



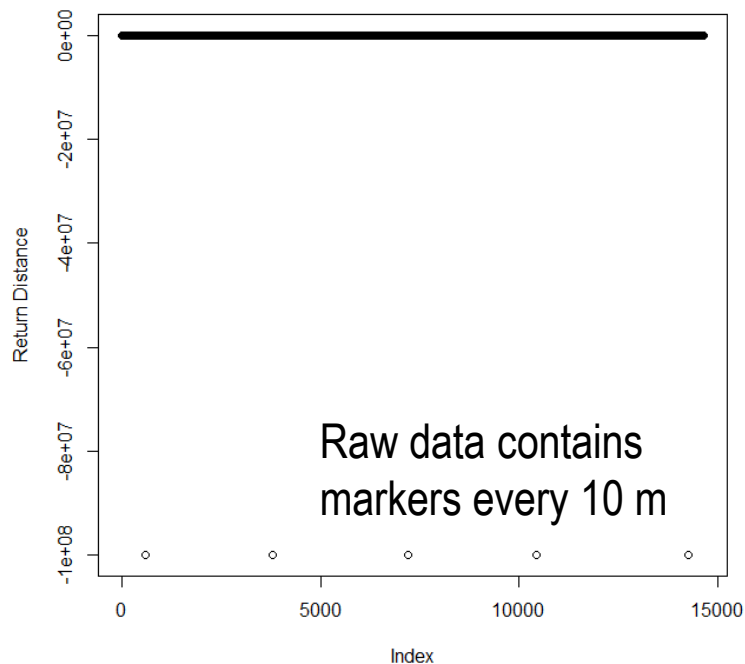
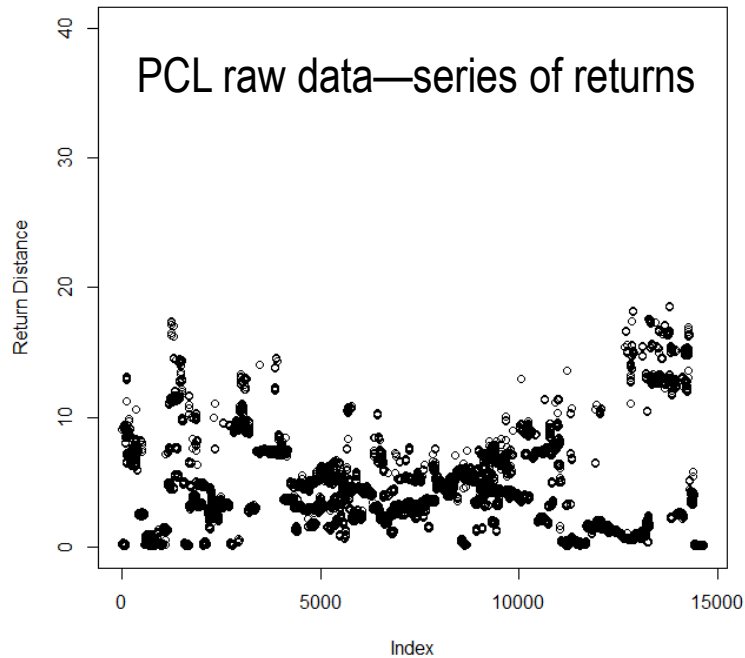
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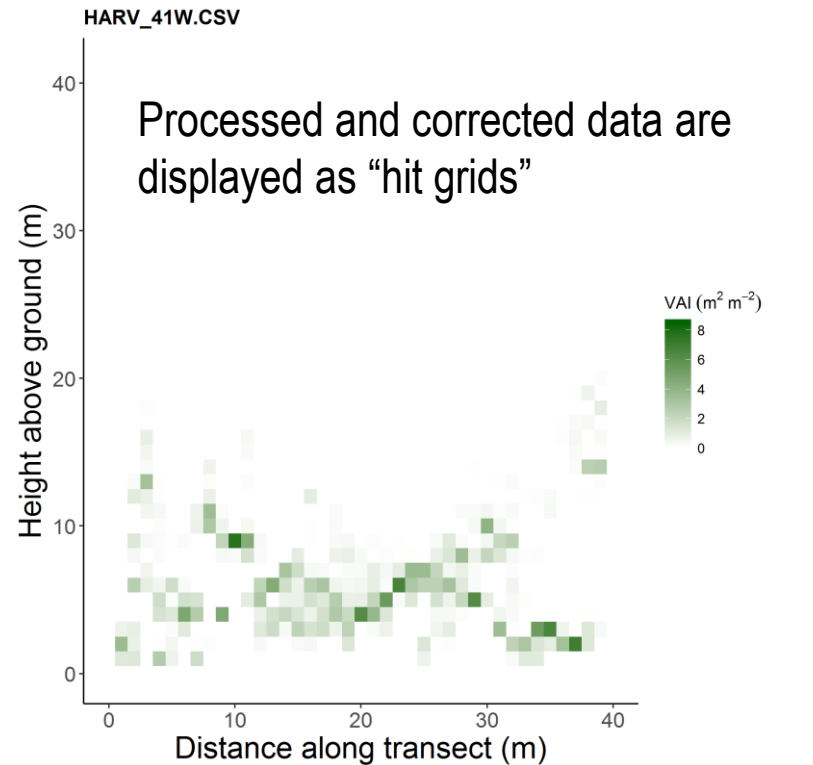


