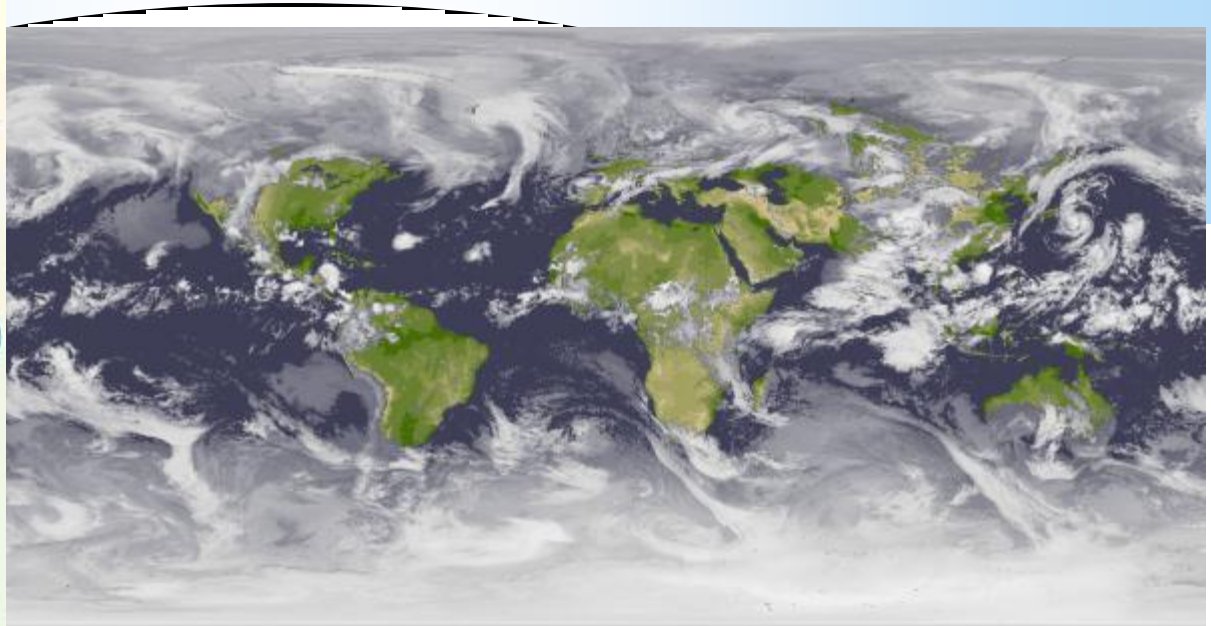


Introducere in teledetectie



Definitie:

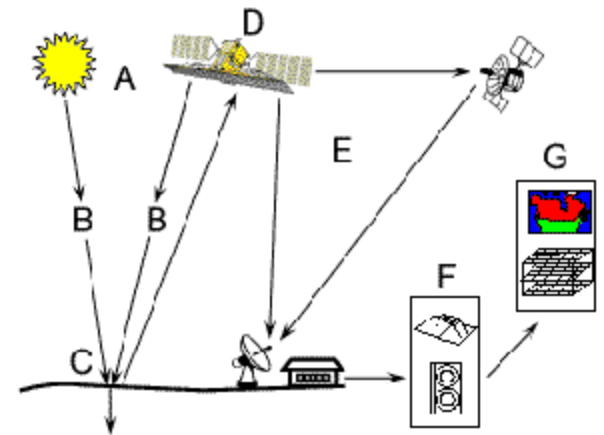
Remote sensing (engl.)

Teledetection (fr.)

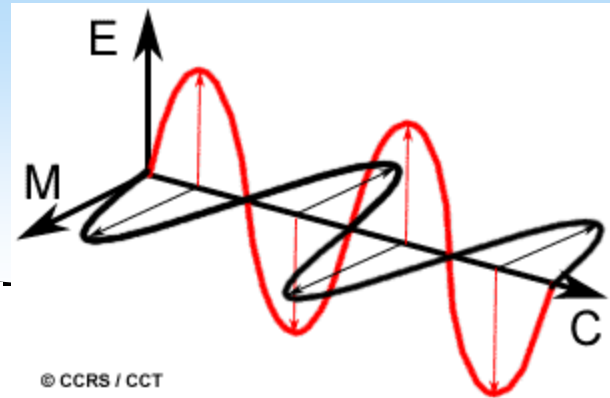
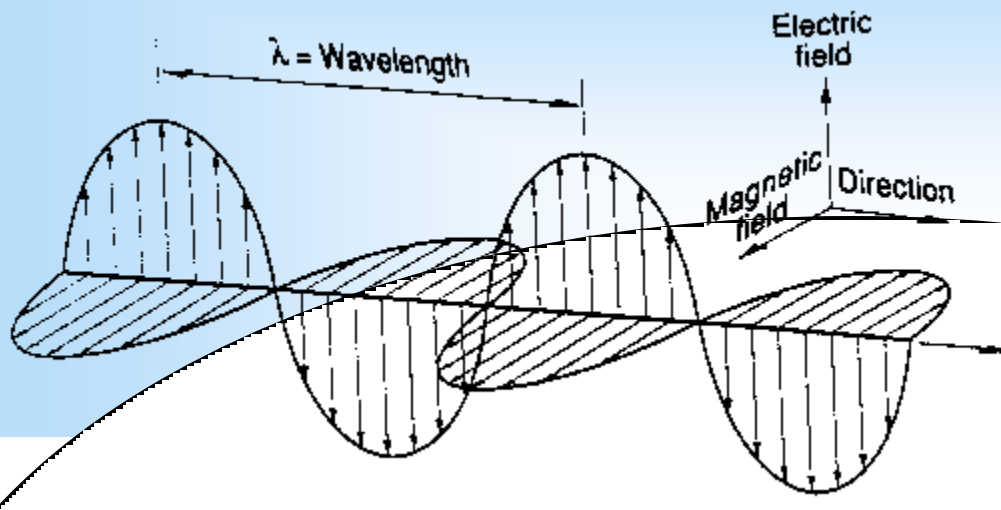
Telerivelmento (it.)

