The Development of a Fine Resolution, Continental Scale Forest Monitoring System using SAR Imagery

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Players and Partners

" Processing

　　NASDA/Earth Observation Research Center (M. Shimada)

　　　" NASDA/Earth Observation Research Center (A. Rosenqvist)

　　NASA/JPL (S. Saatchi)

　　EC/JRC (F. Degrandi)

" Users

　　UC Santa Barbara (L. Hess)

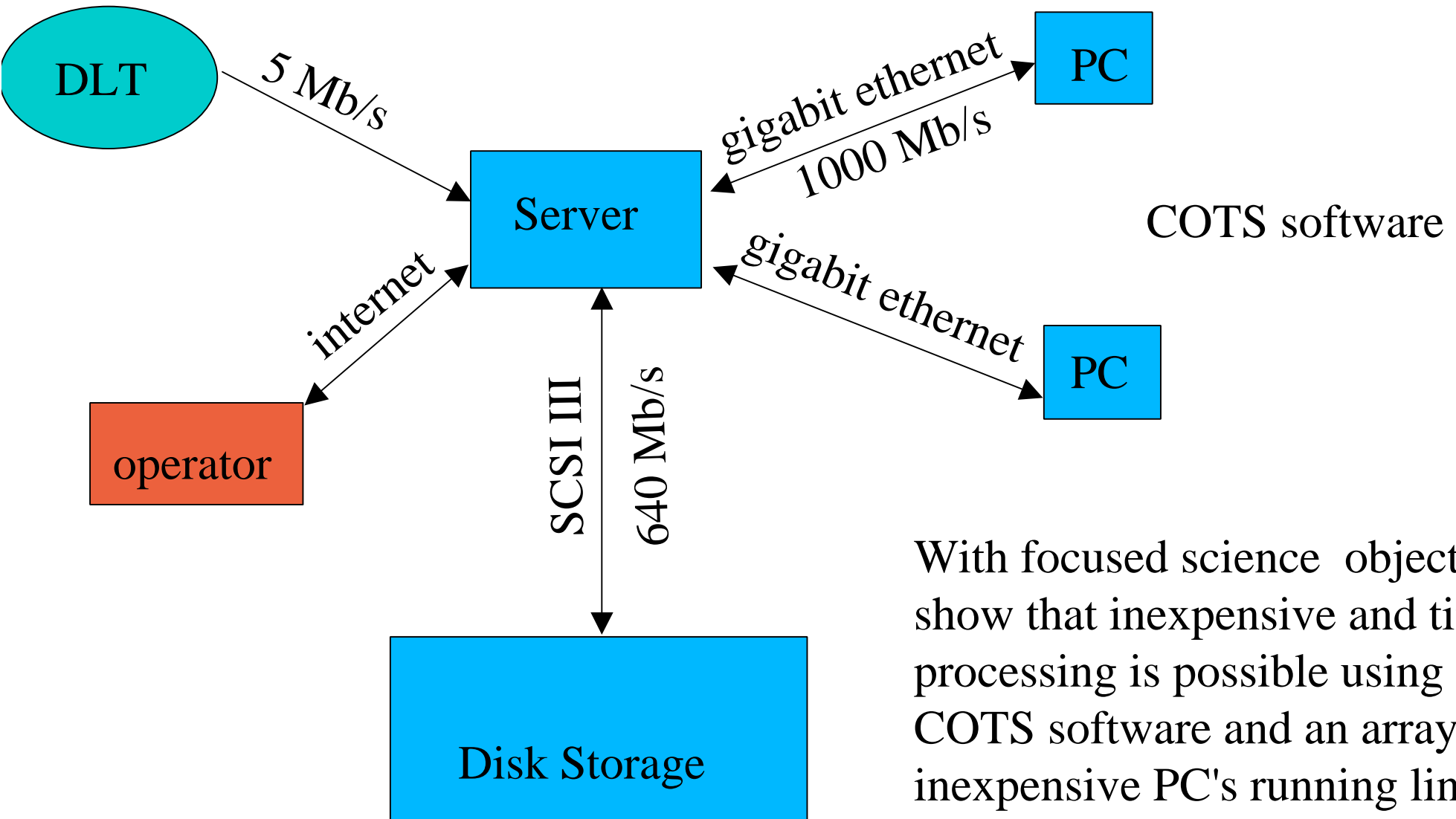　　Max Planck Institute for Biogeochemistry (R. Zimmermann)

　　INPE (L. Dutra)

　　UMD (S. Prince)

" Others...

