Remote Sensing……in the beginning and later….

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What do we consider as the beginning of EO from space?

I suggest: 1972 Why?

before 1972:

-earth observation was exlusively by aerial pictures*

-first meteorological satellite: 1-st April 1960- TIROS1

-EO from satellite from space (Corona-KOSMOZ), military, no public access*

*Analogue systems

What happend in 1972?

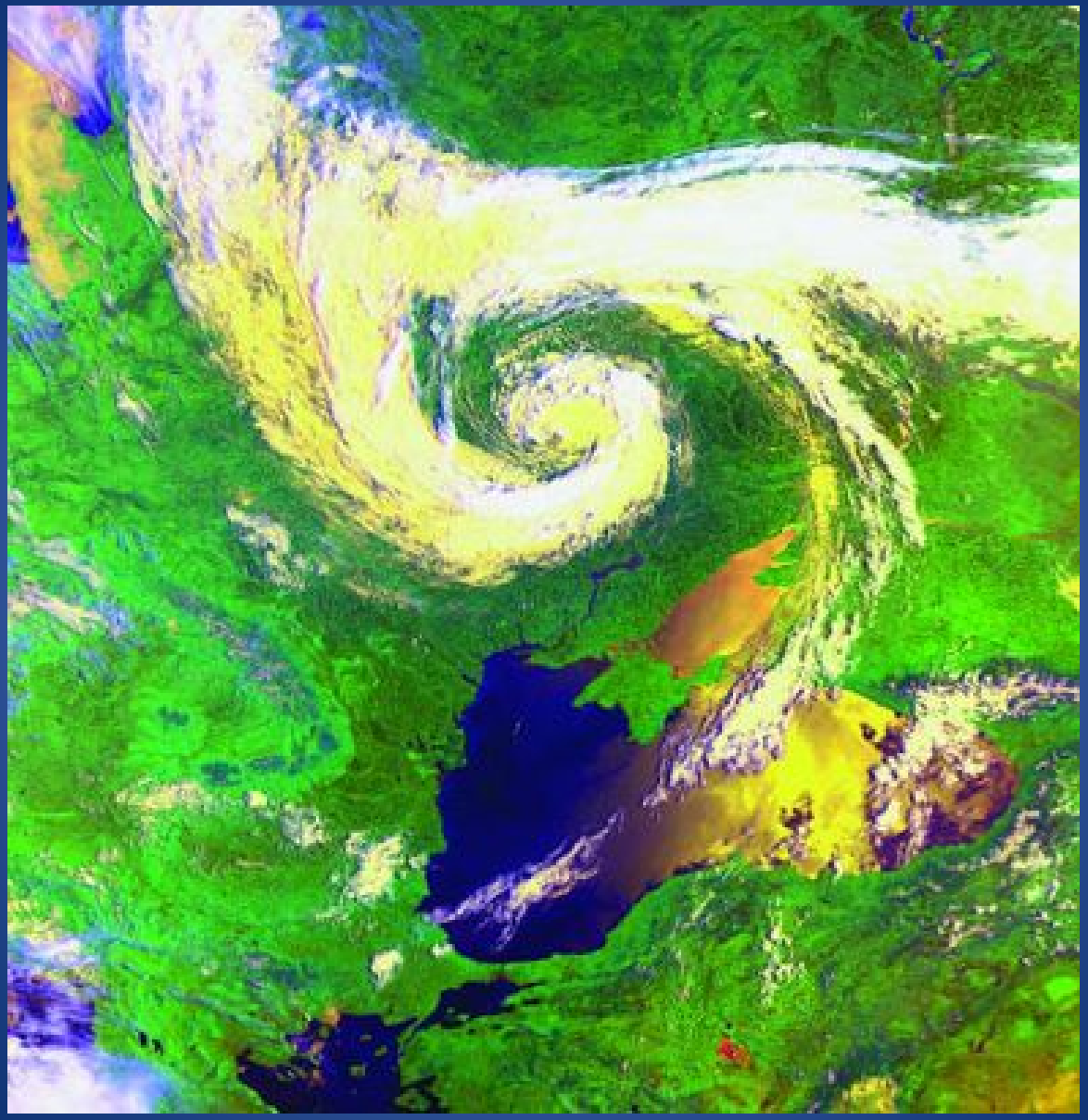
-Launch of ERTS-1, Landsat 1: 23-07-1972

-Launch of NOAA-2 AVHRR: 15-10-1972

	ERTS-1 Landsat 1	NOAA-2 AVHRR
-resolution -bands -prize	79 meter 4: G, R, NIR 8000 US$	1 km 4: R, NIR, SWIR, TIR Only for MET Off

79 meter resolution

1 km resolution



And that came to us…..”remote sensing people”

We were used to work with aerial pictures:

-resolution: 10-50 cm

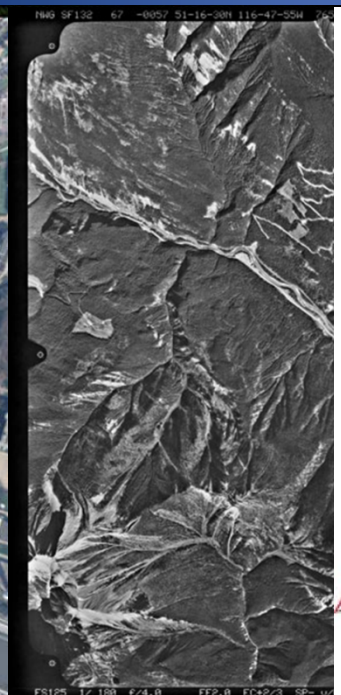
-panchromatic or colour, sometimes CIR, B&W IR

-in stereo, by definition

-analouge interpretation and mapping methods

+stereographic mapping for the topography

+the use of interpretation kyes and PMU mapping



Sl. No.	Ground Features	Interpretation keys				
		Tone	Texture	Shape/ size	Pattern	Association
1	Salt affected soil	Dull white	Rough	Irregular	Dispersed	Weed /grass
2	Waterlogged area with weeds	Blackish red mixed tone	Smooth	Irregular	Dispersed	Salt tolerant weed
3	Normal soil	White gray, white tone	Smooth	Irregular	Regular	Irrigated land
4	Plantation /orchards	Bright red, red and dark red	Smooth	Fixed	Regular	Near road side
5	Sand dunes	Bright white tone	Medium to coarse	Uniform	Contiguous	Shrub/arid plantation
6	Settlement (Habitation)	Cyan, gray pinkish mixed tone	Mottled	Irregular	Clustered	Pond
7	Feeder (Rajasthan canal)	Dark black-bluish line	Smooth	Regular	Linear	Plantation & Un-mettle road
8	Railway line	Dark black with reddish mixed tone	Smooth	Regular	Linear	
9	Metalled road	Black tone	Smooth	Regular	Linear	

And that came to us…..”remote sensing people”

We were used to work with aerial pictures:

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And we got:

-80 meter resolution

-monoscopic images

-BUT MULTISPECTRALITY

→ separation between the photogrammetry and the image interpretation research

What to do with these new “possibilities”?

