

The CEOS Constellation for Land Surface Imaging

**G. Bryan Bailey, USGS
Michael Berger, ESA
Herve JeanJean, CNES
Kevin Gallo, NOAA**

Presentation Overview

- The CEOS Constellations Concept
- Importance of a Land Surface Imaging Constellation
- Mission and Goal of the LSI Constellation
- Objectives of LSI Constellation Studies
- Methodology and Scope
- 2007 Goals, Objectives, and Outcomes
- Summary and Conclusions



The CEOS Constellations Concept

- CEOS Constellations concept is new and still evolving.
- It might best be described as a new CEOS process designed -
 - To enhance effective planning and development of future earth observing systems by maximizing advantages of international collaboration without eroding the independence of individual agencies.
 - To increase the effectiveness with which international assets, including both space and ground segments, can be brought to bear on scientific problems and to meet a wide range of societal needs.
- Fundamental concept is to extract clear requirements from target user communities and translate those requirements into “standards,” which can serve as guidance in the development of future systems and against which future proposed Earth observing systems can be assessed.

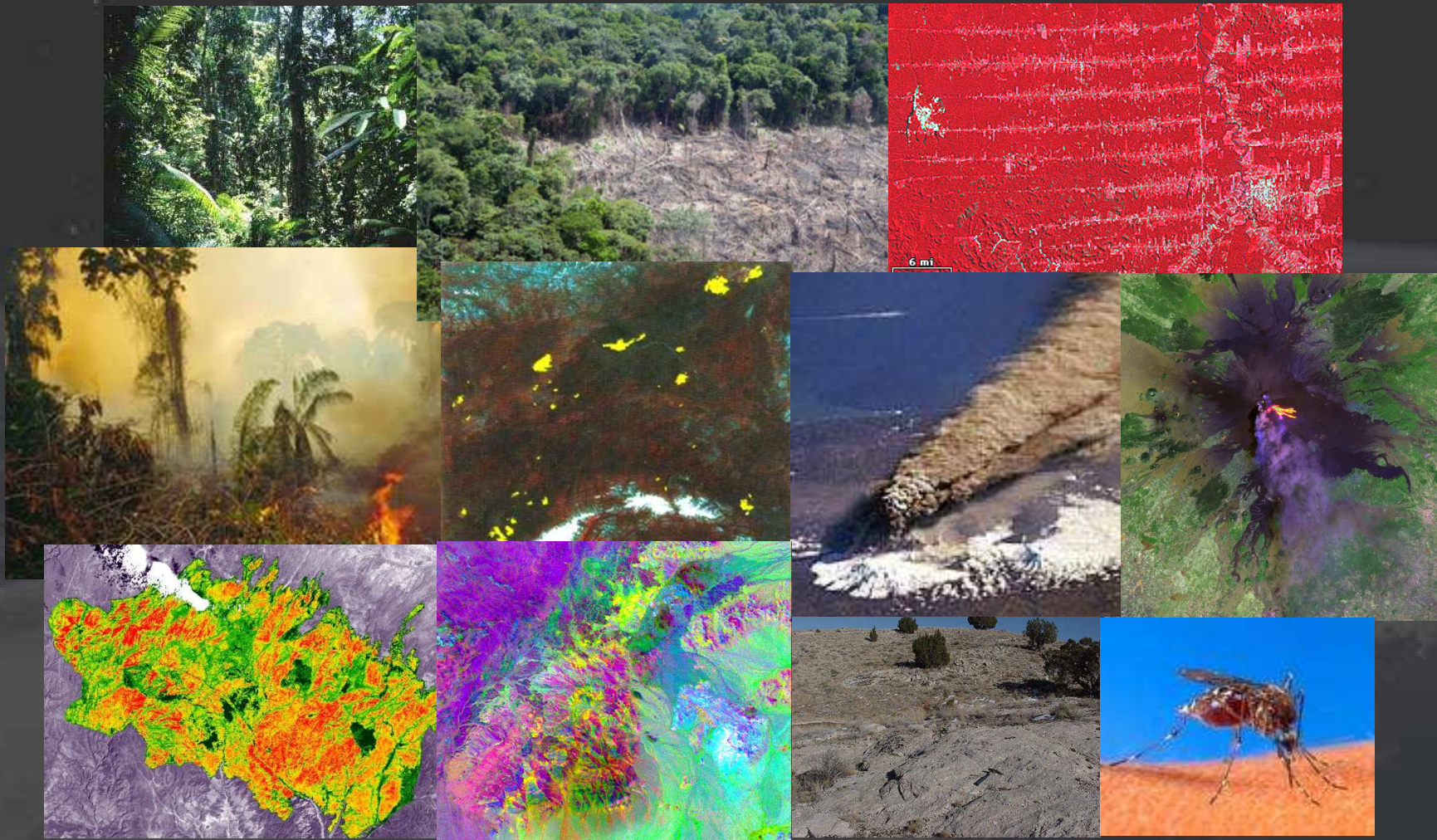


Importance of a Land Surface Imaging Constellation

- Since 1972, land observing satellite systems have been providing users with data useful in addressing many important scientific and practical problems.
- Yet, many systems are duplicative with each other, important data are lacking on a global scale, and continuity has been an issue.
- In the future, systems must provide users with better and more consistent data acquired more frequently and at lower cost.
 - Help predict and mitigate the effects of natural disasters
 - Explore for critical energy and mineral resources
 - Monitor climate change
 - Study ecosystems and biodiversity
 - Address important human health issues
- Quality life for people in all nations and the health of planet Earth would be enhanced through application of LSI Constellation data.