　　USDA - Int. Inst. of Tropical Forestry (E. Helmer)

Objectives of the Study

Prototype inexpensive SAR processing

DLT

5 Mb/s

Server

gigabit ethernet
1000 Mb/s

PC

COTS software

internet

operator

gigabit ethernet

PC

SCSI III

640 Mb/s

Disk Storage

With focused science objective, show that inexpensive and timely processing is possible using COTS software and an array of inexpensive PC's running linux

ALOS

- NASDA mission

- L-band polarimetric SAR

- Two optical instruments

- Launch : 2003

- Two data relay satellites

- ALOS Research proposal accepted

    Image all of South America every 3 weeks for
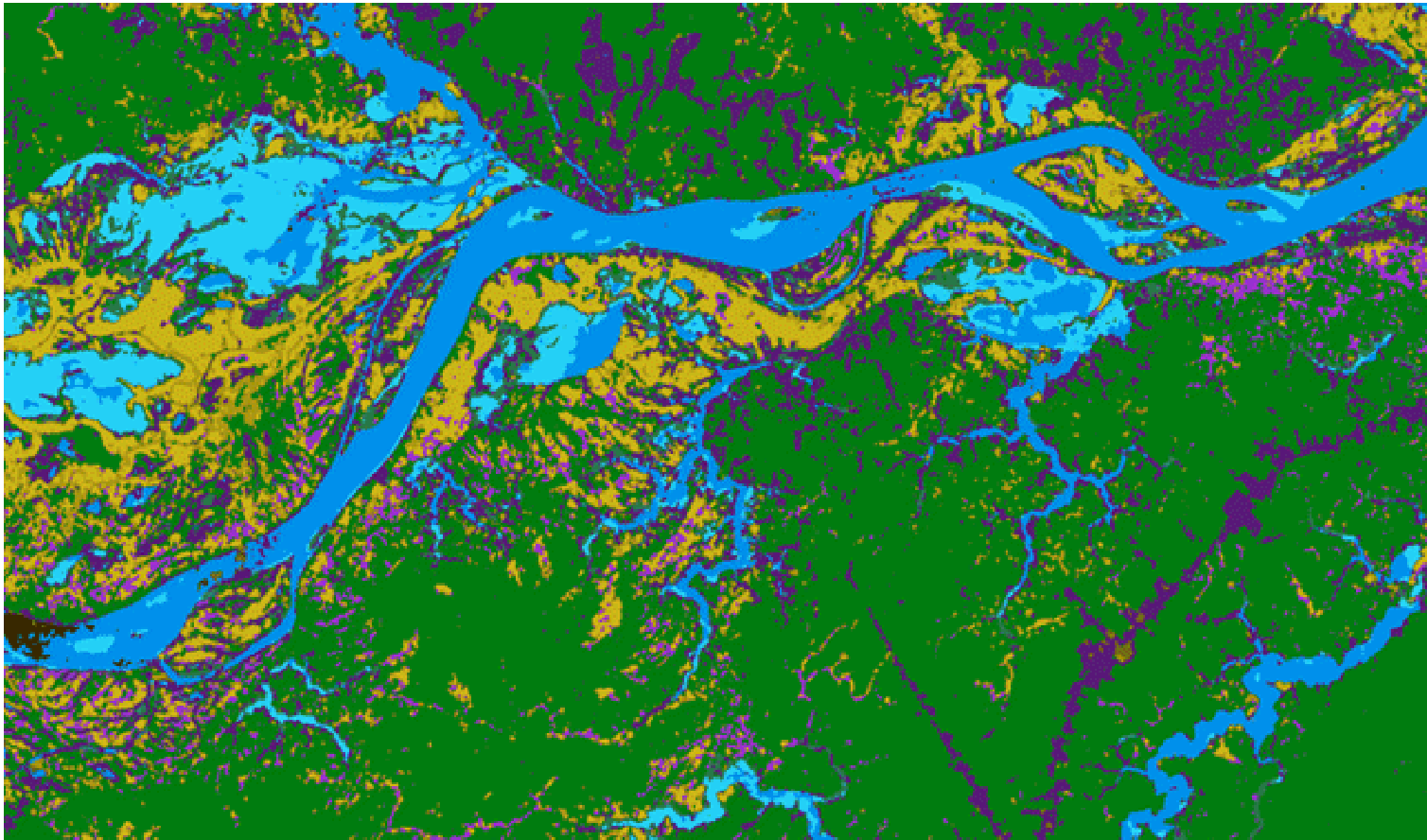   duration of mission