The “old” known techniques were applied to this new imagery, including:

Do not forget, this imagery came under the form of negative film emulsions to the lab’s.

image processing techniques:

-image enhancement, band by by band by the use of high γ-fims

-images enlargments, by photographic enlargments

-colour composites by diazo thechniques

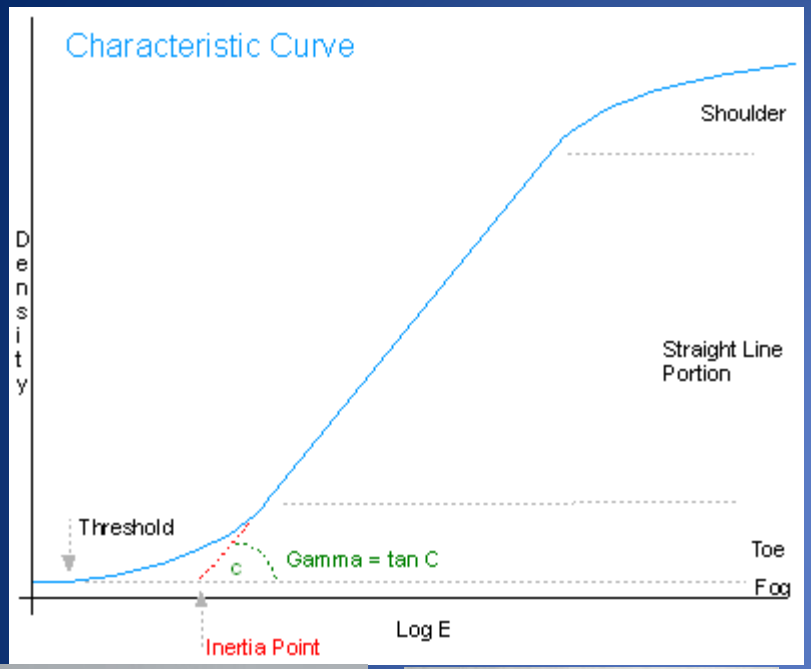
-density analysis by a densitometer on the film

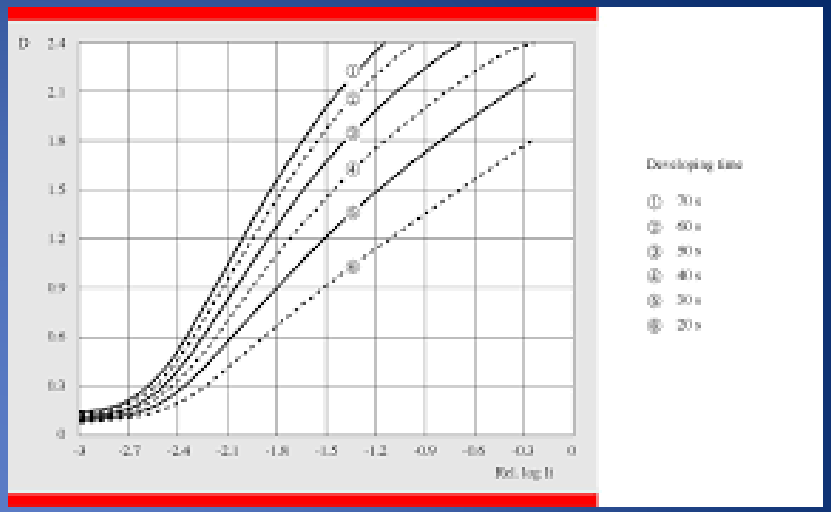
image interpretation methods:

-PMU-mapping

-interpretation keys

image enhancement, band by by band by the use of high γ-fims





Estimated time for 1 enhancement of one band: 1h 1h30min

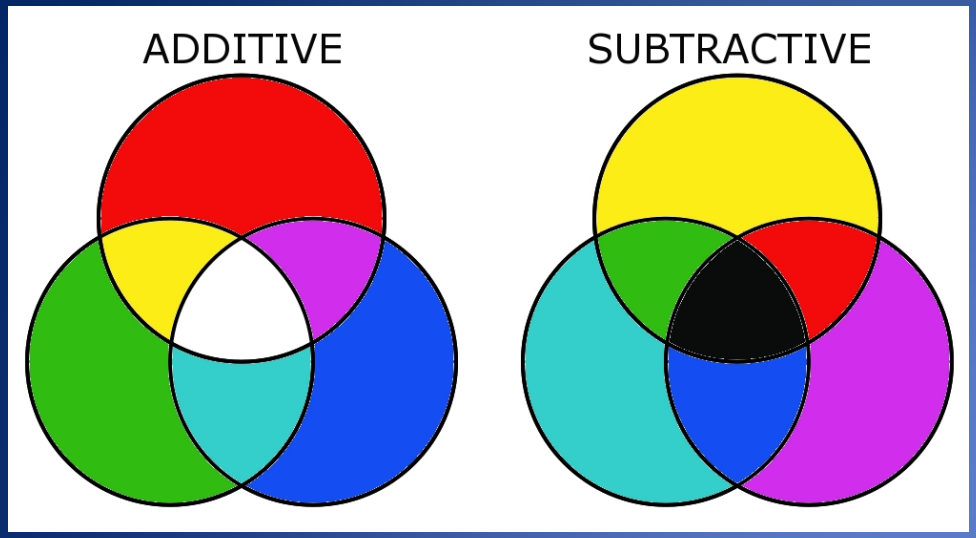
image enlargements by photographic enlargments

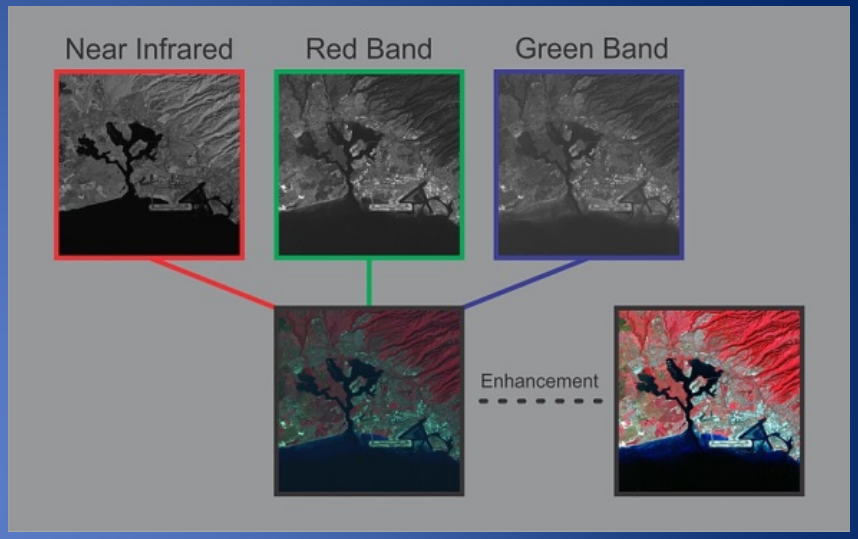
Estimated time for 1 enlargement of one band: 1h 1h30min

colour composites by diazo thechniques

Developed in amonia vapour !!!!!!!

colour composites by diazo thechniques





The only possibility were FCC

Estimated time for 1 FCC based on 3 bands: 3-4 days

Problems: -colour balance between the 3 bands

-much experimental work

density analysis by a densitometer on the film

interpretation keys and PMU mapping

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The (early) 80's

-The introducion of digital image processing

-Landsat 4: 14-th of July 1982

-7 bands (+SWIR, TIR)