"Remote sensing is the science (and to some extent, art) of acquiring information about the Earth's (or any other) surface without actually being in contact with it. This is done by sensing and recording reflected or emitted (electromagnetic) energy and processing, analyzing, and applying that information."

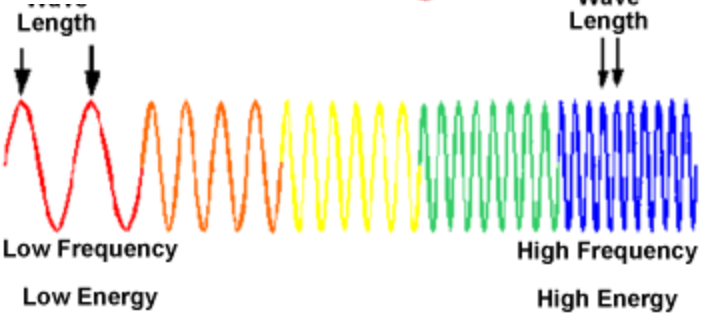
In general ar pute fi incluse si tehnici geofizice (magnetism, gravimetrie)
Dar este limitata la radiatia electromagnetica



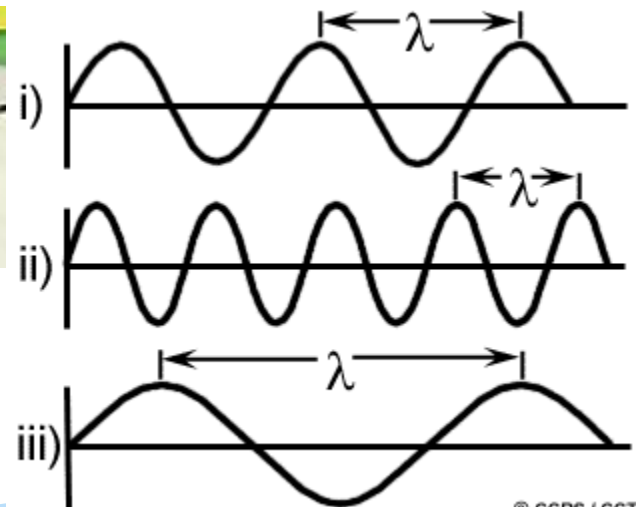
Radiatia electromagnetica



© CCRS / CCT



(NOTE: Frequency refers to number of crests of waves of same wavelength that pass by a point in one second.)

