Forest-mapping instrument for space station passes major milestone

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Temperate and tropical forests, such as this one in Gabon, Africa, will be studied by the Global Ecosystem Dynamics Investigation, which will make the first comprehensive, high-resolution measurements of their vertical canopy structure. Credit: NASA/JPL-Caltech

A laser-based instrument for mapping the 3-D structure of Earth's forests has passed a major milestone toward deployment on the International Space Station (ISS). The Global Ecosystem Dynamics Investigation (GEDI), led by the University of Maryland, College Park, and built by NASA's Goddard Space Flight Center in Greenbelt, Maryland, successfully transitioned to "Phase B," moving from requirements development and mission definition to preliminary design. GEDI will provide the first comprehensive, high-resolution measurements of the vertical canopy structure of Earth's temperate and tropical forests.

These data will enable scientists to better address key questions about Earth's carbon cycle and biodiversity. NASA selected the GEDI proposal in July 2014 to join a growing suite of technologies deployed on the ISS providing key observations about Earth's environment.

"The largest uncertainties in the global carbon cycle concern the net impact of forest disturbance and subsequent regrowth on the amount of carbon stored in forest biomass and its impact on atmospheric CO_2," said Ralph Dubayah, GEDI's principal investigator and a professor and assistant chair of the University of Maryland's Department of Geographical Sciences. "With these data from GEDI, we will advance our ability to model the role of forests in the carbon cycle and to evaluate the impact of potential policy actions to mitigate CO_2 emissions, such as planting trees or reducing deforestation."

Forest degradation and loss is also negatively impacting habitat quality and putting increasing pressure on already fragile biological resources. By making detailed maps of forest vertical structure, the GEDI science team members, working together with forest managers and those who make environmental policy, will help protect ecosystems and the vital services they provide.

GEDI will use a system of laser beams to map the forest 3-D structure—including canopy height of Earth's forests. The instrument is scheduled for launch to the ISS in 2018.

"The time is right for this mission," said Jim Garvin, chief scientist of NASA's Goddard Space Flight Center. "The technology and the algorithms are doable, the team is ready, and the science is of the highest importance. The International Space Station will give us an opportunity to make this approach work very well."

On Aug. 26, NASA's Science Mission Directorate Program Management Council granted approval for GEDI to continue to Phase B and praised the mission for its technical maturity, and the competency of its engineering and management teams. Michael Freilich, NASA's Earth Science Division director, lauded the mission's "peerless science."

"Our success in passing this milestone is the result of the dedicated effort of the entire GEDI team," said Dubayah. "I could not be happier with the collaboration between the University of Maryland and Goddard, which is building the GEDI instrument. The compelling science of GEDI depends upon an instrument whose lasers are capable of providing billions of highly accurate measurements of the Earth's forests and topography from space. This is a remarkably challenging engineering endeavor, but one that is uniquely suited to NASA, given its strong heritage in the deployment of space-based lidar technology."

Provided by NASA's Goddard Space Flight Center