Objectives of the Study

Complete L-band Radar image of forested areas in South America (93-96)

GRFM

Also, forests in Southern Africa
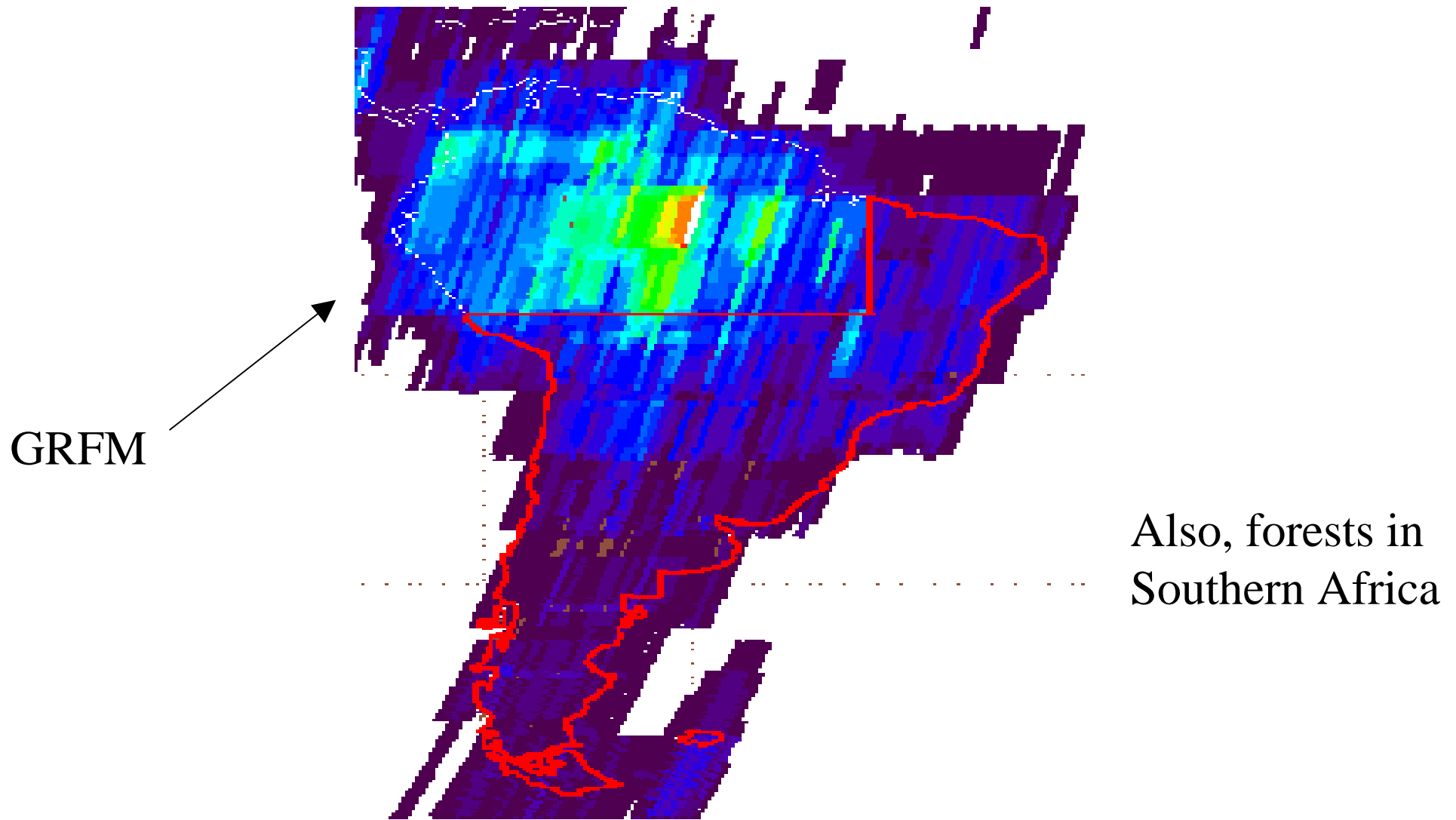
Multiple coverage by JERS-1 SAR in most locations