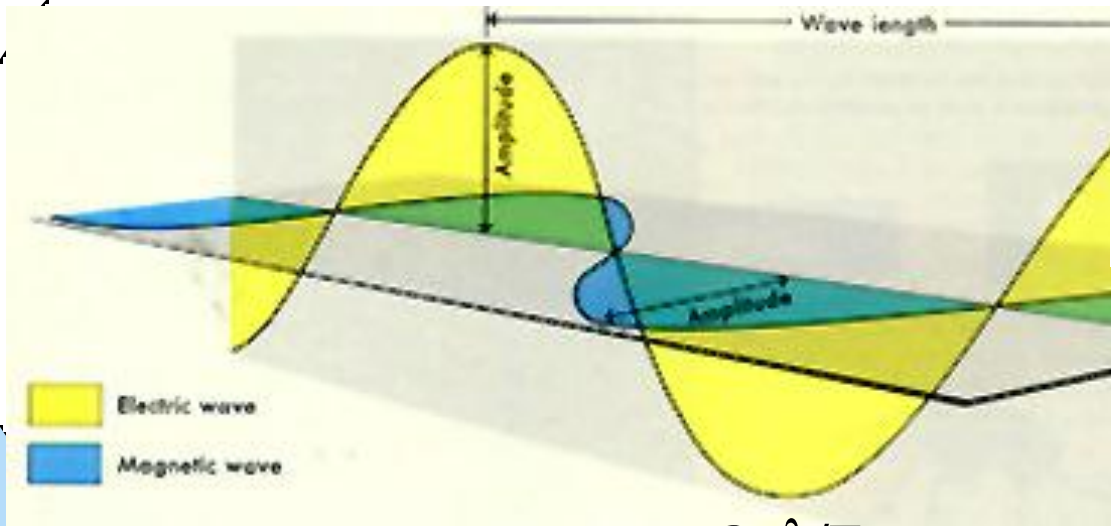


© CCRS / CCT

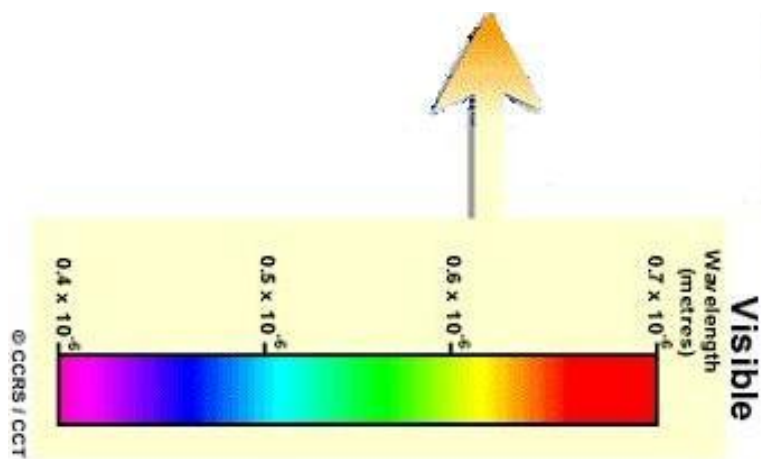
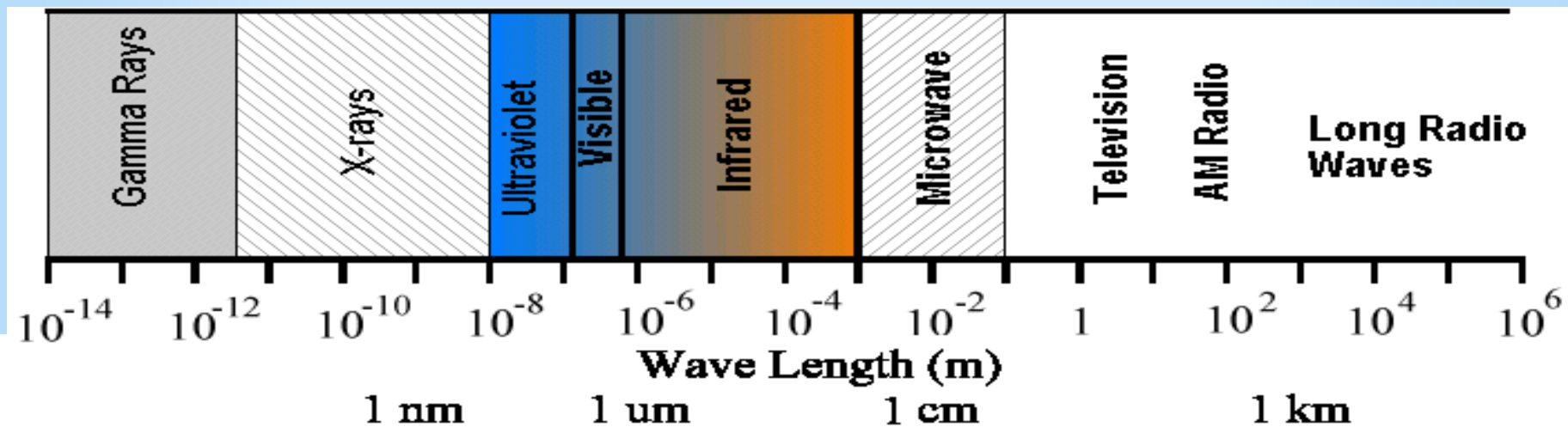
$$C = \lambda / T$$

