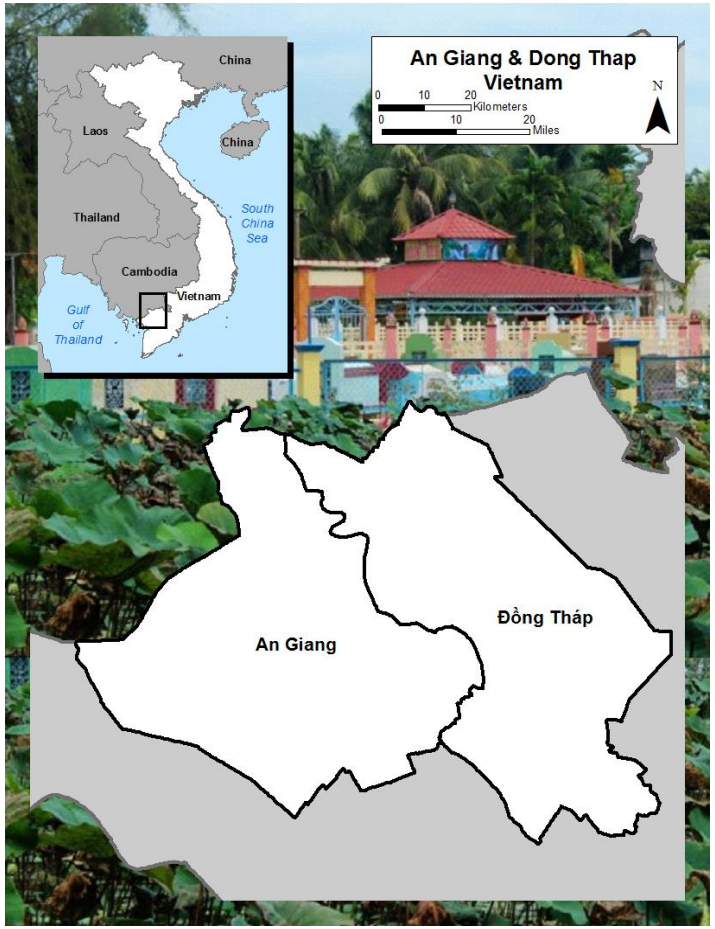
Evaluation of High Resolution Data for LCLUC Science



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Project Title: Land-Cover/Land-Use Change in Southern Vietnam Through the Lenses of Conflict, Religion, and Politics, 1980s to Present

Objectives

1. Augment existing project objective to produce multi-temporal VHR DigitalGlobe-based forest, agriculture, urban LCLUC: circa 2005, 2008, 2010, 2012, 2015, 2018 (CAD4NASA, HEC platforms on ADAPT science cloud and DISCOVER cluster)

Expected data usefulness and benefits:

1. Expand & enhance LCLUC due to more observations from constellation of optical sensors, while enabling more measurements from radar.

2. Shortcomings/benefits of high-frequency cubesat/smallsat observations, plus comparison to our in-situ observations for validation.

Planet Data Requested and Status

- Study Region: Western Mekong of Viet Nam, including Đồng Tháp & An Giang Provinces plus border with Cambodia

- Data download status and plans: 5 m RapidEye, 3 m PlanetScope, and 0.7 m SkySat
  - Amount of data: PlanetScope – 836 assets, SkySat – 40 assets, RapidEye - 2 assets
  - Downloads don't appear to be throttled by Planet and quota usage is clearly reported to track remaining allotment.

