



Evaluation of High Resolution Data for LCLUC Science

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Project Title: Improving Burnt Area Mapping and Validation Efforts in Agricultural Landscapes of South/Southeast Asia Using Multi-Satellite and Very High-Resolution PLANET Data

Objectives

- Agricultural Emissions are highly underestimated in South/Southeast Asia.
- Evaluate very high resolution data for improving burnt area estimates in agricultural residue burning regions.
- Compare high resolution Burnt area estimates with MCD64A1 for the 2018-2019 burn season in agricultural landscapes. Perform accuracy assessment, calibration, and validation to improve burnt area estimates.
- Evaluate the potential of fire-induced spectral changes in the visible and NIR bands versus a combination of visible + red-edge + NIR bands (Planet versus RAPID EYE).

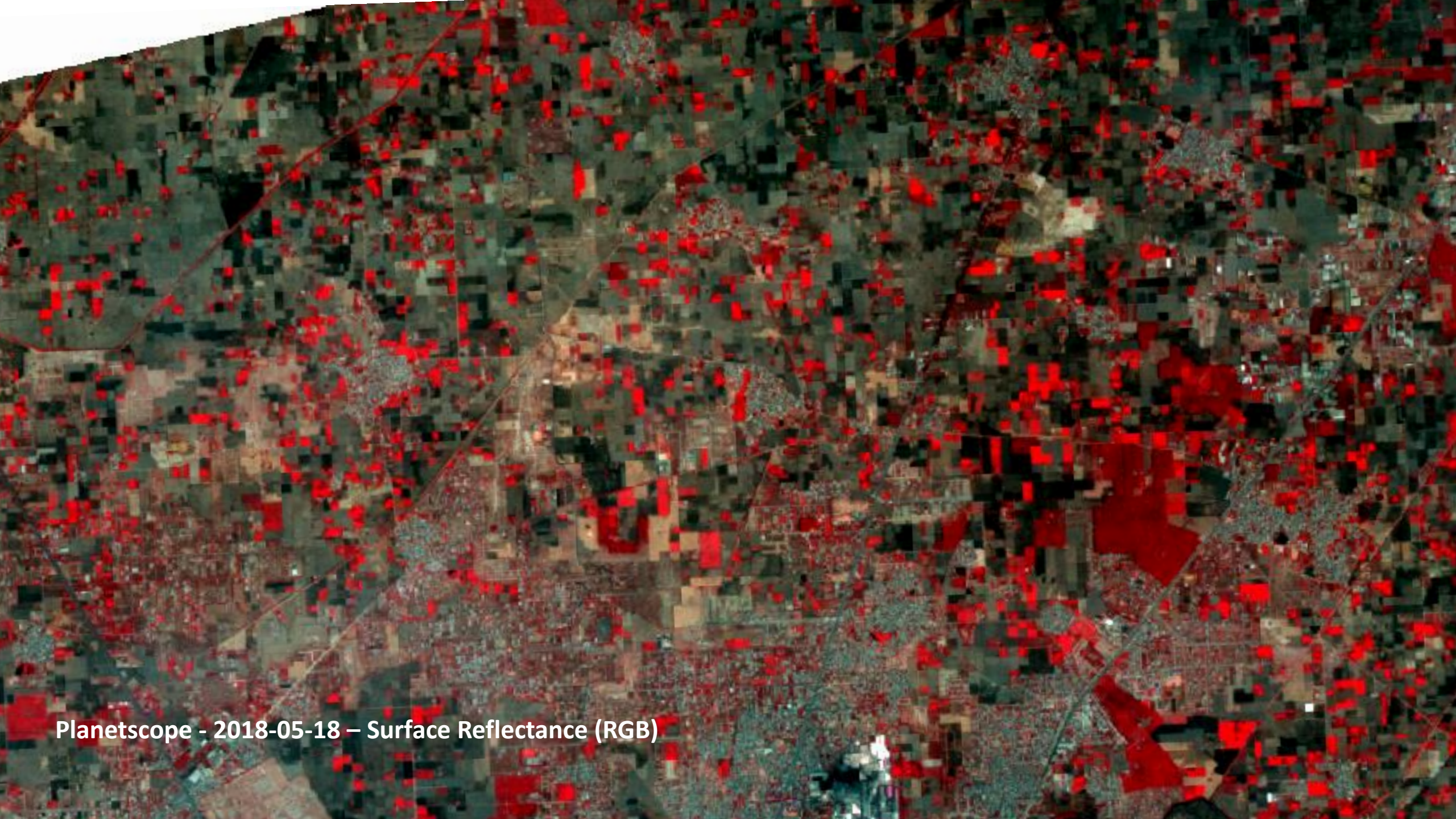
Data Requested and Status

- **Region of interest:**
 - Punjab, India; Ayeyarwady Region, Myanmar and Nakhon Louang, Laos
- **Data downloaded status: ~30%**
 - 4-Band Planetscope data (RGB, NIR)
 - 5-Band Rapid Eye (RGB, Red Edge, NIR)
- **Timeline when you will be completing all data downloads?**
 - Summer – March-May – Peak fire season; already downloaded;
 - Winter – October-December – yet to be downloaded
- **Any issues: or challenges while downloading the data**
 - None

