IGOS
Integrated Global Observing Strategy

IGOL: The Land Theme

Integrated Global Observations for Land:

IGOL Report: Scope

- Land cover, land cover change, fire
- Land use, land use change
- Agricultural production, food security, sustainable agriculture and forestry
- Land degradation and soils
- Ecosystems, ecosystem goods and services
- Biodiversity and conservation
- Human health, impacts of land properties on vectors
- Water resource management, water use for agriculture, human use
- Disasters (fires, floods, droughts), early warning systems
- Climate change impacts on land properties
- Energy (biomass, fuelwood)
- Urbanization and infrastructure

Report Structure

- 1. Basic drivers for IGOL
- 2. Stake-holders
- 3. Relation to other IGOS Themes
- 4. Products and Observables needed
  - - statement of requirements based on sections 1 and 2
  - - current remote sensing capabilities and needed enhancements
  - - current in situ capabilities and needed enhancements
  - - current capabilities for socio-economic variables (census etc) and needed enhancements
- 5. Integration issues
- 6. Delivering Information

Basic drivers

- Agriculture, Forestry and forestry
- Combating desertification
- Ecosystems Goods And Services
- Biodiversity and Conservation
- Human Health
- Water Resource Management (consumption)
- Disasters *(Fires, Floods, Droughts)*
- Energy (*Fuelwood and Biomass)*
- Sustainable settlement

Observables and Products

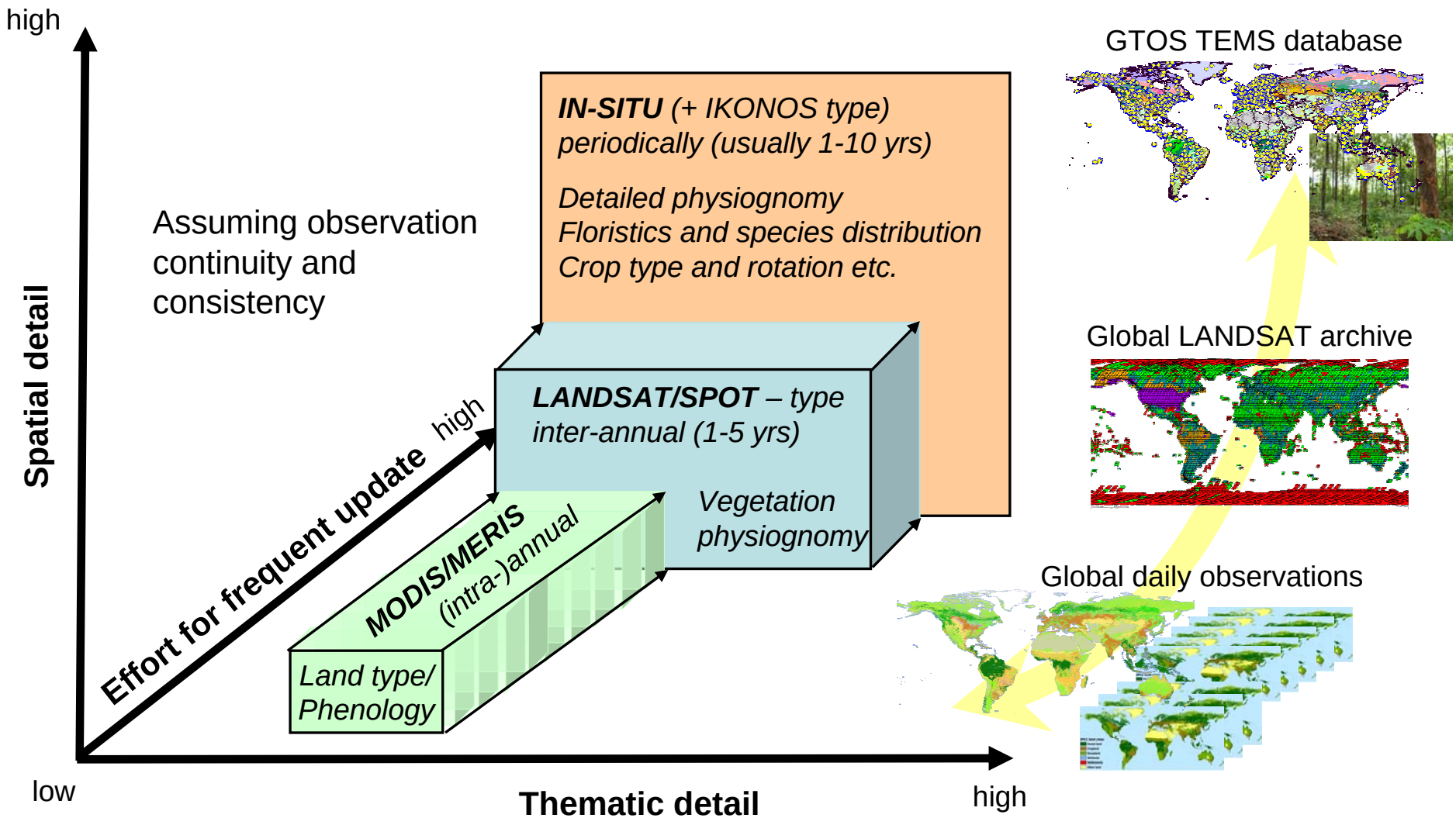
- Land Cover, Land Cover Change
- Land Use, Land Use Change
- Bophysical Properties *(Biomass, 3-D structure)*
- States and Fluxes of Energy and Mass
- Agriculture/Forestry –Food and Fibre Production
- Soil Properties and Land Degradation
- Biodiversity
- Socio-economic Variables *(Human Settlement and Infrastructure; Tenure; Farming Systems*
- Water Availability and Use *(to the extent missing from other docs)*

