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# **LCLUC, GOFC and Disturbance**

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# Programmatic Context to the 1999 NRA

- **NASA LCLUC Announcements of Opportunity:**
  - **First NRA focused on case studies of the drivers of land cover change, combining physical and socioeconomic data**
  - **Second NRA was part of the LBA Announcement focusing on land cover and land use change processes and the carbon cycle in the Amazon Basin**
  - *The 1999 (3<sup>rd</sup> LCLUC) NRA focused on two research areas:*
    - *1) Human and natural disturbance and the implications for carbon dynamics.*
    - *2) Development of remote sensing techniques and data sets that could lead to operational forest monitoring systems*



## **Programmatic Context to the 1999 NRA (cont'd)**

- The LCLUC program is investing in a new-start disturbance research activity and a strategic contribution to GOFC:**
  - strengthening the NASA contribution to the USGCRP carbon program to include disturbance and laying the science foundation for a proposed ‘Recovery’ mission**
  - providing a contribution to GOFC (IGOS-P Carbon Theme - forest monitoring, fire and biophysical characteristics), developing regional and global data sets, researching new methods, transitioning research to the operational domain and using these data and methods for carbon research**



## 1999 NRA: 1) Disturbance

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*The LCLUC Program is requesting proposals that address the development of methods and datasets for exploring the pattern of disturbance and the response of ecosystems to human and natural disturbances. These proposals should give emphasis to understanding the implications of disturbance for carbon dynamics.*

*Proposers are encouraged to submit research proposals that address human induced and natural disturbance, incorporate the use of remotely sensed data or **provide an improved understanding of measurement techniques and requirements needed to improve current or future satellite based monitoring of disturbance.***

- The programmatic context for this LCLUC topic is the current emphasis within USGCRP on the Carbon Cycle, the **development of spatially explicit and dynamic models of disturbance linked to biogeochemical and biophysical process models** and the need for **underpinning science to support future missions looking at vegetation disturbance and recovery**. As with the other components, emphasis is given to regional scale analyses.



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## 1999 NRA: 2) Developing Forest Monitoring Systems

- *LCLUC will entertain proposals that **develop monitoring techniques, algorithms and data sets that focus on the global change science, biodiversity or sustainable forest management needs for operational monitoring of forest cover.** Emphasis will be given to data sets produced at regional to global scales and in areas of rapid land cover change. Proposals are encouraged that combine data from multiple data sources to generate enhanced information. In particular integration of multiple sources of satellite data and in situ data is encouraged.*
- *Attention should be given to the **means by which the output data will be validated, documented, managed and made available to other GOF C partners and data users.***
- *Proposals must apply the data to specific global change research questions or make explicit linkages to users of the resulting data products. Proposals that address the means and mechanisms to develop the transfer of data set production from research to operational mode are encouraged.*
- *Regional studies should develop partnerships with individuals or institutions from the region of study.*



## 2) Developing Forest Monitoring Systems

- NASA GOFC research will:
  - *help establish systematic inventories of land cover from space*
  - *contribute to the goals of GOFC – developing improved monitoring techniques and methods and providing data sets to a number of user communities concerned with forest cover monitoring.*
  - *meet the growing needs of the science and policy communities for timely and reproducible data sets on forest extent, rates of change, fire distribution, extent and emissions and forest biophysical characteristics.*
- The policy interest in forest monitoring is increasing through developments in the Framework Convention on Climate Change and the Biodiversity Convention.



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# GOFC and Disturbance

- **The distinction between GOFC and Disturbance was blurred by some proposals - which proposed to do both**
- **There are areas of overlap e.g. fire and logging are types of disturbance and are subjects of concern for GOFC**
- **Where appropriate “Disturbance” proposals are encouraged to contribute to meeting the goals of GOFC – including participation in relevant GOFC workshops**
- **Disturbance proposals will be a NASA contribution to the USGCRP Carbon initiative – and PI’s may be asked to attend ‘Carbon Program’ meetings**
- **Disturbance PI’s are asked to consider requirements for a potential NASA Vegetation Recovery Mission – as identified at the Easton Planning Meeting 1998**



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# NASA Satellite Missions for LCLUC Science

**NASA needs to tie its science closely to the satellite missions:**

- **Systematic Measurements**

- AVHRR, SeaWiFS, Vegetation, ATSR (land cover, fire, biophysical attributes)
- MODIS ( land cover, land cover change, fire and burn scars, LAI/NPP)
- Landsat 7 ( quantifying land cover extent and rates of change)
- Ikonos commercial data buy ( land use characterization, validation of coarse resolution products)
- Landsat Follow-On ? ( monitoring land cover change)
- NPP-VIIRS ( monitoring land cover, land characterization, fire )