-30 meter resolution

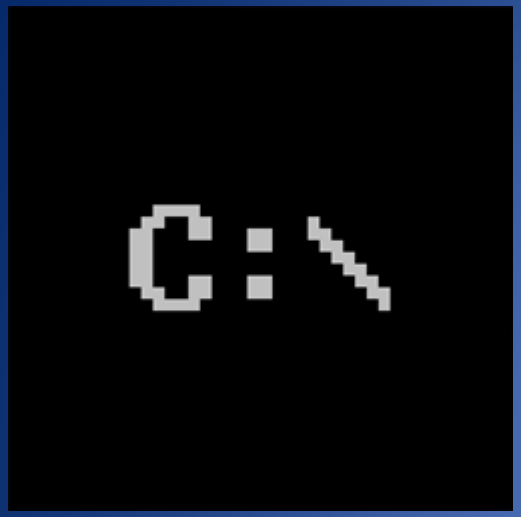
-SPOT-1: 22-nd of February 1986

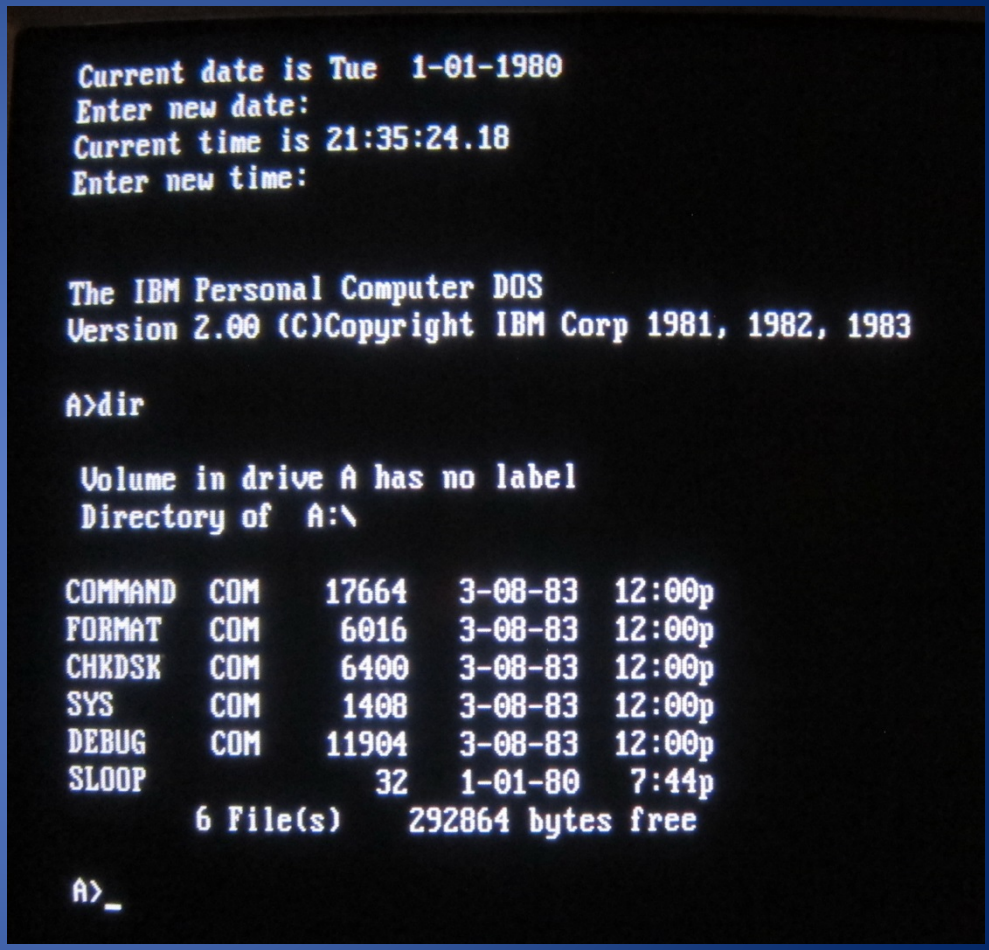
-20 meter resolution is XS

-10 meter resolution in P

-stereo capacity from space

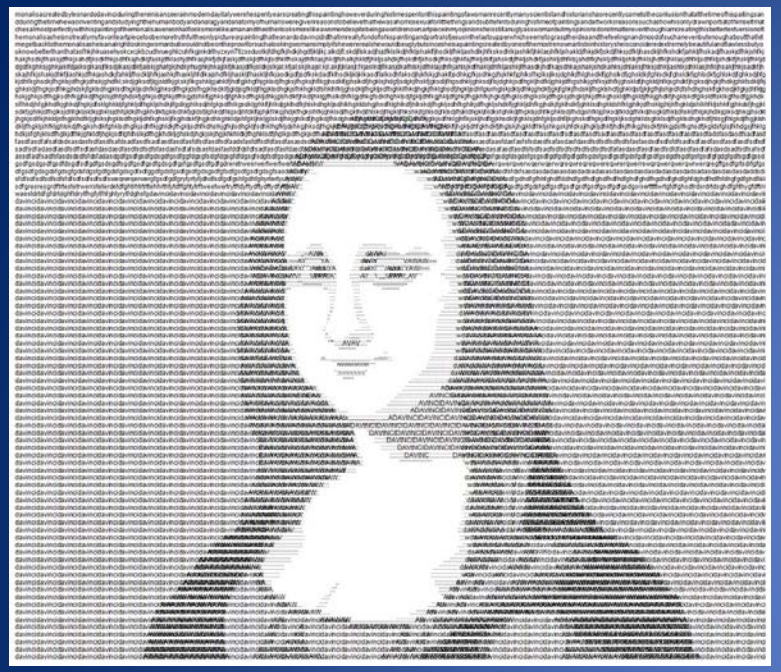
The introduction of digital image processing

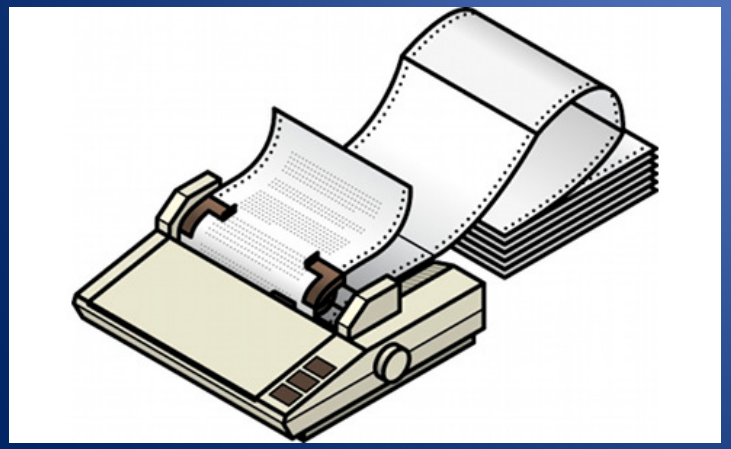




IBM 286

The introducion of digital image processing





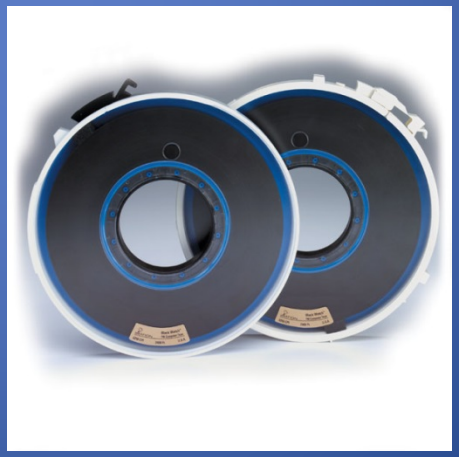
The introducion of digital image processing

-colour display in 4 colours, later 16 colours

-image size: 256 * 256 pixels

512 * 512 pixels

the sub-scenes had to be cut from the full-scenes, stored on CCT's, loaded on a main frame computer and cut from there. E.g. 1 CCT per Landsat 4 –band.