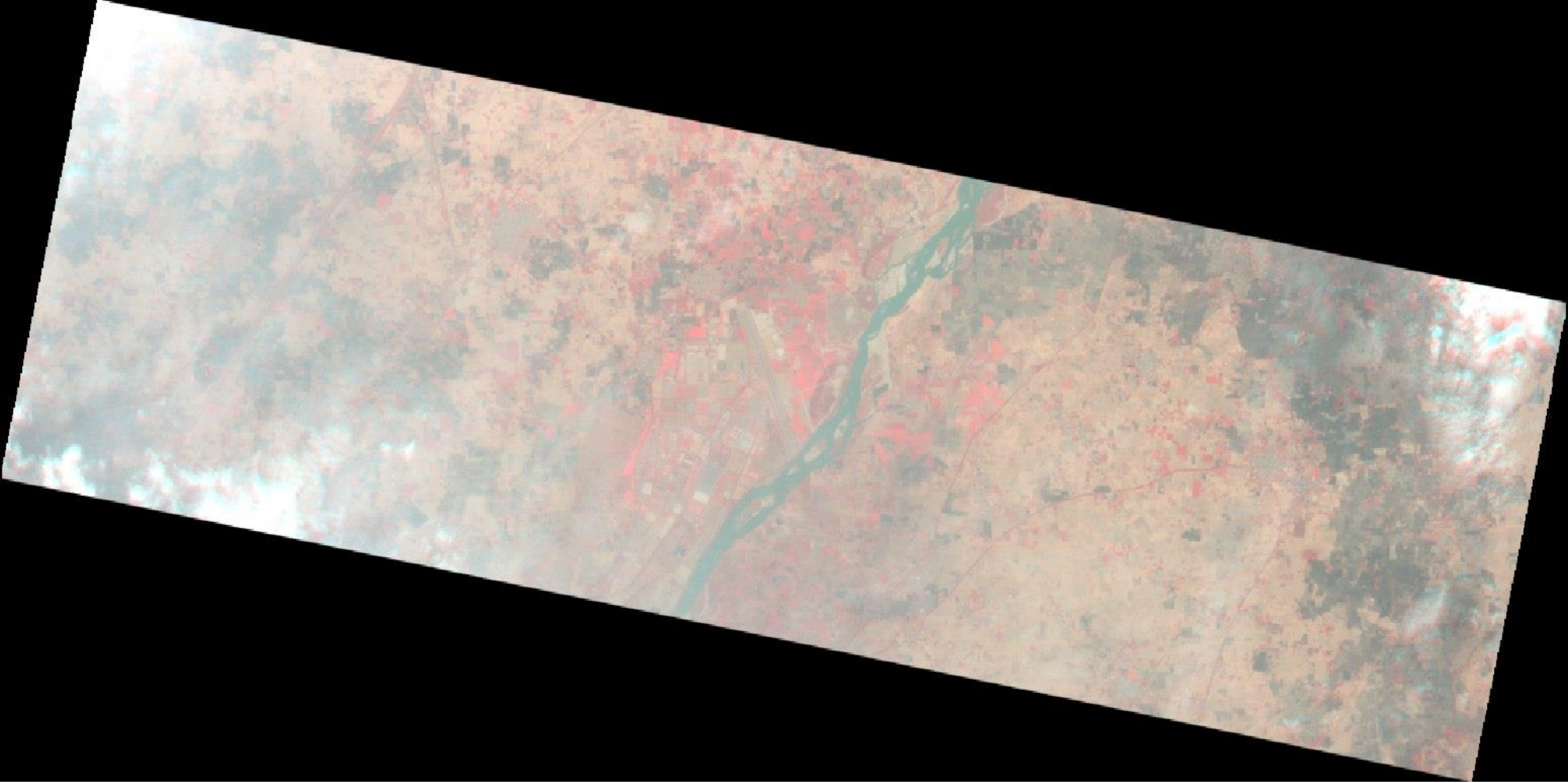
Preliminary Results

Currently Using Surface Reflectance from Planetscope

The Surface Reflectance product is available in the Data API as the `analytic_sr` asset under the `PSScene4Band` item. It is provided as a 16 bit GeoTIFF image with reflectance values scaled by 10,000.



Planetscope - 2018-05-18 – Surface Reflectance (RGB)



Planetscope 2018-05-12 (RGB) Surface Reflectance (RGB)

average of the AOD values within that region. When looking up reflectance values from the LUTs, tables with the closest matching values of water vapor and ozone concentrations are used. Tables built with the two closest solar zenith angles are interpolated between and a linear interpolation is performed for AOD and TOA reflectance. Since Planet satellites are nadir pointing, zenith angle is fixed at 0 degrees.

PRODUCT LIMITATIONS

The Planet Surface Reflectance V1 product corrects for the effects of the Earth's atmosphere, accounting for the molecular composition and variation with altitude along with aerosol content. Combining the use of standard atmospheric models with the use of MODIS water vapor, ozone and aerosol data, this provides reliable and consistent surface reflectance scenes over Planet's varied constellation of satellites as part of our normal, on-demand data pipeline. However, there are some limitations to the corrections performed:

- In some instances there is no MODIS data overlapping a Planet scene or the area nearby. In those cases, AOD is set to a value of 0.226 which corresponds to a "clear sky" visibility of 23km, the `aot_quality` is set to the MODIS "no data" value of 127, and `aot_status` is set to 'Missing Data - Using Default AOT'. If there is no overlapping water vapor or ozone data, the correction falls back to a predefined 6SV internal model.
- The effects of haze and thin cirrus clouds are not corrected for.
- Aerosol type is limited to a single, global model.
- All scenes are assumed to be at sea level and the surfaces are assumed to exhibit Lambertian scattering - no BRDF effects are accounted for.
- Stray light and adjacency effects are not corrected for.

PRODUCT ASSESSMENT

With Planet's constellation of satellites, farming regions can be revisited on a nearly daily basis enabling real time monitoring of crop health and insights on day to day changes in the fields. Combined with the physics-based atmospheric correction methodology used to produce the Planet SR product, crops can be monitored with a high degree of precision. The following section details an assessment of the SR Product for temporal monitoring of crops and an assessment of the correction on derived indices and band reflectances as compared to the Landsat



