COMBINING LIDAR AND INSAR OBSERVATIONS OVER THE HARVARD AND DUKE FORESTS FOR MAKING WIDE AREA MAPS OF VEGETATION HEIGHT

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1. INTRODUCTION

In response to the NRC decadal surveys identified needs for the quantification of carbon storage, vegetation biomass, and characterization of species habitats, a spaceborne mission named DESDynI is defined in part to characterize ecosystem horizontal and vertical structure through the combining of multiple-beam lidar and L-band SAR. In this observing scenario, the lidar provides a method for the sampling of vegetation vertical profiles to high resolution in the variety of biomes that populate the globe and the SAR/InSAR observations used to interpolate the results into swath-wide measures of vegetation 3-D structure and biomass. The work described in this talk describes two experiences in the combining of InSAR and Lidar data. One, over the Duke Forest, where single-pass P- and X-band InSAR data collected by the GeoSAR instrument was used with SLICER, and the other over the Harvard Forest, where repeat-pass PALSAR (L-band) InSAR data is used in conjunction with LVIS.

Over the Duke Forest, the single-pass interferometry provided unprecedented observations of the interferometric correlation related to the presence of volume scattering without the additional error source of temporal decorrelation. Using this approach, lidar measures of vegetation height and the interferometric measures of volumetric decorrelation could be combined to best estimate the vegetation height over the interferometric observing swath. This is accomplished by generating a lookup table which relates the observed volumetric decorrelation (at X-band) to the measured vegetation height from the lidar data. It has been shown that using this methodology, that a basic sensitivity of the interferometric correlation can be made of the vegetation height. This lookup table approach has the advantage of not relying on an analytic model to perform the inversion, as well as the ability to perform vegetation height estimates over large areas without incurring an overwhelming computational burden.

For the Harvard Forest, the long repeat period between observations (46 days) leads to a significant amount of temporal decorrelation which have been observed. Yet, the amount of data (currently, there are a total of 8 revisits), the potential for future observations, and the existence of extensive LVIS lidar coverage make the test site worth further analysis.

In this talk, we will parse through the two different data sets and provide analysis of them individually as well as in comparison to one another.

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