Canada's RADARSAT-1
Understanding the benefits for the mining community

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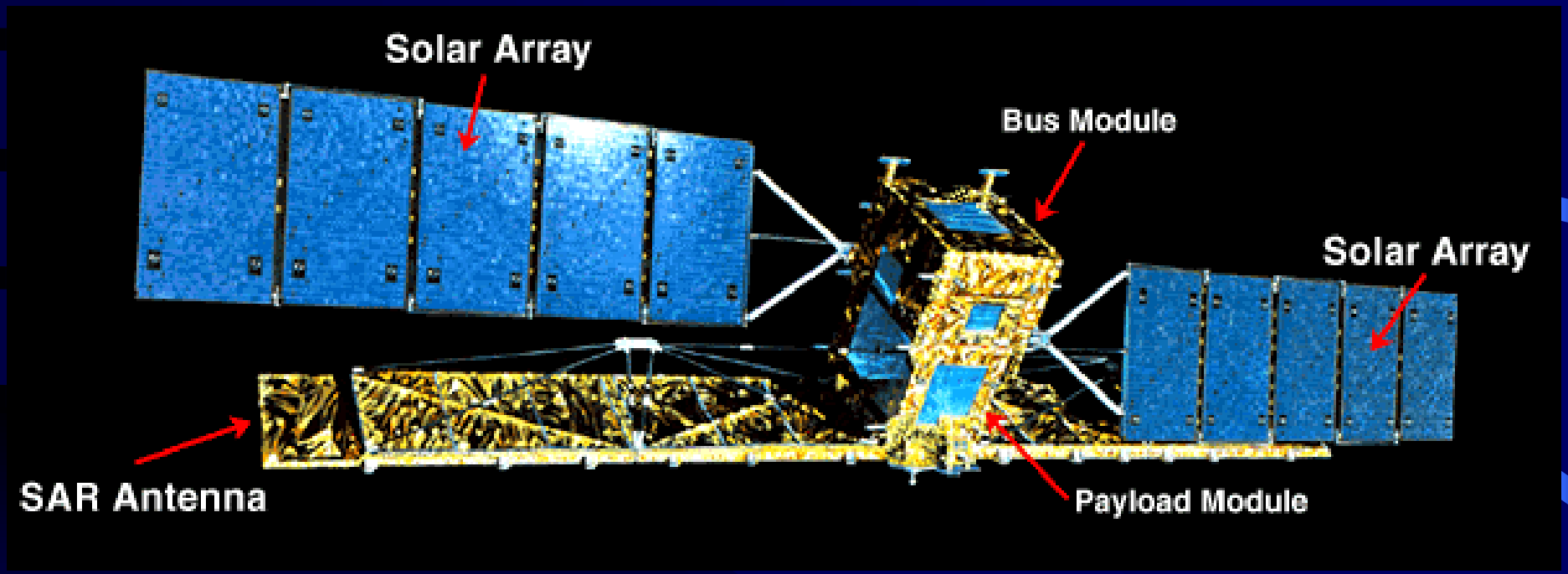
Presentation framework

- RADARSAT : the technology and the capabilities
- RADARSAT : efficient use of the data
- RADARSAT : the benefits