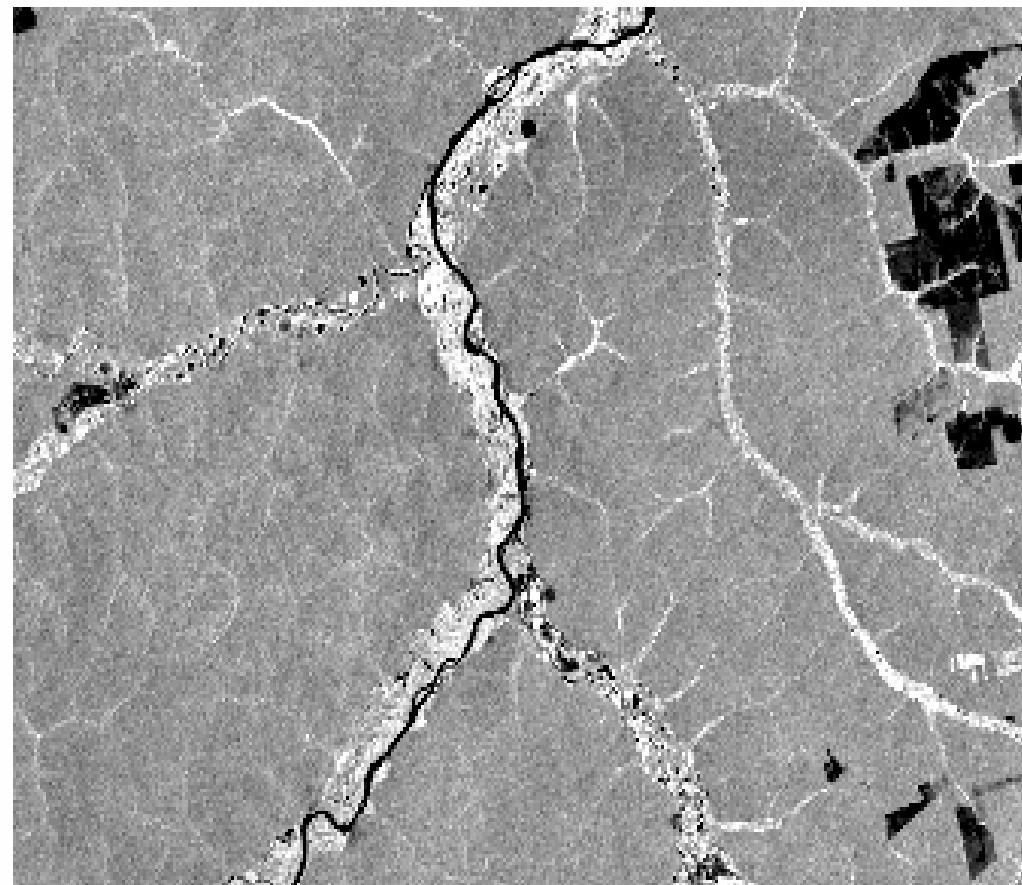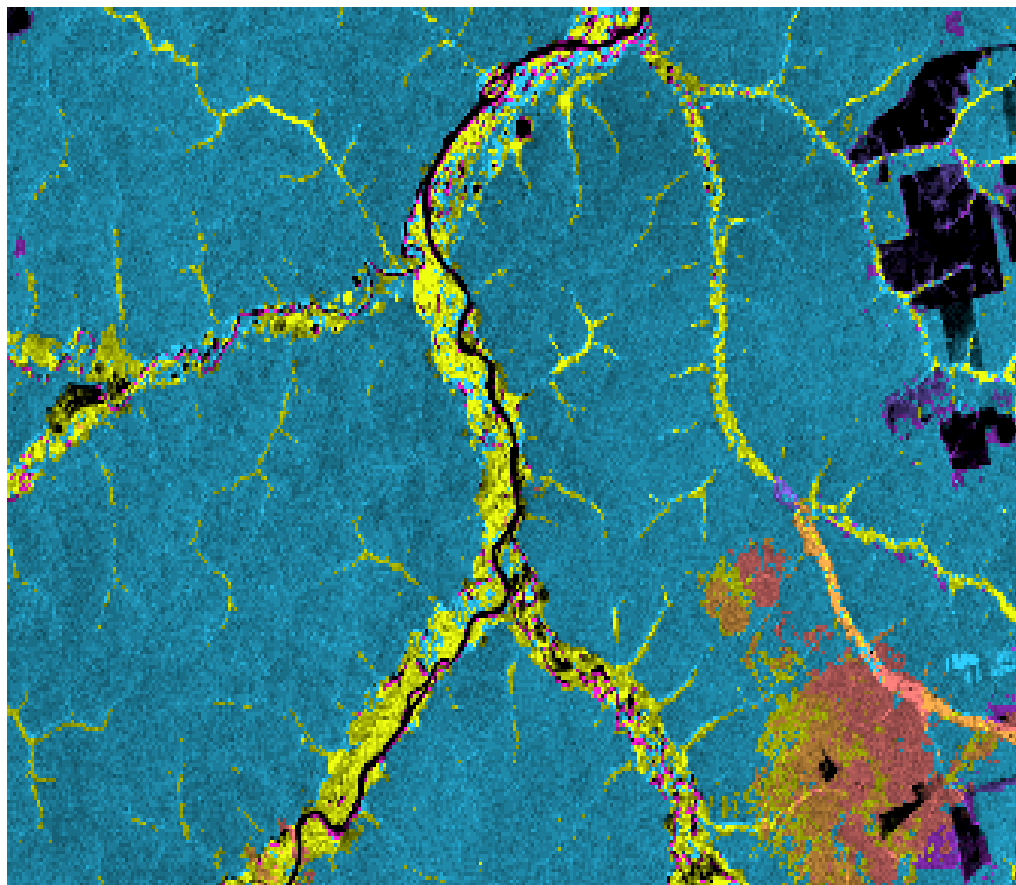
Objectives of the Study