- **Experimental Missions**

- ASTER ( high resolution multispectral thermal)
- MISR ( BRDF)
- EO1 ( hyperspectral cover characterization, vegetation composition)
- VCL ( vegetation structure and biomass, carbon studies)
- Vegetation recovery ( vegetation regrowth, carbon studies)
- LightSAR ( vegetation structure, biomass mapping)



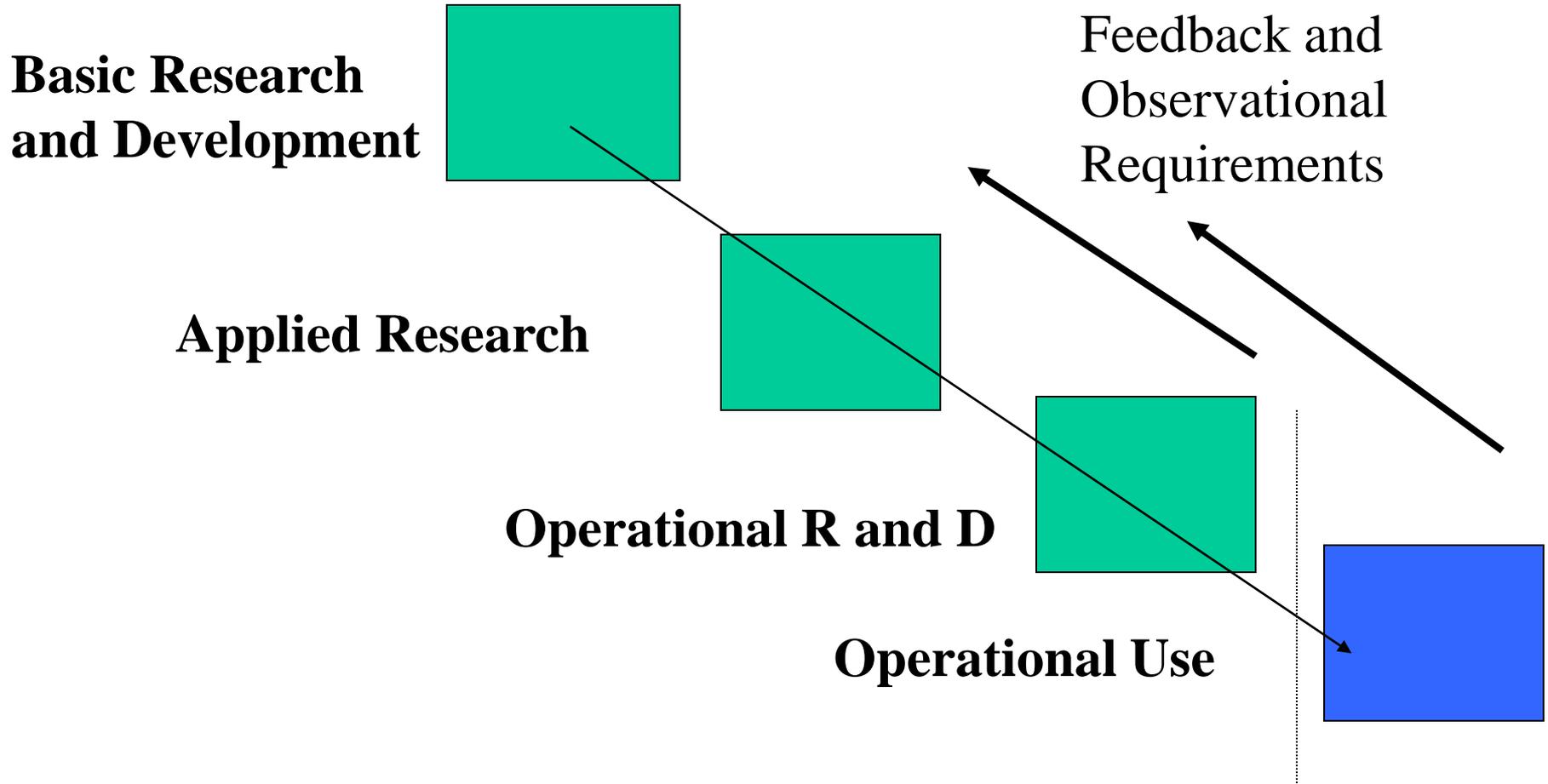
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## **Example Areas for GOFC research:**