IGOL Report: Interfaces

It is recognised that there will be a need to interface with:

- Coastal Theme re overlap of interests on the terrestrial component of coasts;
- Geohazards Theme re other hazards on land and risk assessments
- Carbon Theme re carbon storage issues in soils and terrestrial vegetation
- Water Cycle Theme re water use in agriculture and human settlements
- (and related programs developed in GTOS and G3OS)

Integrated and operational observations



Martin Herold

Where are we now in relation to remote sensing observations?

- Large numbers of mission in orbit.
- Many have no continuity planned.
- Many have poor data policies and weak distribution.
- Overall cooperation in use satellites is weak compared with weather satellites.

Examples of status of some key terrestrial observing systems

	Technical Challenge	Continuity Challenge	Distribution Challenge
Ultra-fine resolution	**No**	Probably not	Y
Landsat-class	**No**	Y now	Y
Thermal	**No**	Y	Y
Mod Res.	**No**	**No**	**No**
Radar	**No**	Y	Y
Canopy Lidar	Y	Y	Y
City Lights	**No**	Y	Y

Special meeting on biodiversity

- November 2005 at Heinz Center, Washington DC.
  - Chaired by Tony Janetos
- CBD, WCMC, other NGOs, NASA, B-GTOS

Primary Data Needs

- Importance of 30m Landsat class resolution and moderate resolution (250-1km)
- Additional needs
  - 30m global topography
  - Very High Resolution Cloud Free Imagery at low cost for rapid response in key areas
  - Vegetation Lidar type data for structural information
  - Radar data for all weather access for rapid response on forest issues.
- Species biodiversity
  - Responsibility of GBIF (not in IGOS-P)
  - General belief that protocols now well established (needs reaffirming).

Derived Products

- Long-term record of LC Change and Fragmentation at 30m resolution
  - Wall-to-wall land-cover change product from existing global Landsat data sets
- Disturbance monitoring from moderate resolution remote sensing data
  - Global, continuous, long-term forest degradation product (MODIS scale); early-warning system
- Adopt consensus ecosystem classification hierarchy
- More sophisticated remote identification of individual biological communities
- Data on distribution of species abundance and change in relation to various stresses (time series)
  - Comparable data on invasive species and impacts

Derived Products 2

- Land degradation product
- Global habitat suitability at 100m resolution
- Indices of ecosystem health and integrity (NPP, structural integrity, ecosystem quality)
- Data to support downscaling of GCM’s
- Soil Moisture
- Global impervious surface
- Continuity of phenology data sets
- Canopy height data sets

