Model Predictive Control (MPC) Architecture for Optimizing Earth Science Data Collection (PCAES)

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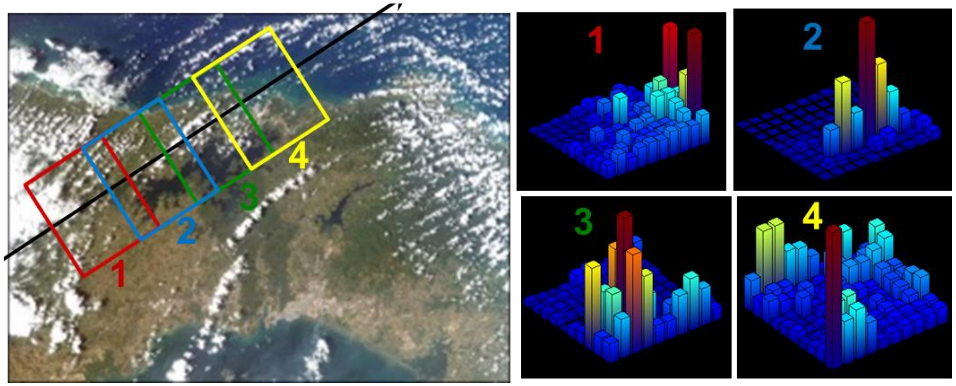
Objective

- Enable new measurement strategies through autonomous, real-time control of configurable instruments
  - Conceptualize an onboard multi-layered system architecture based on Model Predictive Control (MPC) technology
  - Assess value, performance and operating characteristics considering clouds and multiple constraints
  - Apply to an Electronically Steerable Flash Lidar (ESFL) to demonstrate approach
  - Conceptualize application to U-class satellites
- Demonstrate feasibility and effectiveness of onboard MPC architecture in reconfiguring an ESFL in a laboratory setting



10x10 Multi-Beam Lidar Power Distribution showing evolution of optimized power maps with simplified image weighting

Accomplishments

- Demonstrated that the Model Predictive Control architecture can optimize remote sensing data collection for lidar
- Performed extensive mission analysis of lidar on-orbit requirements to create baseline set of scene models
- Demonstrated the software product will provide autonomous, rapid and adaptive data collection by creating a science optimized, time-evolving power map
  - Power map indicates energy going to individual pixel of interest as scene changes

Co-Is/Partners:

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TRL_{in} = 2 TRL_{out} = 4