Speedy MINX Results

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Goals

- Comparison for plumes retrieved by MINX and model plumes
- Get useful stats in comparison
- Check if current definition of plume from model is actually accurate

preMINX Processing

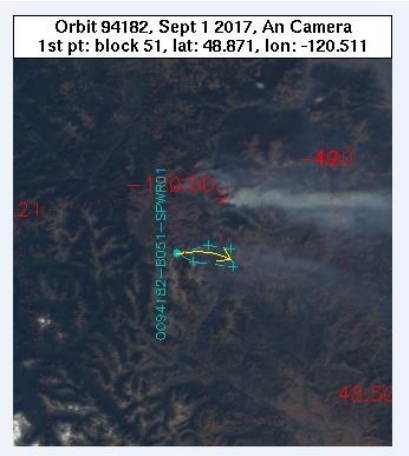
- Using AB/SK area during Sept 1-15, 2017
  - Retrieved results using preMINX
    - Filtered FirePixels text file using
      - 1. Top 10% in Power (MWatts), greater than 60% Confidence
      - 2. Top 20% in Power (MWatts), greater than 50% Confidence

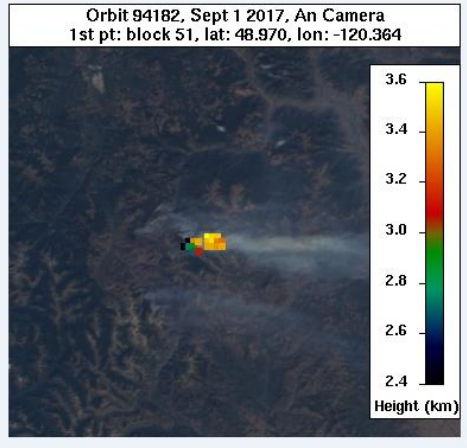
FirePixels_MOD14_094...

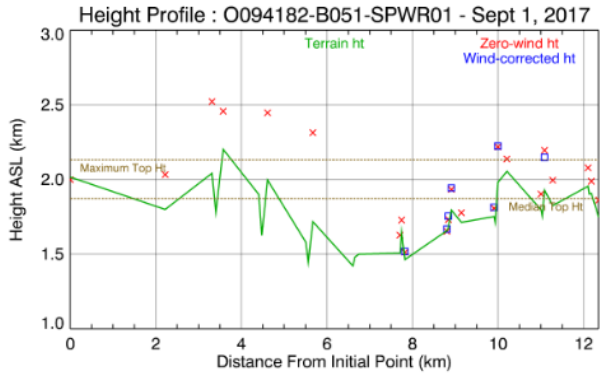
```
1 Fire pixels from MODIS granules on 275m MISR SOM grid for project : sept012017
2 94182 / 45 / 2017-09-01  : orbitnum / pathnum / date
3  Longitude  Latitude Blk Samp Line  Power ReflR2 BTmpT21 BTmpT31 BBTmpT21 BBTmpT31 Conf
4   degrees    degrees      0-based   MWatt reflec fire(k) fire(k) bkgnd(k) bkgnd(k)   %
5 -116.24072  49.83686  50 1754  369  147.3  0.121  373.4   294.4    295.8    289.8   100
6 -116.22691  49.83442  50 1757  369   58.7  0.180  344.6   291.3    295.4    289.3    94
7 -118.53010  49.52562  51 1191  103  290.1  0.196  405.8   303.0    300.6    294.1   100
8 -120.40353  49.04226  51  738  383   93.7  0.140  364.8   303.6    305.8    296.3   100
```

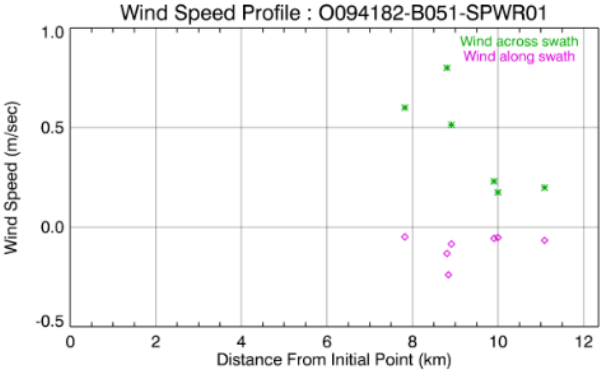
Digitizing in MINX

- Display customized FirePixels overlay
- Select plumes based on
  - Not under lots of cloud cover
  - Quality: Fair or Good
  - Roughly within 10km from origin