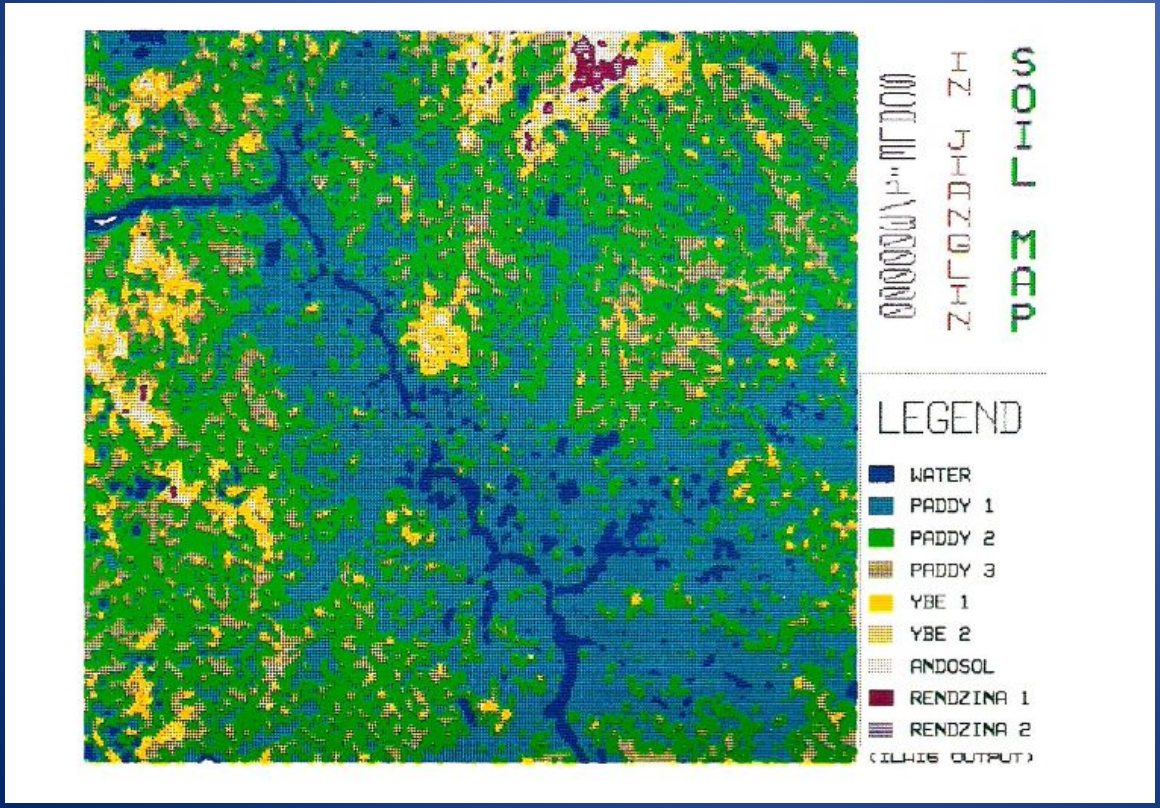
-Image processing: image slicing, lineair stretch

The introducion of digital image processing

-an image classification of an image of 512 * 512 pixels took +/- 24h (max.likelihood)

-limited number of classes

-limited lay out possibilities



O.K., the image display improved, more colours, some faster processing with the IBM 386

But: all the ancillary data where in analogue format and these data needed to be digitised mannualy

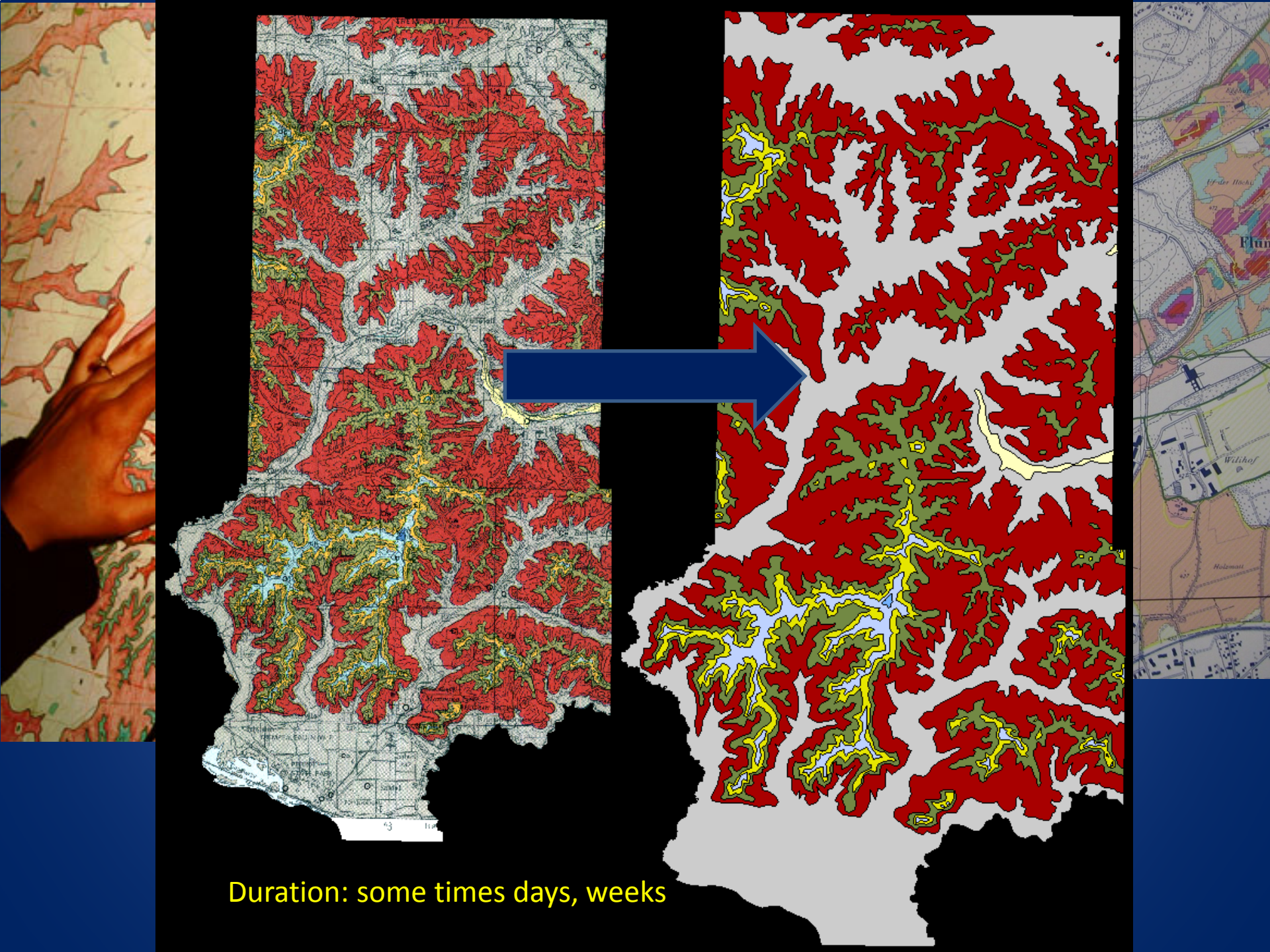
-contour lines to build a DEM

-polygone lines for geology, soil, land use

-points and tables for climatology, soil properties , like chemical composition, salinty etc…