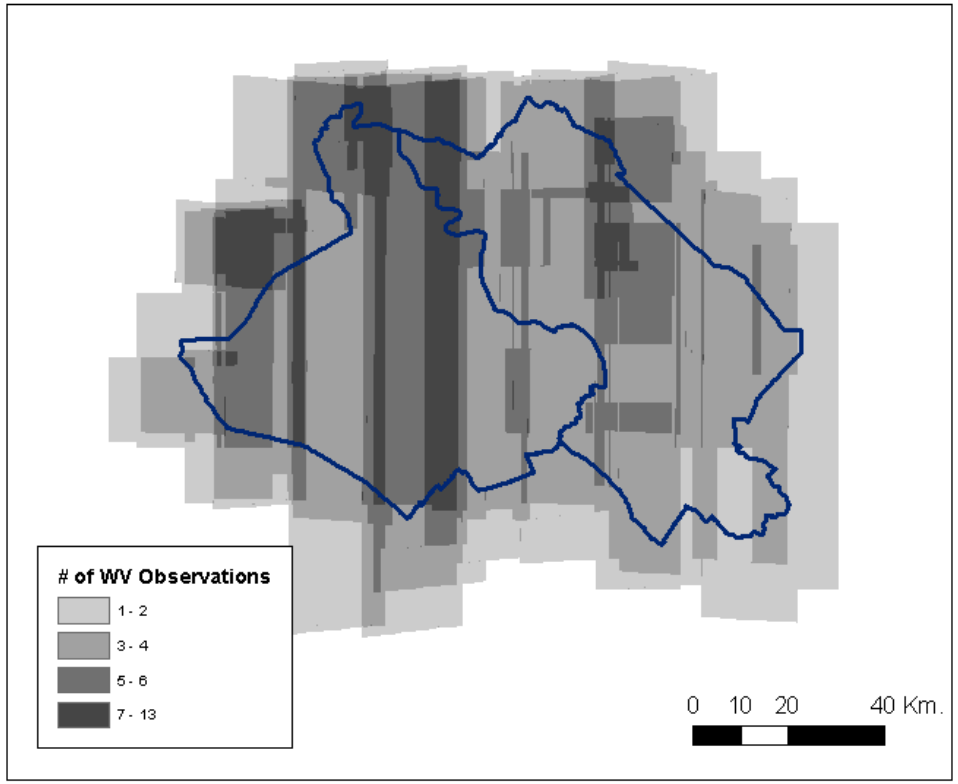
- Planet Explorer is intuitive and easy-to-use. **Two major issues**:
  1. No shopping cart and easy to deselect part of your order.
  2. Not possible to order >100 images at once; nature of Planet data means very easy/common to exceed limit.
     A. Forces one to use the ordering API for anything more than small, exploratory orders. The API itself may be very robust, but is also fairly complex, and *therefore writing one's own ordering application is not trivial.*

- Planet's command-line client built on top of the API improves functionality, but is unstable and poorly documented. Writing a shell script to order a list of images through this client took hours and considerable trial-and-error. https://github.com/planetlabs/planet-client-python

- Planet seems to have focused on allowing other technology companies to write applications that interface smoothly with Planet's archive. **They do not seem to have equally good support for scientific users** that want to obtain large amounts of data directly from Planet without substantial software engineering expertise.

Preliminary Results

- WorldView-1 & WorldView-2 Panchromatic data, 2008 – 2015: removed duplicate data converted 173 individual scenes to 45 strips representing unique observations & created per-pixel TOA composites to represent large-scale land cover/land use