Portable Canopy LiDAR (PCL) and Canopy Structural Complexity (CSC)

Jeff Atkins, Robert Fahey, Chris Gough, and Brady Hardiman



Processing algorithm
scripted in R, the
forestr R package

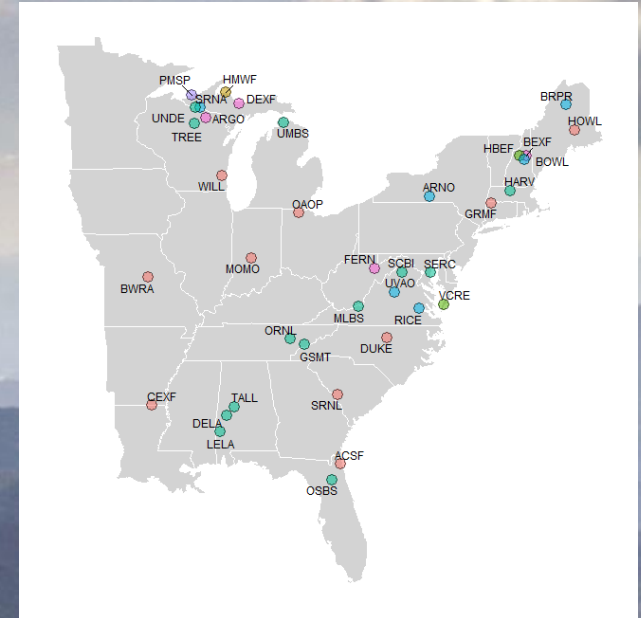


CSC Metrics Are Calculated:

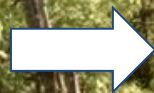
- Canopy Rugosity
- Surface or Top Rugosity
- Rumple
- Clumping Index
- Mean and Max VAI
- Canopy Porosity
- Sky and Cover Fraction
- Mean, Max, and SD of Canopy Height etc.

PCL & Structure-Function Relationships

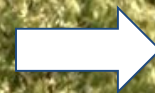
- CSC variance
- CSC, fPAR, GPP
- Scaling and model integration
- Cross-platform comparison



Physical
Structure



Resource
Acquisition
+
Efficiency



Production

Beyond LAI . . .

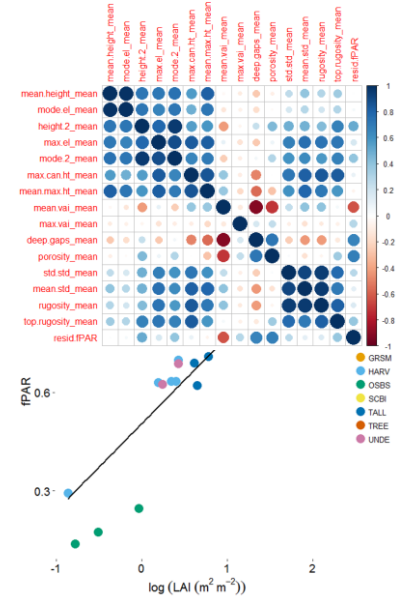
Resource efficiency and acquisition,
correlation, non-linearities