Planet Scope – Surface Reflectance Products

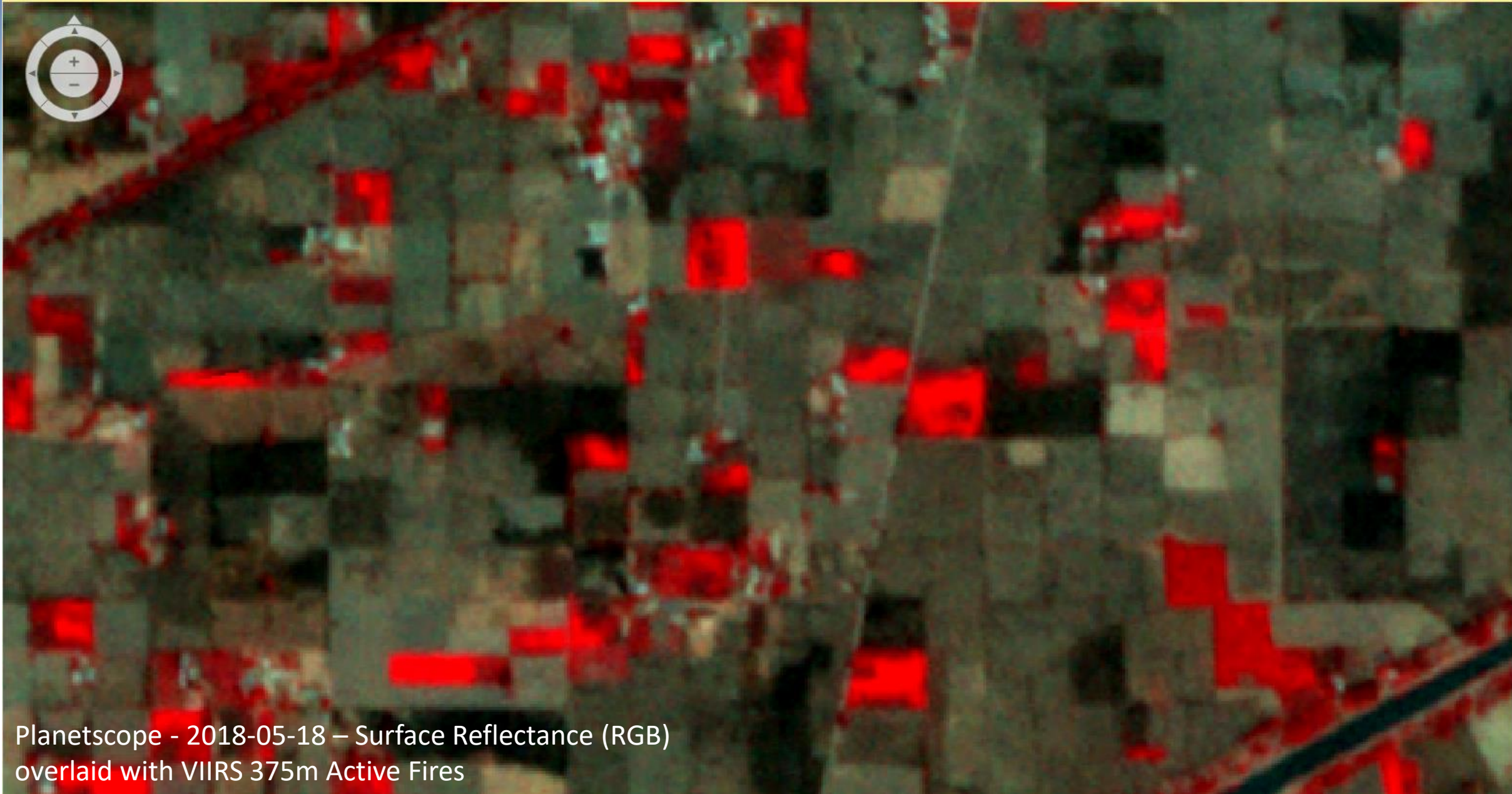
Scope for improvement

-Current Aerosol model:
Continental Type (uniform across the world) –

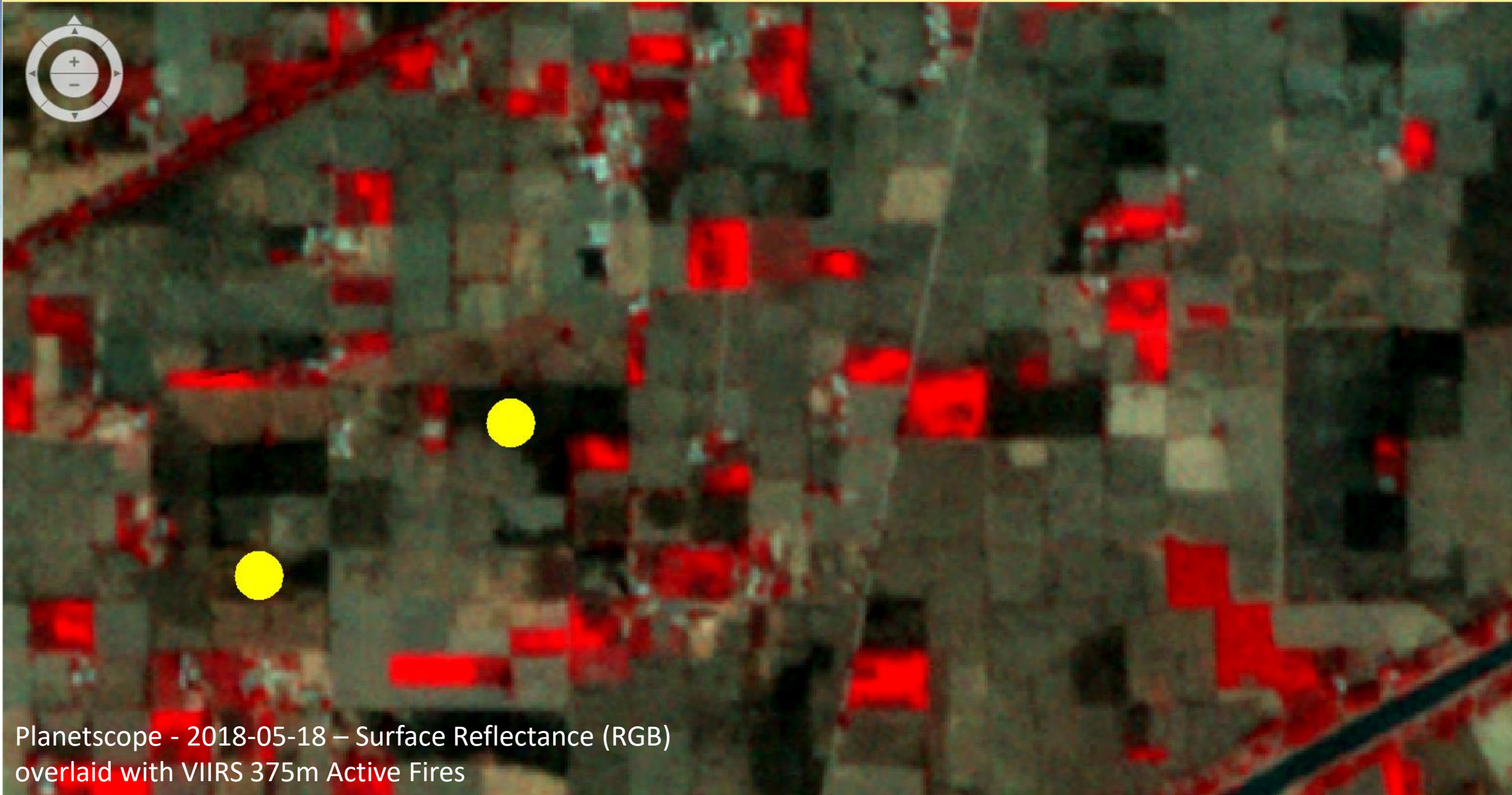
Urban type preferred when close to N.Delhi