Derived Products 3

- Roads and Transportation Networks
- Land ownership and tenure product
- Cropping system data disaggregated by crop sufficient to detect small holders (ca. .5 ha)
- Improved Protected areas database
- Seasonal monitoring of freshwater distribution and flow perhaps sufficient to detect irrigation scheme
- Monitoring of bush-meat trade through market statistics

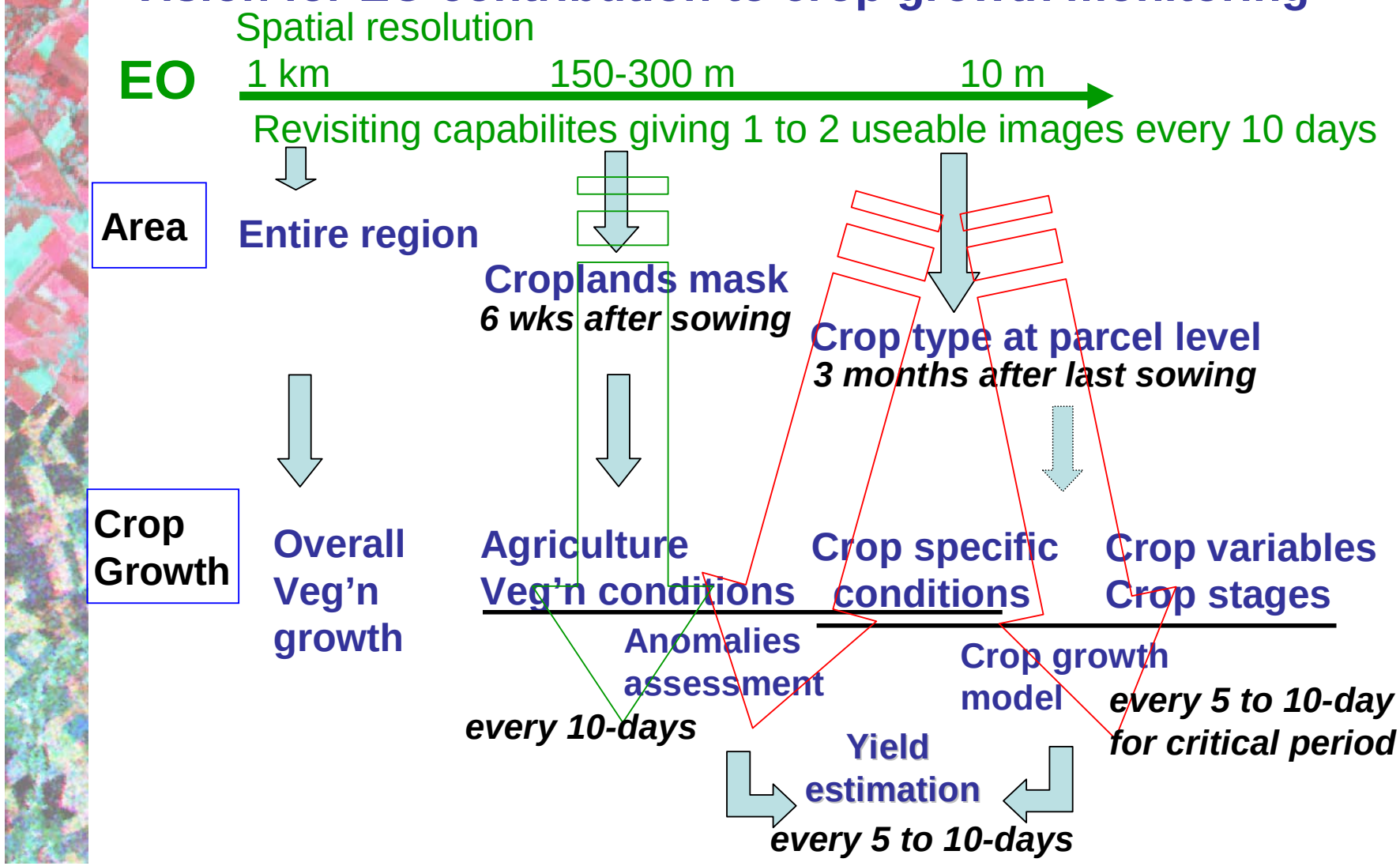
IGOL Agricultural Workshop

- i) Multiple, low cost, calibrated, multispectral sensors (vis, nir, swir), with 10m resolution coordinated to provide continuous 5-8 day orthorectified global cloud free coverage on an operational basis
- ii) Operational calibrated, polar orbiting, multispectral instruments providing daily observations (am and pm) in visible to thermal wavelengths at 250m providing daily imagery and temporally composited vegetation indices, active fire products, and drought alerts. Providing dynamic continuity with current systems.
- iii) A global network of geostationary satellites providing 30 minute vegetation index and active fire products at 500m-1km.
- iv) Targeted acquisition of very high spatial data (1m-3m) in visible and near infrared bands providing on demand acquisition within 24 hours
- v) Standardized operational collection of sample geolocated ground based data on crop condition in prioritized agricultural areas and rapid access to national networks of rain gauge data in near real time.

IGOL Agricultural Workshop

- vi) Operational altimetry observations providing information on reservoir height for inclusion in water use models
- vii) Operational tandem like operation of two C and L band, 30m SAR sensors HH+HV polarization providing 10-15 day repeat coverage.
- viii) A coordinated acquisition policy and distributed dissemination mechanisms providing free and open access to data for the GEOSS Global Agriculture Monitoring Partners and science users. Hyperspatial data (1m-3m) purchased in support of the international community emergency needs.

Vision for EO contribution to crop growth monitoring



Validation data set required to extend current local research results

Categorize nature of improvements needed

- Observations
  - **OEC**: Existing observations – long term continuity not assured.
  - **OEI**: Existing observations – increase in some way e.g. frequency using existing asset
    - (e.g. change acquisition strategy).
  - **OEF**: Existing type of observations but change in frequency (e.g. 2 weekly to 1 day) sufficient to need additional mission or combining assets from multiple existing missions
  - **ONO**: New observation type needed; technology exists.
  - **ONC** New observations needed but technology challenge.
  - **OIC** Inadequately characterized obs