- Cloud % on PlanetScope & SkySat problematic
- VERY LIMITED SkySat

Tram Chim, 26 Sep 2018 **Long Xuyen, 31 Oct 2018**

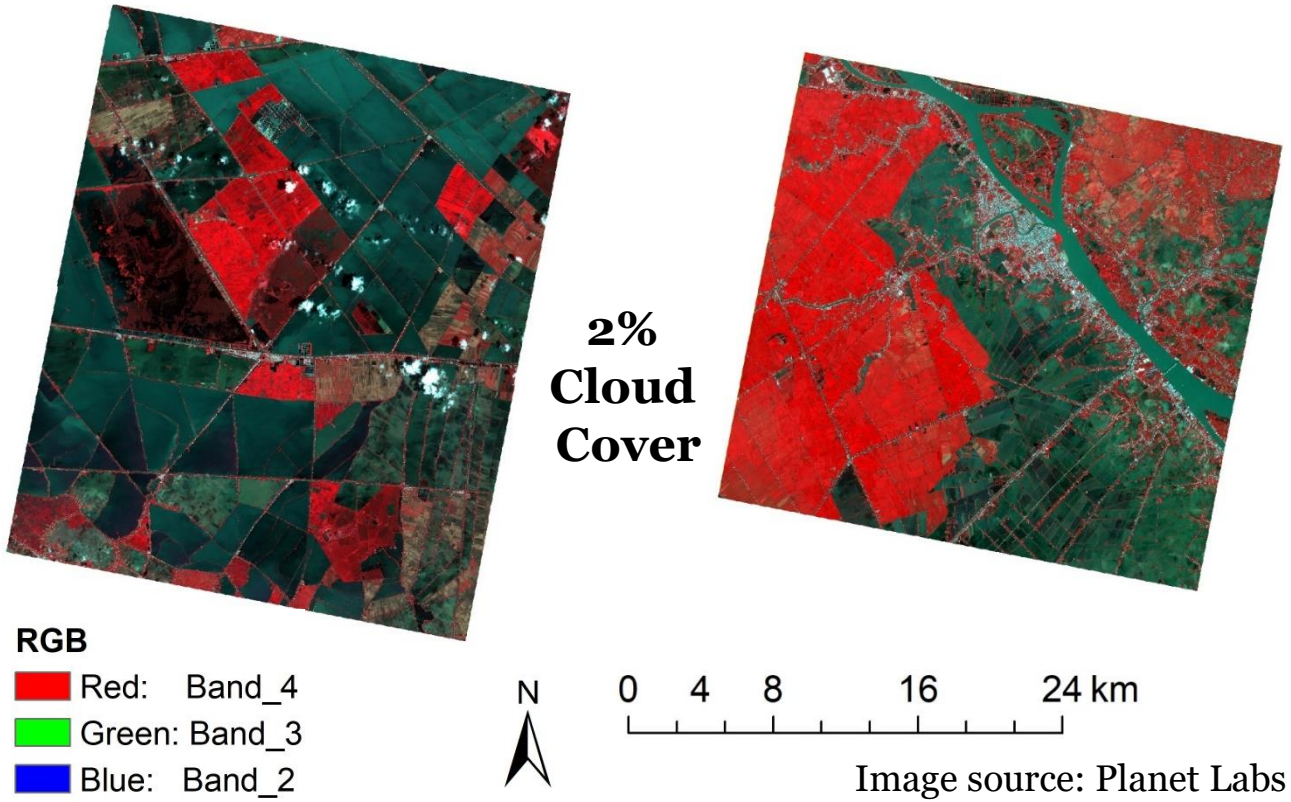


Image source: Planet Labs

Next Steps

- Data analysis: SkySat - PlanetScope - RapidEye - WorldView data comparison and fusion in context of Landsat 8/Sentinel-2 data standards & science products
- Validation: 2018-2020 field campaigns
- Algorithms: Extend Neigh et al. (2018) & improve SAR-based estimates of paddy agricultural change and infrastructure
- Enhancing LCLUC science: in-situ observations provide valuable resource of validation to ensure LCLUC maps meet high resolution ECV standards (https://www.ncdc.noaa.gov/gosic/gcos-essential-climate-variable-ecv-data-access-matrix/gcos-land-ecv-land-cover/)
  - Relevant ECV: Multi-temporal maps of land cover at resolution that exceeds GCOS Land ECV by factor of 10 using DigitalGlobe products (30-50 cm pan, ~ 1.25 m multispectral)

References

Neigh, C.S.R., Carroll, M., Wooten, M.R., Powell, B., McCarty, J.L., Husak, G.J., Enenkel, M., & Hain, C. (2018). Smallholder crop area mapped with wall-to-wall WorldView sub-meter panchromatic image texture: a test case for Tigray, Ethiopia. *Remote Sensing of Environment, 212*, 8-20

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Neigh, C.S.R., Masek, J.G., & Nickeson, J. (2013). High-Resolution Satellite Data Open for Government Research. *EOS Transactions, 94*, 121-123

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