$$\nu = 1 / T$$

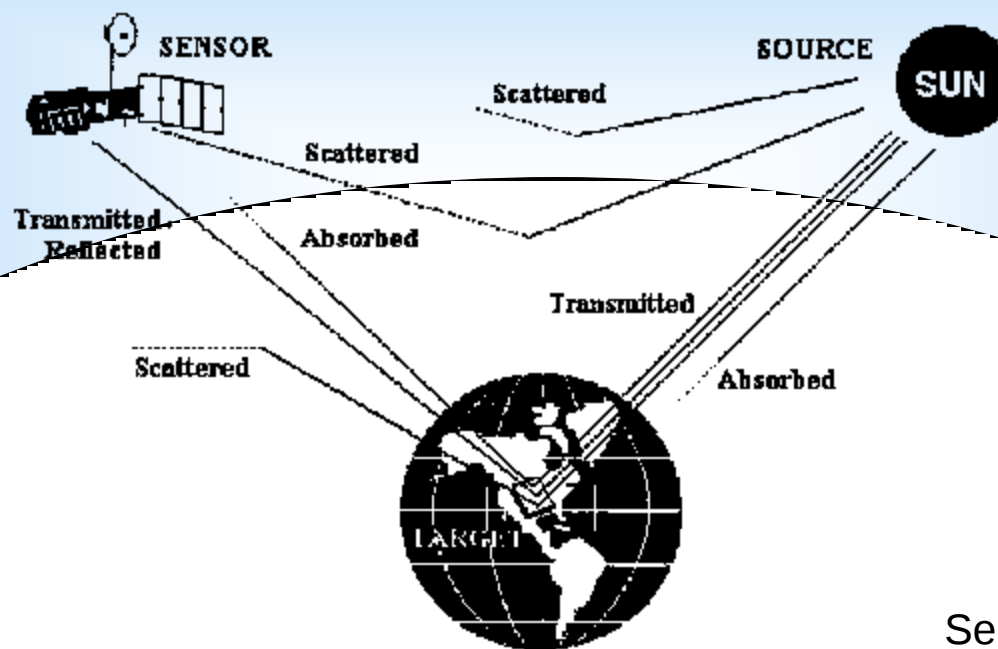
$$\nu = C / \lambda$$



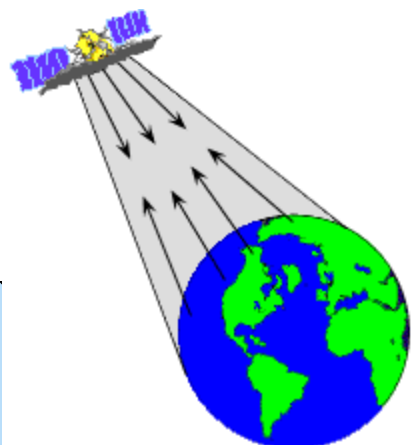
Electric wave
Magnetic wave



Detectia radiatiei

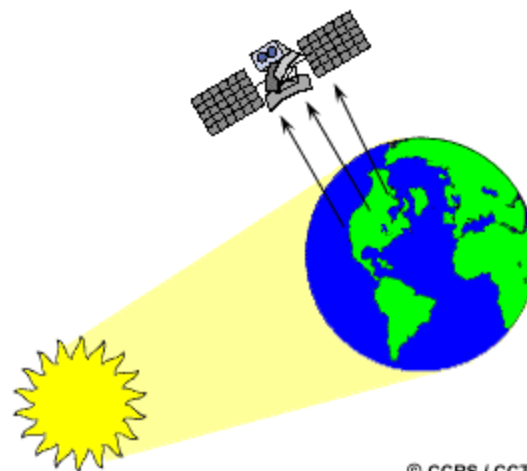


Senzori activi



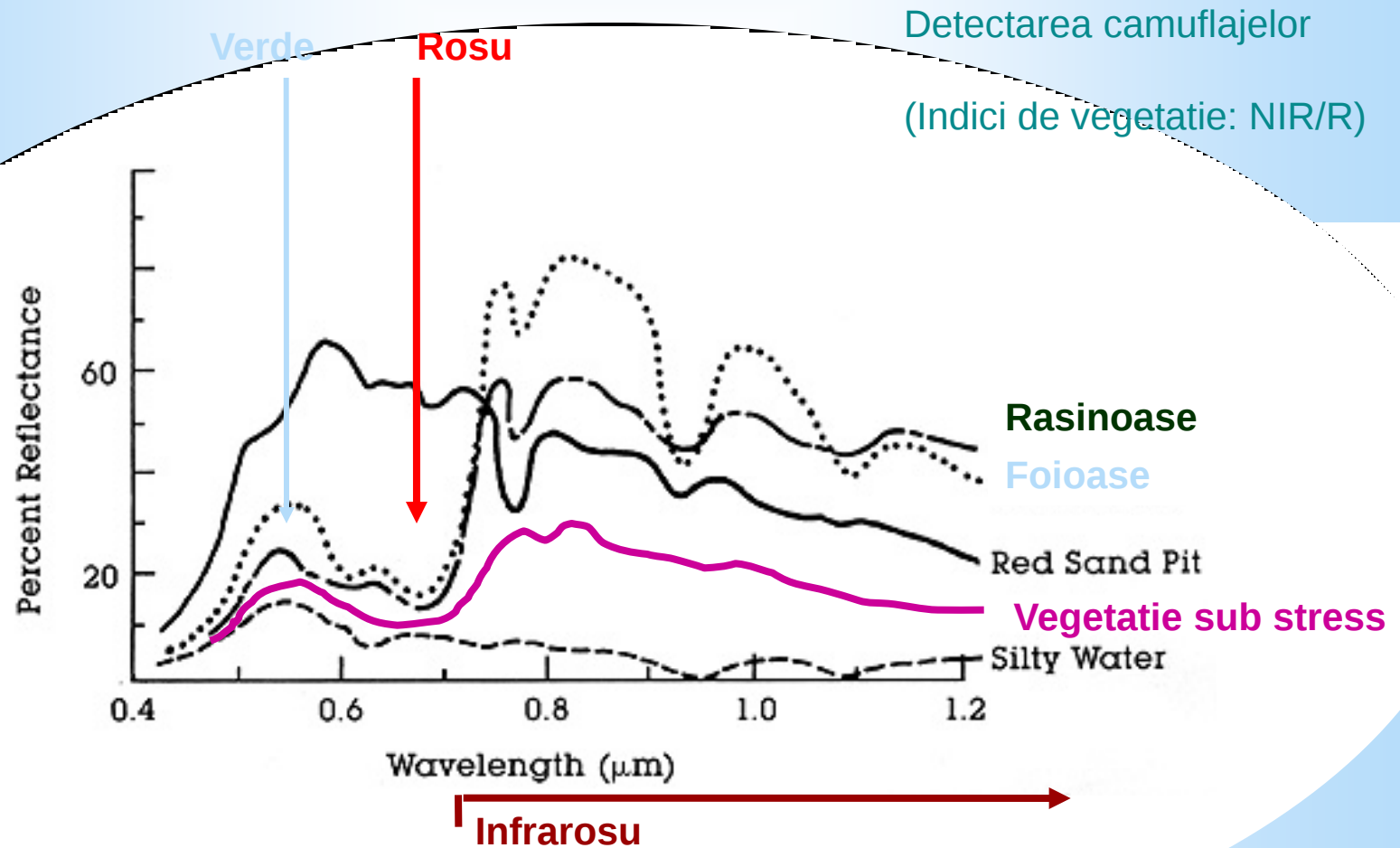
© CCRS / CCT

Senzori pasivi



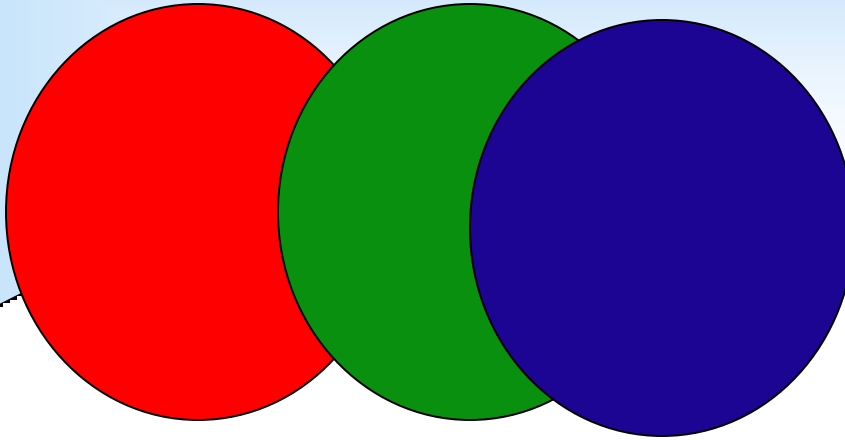
© CCRS / CCT

Caracteristici spectrale



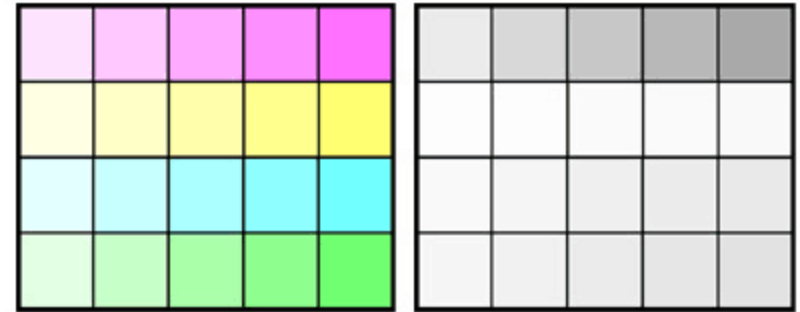
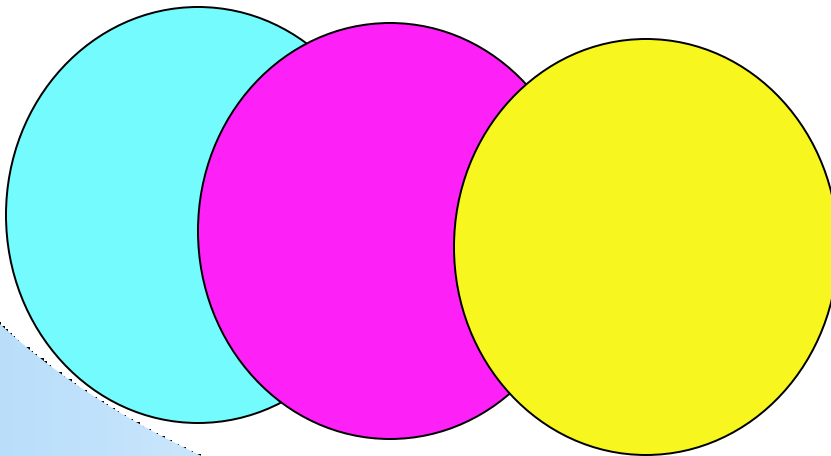
Imagine color