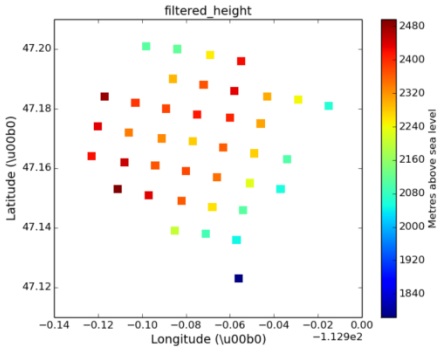


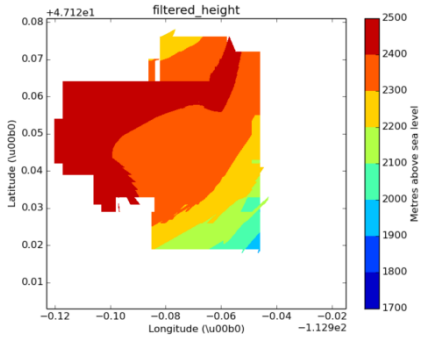


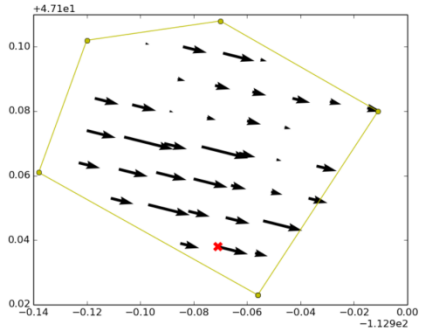
postMINX Processing

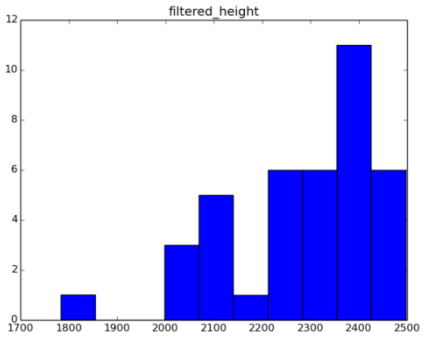
- Sorted red and blue band plume results
  - Used the red band results if the terrain was not visible below the plume
  - Otherwise used blue band results
  - From MINX article, doi:10.3390/rs5094593:
    - stereo retrieval coverage deteriorates dramatically as wavelength increases
    - In certain cases, the greater sensitivity of the blue band to thinner aerosols allows aerosol features to be matched that correspond to a higher altitude for the plume.
    - NOTE: default MINX uses both red and blue bands to image match, I picked either the blue or red band results afterwards. This should have the same effect.
- speedyAltMINXdemo.py (apply to one plume)
- loopSpeedMINX.py (apply to all plumes)
- FST files, high resolution (for comparisons)
- Produced:
  - MINX plumes: colour, contour, direction, histogram, polynomial fit, scatter, shape and surface plots, basic stats (max, min, median, mean, std)
  - MINX and Model plumes: colour, contour, histogram, polynomial fit, and scatter plots
  - All plumes together: basic stats (total max/min, RMSD, correlation coefficient, mean bias), MINX plume and model plume comparison plot

