

**Session I – Climate Change and Challenges to Ecological and Economic Sustainability**  
**11:20 AM**

**Combined Use of a Storm Model and Multi-satellite Remote Sensing for Assessing Ecosystem Impacts of Tropical Cyclone Sidr on Coastal Mangroves of the Ganges Delta**

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**Abstract**

Tropical Cyclone Sidr struck the coastal areas of the Ganges delta in Bangladesh, on the 15th of November, 2007. With a sustained wind speed of 240 km/h at landfall and a radius of 450 km, it was the most severe cyclone striking the Bangladesh coast since 1991. Landfall of Sidr was ~8 km east of the world's largest patch of coastal mangrove, the Sundarban, a World Heritage site and home of the Royal Bengal tiger. Sidr had a 60 km radius of maximum wind, which passed through the eastern part of the mangrove forest causing widespread wind damage and tidal surge. Satellite images from NASA's MODIS sensor, taken before and after the cyclone, show the vast area of affected forest. But MODIS images provide only the 2-dimensional surface reflectance values at pixel scale. For an estimate of actual forest damage or the amount of lost carbon due to the cyclone, 3-dimensional representations of the affected area before and after the cyclone are needed. Ground data are very scarce in that region to establish any empirical relationship between satellite imagery and actual damage or carbon loss. We used an innovative method to merge radar, lidar, optical and infrared data from NASA's space shuttle and different satellites to produce a 3-dimensional estimate of the cyclone-induced mangrove damage. In the absence of field data to validate the results, we used a storm model to simulate the cyclone's wind patterns and strength over the forest, then converted that to Enhanced Fujita Scale of damage assessment and used that to validate our image-based estimates. We present the techniques and the results of our method, which shows a potential of combining storm models and multi-satellite remote sensing to estimate cyclonic damage to coastal ecosystems, especially for the data-scarce regions of the world.