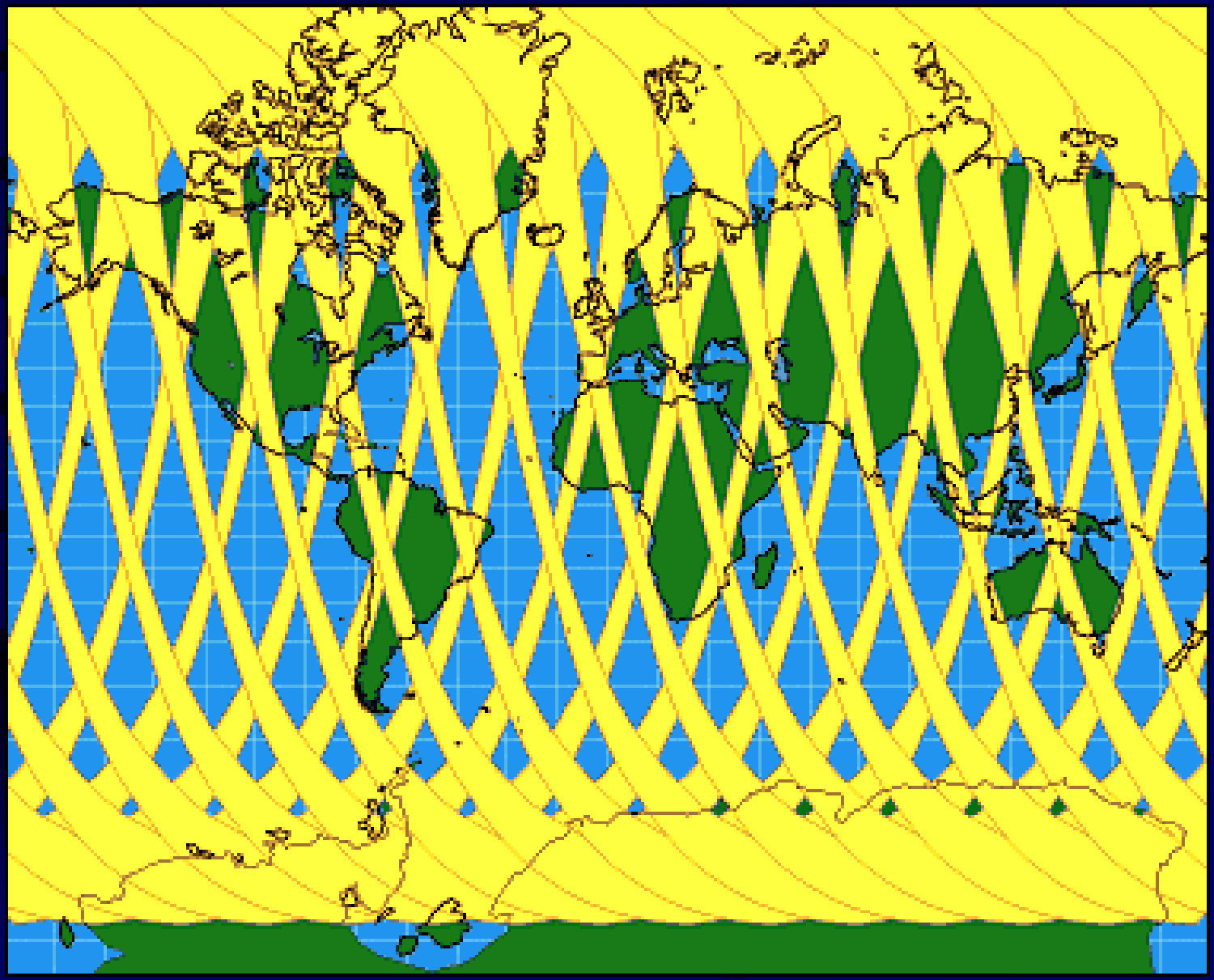
RADARSAT-1 The tool



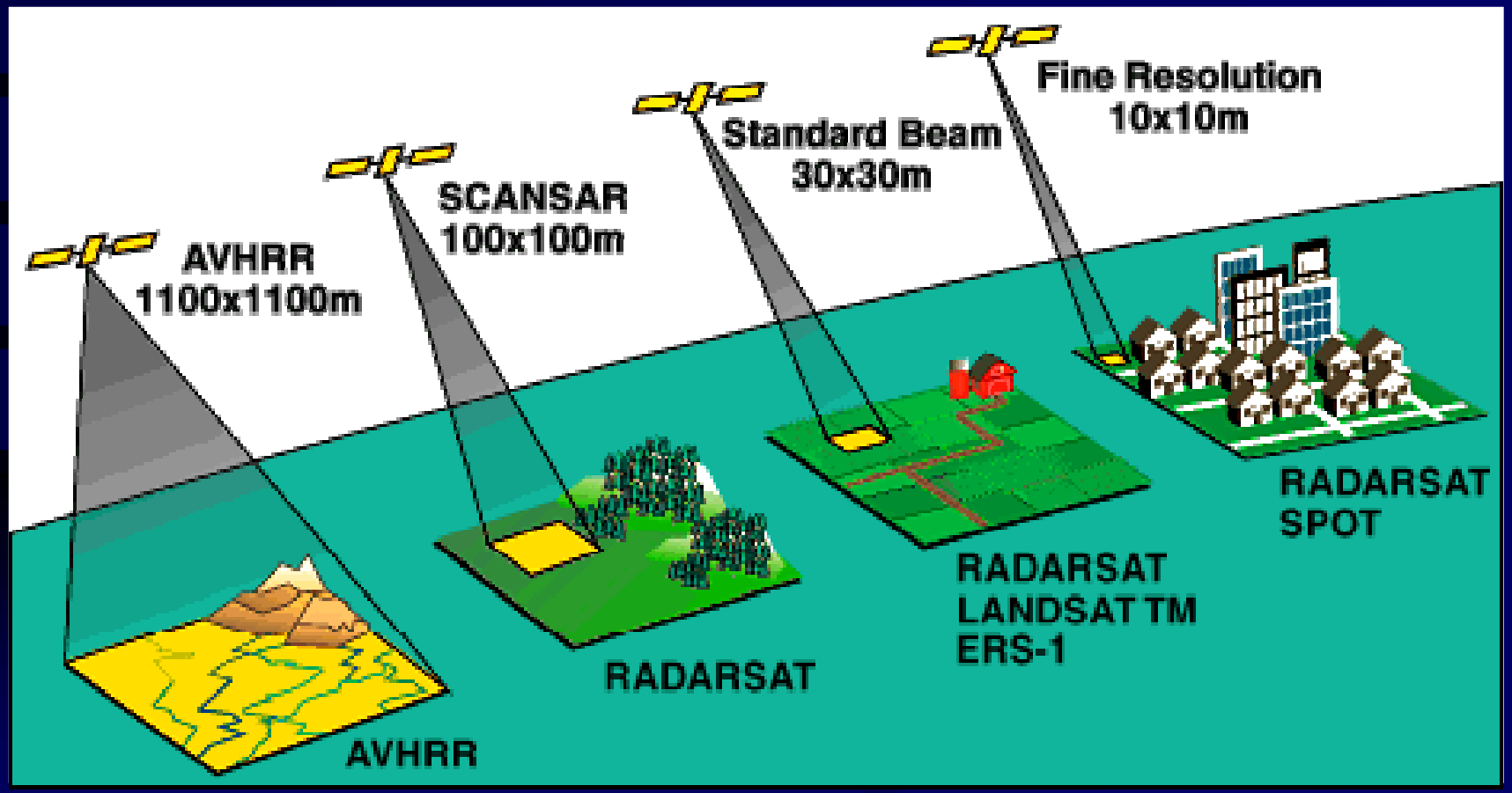
RADARSAT-1 The products

- Up to 5 processing levels
- Coverage between 2500 - 250 000 km^2 per scene
- 36 different beam modes are available
- Resolutions varying between 8 and 100 m
- Incidence angles varying between 10° and 59°
- 2 different look directions

RADARSAT-1 ScanSAR one day coverage



RADARSAT-1 resolution comparison



How to optimize the information content for geological applications

- RADARSAT-1 data will reveal terrain morphology that can lead to geological structure (geological contacts, faults, bedding, etc.)
- Choosing the right resolution, incidence angle, look direction

Guidelines for Geology

Terrain Area	Relief	Recommended viewing geometry (incidence angle)	Features identified
Cordillera Fraser Valley, BC	High 50 – 1370 m	S6 – S7 (40° – 60°)	Block slides, ridges, scarps, faults
Highlands Cape Breton Is, NS	Moderate – high 0 – 350 m	S1 – S4 (20° – 35°)	Faults, folds, drainage patterns, ridges
Canadian Shield Geraldton, ON	Moderate, rolling 300 – 500 m	S1 – S4 (20° – 35°)	Faults, flutes surfaces, eskers, till, organic terrains, some lithotectonic units
Prairies Morden, MN	Low - moderate 300 – 400 m	S1 – S7 (20° – 50°)	Strandlines, flow slides, drainage pattern, alluvium

Adapted from : Singhroy V. and Saint-Jean, R., 1997. “Effects of relief on the selection of RADARSAT beam modes for geological mapping”.