Simple land cover map

- forest

- non-forest

- inundated forests

- open water

ALOS SAR will be better at discriminating some classes than JERS
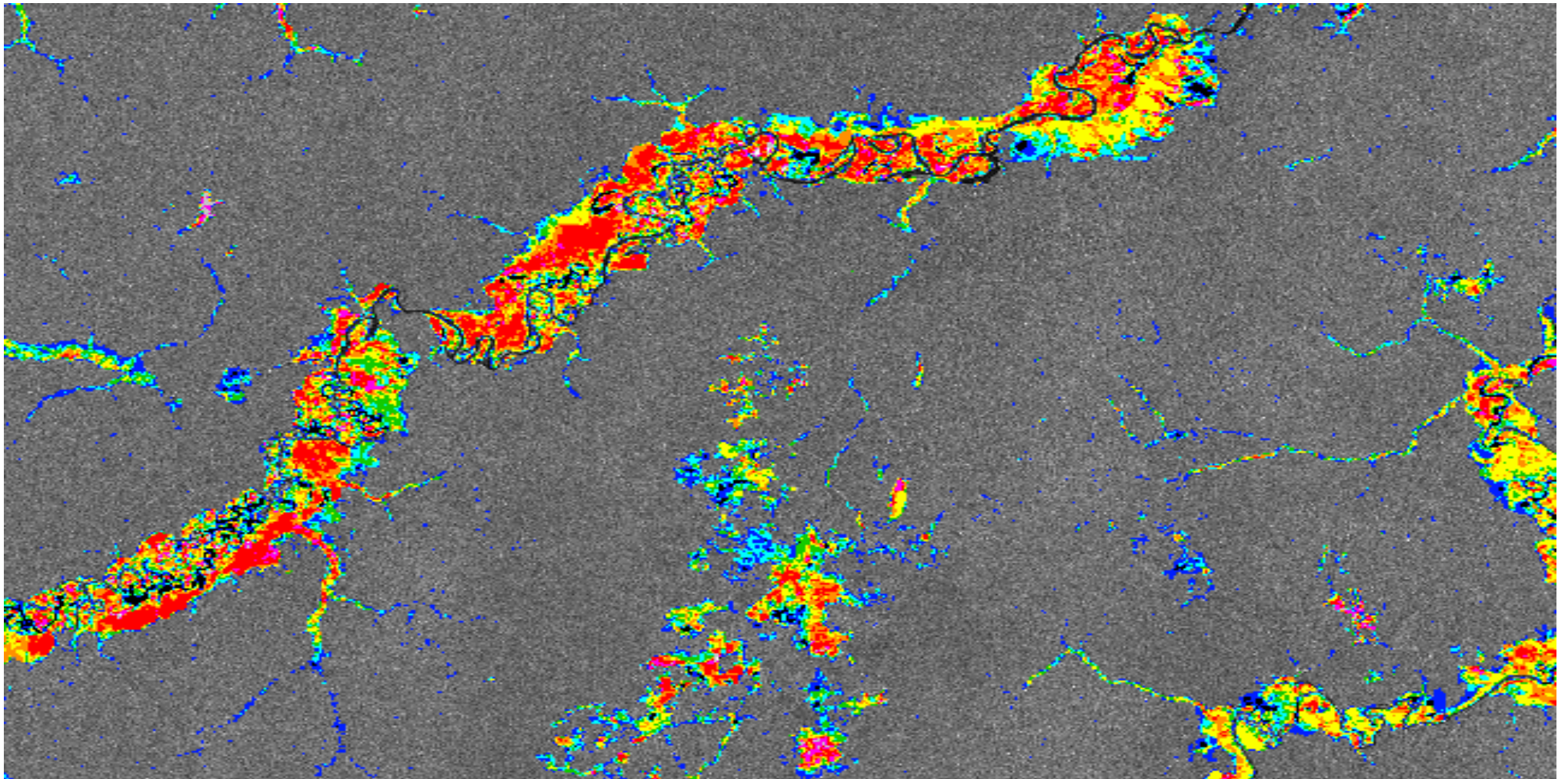
Objectives of the Study

Fill in gaps in Landsat coverage

ALOS will acquire data over all of
South America every three weeks.