fPAR

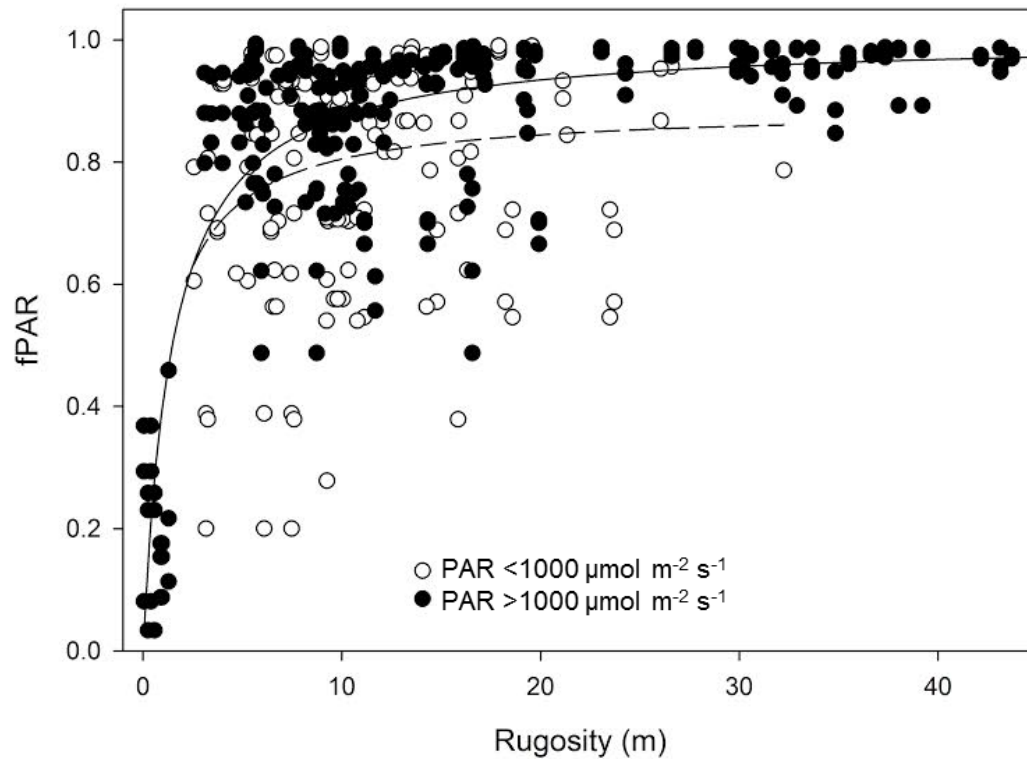


CSC metrics

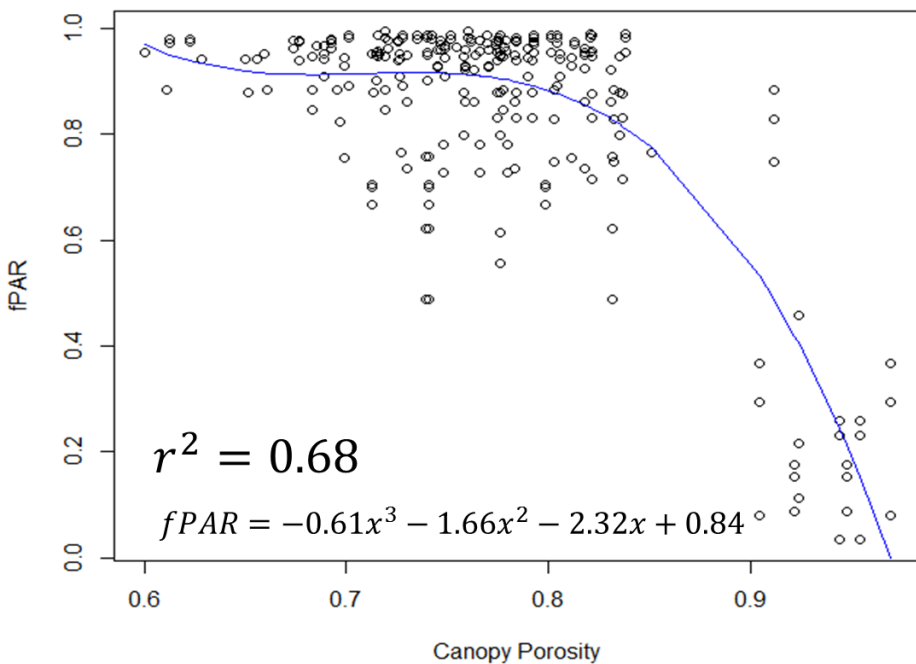