New techniques using RADARSAT

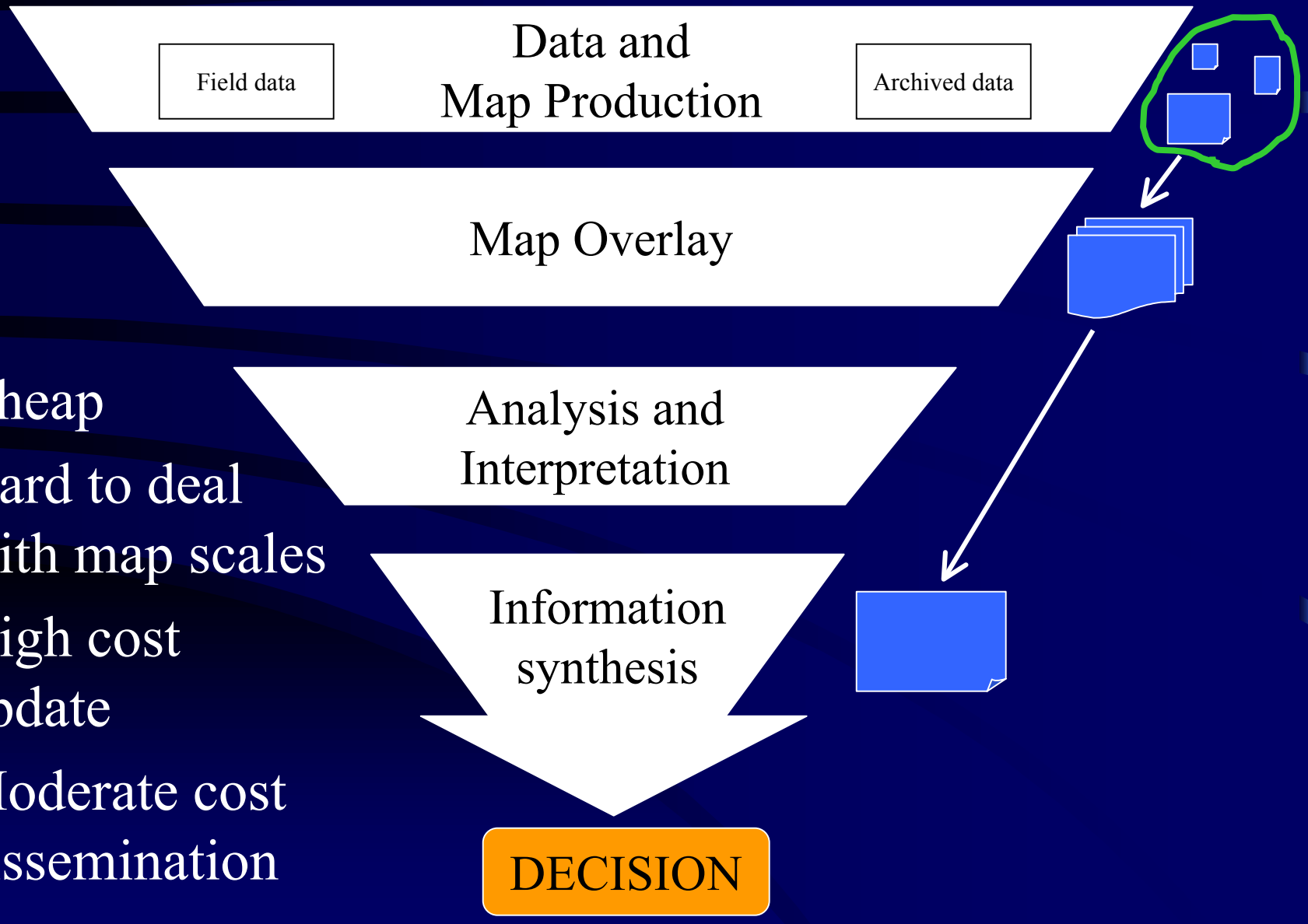
- DEM production using stereo photogrammetry
- Image interpretation using stereo pairs

The GIS concept for remotely sensed information management

- GIS are the tools used to manage the information leading to a sound Integrated Exploration Approach
- RADARSAT data serves as an additional layer of information relevant to the study site
- A clever synthesis of the analysed data can lead to innovative interpretation

Efficient use of the data

The Traditional Method



- Cheap
- Hard to deal with map scales
- High cost update
- Moderate cost dissemination