- **Enhancing existing products and improving access to current satellite data for forest monitoring – e.g. providing consistent and reliable data with stated accuracy to the users**
- **Demonstrating current capabilities and new technologies for forest monitoring – e.g. implementing operational pilot projects – what case can be made from previous studies?**
- **Research and Development priorities e.g. developing new techniques - building a foundation for future operational systems – identifying opportunities for technology infusion and mechanisms for the transfer of technology and methods from research to operational mode**
- **Articulating the current and future remote sensing needs for forest monitoring and securing the long-term operational provision of fire information – e.g. recommendations to CEOS**
- **Helping to develop the user community – strengthening regional networks of satellite data users – e.g. encouraging use of appropriate technology and methods**



# Types of LCLUC GOFC Research





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## Potential Contributions from LCLUC to GOFC

- Demonstration of satellite methods for operational forest, fire and carbon monitoring through the existing regional case studies and data set projects
- Provision of validated ‘key’ data sets for global change research
- Provides the foundation for some of the GOFC regional networks and implementation through LCLUC P.I. collaborations and START (e.g. S.E. Asia LUCC, Miombo Network, C. Africa, Russia / Siberia,)
- Development of new experimental satellite derived products (e.g. forest type, % tree cover, burned area, NPP, land cover change, vegetation structure, biomass ) and their validation (e.g. through CEOS Cal/Val Working Group on Land Product Validation)
- Development of data / instrument / mission requirements for future missions for Land cover and Land use Change (NPP-VIIRS, Landsat Follow-On, NASA Recovery Mission).



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# Current and Future Directions for LCLUC

- **Satellite based process studies on causes and impacts of land cover change - blending physical and social science - developing predictive capabilities in the context of climate and global change (50 yrs).**
- **Land cover - land use component of the Carbon Cycle - contributing to the emerging USGCRP Carbon initiative**
  - **CEOS GOFC - operational data for LCLUC Carbon research**
  - **LCLUC disturbance initiative**
    - **Integrating satellite based LCLUC data into regional and global models**
- **Incorporating satellite data in science assessments (national /regional)**
- **Developing new methods and techniques for satellite land cover characterization and monitoring using existing and new systems e.g. AVHRR/ Landsat/ JERS/ MODIS**
- **Planning and preparation for new land cover related satellite missions EO1 / VCL / Lightsar / Landsat follow-on / NPP**
- **Highlighting and demonstrating policy relevance of LCLUC science re.- biogeochemistry - carbon cycle, land atmosphere interactions, water and food supply, human health, biodiversity.**
- **Modelling impacts of climate change on land use and land cover**
- **Science underpinning to sustainability and vulnerability questions re. land use**



# LCLUC and Data Issues

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- **NASA promotes the free and open sharing of data**
- **GOFC has adopted the same approach within the constraints given by the various data providers**
- **LCLUC expects its PI's to make their data and products available to the broader community**
- **NASA is being encouraged to consider commercial data buys**
  - the CRSP program is a source of data for GOFC
  - Landsat Follow-On
- **Data systems and services are currently one of the biggest challenges to earth observation systems e.g. Terra data**
- **NASA ESIPS providing new approaches to data services e.g. MSU and UMd ESIPS will redistribute Landsat 7 data**
- **NASA NEWDISS will replace EOSDIS and will be the proving ground for innovation**
- **LCLUC Landsat Data Buy to help meet PI data needs**
  - Data buys in progress
  - Incremental purchases as funds are available
  - Data sharing is encouraged



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# LCLUC and Regional Networks

- **LCLUC advocates close links between its projects and regional scientists with local/regional expertise – partnerships**
- **Regional LCLUC science/forestry networks provide an important means by which GOF C will be implemented and operational monitoring will be sustained**
- **NASA LCLUC is supporting regional networks in SE Asia, Southern Africa, Central Africa and Russia.**
- **Other agencies are supporting other networks e.g., CCRS -South America, CNES - Mediterranean (MEDIAS)**
- **Regional networks provide**
  - **an invaluable source of local knowledge**
  - **a source of in-situ data,**
  - **a means to validate regional and global products**
  - **a means for regional capacity building through lateral technology transfer**
  - **advocates for the appropriate use of satellite technology**
- **LCLUC Program would like to see funding leverage for the regional networks**



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# Objectives for this Meeting

- **P.I.'s to Present their project goals, work plans and schedules**
- **Program management to:**
  - **present context in which the research will be undertaken**
  - **present programmatic expectations**
    - **Publications**
    - **PI Project Web site (please see Missy Crisologo)**
    - **Annual reporting**
    - **Data and products sharing**
    - **LCLUC Significant results packages**
- **Explore opportunities for collaboration within the program**
- **NASA LCLUC /USFS Forest Service Session**
  - **Assessment of areas for NASA LCLUC / USFS collaboration in the context of GOFC**
  - **Assessment USFS satellite data and information needs**
  - **Identification of immediate opportunities for collaboration**
- **Opportunity for PI feedback on how to improve the program**