2 3 C
5 6 D
8 9 E
0 B F


1 2 3 C
4 5 6 D
7 8 9 E
A 0 B F


Duration: some times days, weeks

Now a days: all these ancillary data is in digital form available, often for free or at limited prices.

e.g.:

-DEM's: ASTER and SRTM, Regional DEM'sNational Geographic Institute's

-climatic data: NOAA, EUROMET…

-geology, soils, vegetation, LULC etc: USGS, different national and regional offices

The “big” chance: end of the 90’s

-For the first time VHR-images for civilian purposes

launch IKONOS-2: 26 September 1999

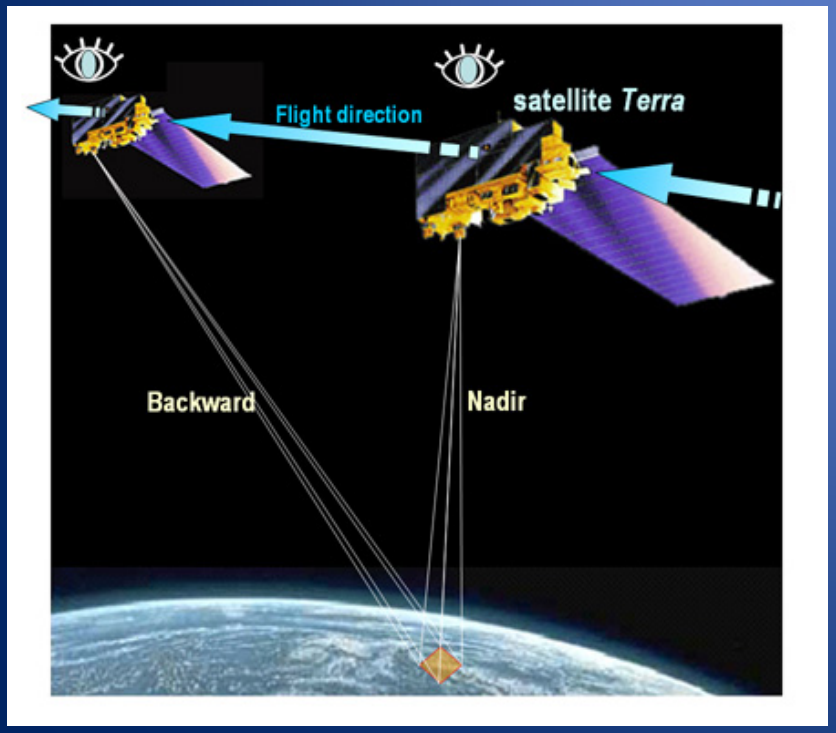
-1m resulution in P

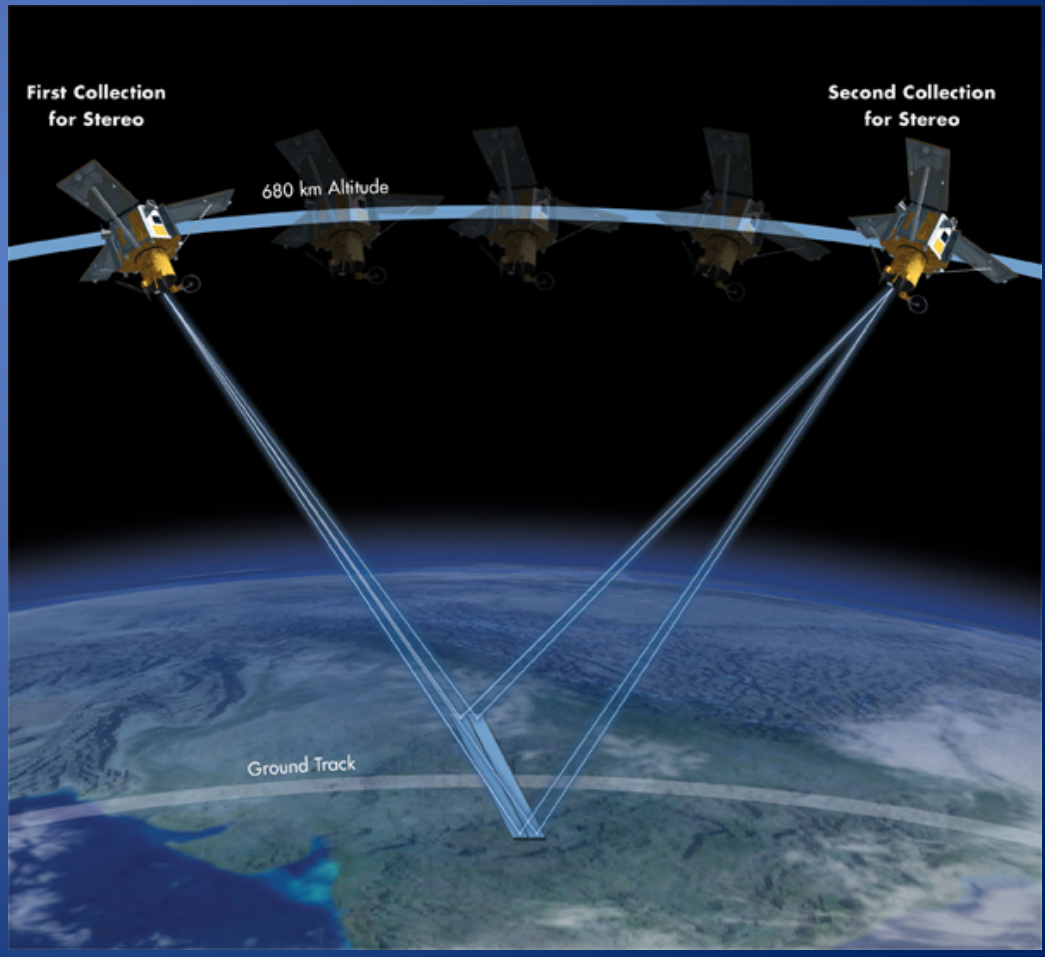
-Stereo capacities!!! From space

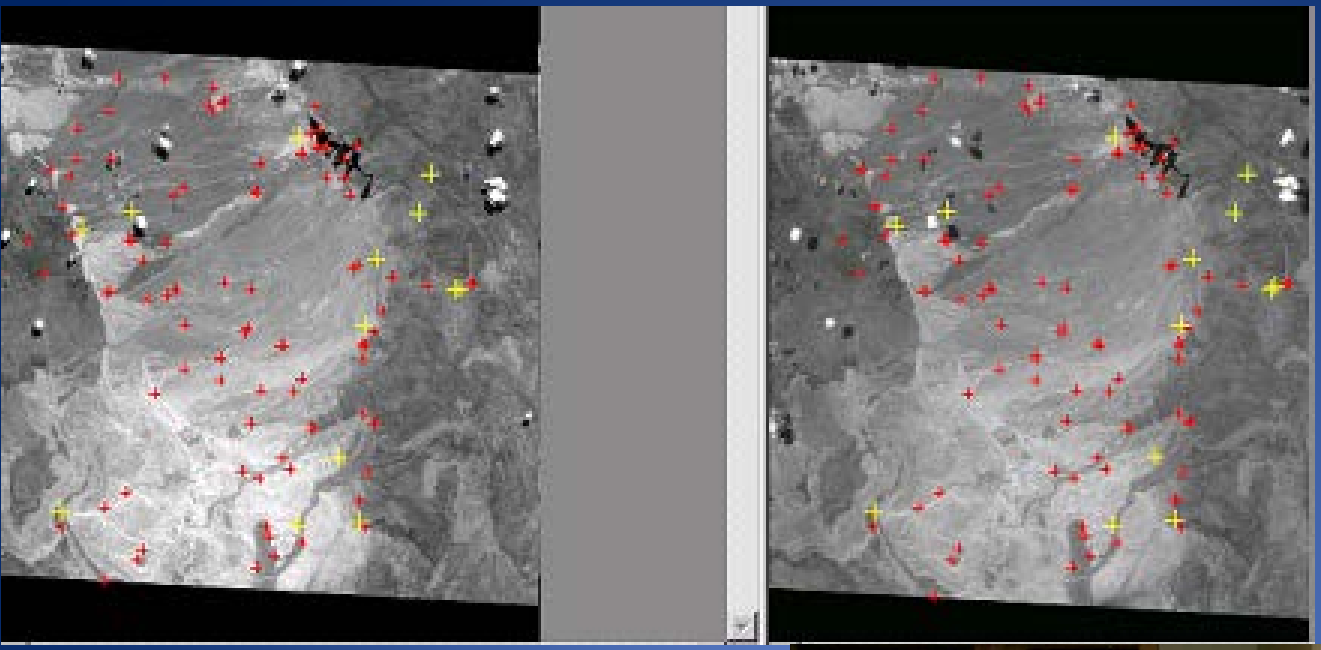
launch Terra-Aster: 18 December 1999

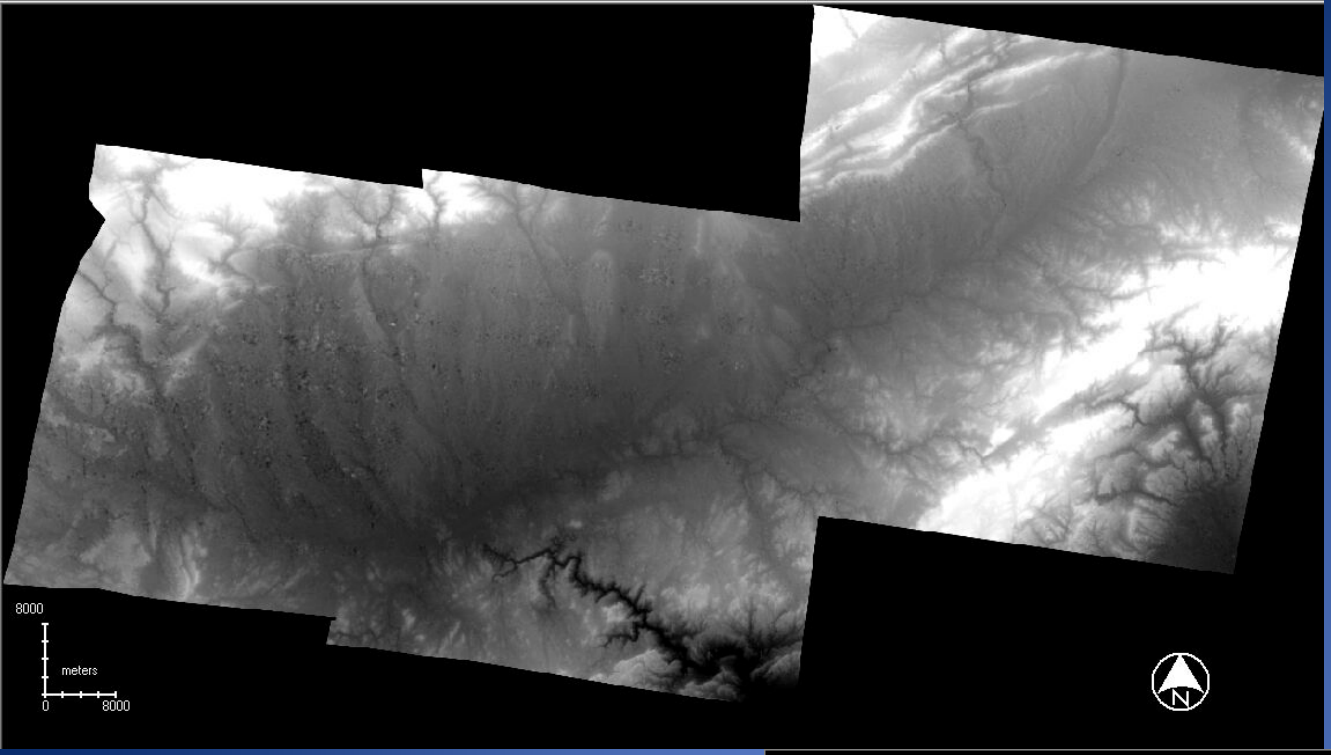
-Photogrammetry becomes digital and is re-entering the “remote sensing community” again due to the finer resolution and the stereo capacities from space images