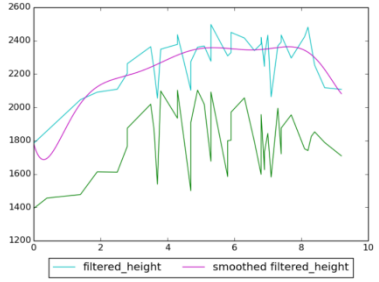
Sample Results – MINX Plume

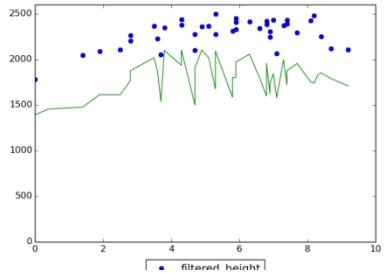


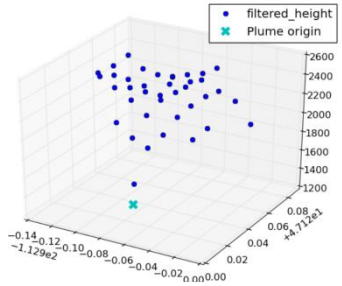


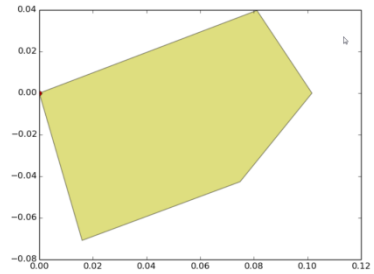


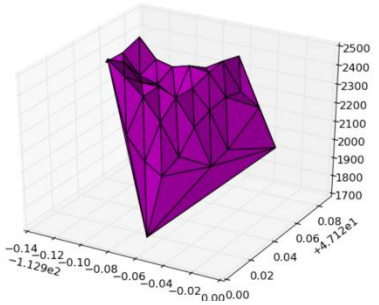






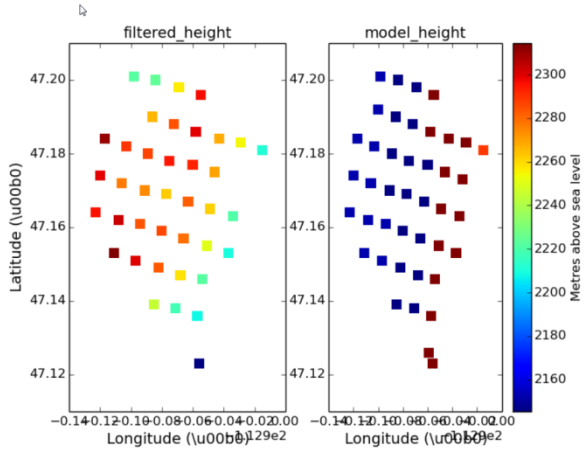


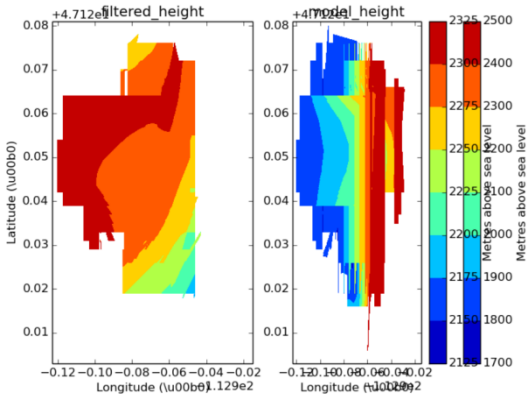


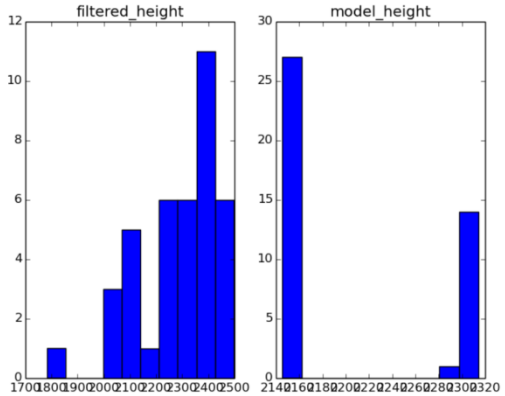


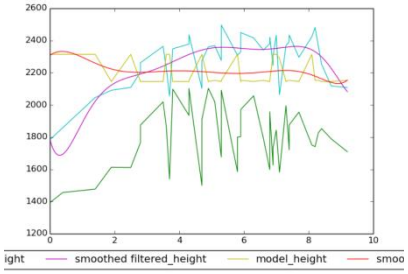
```
method,filtered_height
max,"({'distance': 5.3, 'direction': 346.0, 'total_wind': 1.8, 'terrain': 1677.0, 'longitude': -113.011, 'filtered_height': 2497.0, 'across_wind': nan, 'along_wind': 1.6, 'nowind_height': 2611.0, 'latitude':
47.153, 'wind_height': 2537.0}, 9)"
min,"({'distance': 0.0, 'direction': 346.0, 'total_wind': 0.0, 'terrain': 1393.0, 'longitude': -112.956, 'filtered_height': 1784.0, 'across_wind': -0.0, 'along_wind': 0.0, 'nowind_height': 1598.0, 'latitude':
47.123, 'wind_height': 1709.0}, 0)"
median,2345.0
mean,2286.2051282051284
std,151.60613266250479
```

