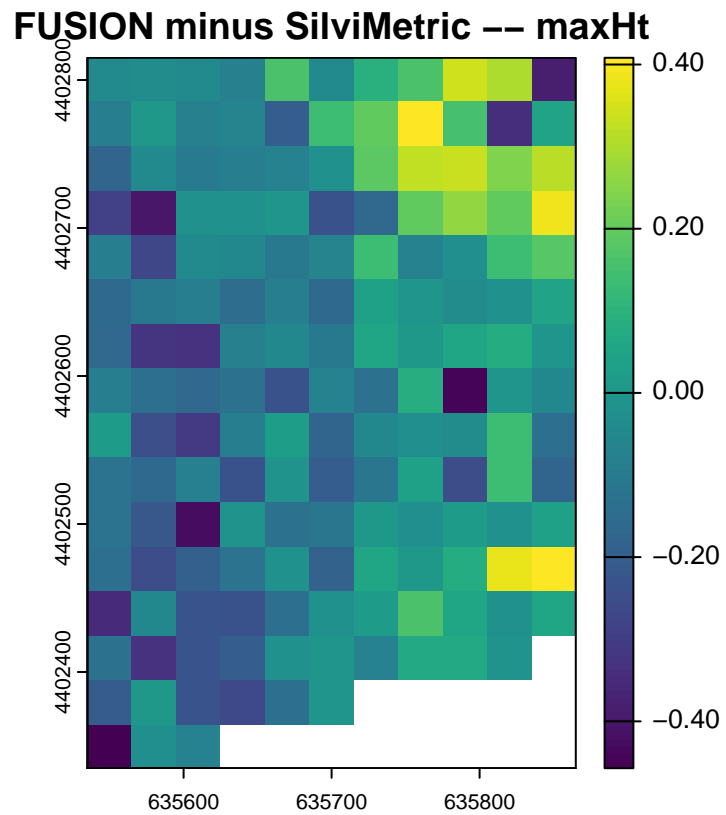

```
##      Layer_1
##  Min.   :-0.45707
##  1st Qu.:-0.14786
##  Median :-0.05304
##  Mean   :-0.04961
##  3rd Qu.: 0.03554
##  Max.   : 0.40818
##  NA's   :14
```