

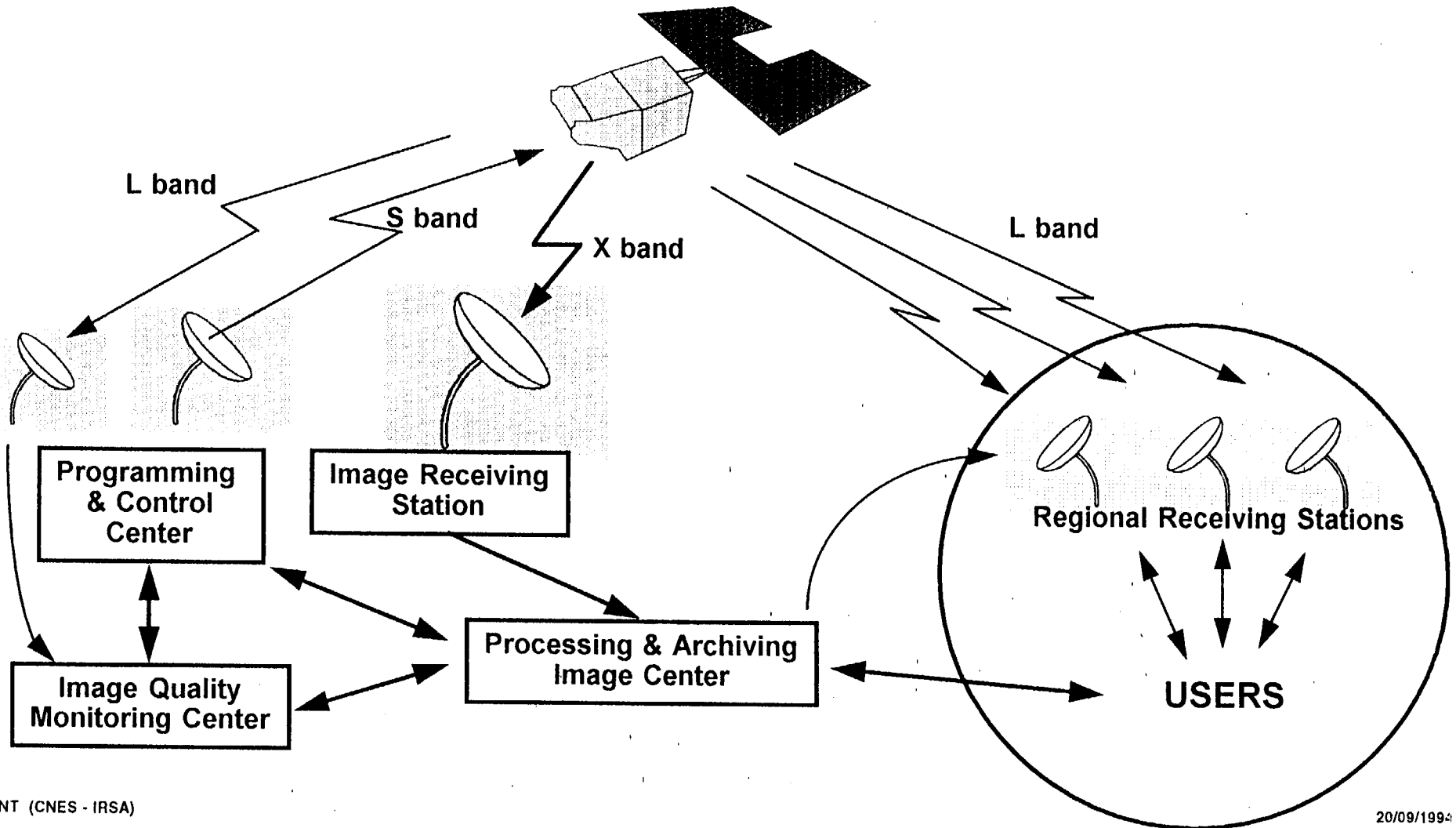
VEGETATION onboard SPOT 4

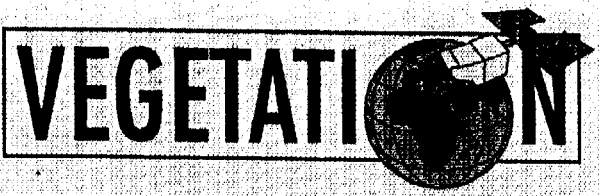
A MISSION FOR GLOBAL STUDY

OF THE BIOSPHERE

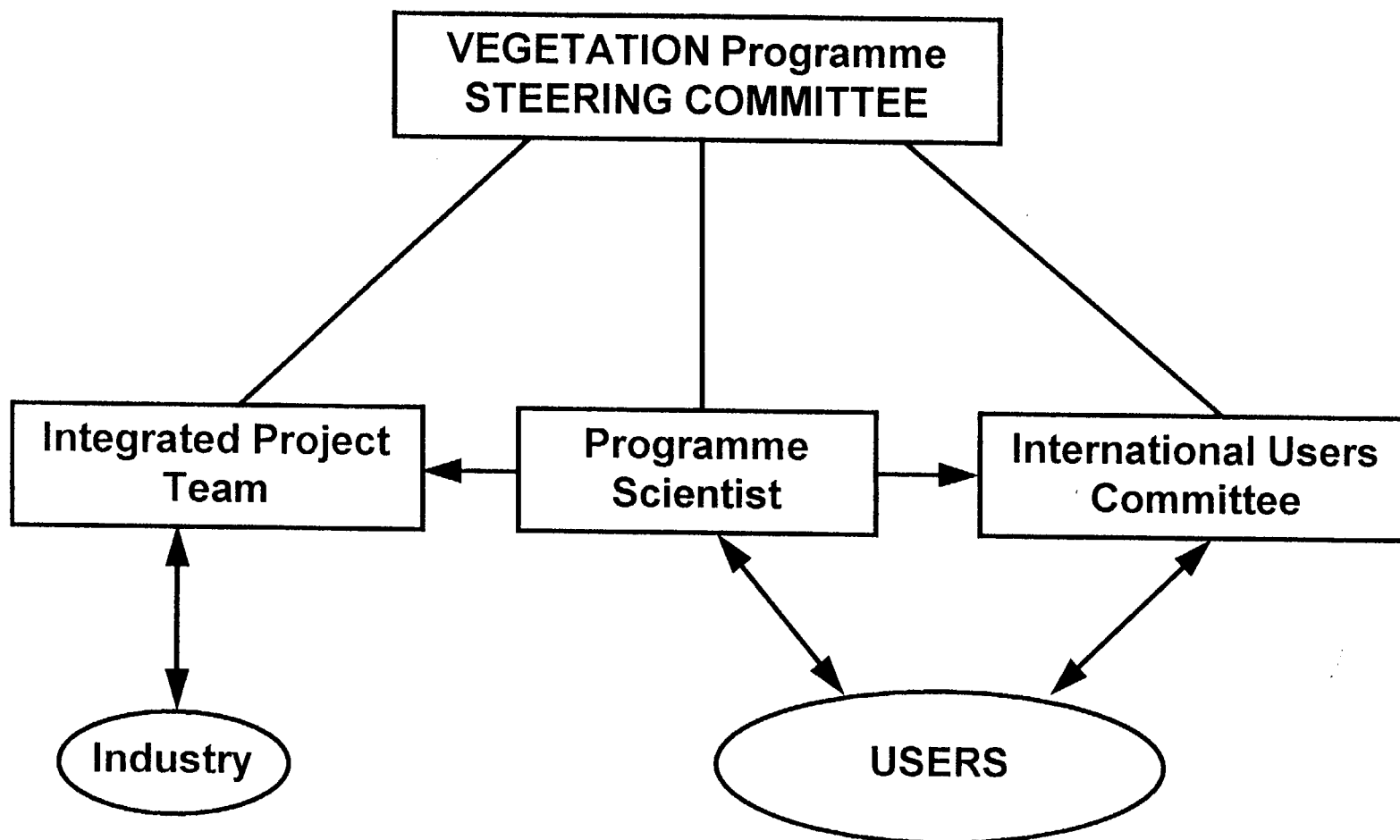


OVERALL SYSTEM STRUCTURE



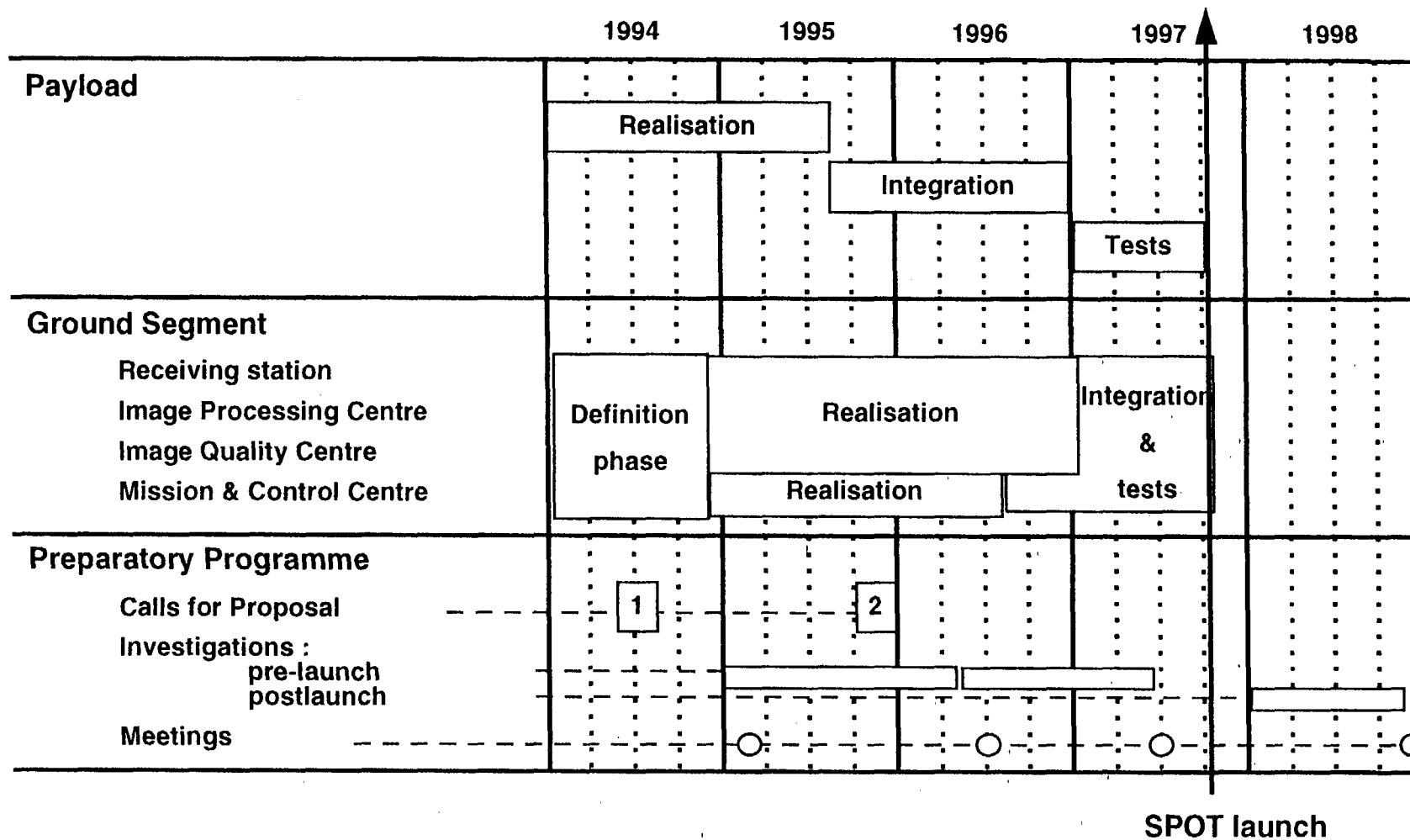


PROGRAMME ORGANISATION





PLANNING





Main missions for Vegetation monitoring

- Surface parameters :**
to describe spatial and temporal distribution of radiative properties
- Vegetation resources :**
monitor productions (agriculture, forestry, grasslands...)
- Biosphere processes :**
understand and modelize functioning of ecosystems, their interactions with the atmosphere and with human activities

COMMON STRATEGY :

document processes at different scales,
for spatial and temporal aspects.