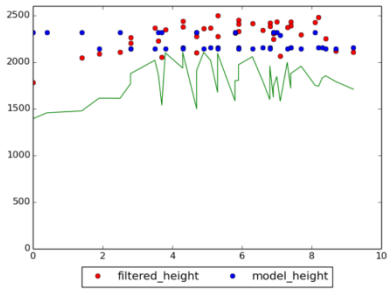
Sample Results – MINX and Model Plume

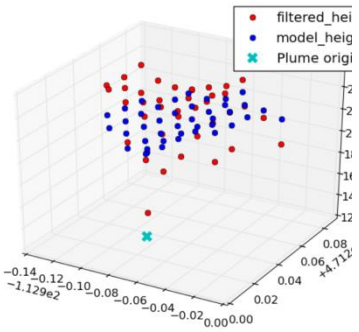


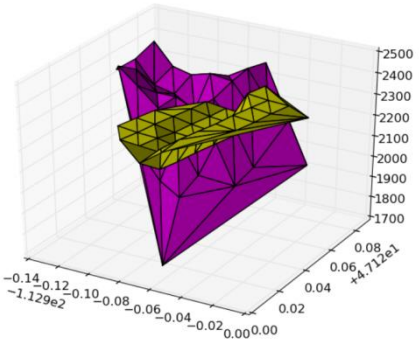




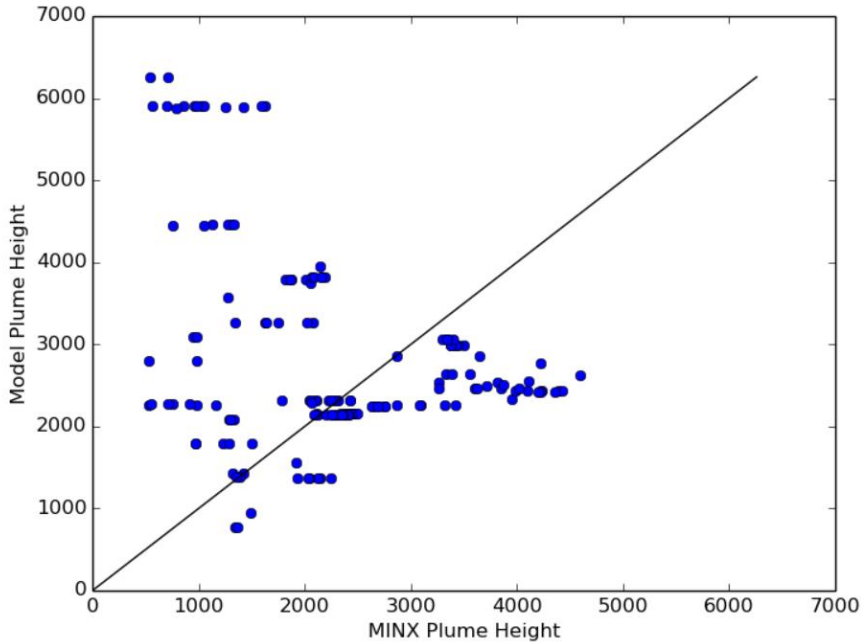








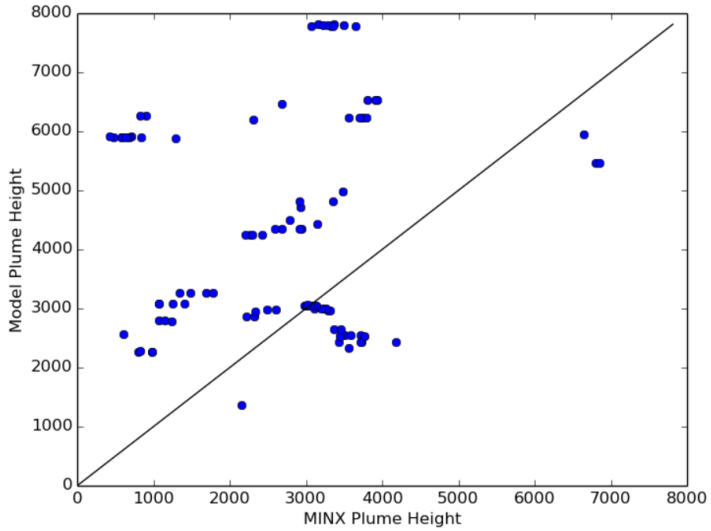
Sample Results – All Plumes



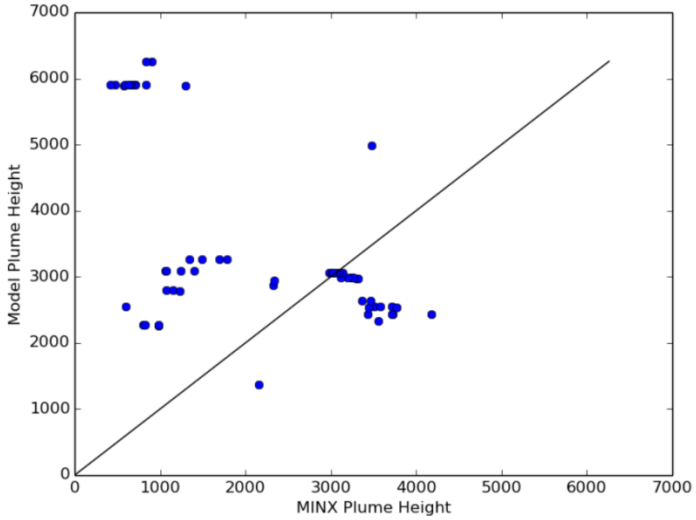
MINX Plume Max, 4598.0
Model Plume Max, 6259.32714844
MINX Plume Min, 527.0
Model Plume Min, 768.591308594
RMSD, 1867.73033029