  - Add after each
    - **r** for remote sensing.
    - **i** for in situ
    - **s** for Survey
- Products:
  - **PNV:** Products needing significant additional validation
  - **PNO:** New Product needed that can simply be derived from existing observations
    - e.g. finer resolution product needed and possible from existing observations.
  - **PNF**: New product needed requiring data fusion
  - **PNA**: New product needed requiring data assimilation PRD
- Model needs
  - **MND**: Models make new demands for products or new observations.
  - **MNB:** Models inhibited by other barriers e.g. computational constraints
  - **MNR:** Models require additional research.
- Information
  - **IAP:** Information access constrained by policy (not charging).
  - **IAC:** Information access constrained by charging
  - **IAI:** Information access constrained by Information System inadequacies (multiple systems, disparate georeferencing systems etc)

IGOL Report: Timelines

- September 2004 1st meeting of Team: Agreement on the scope of IGOL, FAO Rome.
- January 2005: first preliminary statement made of needed enhancements.
- March 2005 the first draft of plan.
- July 2005 2nd Meeting of Team, USGS Reston.
- September 2005 Special IGOL meeting in China
- October 2005 Biodiversity and Conservation Meeting, Washington DC
- February 2005 3rd Meeting of Team, Beijing
- March 2006 Agricultural Monitoring and Forecasting Meeting, FAO Rome.
- April 2006 Preliminary Report Submission for IGOS-P meeting in May 2006, Geneva
- August 2006 Final Report Submission

IGOL

The general thrust of what is proposed for IGOL is consistent with proposals in the GEOSS 10-year Implementation Plan.

It is expected that GEOSS will implement much of the work being done under the IGOLTheme.

Need for simplification of current international coordination mechanisms.

Extra slides

Models and Model Development

- Improved biodiversity modeling with Guidelines for use
- Modeling and maps of landscape condition and integrity
- Understanding of provision of goods and services from biodiversity
- Urban and rural growth models/data

Capacity and Institution Building

- Networks of *in situ* studies of biodiversity including protocols and sampling frames
- Capacity for imagery processing and interpretation
- Landsat 5 Receiving Stations for continuous monitoring of tropical natural envt's (especially key areas)
- Plan for continuous long-term monitoring for key biological areas
- Peer-to-peer education efforts and outreach about existing (and planned) observation capacity
- Integration of relationships of identified variables and how they respond to the needs of the conventions
- Provisions of treaties and other international agreements