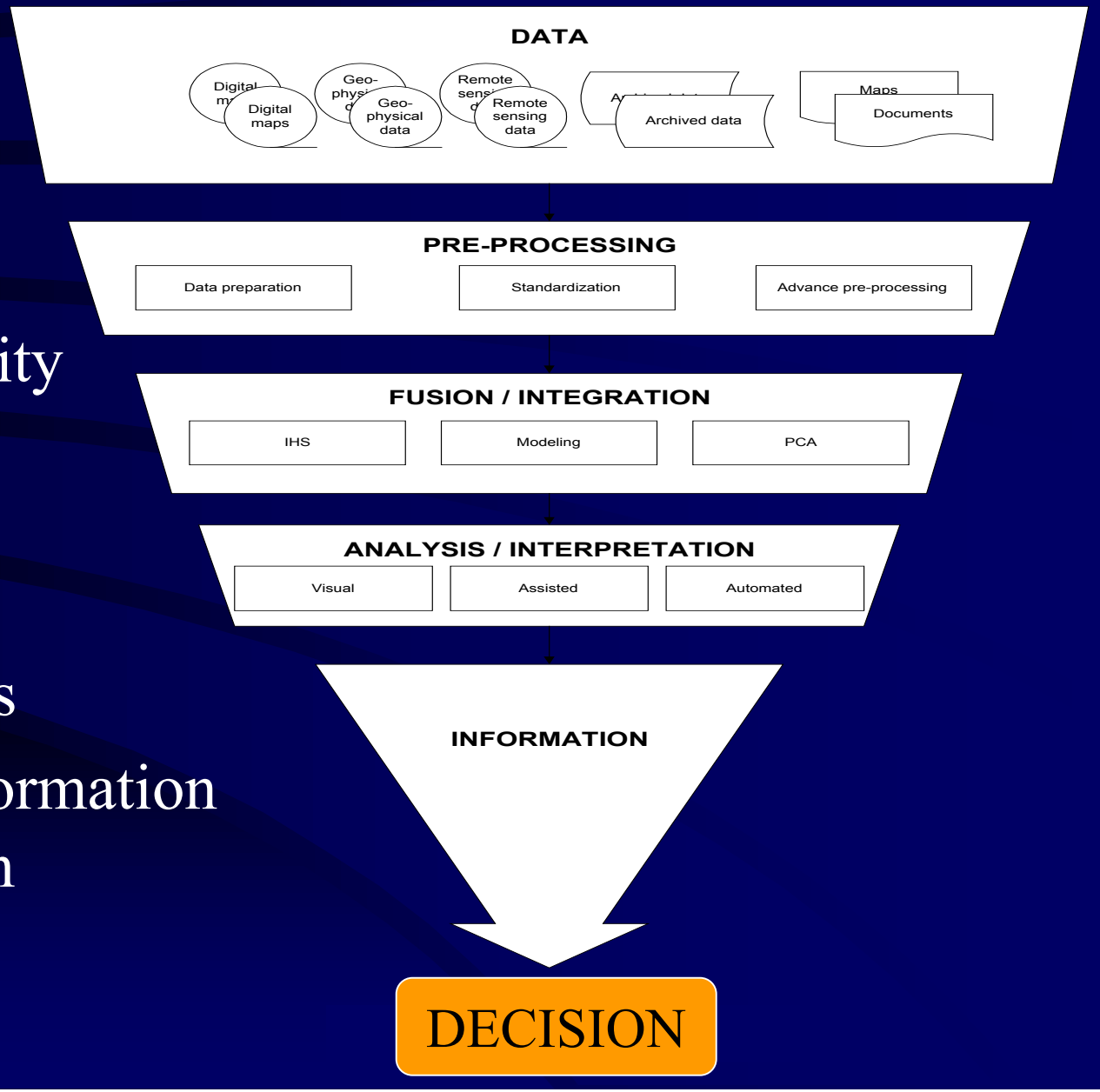
Data Analysis : The Traditional Method

- Hard copy information
- Difficult to deal with various scale, projection, format, medium, etc.
- Analysis = simple data overlay + user interpretation (1st order)
- No physical data fusion or integration - the user only has a mental image
- In this case, the derived information may only be the sum of the information layers

Efficient use of the data

Integrated Exploration Approach

- Total flexibility
  - Standard
  - Analysis
  - Output
- Easy up-dates
- Low cost information dissemination



Data Analysis : The Integrated Exploration Approach

- Various sources of digital information - easy to manipulate, total flexibility for scale and projection
- Analysis = data fusion/integration + user interpretation
- Data fusion/integration techniques: IHS, image arithmetic, principal components analysis, etc.

"The integrated image has more value than the sum of its components"