Correlation Coefficient, (-0.31736273589809633, 3.4625309580168156e-05)
Mean Bias, 1214650.36139
Number of Pairs, 164

Results for Case 1 (P90, C60)

- Threshold = default = 4
  - RMSD, 2720.24617395
  - Correlation Coefficient, (0.11845588056825707, 0.25549033571820351)
  - Mean Bias, 3176143.78634

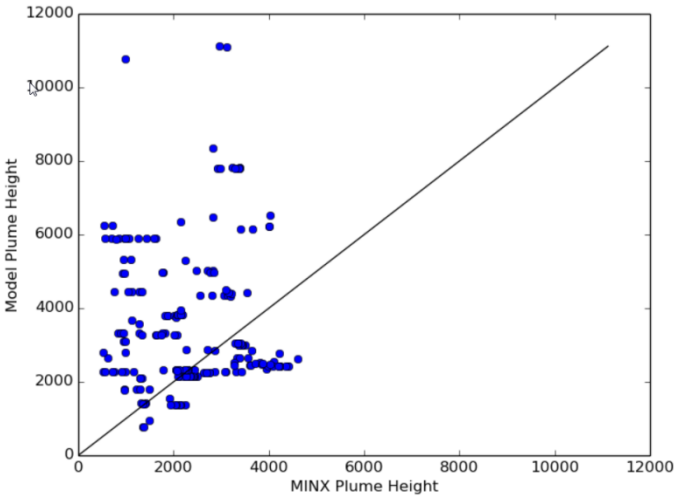


- Threshold = 15
  - RMSD, 2635.61288679
  - Correlation Coefficient, (-0.56235304904112915, 5.3018125518963431e-06)
  - Mean Bias, 1807981.51358
  - Number of Pairs, 57