Aditiv (RGB)



Monitor

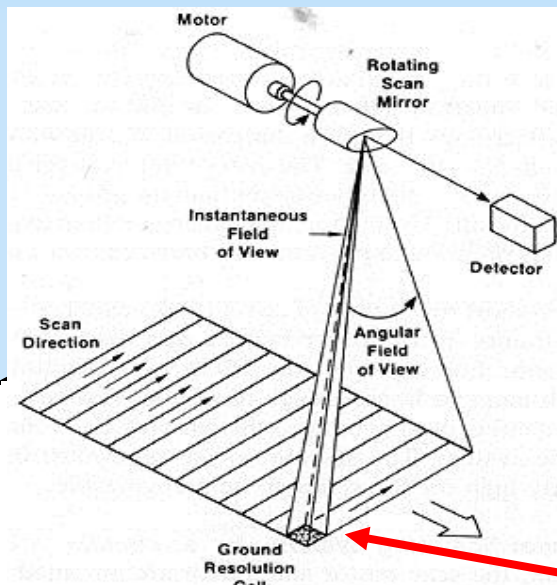
Substractiv (CMY)



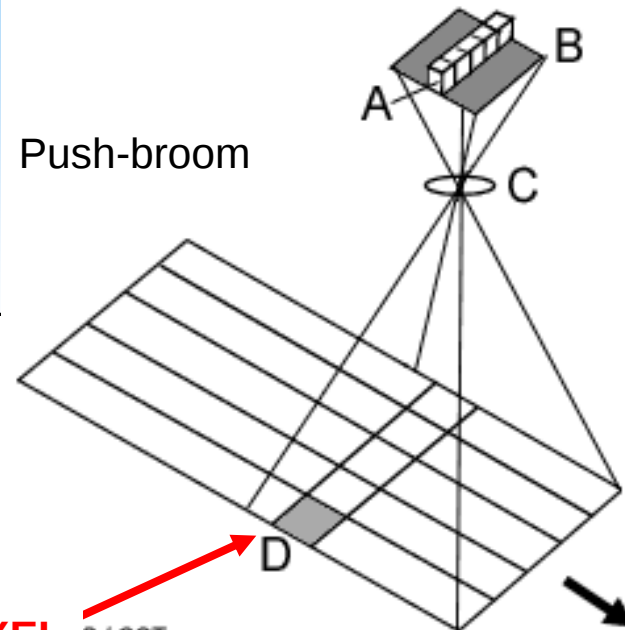
Imprimanta

Senzori

Baleiaj

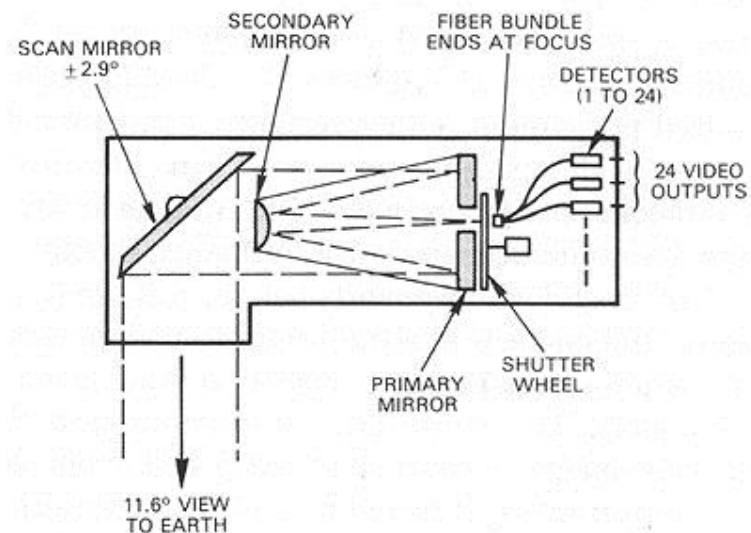
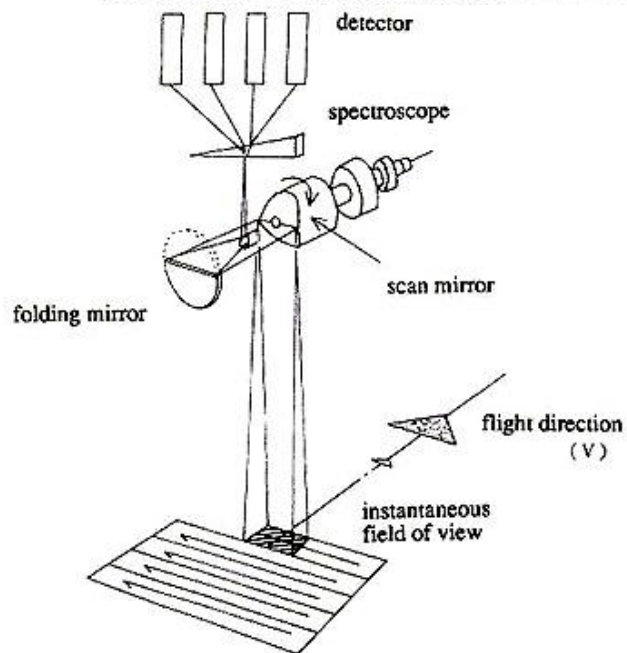