Potential Contributions of a LSI Constellation



Mission and Goal of the LSI Constellation

- “The Land Surface Imaging Constellation seeks to promote the efficient, effective, and comprehensive collection, distribution, and application of space-acquired image data of the global land surface, especially to meet societal needs of the global population, such as those addressed by the Group on Earth Observations (GEO) societal benefit areas.”
- This mission statement embodies what the LSI Constellation Study Team sees as the fundamental goal of the CEOS LSI Constellation.
 - Emphasis on addressing the needs of society.
 - *Accommodates* the broad scope of technology and applications inherent in land remote sensing.



Objectives of LSI Constellation Studies

- Define a broad range of rather detailed characteristics (*standards*) that describe optimal, end-to-end capabilities (and policies) to acquire, receive, process, archive, and distribute to the global user community space-acquired land surface image data.
- Extensively engage broad segments of the land remote sensing user community to fully determine the scientific information requirements that must be met by the data acquired.
- Identify opportunities where near-term gains may be achieved.
 - Early determination of user requirements and development of related standards for urgently needed systems.
 - Applying newly developed policy recommendations to existing systems.
 - Facilitating CEOS efforts to integrate data from multiple systems to fill a potential gap in the continuity of LSI data.



Methodology and Scope

- Methodology will focus on definition and conduct of a series of Constellation studies and activities.
 - Carried out or directed by the LSI Constellation Study Team
 - Result in the definition of standards for optimal future systems
 - Also address shorter-term problems and issues
- In terms of scope, studies leading to the definition of standards for a LSI Constellation will be based on a compilation of representative user requirements and will examine at least three fundamental areas.
 - Space Segments
 - Ground Systems
 - Policies and Plans