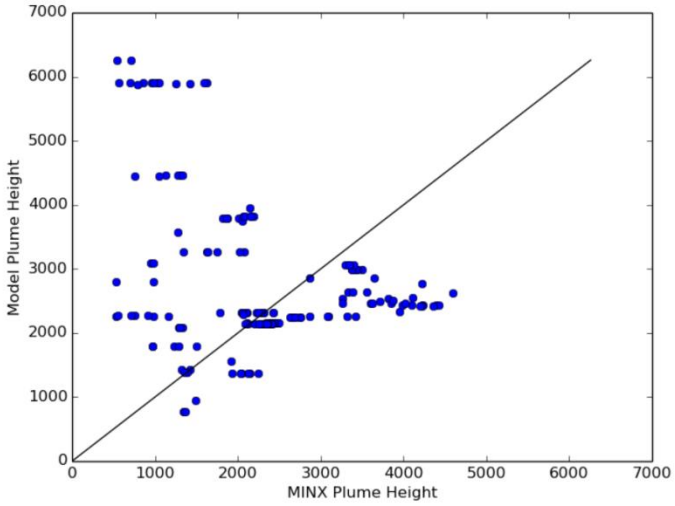


Results for Case 2 (P80, C50)

- Threshold = default = 4
  - RMSD, 2415.7960233
  - Correlation Coefficient, (0.0084792036678869188, 0.90139646216419811)
  - Mean Bias, 2676414.46297



- Threshold = 15
  - RMSD, 1867.73033029
  - Correlation Coefficient, (-0.31736273589809633, 3.4625309580168156e-05)
  - Mean Bias, 1214650.36139
  - Number of Pairs, 164

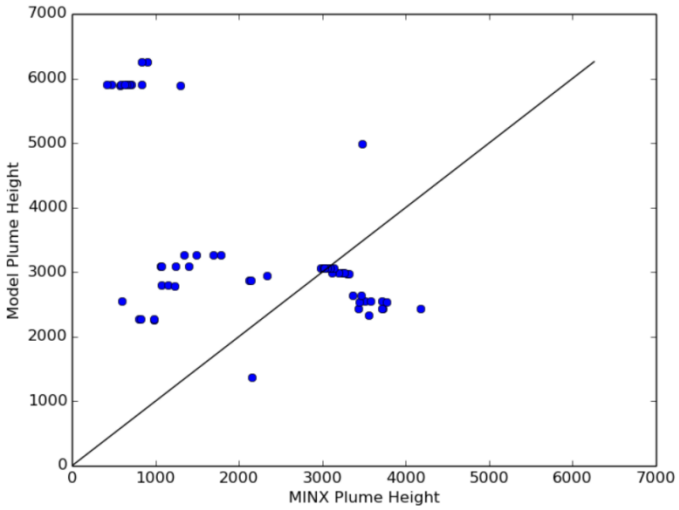


Blue and Red Bands

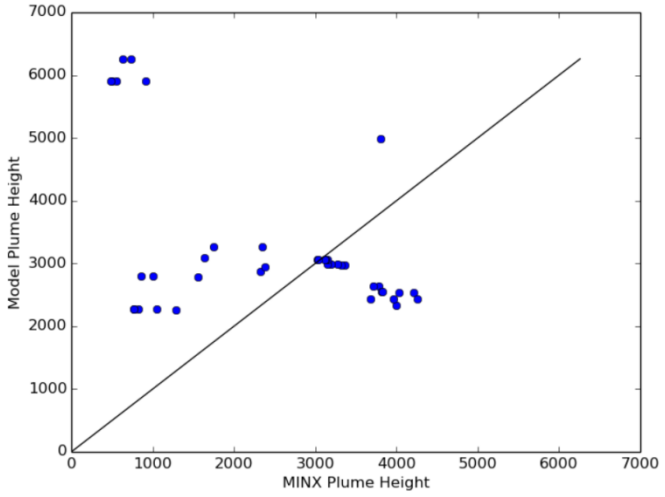
- Ran additional cases
- If digitizer doesn't know how to classify red/blue
- Using the same 2 conditions, threshold = 15, Processed:
  - All blue band plume results
  - All red band plume results