Stereo-recording from Space








8000
meters
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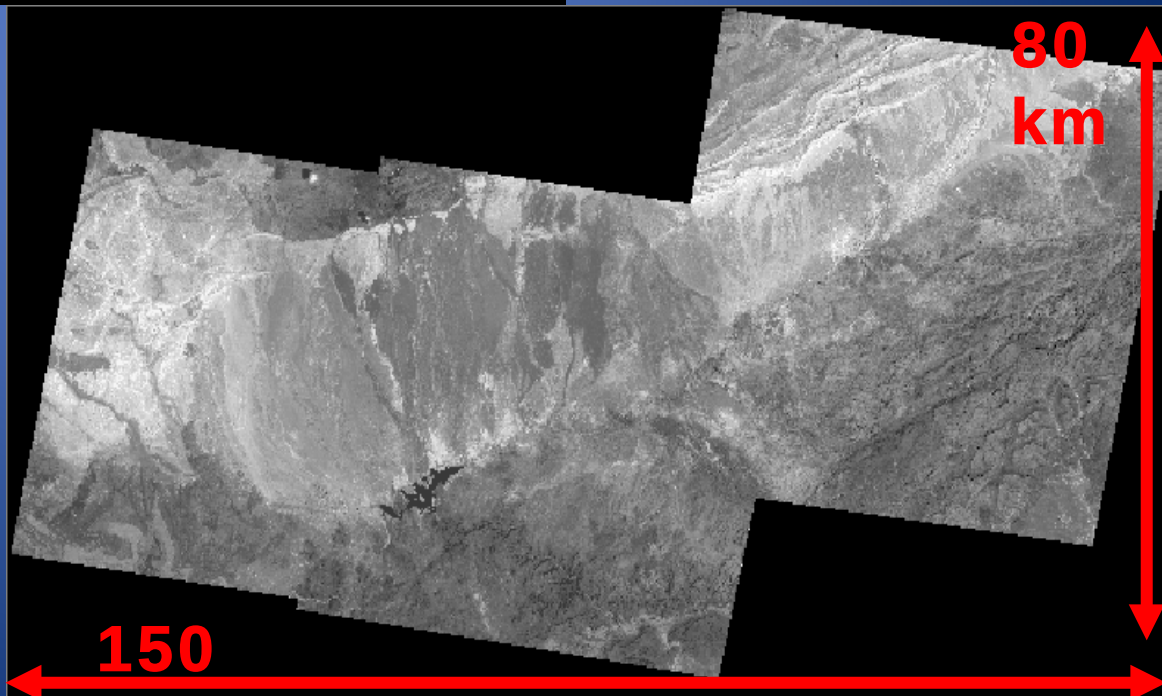
