ALOS Kyoto & Carbon Initiative
Science Advisory Panel Meeting

- ALOS technical/operational capabilities and limitations
- ‘Optimal’ sensor configuration(s)
- Kyoto & Carbon: political & scientific info requirements
- From data to information (bits to understanding)
- Regional considerations
- ALOS K&C systematic data acquisition strategy
- Re-drafting the acquisition strategy
- Action items

ALOS Technical/Operational Capabilities and Limitations
(Rosenqvist, Ito and Shimada)

Systematic observation support of:

- Kyoto Protocol
- Global Carbon Cycle Science

Three main observational themes:

- Monitoring land-cover dynamics (especially forest)
- Monitoring methane sources (natural and anthropogenic)
- Land-cover and land-use

Meeting Objective: Pin down observational strategy

ALOS Technical/Operational Capabilities and Limitations

ALOS Status:

- Launch - June 2004
- Design life - 3 to 5 years
- 46 day repeat
- PALSAR modes (polarization, angle, resolution, swath)
  - Quad-pol (experimental mode)
  - Dual-pol (hh + hv, vv +vh)
  - Single-pol (high resolution and ScanSAR)
- Product levels, EORC processing capability, scene size

‘Optimal’Sensor Configuration(s)

Optimal configuration must considered within the context of information needs and how derived ‘product’ is determined.

Incidence Angle:

- Low angles optimize sensitivity to surface features (eg. roughness)
- High angles optimize sensitivity to vegetation features (eg. Biomass)
- Moderate angle (35 deg) is a good compromise for both land-cover/disturbance monitoring and sensitivity to surface properties (inundation and freeze/thaw)
- Continuity with JERS

‘Optimal’Sensor Configuration(s)

Polarization:

- Polarimetry (experimental mode) - provides best land-cover classification, but cannot provide global coverage except at low angles of incidence
- Dual-pol - (hh + hv) provides good response to surface (hh) and vegetation related properties (hv); preferred over (vv + vh). HV is very important for biomass!
- Single-pol - in general, only of interest for ScanSAR to obtain good temporal sampling of surface dielectrics (inundation and freeze/thaw) and disturbance

‘Optimal’Sensor Configuration(s)

Ascending/Descending (p.m./a.m.):

- Ionospheric influence - slight preference for ascending
- Need regional consistency (use one or the other)
- Ascending (p.m.) minimizes competition with PRISM and AVNIR-2
- Freeze/thaw requires descending ScanSAR in spring

ScanSAR:

- Best for high temporal repeat sampling (eg. flooding and freeze/thaw) if hv not required
- ScanSAR calibration is essential,
- Algorithms need to explicitly account for angular change

Kyoto & Carbon:
Political & Scientific Info Requirements

Kyoto Protocol

- Information needs that can be addressed by ALOS Palsar:
  - land-cover, land-use and change
  - Above-ground carbon (from biomass)
- Spatial resolution: less than 1 ha
  - requires high resolution/ but hv is more important
- Temporal revisit
  - Nominally 5 years (2008 and 2012, reference 1990)
  - Land-use and disturbanced requires monitoring over shorter intervals Nominally 1 year.

Kyoto & Carbon:
Political & Scientific Info Requirements

Carbon Cycle Science

- Information needs:
  - Land-cover, land-use and change
  - Above-ground carbon (from biomass) and regeneration
  - Methane sources - Inundation extent and duration (rivers, wetlands and rice)
  - Photosynthetic on/off switch - high latitude freeze/thaw transition
- Spatial resolution: 1 km threshold, 100-m objective
- Temporal revisit
  - Annual - for land-cover, biomass and disturbance
  - Monitoring of ‘duration’ requires weekly/monthly repeat

From Data to Information (bits to understanding)

Data acquisition strategy must consider how data will be converted into ‘operational’ products.

- Who are the ‘operational’ users?
- What are the products?
- How will they be derived?
- What are the required resolutions, polarizations, timing, etc…
- What synergies are needed?
- How does this vary by region?

Regional Considerations

- Continental vs. regional scale acquisitions
- Required sensor configuration(s)
- Relative timing and repeat interval
- Regions considered:
  - Boreal regions (forest and tundra)
  - Temperate forest
  - Tropical forest
  - Arid and semi-arid (savannah and woodland)
  - Wetlands (tropical and boreal)
  - Agricultural regions (rice in particular)

ALOS K&C Systematic Data Acquisition Strategy

- Reviewed draft strategy used in current simulation
- Revised this for a number of areas
- Determined that dual-pol (hh + hv) at 35 deg satisfies most requirements for coverage
- Revised acquisition plan for focus #2 (methane) due to orbit configuration - now use ScanSAR
- Eliminated focus #3 -

  Global land-cover using polarimetric PALSAR
- Generated a list of action items

Action Items

- Take advantage of PI team expertise to help
  - Specify product derivation algorithms
  - Test biomass increment algorithms; are they robust?
  - Provide ScanSAR calibration
- Investigate synergies with other sensors
  - eg. Boreal freeze-up (MODIS or QuickSCAT)
- Examine incidence angle effects on ScanSAR (inundation algorithm)
- KP & C cal/val ‘supersites’ to answer experimental questions
- Develop subsampling strategy for inundation monitoring (eg. Intensive sites)
- Characterize ionospheric impacts on cal
- Need to meet again to monitor progress (1 year)