Push-broom

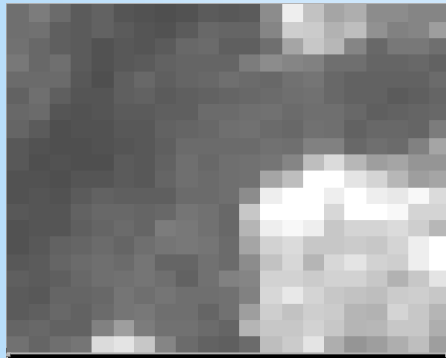


PIXEL S / CCT

A. CROSS-TRACK SCANNER.



Imaginea digitala



Pixel = picture element

111	124	107	91	96	81	79	82	91	88	91	142	236	194	168	171	142	142	136	161
111	113	95	91	96	81	85	82	91	104	101	131	136	206	178	187	145	127	136	161
113	104	95	91	82	88	85	91	104	107	95	96	111	165	199	183	133	104	120	121
113	104	111	91	82	88	85	91	104	101	101	124	140	124	169	111	111	101	104	98
107	107	107	88	75	95	94	95	101	114	111	107	104	113	117	104	98	98	98	107
98	111	95	85	75	95	94	95	91	95	98	104	107	111	111	104	98	91	95	101
104	107	85	82	85	91	91	95	95	107	107	111	113	107	111	111	104	98	104	104
101	79	79	82	82	88	88	98	101	104	111	113	107	104	113	111	98	98	104	104
88	75	82	79	82	85	88	98	107	104	111	107	113	111	127	127	104	111	107	129
79	82	79	82	79	81	88	98	107	104	111	113	117	137	187	219	163	165	182	166
82	82	79	85	85	91	98	101	111	107	111	113	168	190	255	255	228	212	163	166
85	82	82	91	98	95	95	95	95	107	107	111	142	241	255	255	235	238	246	249
88	85	85	98	104	104	104	104	107	113	104	107	197	255	255	255	215	255	215	212
82	85	85	95	101	107	107	124	124	130	133	104	181	241	251	236	199	212	219	205
82	88	98	101	107	101	111	117	120	117	107	165	210	199	199	199	203	212	212	241
85	91	101	107	111	107	117	101	101	113	107	140	194	215	181	215	226	210	206	241
98	91	95	104	111	113	117	111	98	113	129	133	210	210	210	210	219	199	179	228
91	88	101	104	104	117	117	111	111	111	113	127	215	212	212	199	194	187	203	206
91	95	104	98	107	117	120	111	111	101	113	158	206	194	206	203	181	178	212	199
101	104	98	98	129	161	161	113	113	107	101	181	196	197	210	198	181	168	158	176



170	238	85	255	221	0
68	136	17	170	119	68
221	0	238	136	0	255
119	255	85	170	136	238
238	17	221	68	119	255
85	170	119	221	17	136

[illegible][illegible]

Caracteristicile imaginilor digitale

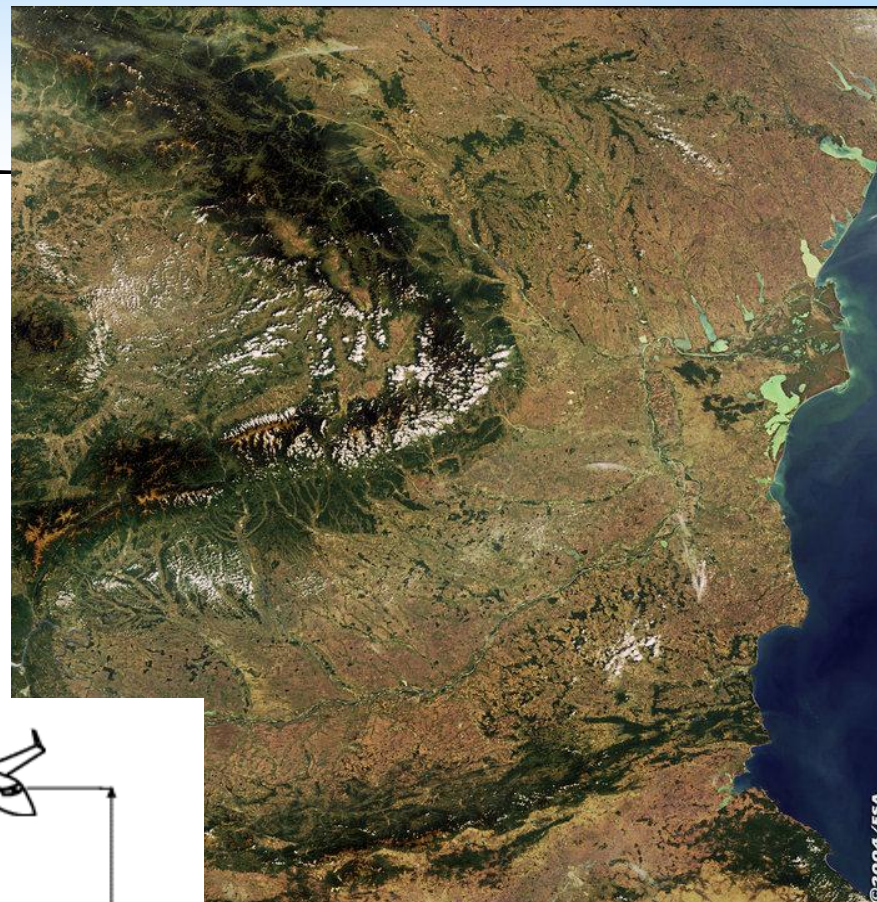
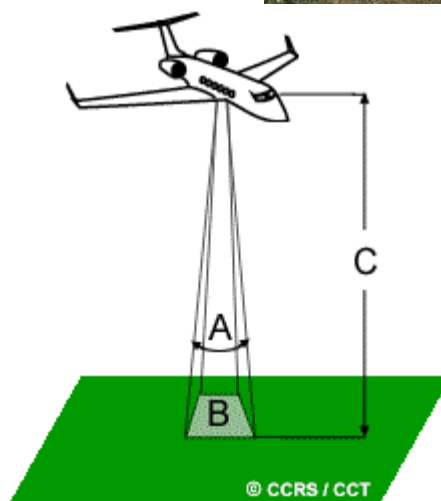
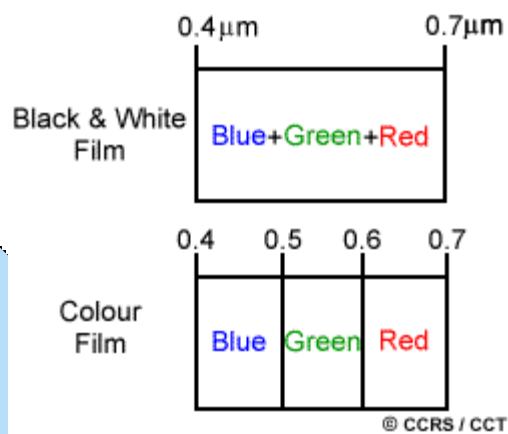
Rezolutie spatiala