-Effects of Haze and thin cirrus clouds not corrected for

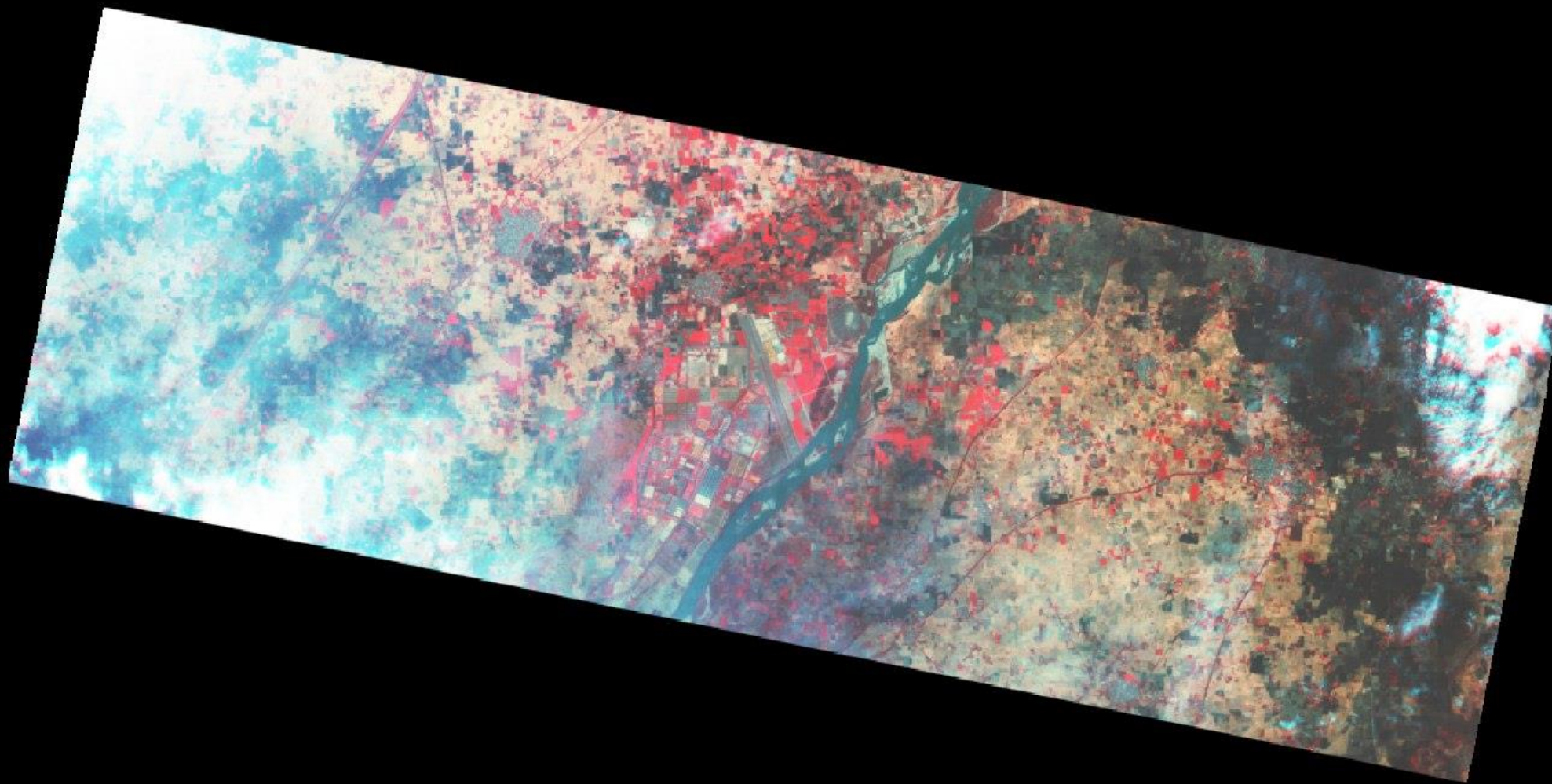
-Adjacency effects not corrected for



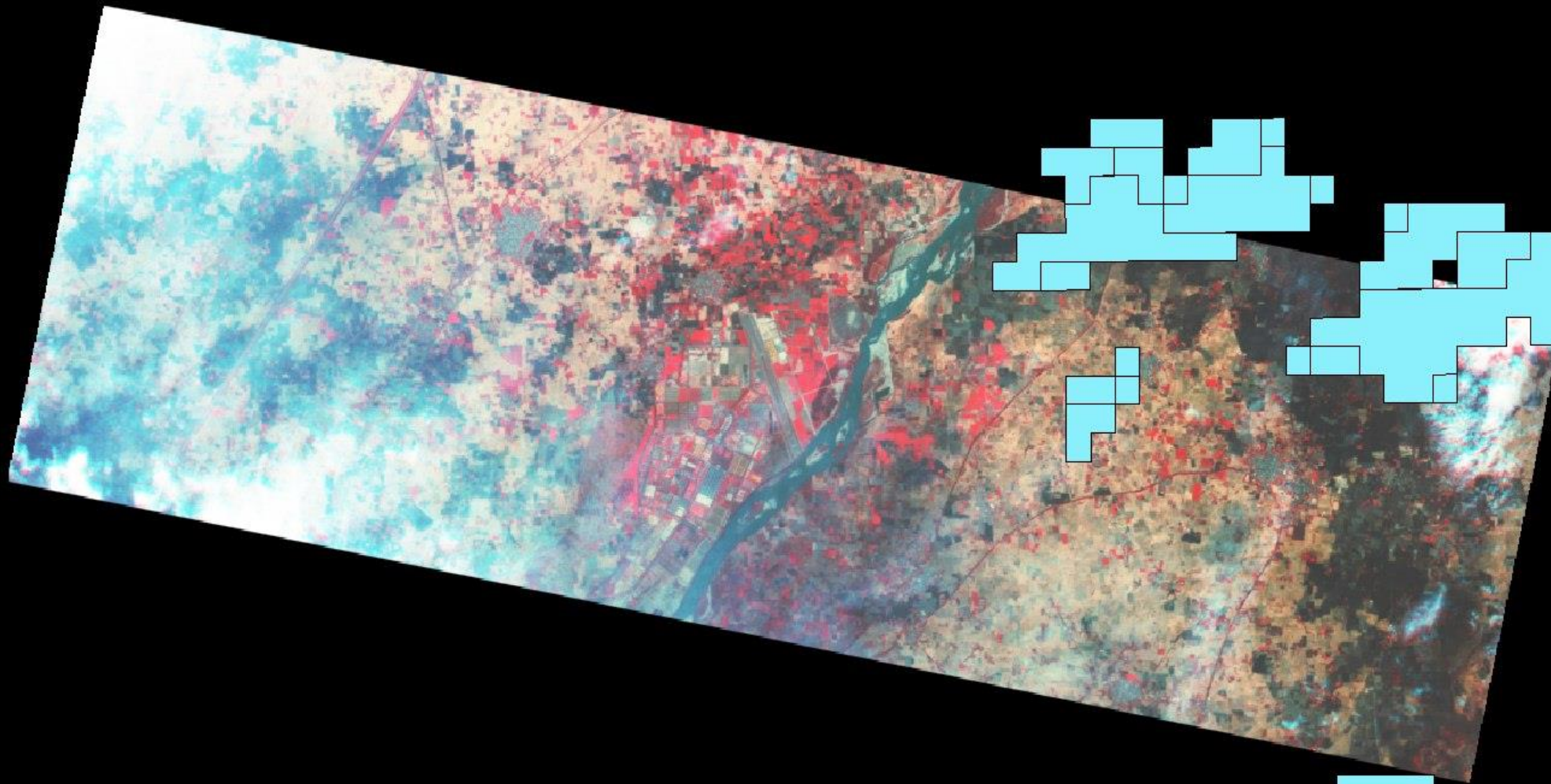
Planetscope - 2018-05-18 – Surface Reflectance (RGB)
overlaid with VIIRS 375m Active Fires



Planetscope - 2018-05-18 – Surface Reflectance (RGB)
overlaid with VIIRS 375m Active Fires



PlanetScope - 2018-05-12 – Surface Reflectance (RGB)



Planetscope - 2018-05-12 – Surface Reflectance (RGB)
overlaid with MODIS Burnt Areas

Next Steps

- Assess more scenes and do atmospheric corrections as necessary with change in type of aerosols and other parameters;
- Compare with VIIRS active fires in agricultural areas to infer burnt areas;
- Ground truth data collection for the current year (next month and during October) to arrive at spectral response curves; Use Landsat and Sentinel 1&2 data as necessary to interpret burnt areas.
- Assess commission and omission errors in burnt area products from MODIS as that of Planet data and arrive at correction factors for burnt areas.
- **Approaches:**
- A). Visual interpretation and digitization of burnt area polygons in selected areas; b). Burnt area mapping using burnt area and vegetation indices (including Red Edge band) using random forests; classification accuracy assessment.
- *Re-calculate emissions from agricultural residue burning for the study areas*

Usefulness: A). Mapping and Monitoring of Burnt Areas; B). Validation Efforts; C). Improving Emission Estimates;