optical and radar sensors – which an Open Skies mission could provide and which satellites as readily cannot provide[30].

At the same time, it needs to be re-emphasized that climate change is a global phenomenon.[31] Scientific and technical research designed to reduce uncertainties related to climate change needs global-scale data and information. Global in scale, uniformly consistent and repetitive, and continuous measurements of the carbon stored in terrestrial vegetation and soil can at present be obtained only through the use of EO satellites. These systems also offer the most cost-effective means for obtaining long-term data sets on biomass productivity and vegetation structure generally.

What are the Areas of Synergy between Open Skies-Type Surveillance and Other Forms of Environmental Data Collection, be it Space Remote-Sensing or On-Site Inspections?

The capacity for determining land-use changes of vegetated surfaces and tracking developments in forested areas will be of paramount importance for the monitoring of compliance with the Kyoto Protocol. In case of forests, of particular importance will be the issue of forced forest conversion through unaccountable activities, like illegal logging, grazing and/or cropping, as well as timely and accurate mapping of burned areas. In that context there exists a number of opportunities for synergistic combination of data derived from Open Skies missions with measurements taken both by satellites and *in situ*.

For instance, as a preparatory step in support of ground inspections, the Open Skies optical photography could be used for mapping the layout of the terrain, including access routes, as well as local settlements and structures related to the activity being investigated. Where ground inspections could not take place (i.e., physical access, insurgency) Open Skies slant photography might be the closest thing to a pair of eyes on the ground.

In case of burned area mapping (and damage characterization) unique opportunities exist in the use of an Open Skies instrument to complement functionally the same instruments carried by the satellites. Most notably, the Open Skies high-resolution SAR imagery could be used to complement the medium-resolution SAR imagery produced by the numerous SAR-carrying satellites. Such combination offers opportunity for improving the frequency of observations and for intercalibration and comparison of measurements taken by independent sensors. The combining of the Open Skies optical and SAR data with satellite medium-resolution multi-spectral radiometric data offers even more unique synergistic opportunities, although mainly for purposes of event bio-geophysical characterization rather than event detection and areal delineation.[32]

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[30] The images produced by the satellite sensor most commonly used now in carbon budget investigations – the Moderate-resolution Imaging Spectroradiometer (MODIS) instrument flown on-board of NASA's *Terra* and *Aqua* spacecraft – vary between 250 to 500-meter and 1-kilometer resolution. A single MODIS-type pixel (i.e., the smallest visible unit in the picture) thus represents quite a large area. An area 500 square meters in size can easily contain highly variegated mixture of vegetation, yet the MODIS-pixel will record only one type of ground cover. The satellite, as one user of MODIS imagery has commented wryly, is always "going to average something out of the picture." And so he supplements his MODIS-type data with the CORONA-program B/W framing cameras photography! See Michon Scott, *Fiery Temperament*. NASA Earth Observatory Features Report (May 14, 2002), p. 5.

[31] Both the Convention and the Protocol are international treaties with global character. Article 10(d) of the Protocol puts an obligation on the committed parties to contribute to global observing systems and to support scientific and technical research concerning the climate system and climate change.

[32] A very useful discussion of space instrument synergies can be found in R. A. Vaughan and S. T. Wilson, "*Envisat* – the Mission," ch. 13 in: Arthur P. Cracknell (ed.), *Remote Sensing and Climate Change: The Role of Earth Observation*. Chichester, UK: Praxis Publishing, 2001, esp. pp. 248-251.