WHICH USERS ?

- Users** : for methodological development.
they will request large series of data, i.e. one year of weekly data over regions (~ 500 x 500 km²). Very few will require one image at a time.
- Projects** : apply methods to derive information for thematic use.
these particular users will require extensive data sets, on large areas or for every year

examples :MARS,
IGBP Global Archive and CPs, TREES...



MISSION REQUIREMENTS

- Time scales :** High revisit capability,
Long term acquisition
Archive

- Spatial scales :** wide FOV
zoom capability

- Observability :** spectral bands
both for information and correction

- Accuracy :** radiometric calibration
geometric quality



SPECIFICATIONS : RADIOMETRY

SPECTRAL BANDS	Wavelength	Surface reflectance range
Operational	RED : 0.61 - 0.68 μ	0.0 - 0.5
	NIR : 0.78 - 0.89 μ	0.0 - 0.7
	SWIR : 1.58 - 1.75 μ	0.0 - 0.6
Experimental	BLUE : 0.43 - 0.47 μ	0.0 - 0.5

RADIOMETRIC RESOLUTION ($NE\Delta\rho$)

RED	0.001 for $\rho < 0.1$ linear increase up to 0.003 for $\rho = 0.5$
NIR, SWIR	0.003 on the entire range
BLUE	0.003 on the entire range

CALIBRATION

intra-image consistency	within an entire image, corresponds to $NE\Delta\rho$ of 0.005 for any reflectance value
interband & multitemporal consistency with HR	3 %
absolute	5 %



SPECIFICATIONS : GEOMETRY

SPATIAL RESOLUTION in both directions : 1km at nadir (+/- 20%),
minimum variations for off nadir observations