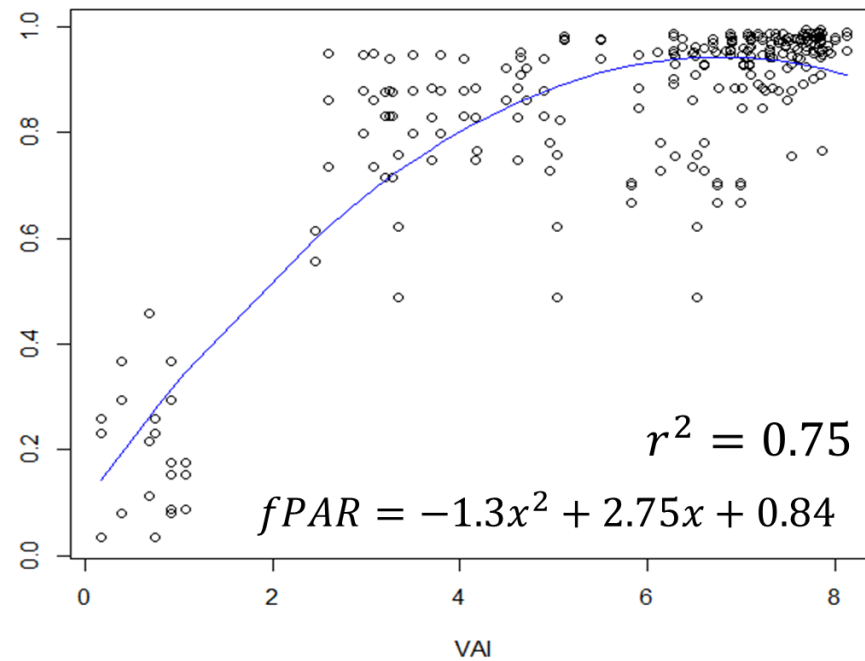
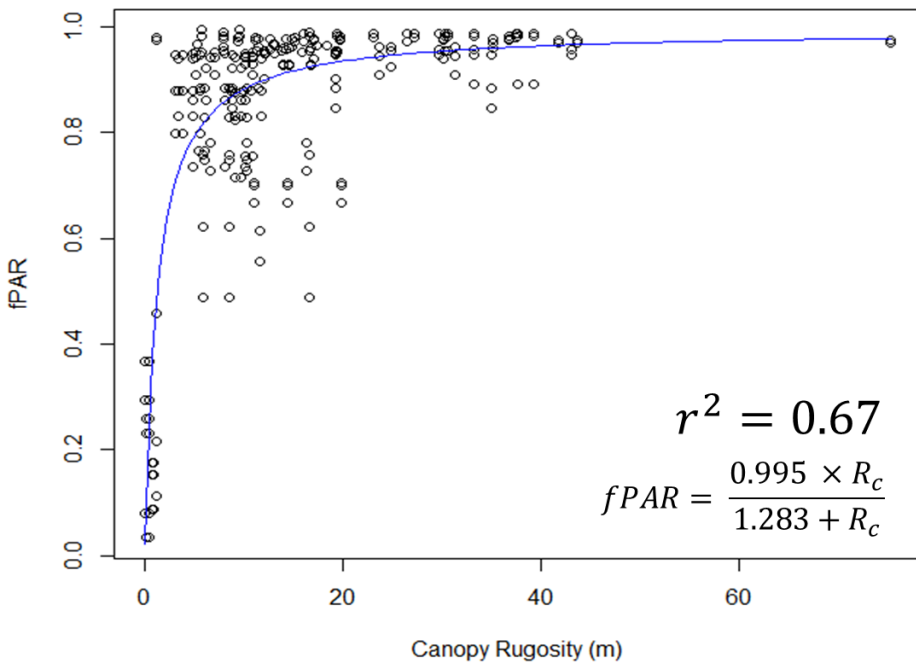