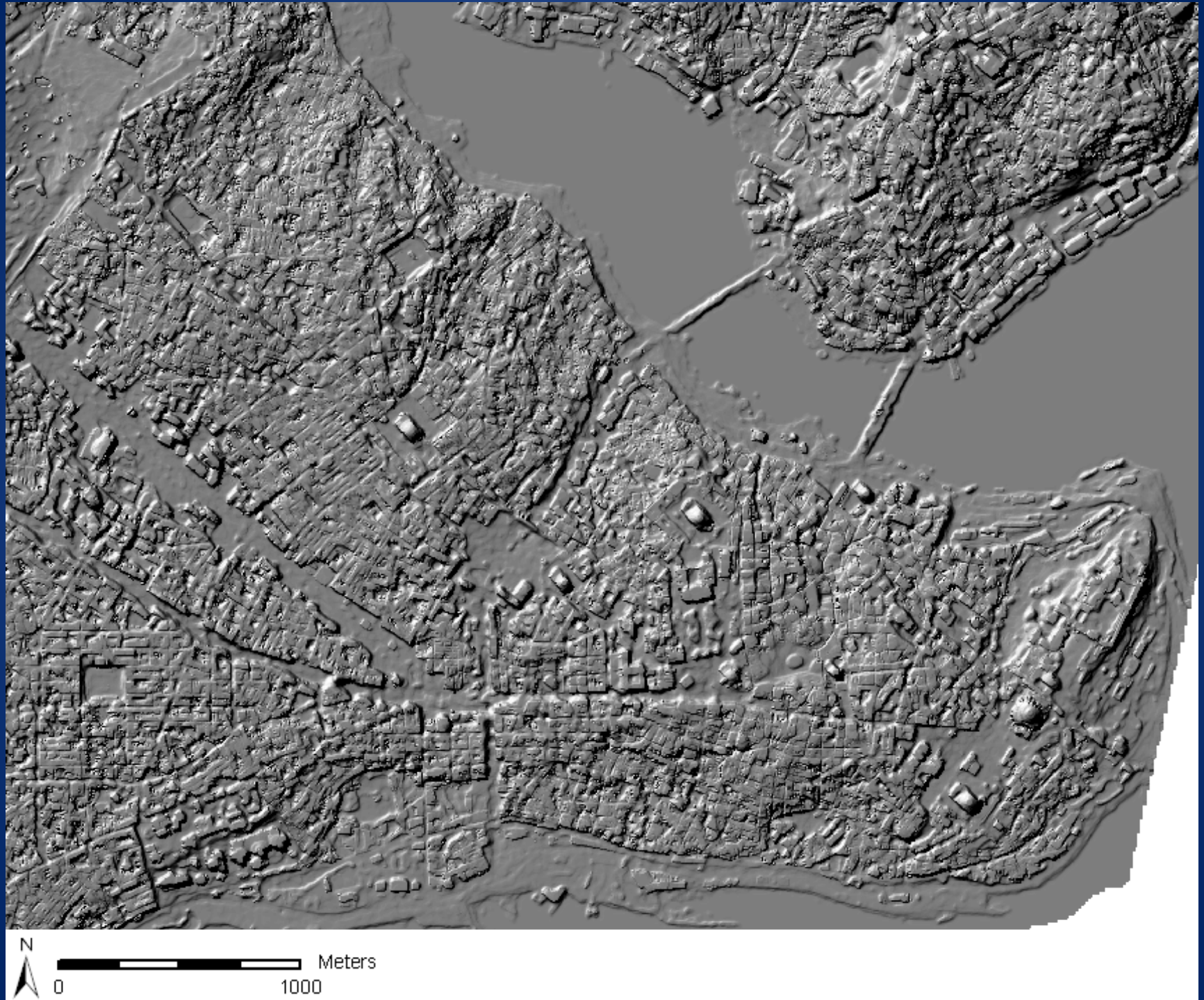
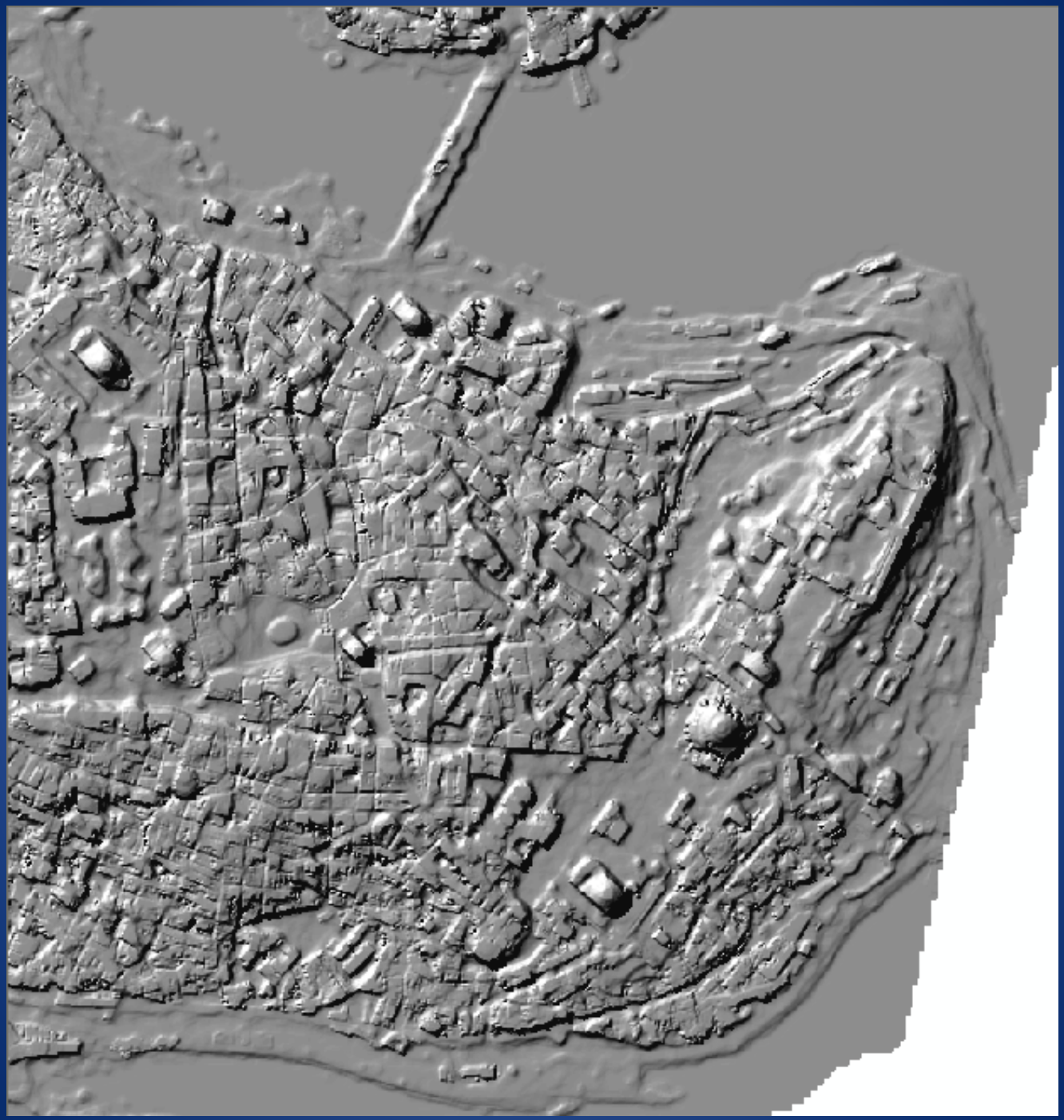
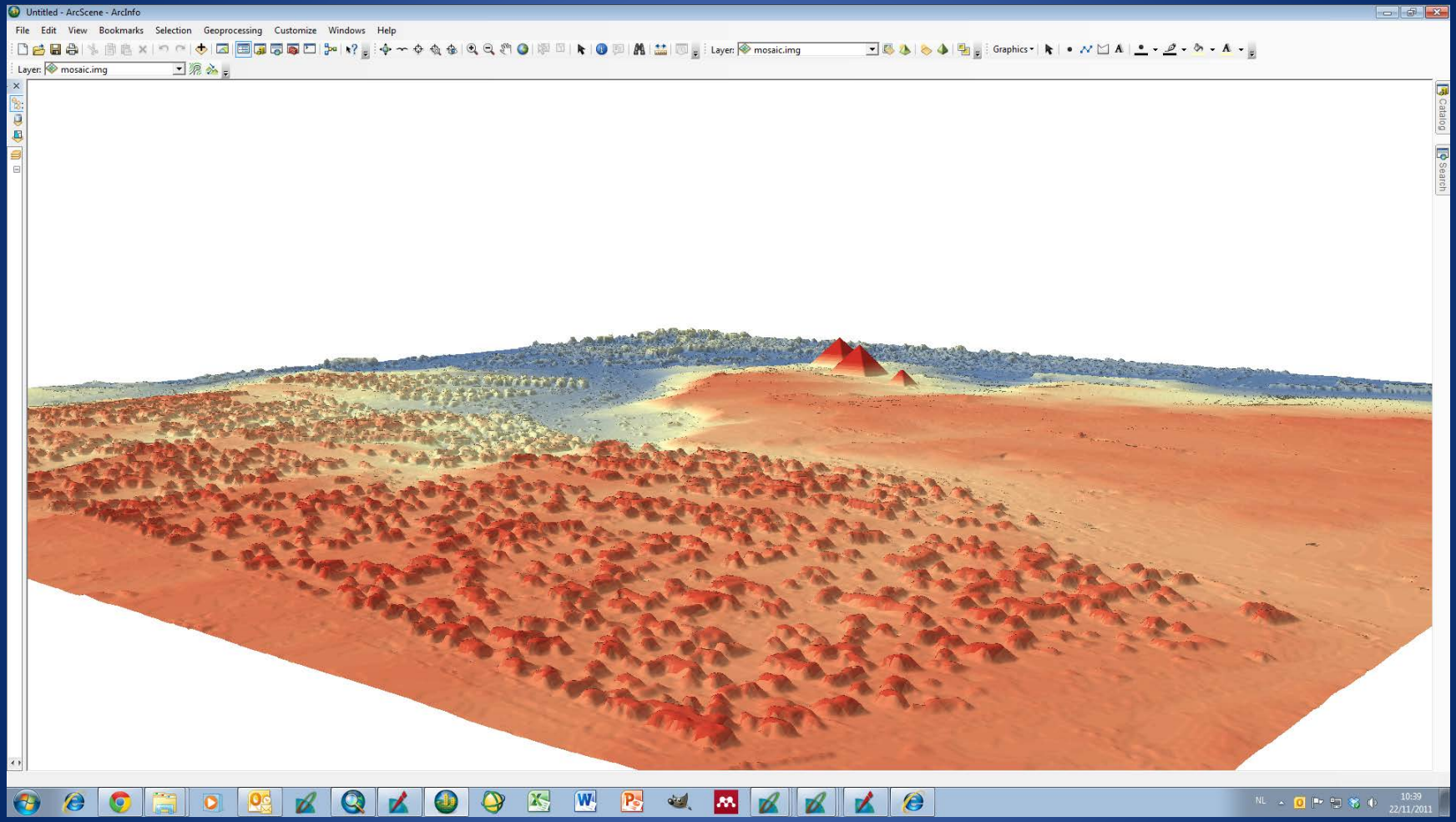
8000
N