FIELD OF VIEW compatible with 1 day coverage,
off nadir observation angle < 50°

ACCURACIES

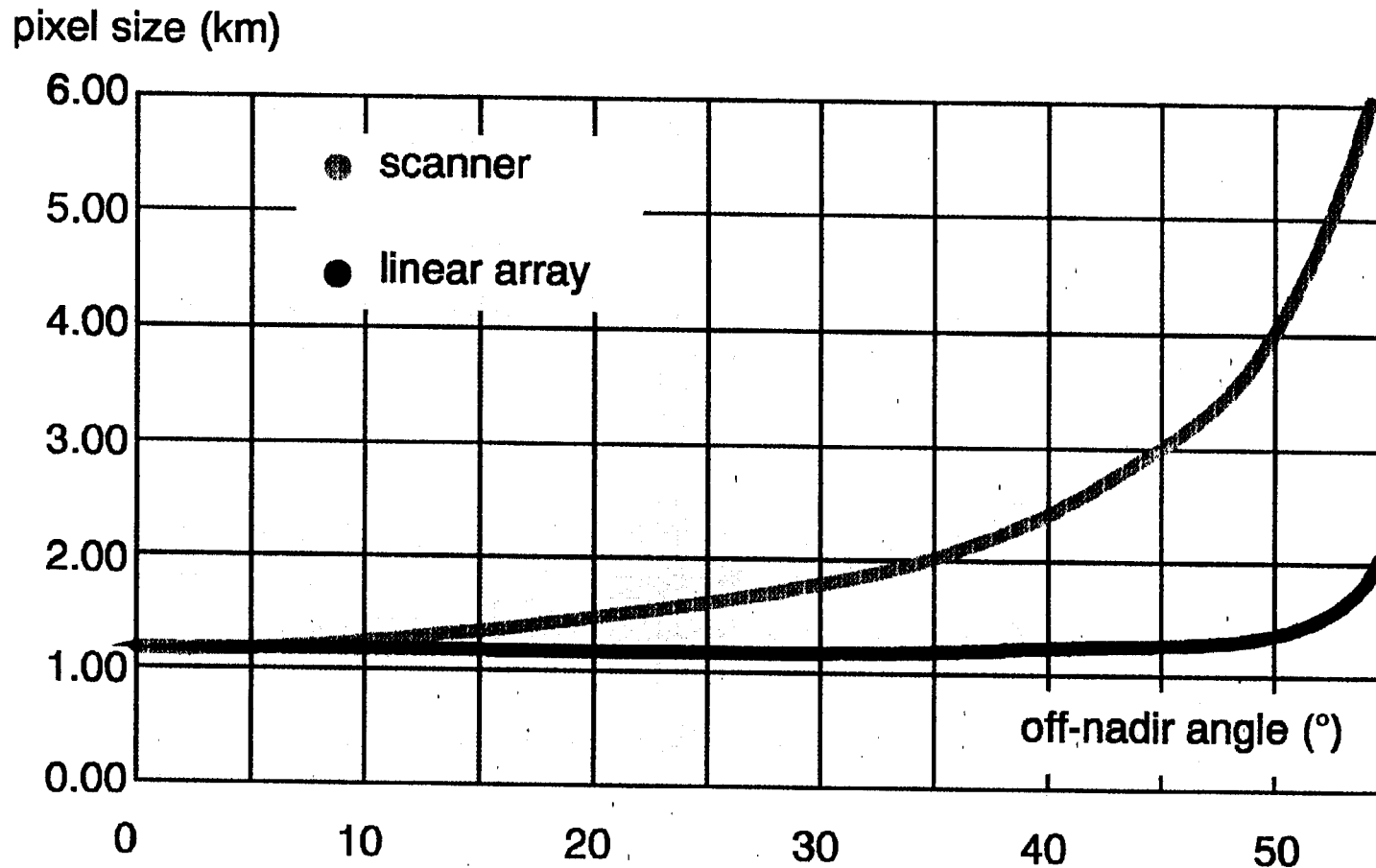
local distorsion less than 0.3 pixel

order of priority : multispectral registration,
collocation with simultaneous HRVIR data,
multitemporal registration
absolute location



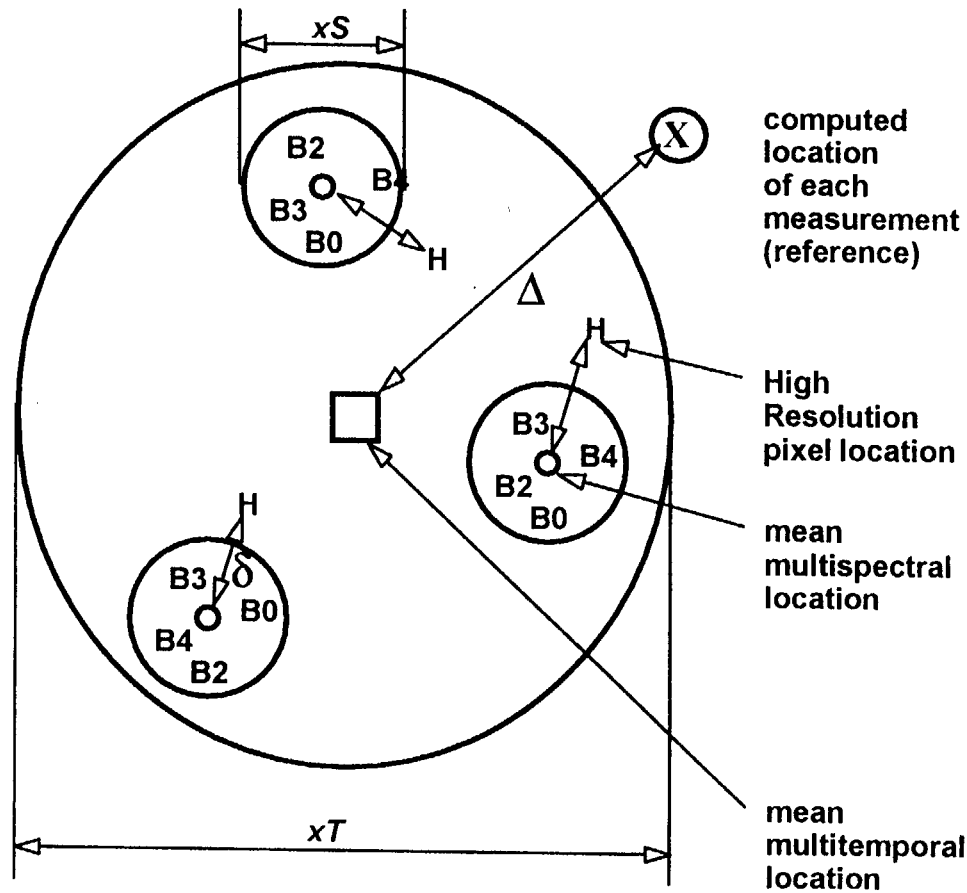
VEGETATION : GEOMETRY

Resolution comparison between linear array and scanner :