Statistical analysis
& Modelling

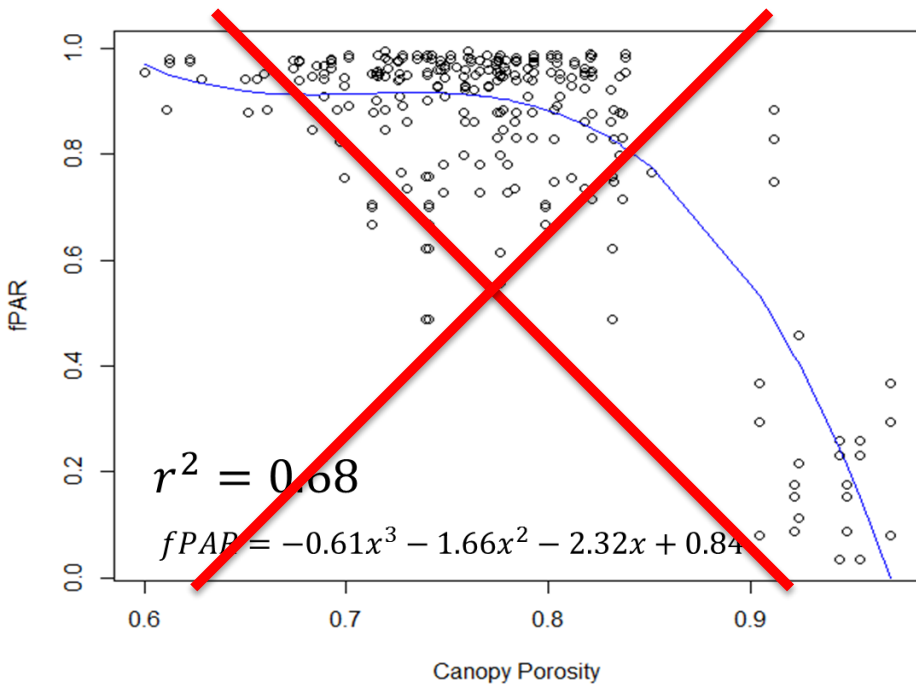
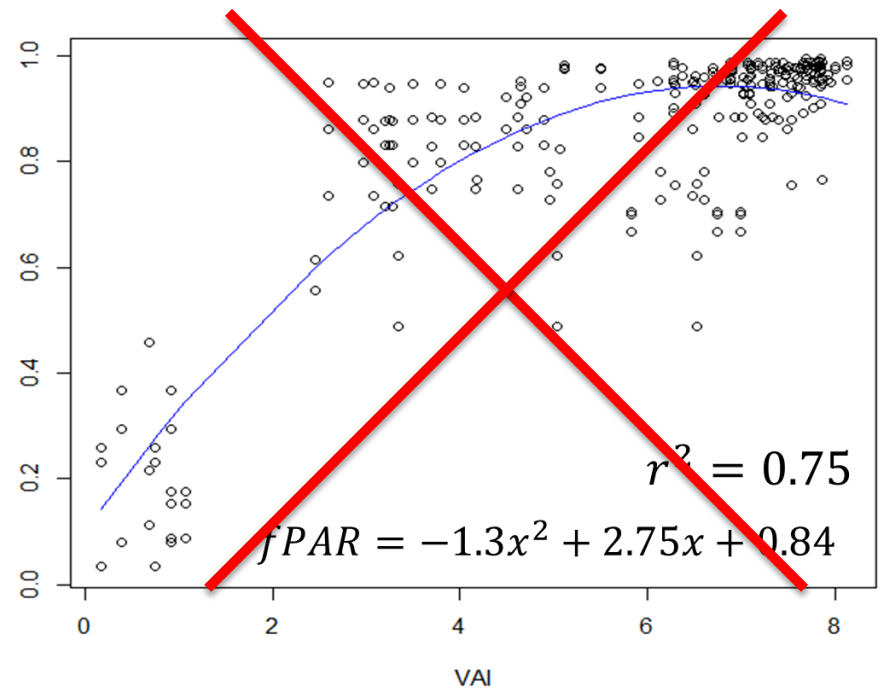
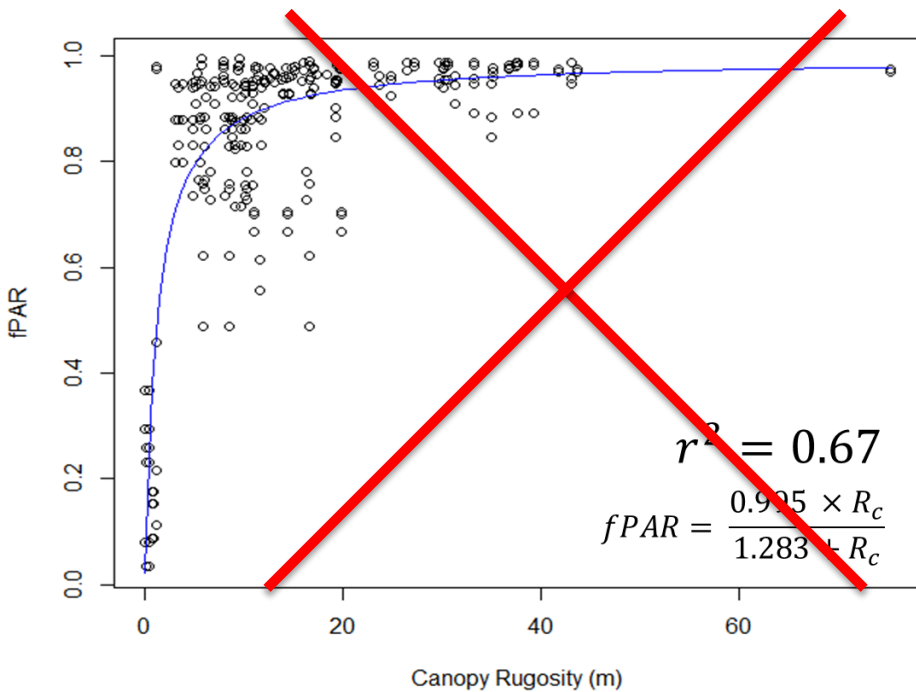
What suite of CSC variables best predict fPAR?
Do relationships hold within sites, hold across sites?



