Integration of the PRI and fAPARchl Products for Carbon Monitoring

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Objectives

• Two of the HyspIRI Products: PRI & fAPARchl
• GEP = LUE x PAR x fAPAR

• Photochemical Reflectance Index (PRI)
  – physiological condition: xanthophyll signal@531nm
  – correlation with LUE

• fAPARchl
  – enhanced fAPAR
  – derived from inversion radiative transfer modeling

• ?? Integration of PRI and fAPARchl: estimates of GEP directly from spectral observations
Previous work


5/18/2011
• GEP = \( f(PRI, PAR, fAPAR_{chl}) \)
• Start at canopy level, then scale up to imagery
• What we did: weekly field campaign, OPE3 corn field of USDA BARC, summer of 2008
• What we got: tower based CO\textsubscript{2} and PAR; spectral observations for corn canopies
Going Regional and Global

• Initiate the process: apply what we have learned in the field to a greater scale
• **Simulate HyspIRI imagery from EO-1 Hyperion & demonstrate integration of PRI and fAPARchl**

• Spatial resolution ➔ take advantage of the fine spectral and spatial resolution of HyspIRI
• A question need to ask for any product whether to use it directly or input to models
• Changes in average values due to aggregation
• **PRI & spatial resolution**
Continue What We Have Started
EO-1 Hyperion
True color

$f\text{APAR}_{\text{chl}}$

$f\text{APAR}_{\text{canopy}}$

DOY
108 172 190 195 231 277

Spring  Summer  Fall

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Comparisons of GEP from various algorithms

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<tr>
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<th>60m Hyperion RGB</th>
<th>60m Hyperion PRI &amp; fAPARchl</th>
<th>60m simulated MOD17</th>
<th>MOD17 1km GPP</th>
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<td><strong>GEP (gCm^{-2}d^{-1})</strong></td>
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GEP (gC m\(^{-2}\) d\(^{-1}\))
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Hyperion imagery, August 18, 2008
Histogram and average of PRI derived @ various scales

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Hyperion imagery, August 18, 2008
 Histogram and average of PRI derived @ various scales

Changes in both the mean value and distribution histogram of PRI due to the increase of pixel size

Regional mean derived from 30-m PRI was 10% more compared to that derived from 960-m PRI
Comparisons of GEP at various spatial resolution
Comparisons of GEP at various spatial resolution

Average GEP (gC m$^{-2}$ d$^{-1}$)

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Summary

• Demonstration of using both the PRI and fAPARchl products for carbon monitoring and effects of spatial resolution

• Continue testing the robustness of the algorithm
• Confounding effects on PRI / PRI:LUE
• Uncertainty assessment in LUE and GEP estimates
• Various case study

• Use PRI and/or fAPARchl as model inputs
• Comparisons among various models (Cal/Val)
Thank you!!