VEGETATION : GEOMETRY



Specifications	
multispectral registration xS :	$\ll 0.3$ km objective : 0.1 km
collocation δ :	< 0.3 km
multitemporal registration xT :	< 0.5 km, objective : 0.3 km
absolute location Δ :	< 1 km, objective : 0.5 km



COVERAGE and DATA ACCESS

COVERAGE :

on any land area for solar elevation angle $>0^\circ$
quality specified for solar elevation angle $> 30^\circ$

For REGIONAL STUDIES :

either from central archiving center
or from local receiving stations

For GLOBAL STUDIES :

from central archiving center



PRINCIPLES for PRODUCT DEFINITION

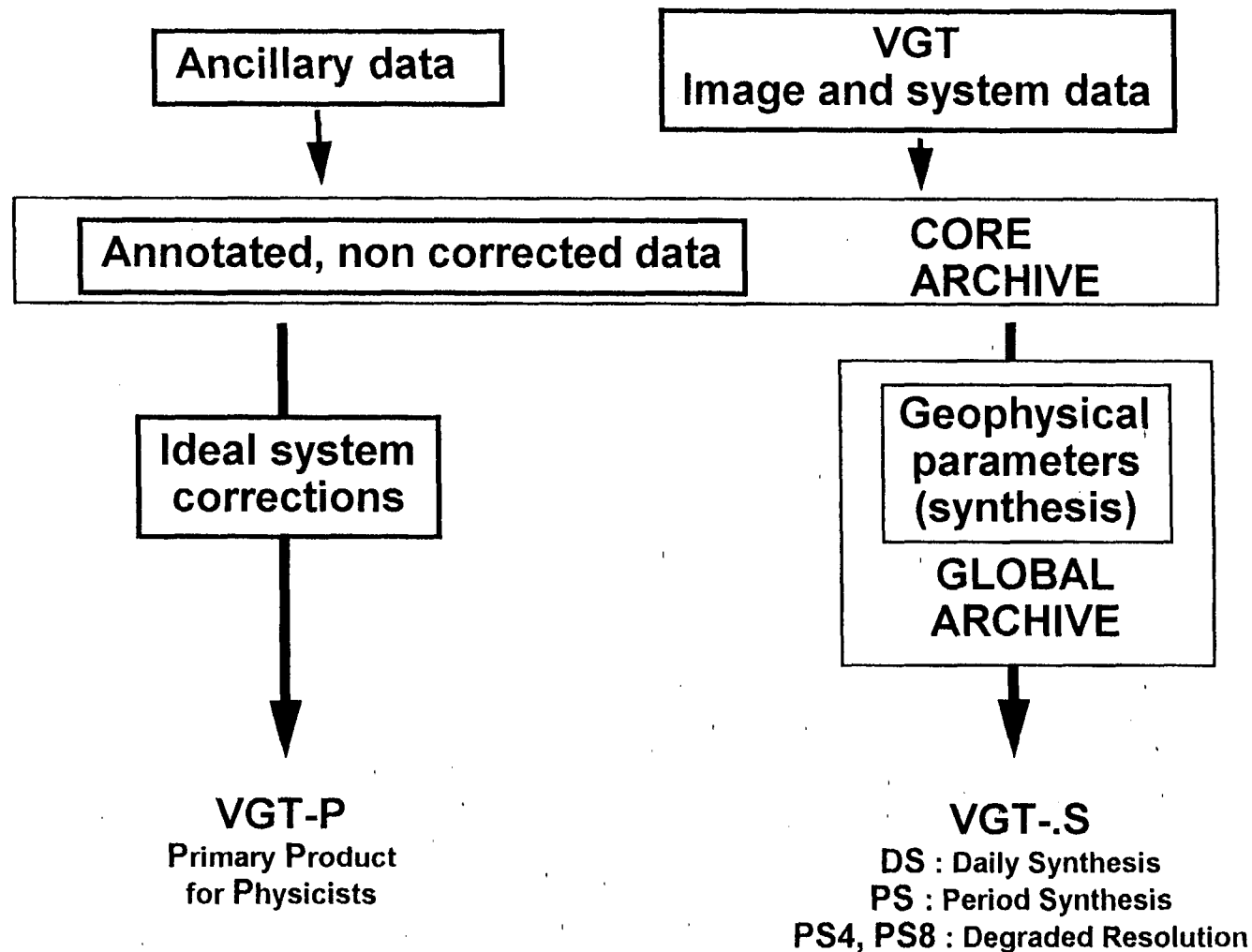
- Products available from Ground Processing Segment**
 - ◆ defined and adapted specifically to the use in vegetation studies,
 - ◆ capabilities to adapt
 - to "important" projects
 - to evolution (18 months - 2 years)
 - ◆ compatibility with HR products should be maximum,