- Effect of R_c on fPAR diminished under low light conditions
- Greater variance w/ low light conditions
- High light will have shallower slopes



Early modelling work and over-fitting

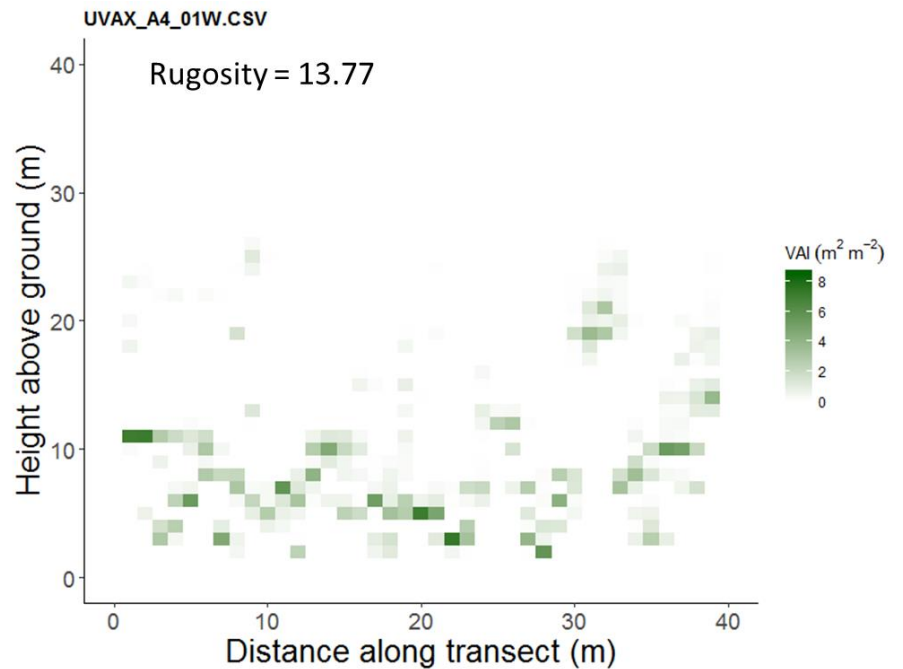
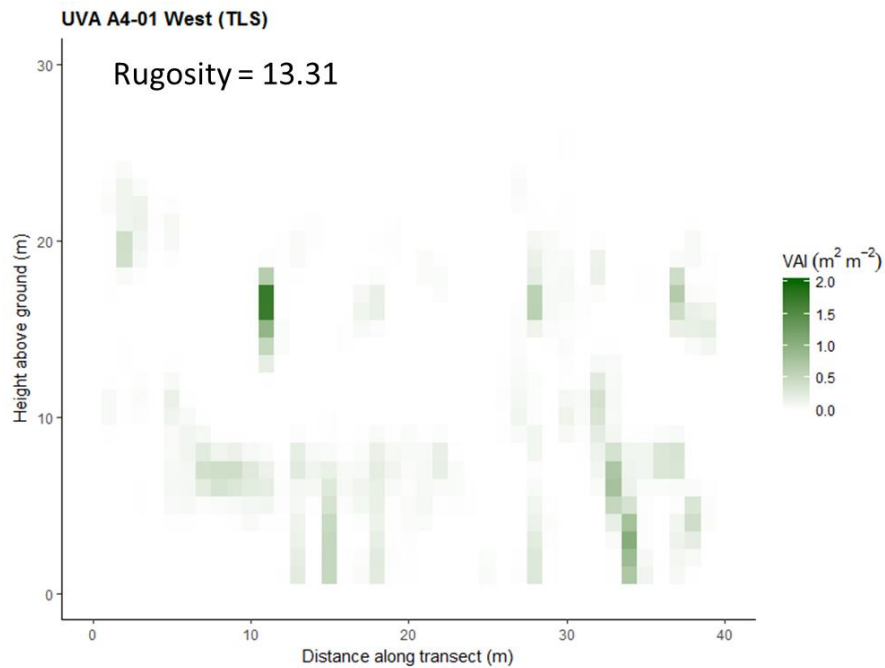
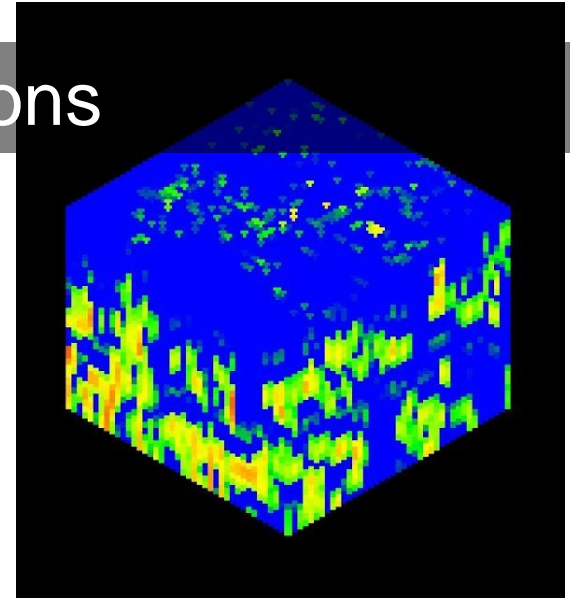