Science Implications

" Regional Wetland Mapping

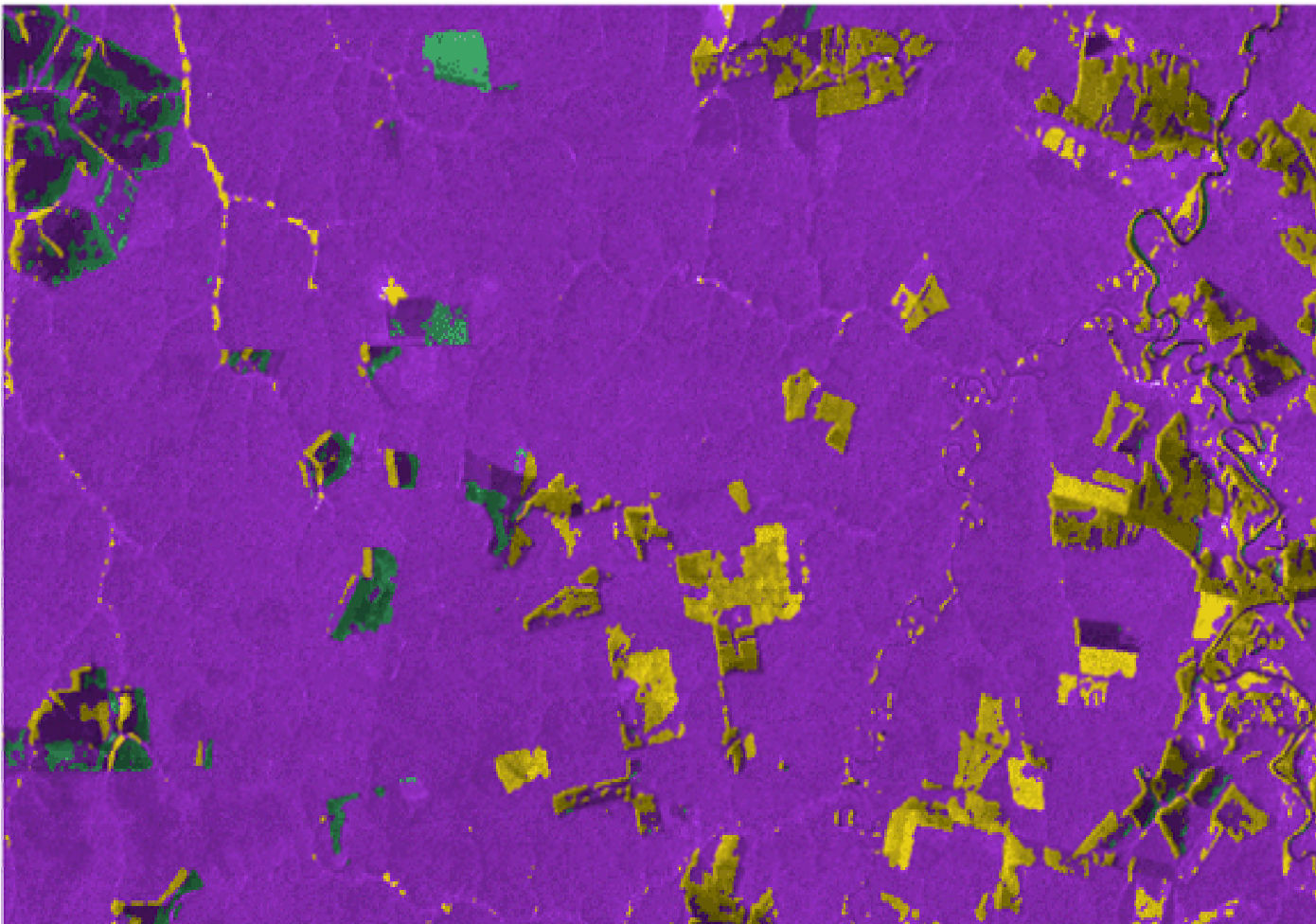

Jau River, 1995-1996   Rosenqvist et al, 1999

Science Implications

Land Cover Change

JERS-1 radar image
change detection

Comparison
Sept 1995 / May 1996

yellow : 2db brighter

purple : no change

green : 2db darker

Heritage of the Research

" GRFM / JAMMS
project

Methods

- Simple land cover classes

  L-band radar is sensitive to forest structure and the resulting scattering mechanism

  - diffuse scattering : Forest (-5.5 to -8.5 db)
  - specular scattering : non-forest/water (darker than -9 db)
  - double bounce : flooded forest (brighter than -5 db)

  these scattering mechanisms result in distinct radar backscatter values

- Classification can be performed at time of processing.

- Dual Pol ALOS will be better at distinguishing scattering mechanisms.

Methods

" Raw signal processing

    COTS software

    control of processing priority and quality

    strip map processing

    mosaicking integrated into processing

    classification integrated into processing

    multiple output products

        " projection (geographic, UTM, WRS) , resolution

" processing benchmark for future systems

Methods

- Experimental ALOS prototype measurements

  Change detection

  Interferometry processing

  Terrain correction

  Biomass

  - Biomass from derived structure
  - Measurement confusion

    double bounce (flooded forest)

    low vegetation specular scatter (influenced by soil moisture)