- Products available from secondary receiving stations**
 - ◆ no specification given but high compatibility recommended
 - ◆ ? : possibility to provide requirements , software package

- Other data sets**
 - ◆ not available as current products but retain capabilities to provide other data sets (i.e. raw data) under special agreement



PRODUCTS : OVERALL FLOWCHART





VGT-P

Goals

- ◆ nature and quality designed for physical studies
 - TOA reflectances
 - provide direct multitemporal registration
 - as much coherence as possible with existing high resolution product
 - annotation with ancillary data or metadata
- ◆ ideal instrument (mission specifications)
 - data reference to segments of orbital path

Geometric projection

- ◆ small set of projections (coherent with projections available for High Resolution data)



VGT-.S

□ Goal :

- ◆ provide synthesis of corrected data for end-vegetation users with coherence to other data sets
 - two types of synthesis :
 - daily
 - decade : full resolution and degraded resolution (4 & 8km)
 - capability to evolve from selection of best measurement in the period to computed representative parameter
 - surface reflectances,
 - some derived surface parameters
 - should be widely known and accepted (i.e. NDVI)
 - capability to add new parameters in evolution of the system
 - data reference to geographic areas



PRODUCTS SUMMARY

NAME	NATURE	ZONE	DELIVERY TIME	REQUEST	VOLUME (1)
P	"Ideal system" corrected data	Orbit segment	2-4ds / acqu. 1wk / request	a priori a posteriori	2 1
.S	Resampled (space & time)	Geographical zone			
DS	Daily synthesis		2-4days	a priori	6-8
PS	Decade synthesis		<1wk	a priori a posteriori	10 5
PS4/8	Degraded resolution (4 - 8km) decade synthesis		<1wk	a priori	<10

1 : estimated volumes in equivalent Global Coverage



OTHER PRODUCTS/SERVICES

Evolution of product quality

- ◆ newly developed and *validated* methods for data correction should be used to regularly update algorithms implemented in the system, *providing continuity*: these methods will come either from the use of VGT itself or experiments on other available sensors.
- ◆ coordination with new projects should provide a basis for definition of new products that could be included in the system (partially or totally)

"Non data" products

- ◆ to assist users or Specialized Processing Centers using VGT data, methods to access to data in any format and algorithms for processing should be made widely available.



EVOLUTION of the SYSTEM

- Change from acceptable solutions to validated and widely accepted new methods
- Development of new methods due to availability of VEGETATION data or other experimental and operational systems



VEGETATION Preparatory Programme

- **OBJECTIVES** : prepare and promote the use of the system through :
 - ◆ support for development or improvement of applications using VEGETATION data sets.
 - ◆ R&D on use of RS data in problems related to specific VGT features : integration of various scales is a priority
 - ◆ development for enhancement of products.

- **CALL for PROPOSAL #1** : issued August 1994
 - ◆ Proposals due for October 15 1994

- **UP to 100 INVESTIGATIONS** to be selected :
 - ◆ pre-launch phase : address all methodological problems using representative data sets,
 - ◆ post launch phase : validate on actual VEGETATION data.