Multiple Regression shows mean VAI * $\ln(R_c)$ to be the most predictive model with plot level data:

$$fPAR = 0.337 + 0.07VAI + \ln(R_c)$$

$$\text{Adjusted } r^2 = 0.73$$

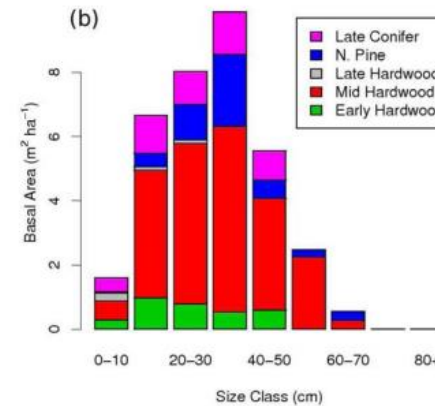
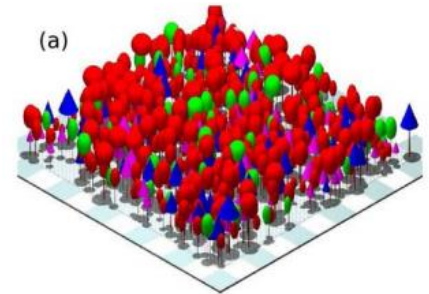
TLS-PCL Comparisons



Scaling and model integration



Scaling
(e.g. Landsat, etc.)



Model Integration
(e.g. ED2)

Questions?

