Measuring global forest biomass: current status and new developments

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Above-ground forest biomass is a fundamental biophysical variable strongly linked to climate. Decreases in biomass through deforestation or forest degradation or increases due to forest growth translate respectively into CO2 emissions to the atmosphere and CO2 uptake from it. The emissions form a significant fraction of anthropogenic emissions of CO2, while the uptake slows the build-up of atmospheric CO2, but both are poorly quantified. Storing biomass in forests is also the only internationally agreed way to offset emissions (through the Kyoto Protocol), though the UN REDD+ initiative is also aimed firmly at reducing forest biomass loss. In addition biomass provides a key constraint on the land component of climate models, helps to quantify the carbon turnover time in forests, and is strongly linked to biodiversity and a range of ecosystem services needed for human welfare. In the boreal and temperate zones there are large numbers of in situ biomass measurements because of the information needs of commercial forestry. However, in the tropics, which is where information is most needed for climate purposes, the measurements are sparse and of limited representativeness. The difficulty and cost of tropical in ground-based measurements precludes any solution to this based only on more in situ data. In addition, there is an increasing need for gridded biomass data to support emission calculations and modelling. This has led to several efforts to exploit space-based measurements, together with ground data, to generate continental scale biomass maps. These are increasingly being supported by new ground-based measurement techniques (notably Terrestrial Laser Scanners) together with biomass estimates from airborne lidar data. Furthermore, new space missions to measure biomass are planned to launch during the next 5 years, notably the NASA GEDI lidar and the European Space Agency BIOMASS P-band radar satellite, together with L-band radars to be flown by Argentina and NASA. The current status of biomass measurements, their implications for our quantitative knowledge about the terrestrial carbon cycle, and the prospects opened up by these new developments in biomass estimation will be addressed in this talk. In addition, we will address the lack of any international organisation responsible for biomass as an ECV, and the problems this presents.