Derived Information from Traditional and Integrated Exploration Approaches

Data overlay

Input data

Information

Data fusion and integration

Input data

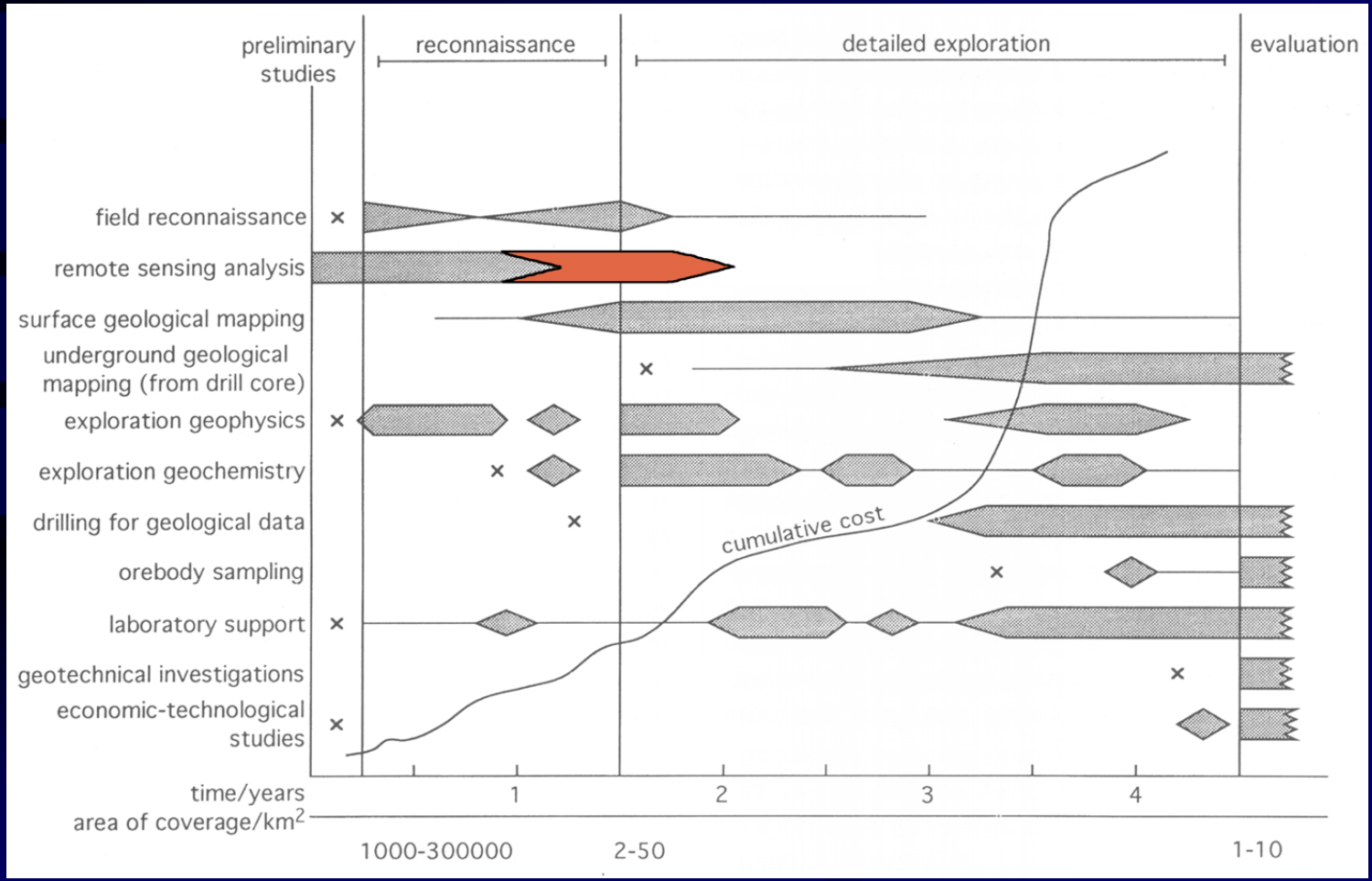
Information

Cost effectiveness of some exploration methods

Method	Cost (US $)	Efficiency (km^{-2} day^{-1})
Preliminaries		
RADARSAT scene	0.28 km^{-2} (1998 data)	10^4
Interpretation and map	0.7 km^{-2}	10^4
Airborne Remote Sensing	10 km^{-2}	500
Interpretation and map	5 km^{-2}	50
Airborne Geoph. (MAG, EM)	25 km^{-2}	500
Interpretation and map	10 km^{-2}	25
Literature search	250 day^{-1}	—
Field studies		
Geological reconnaissance	160 km^{-2}	10
Geochemical survey (soil)	750 km^{-2}	2
Geophysical survey (IP)	160 km^{-1}	0.5
Diamond drill cores	40 m^{-1}	—
Shaft sinking	5000 m^{-1}	—

Adapted from : S.A. Drury, 1993. “Image Interpretation in Geology”, second edition. (1988 data)

General stages of a mineral exploration program



Adapted from : S.A. Drury, 1993. “Image Interpretation in Geology”, second edition.

Conclusion

- RADARSAT-1 data is rich in information for geologists
- A cleaver Integrated Exploration Approach of the data can lead to innovative interpretation
- For Remotely Sensed data, the benefit / cost ratio is high