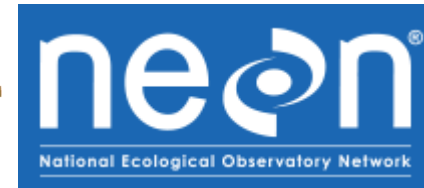
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LASER  QUEST



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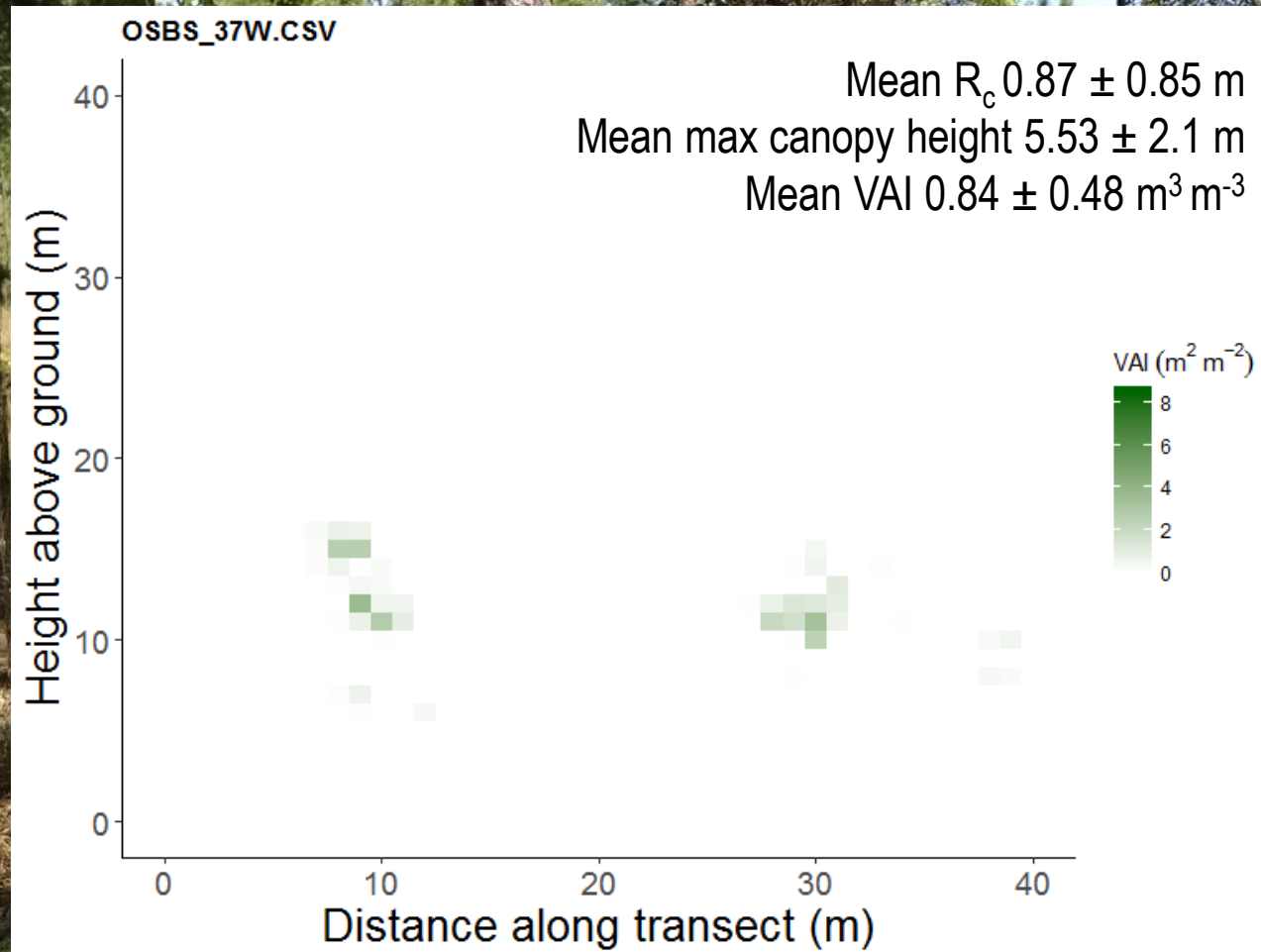


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Ordway-Swisher Biological Station



Great Smoky Mountains



Great Smoky Mountains