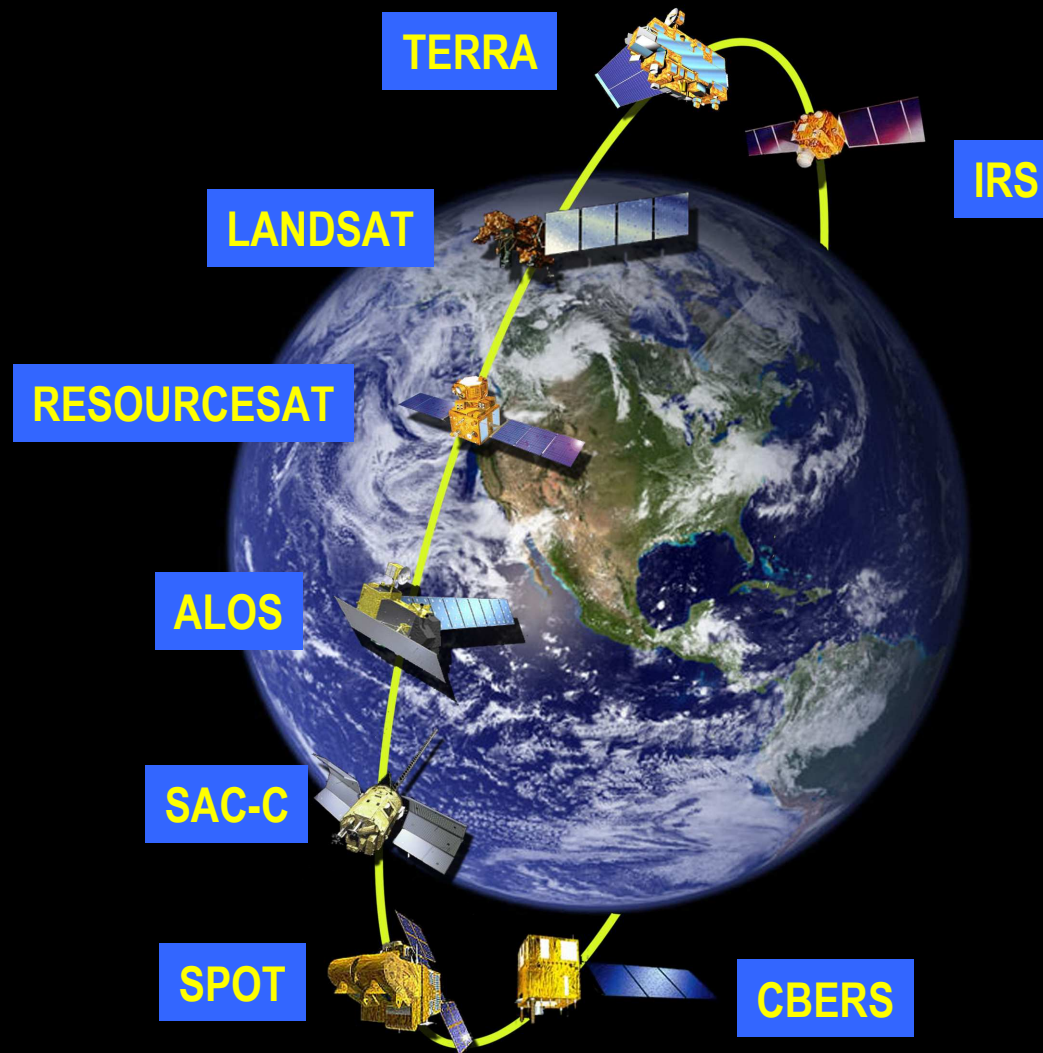


2007 Goals, Objectives, and Outcomes

- Definition, development, and implementation of CEOS LSI Constellation will not be a trivial undertaking, and is one that will be accomplished only with a phased approach.
- 2007 LSI Constellation studies place heavy emphasis on mid-resolution land surface imaging systems.
- Three primary goals were identified for 2007.
 - Establish agreement(s), among space agencies currently operating mid-resolution land surfacing imaging satellite systems, to cooperate more closely together to operate those assets as a real prototype Land Surface Imaging Constellation.
 - Develop preliminary standards for a mid-resolution Land Surface Imaging Constellation.
 - Meaningfully contribute to the production of a fundamental climate data record (FCDR).



A Potential *Real* Prototype Land Surface Imaging Constellation



Agreement for a *Real* Prototype Constellation

- To be accomplished in two parts.
 - A “*Declaration of Intent for Cooperation on Mid-Resolution Satellite Systems*” asks space agencies to “resolve to realize the benefits of a Land Surface Imaging Constellation by actively seeking ways to cooperate more fully in the operation of their existing mid-resolution land surface imaging satellite systems.”
 - Annexes to the high-level agreement that add specificity and detail concerning cooperation in designated areas will be developed by sub-groups of the LSI Constellation study team.
 - Data and operations policy
 - Ground systems operations
 - Data acquisition & data management
- Annexes will seek a balance between what users may desire and what space agencies realistically can accommodate.
- Still, annexes developed by sub-groups may not be accepted and adopted unanimously by all agencies, at least not initially



Constellation Standards: Mid-Resolution Systems

- This goal ensures 2007 studies address the fundamental objective of CEOS Constellations Concept.
- The primary objective is to define an initial suite of standards (or guidelines) that describe optimal characteristics of a mid-resolution LSI Constellation.
 - Space segments
 - Ground systems
 - Policies and Operational Considerations
- Standards will be based on the compilation of a representative cross-section of user information and technical requirements.
- Sub-groups of the LSI Constellation Study Team will work to develop the three groups of standards, and assistance with user requirements compilation is being provide by a USGS contract.



Data for a *Fundamental Climate Data Record*

- The objective of this 2007 goal is to demonstrate the value and viability of the LSI constellation and to make a tangible contribution that both advances science and benefits society.
- The UN FAO Forest Resource Assessment 2010 (FRA2010) is the FCDR selected for contribution, with the goal to provide the land surface image data needed to complete this assessment.
- Data requirements to fill holes in the primary Landsat data set, and options for meeting those requirements, are being defined by the LSI Constellation Study Team and FRA2010 Project.
- Agreements necessary for providing the required data will be established as part of developing the annexes that will specify areas of expanded cooperation among space agencies that operate mid-resolution LSI systems.



Summary and Conclusions

- The CEOS LSI Constellation Study Team currently is engaged in the first of many studies that ultimately will define, based on identified user requirements and in terms of specific standards, characteristics of optimal future land surface imaging systems.
- Standards defined by the studies can serve as benchmarks, which space agencies will aspire to emulate in the design and operation of their future land surface imaging space missions, as well as criteria against which future proposed systems can be assessed.
- The studies also seek opportunities for early gains by addressing high priority issues and by implementing aspects of the defined LSI Constellation in the near-term, thereby enhancing beneficial use of existing land surface imaging system by the global land remote sensing user community.