Rezolutie spectrala

Rezolutie radiometrica

Rezolutie temporala

+ Stereoscopie:
lateral (across track)
longitudinal (along track)



Furnizori de date: ESA/NASA

Satelitii Landsat (7, 8)

Caracteristicile tehnice principale ale senzorului ETM+

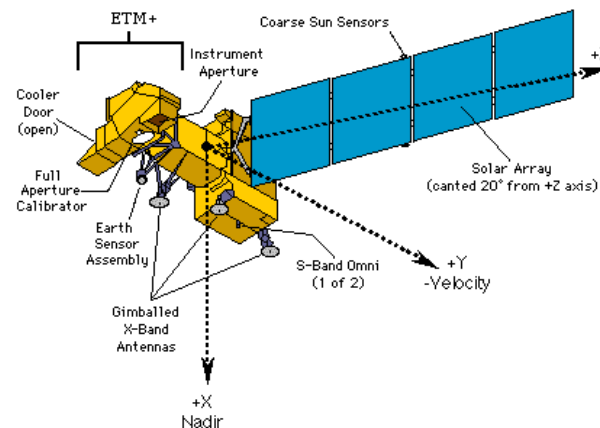
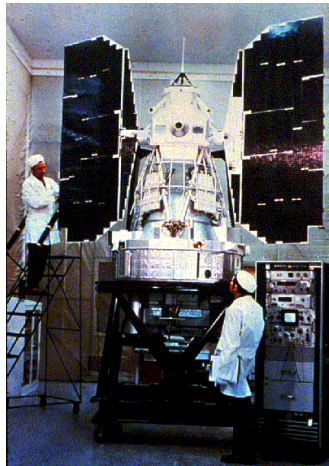
Platforma: satelitul Landsat 7

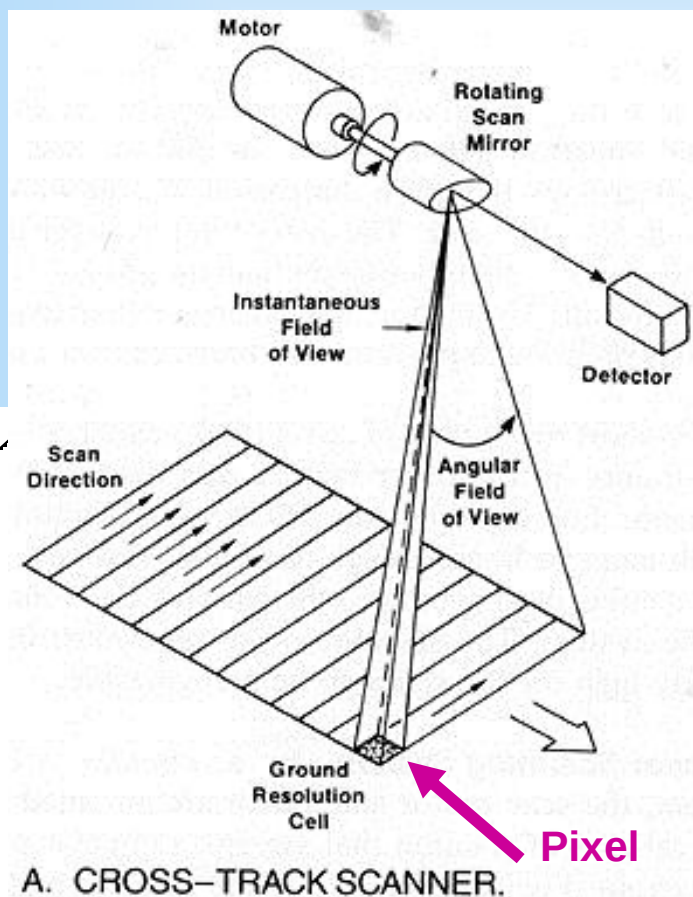
Orbita : quasipolară, heliosincronă, altitudinea medie **705 km**, înclinată **98,2°**, perioada 99 de minute.

Traversează ecuatorul la ora locală 9:30 iar **paralela 45 la aproximativ 10:17 (ora locală)**.

Revenirea: **16 zile**.

Cadru: **185 x 185 km**, cu suprapunere longitudinală de 5,4% și laterală de 7,3%.