80
km
150

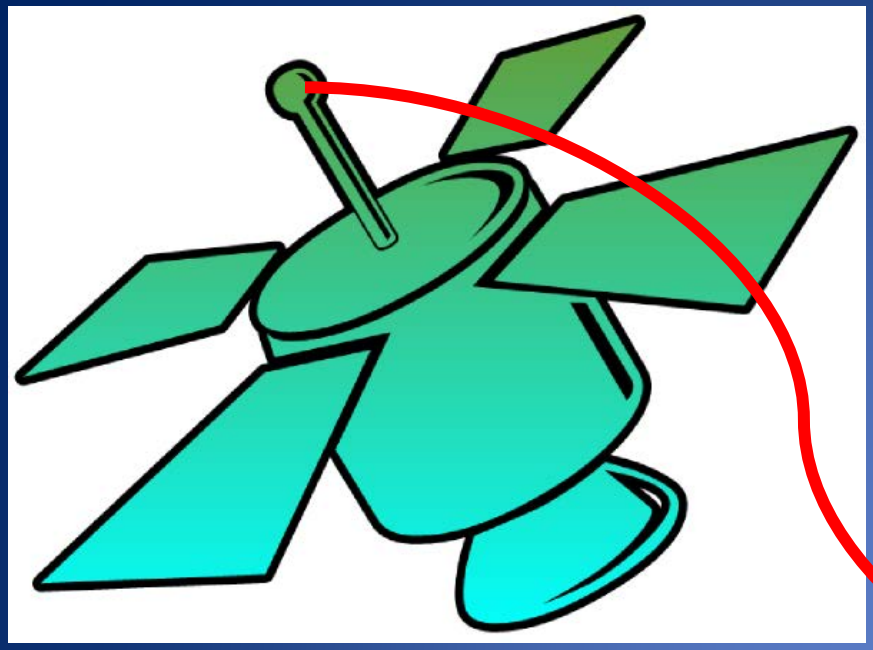

N
Meters
0
1000




Untitled - ArcScene - ArcInfo
File Edit View Bookmarks Selection Geoprocessing Customize Windows Help
Layer: mosaic.img
Graphics
Layer: mosaic.img
Catalog
Search

And so…after more than 40 years …we end up with a fine resolution and stereo-viewing

but with
-multispectrality
-wide range of resolutions (ground, temporal, radiometrical)
-digital processing



Thank you for your attention….

And let’s stay in contact