Results for Case 1 (P90, C60)

- Red Band Plumes
  - RMSD, 2615.38515849
  - Correlation Coefficient, (-0.5601613690230256, 4.8245153034138419e-06)
  - Mean Bias, 1811570.28575
  - Number of Pairs, 58

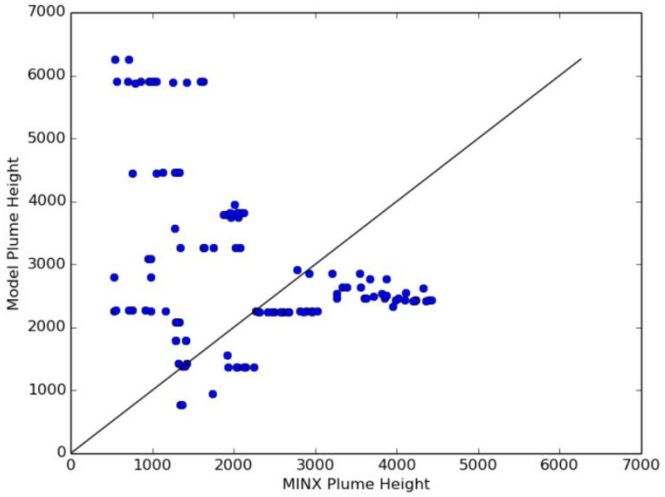


- Blue Band Plumes
  - RMSD, 2346.52238071
  - Correlation Coefficient, (-0.48455015807666041, 0.001532602190660252)
  - Mean Bias, 1084959.07057
  - Number of Pairs, 40

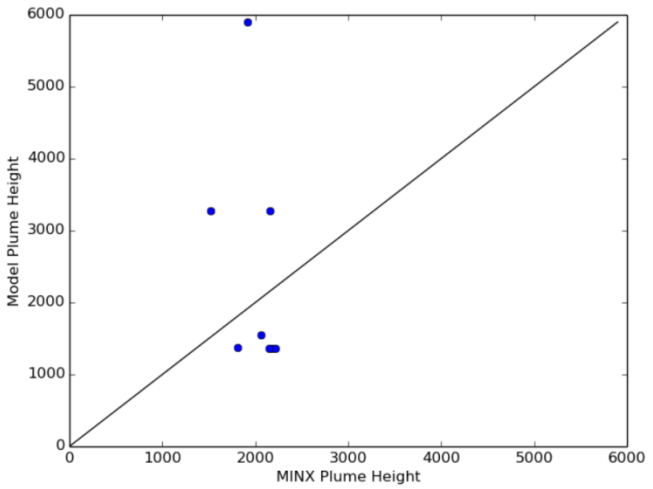


Results for Case 2 (P80, C50)

- Red Band Plumes
  - RMSD, 2197.17999412
  - Correlation Coefficient, (-0.36147195144609651, 6.222726409088604e-05)
  - Mean Bias, 1405047.73982
  - Number of Pairs, 117



- Blue Band Plumes
  - RMSD, 1681.96838944
  - Correlation Coefficient, (-0.36208131455134307, 0.37810112306164534)
  - Mean Bias, 435233.486629
  - Number of Pairs, 8



Next Steps

- Do a few more cases (vary percentile and confidence, more days if available)
- Incorporate observational data (from hotspots)
  - Ideally find fires longer than one day
  - Compare model predictions, satellite values and reported values
  - Check that reported values are actually matching up to satellite values
    - May find that satellite and hotspot info don't match up, would expected model to be off as well…

All Results

- Link to results: https://hpfx.science.gc.ca/~eld001/MINXResults/sept_01_15/