    moisture in canopy
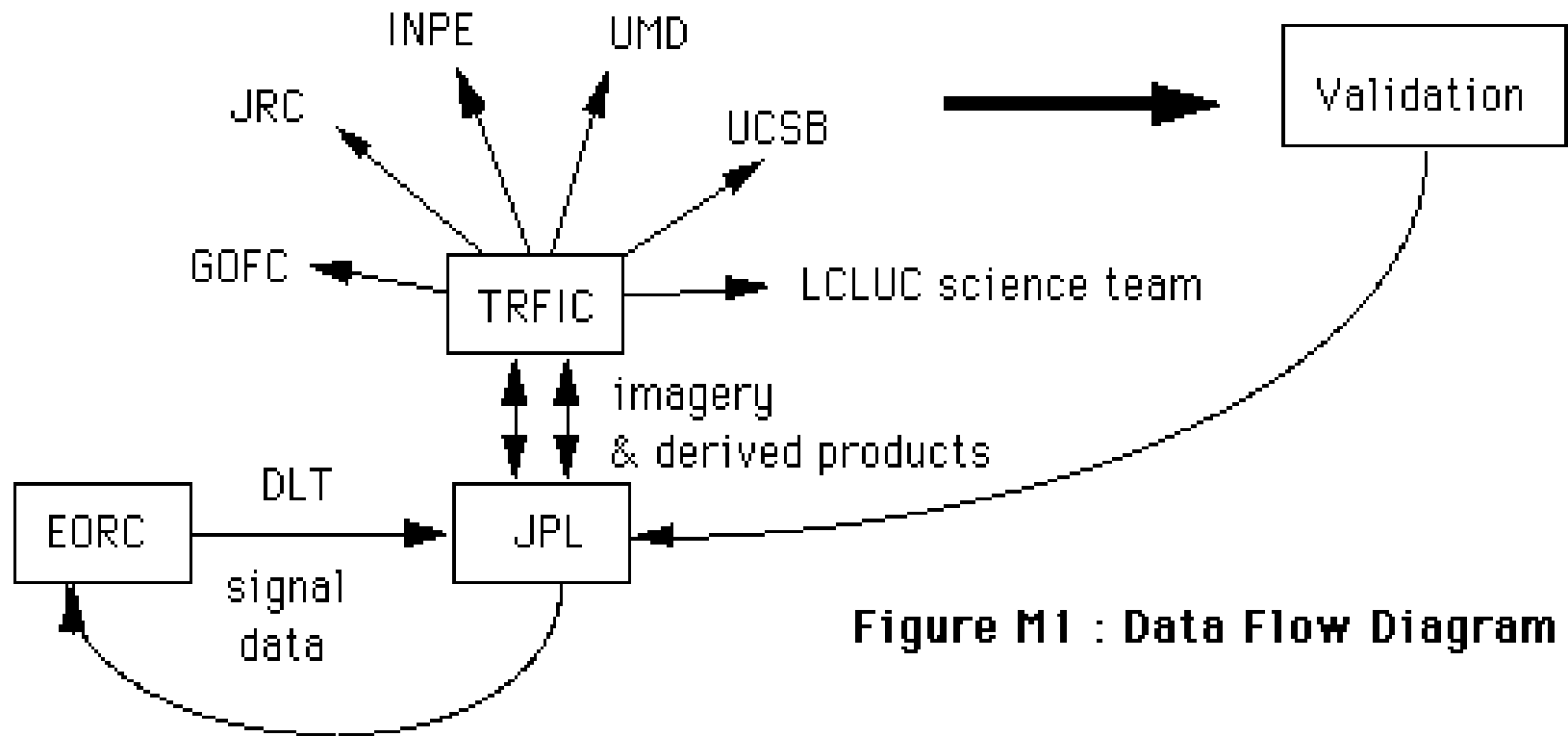 - Dual pol L-band on ALOS can eliminate some of this confusion

Data Plan

Figure M1 : Data Flow Diagram

Work Schedule

" Year 1 (00-01) :

    integrate hardware and software components

    test processing

" Year 2 (01-02):

    operational processing

    testing and validation of derived products

" Year 3 (02-03) :

    completion of image processing

" *Year 4 : ALOS is launched (June 2003)*