Scanare (baleiaj) perpendicular pe directia de zbor

Zona spectrală de lucru a senzorului ETM (după Ekinaga, 2001)

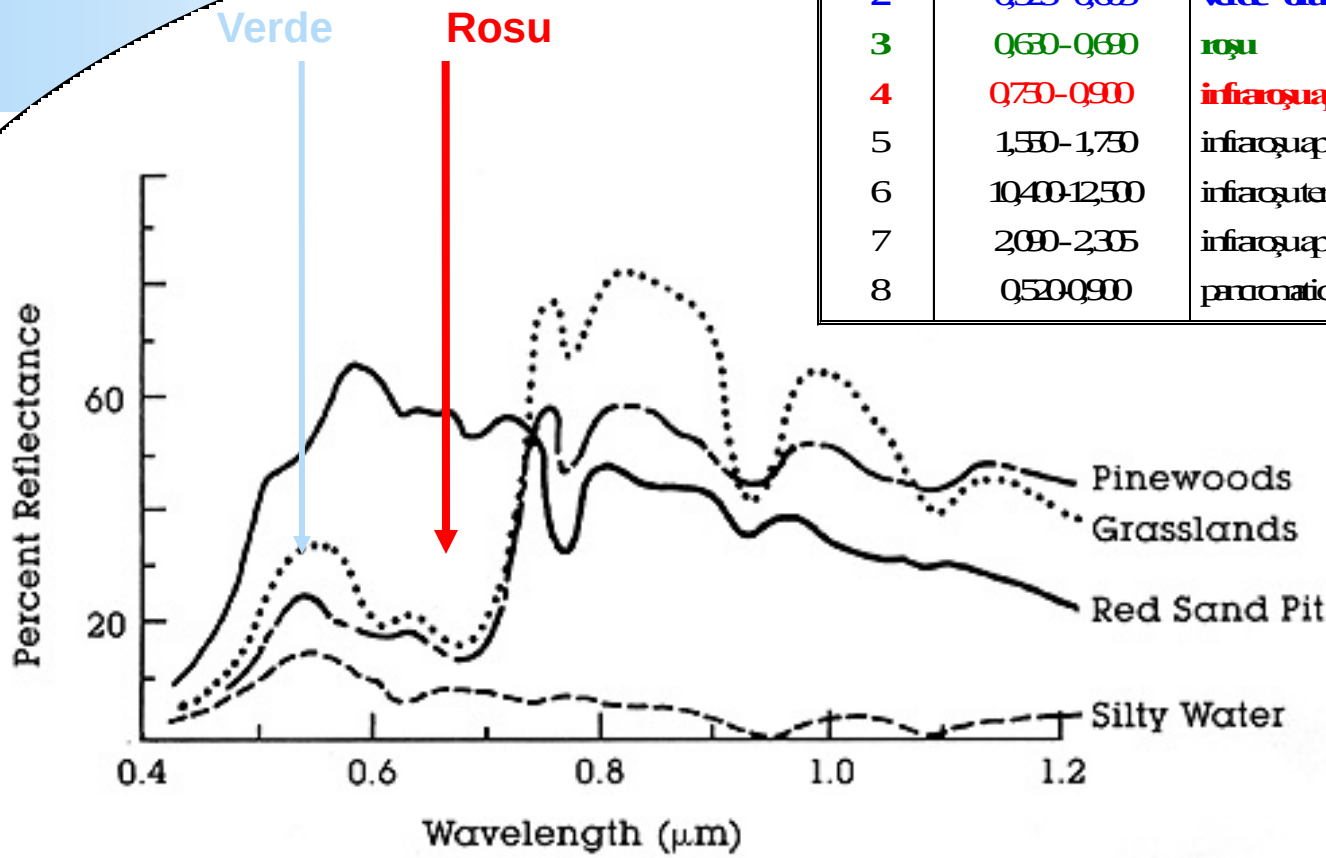
Bandă	Înălțime de undă (μm)	“Culoarea”	Rezoluția spectrală (m)
1	0,450-0,515	indigo-albastru	30
2	0,525-0,665	verde-gălbui	30
3	0,630-0,690	roșu	30
4	0,730-0,900	infraroșu apropiat	30
5	1,550-1,750	infraroșu apropiat	30
6	10,400-12,500	infraroșu termal	60
7	2,090-2,305	infraroșu apropiat extrem	30
8	0,520-0,900	pancromatic	15

Caracteristica spectrala a vegetatiei

Cobinatie fals color compozit

Zona spectrala de lucru a senzoriului EIM (dupa Evinage, 2001)

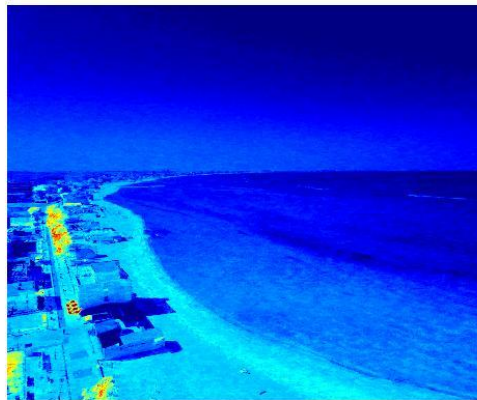
Band	Interval de undă (μm)	“Culoarea”	Reducția geometrică (m)
1	0,40-0,515	indigo-albastru	30
2	0,525-0,605	verde-aeraj	30
3	0,630-0,690	roșu	30
4	0,750-0,900	infraroșu apropiat	30
5	1,550-1,750	infraroșu apropiat	30
6	10,400-12,500	infraroșu terenal	60
7	2,000-2,305	infraroșu apropiat extrem	30
8	0,520-0,900	panromatic	15



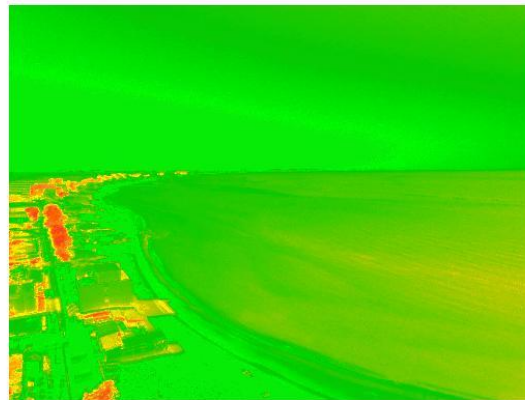
Spectroscopia aerea



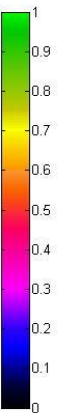
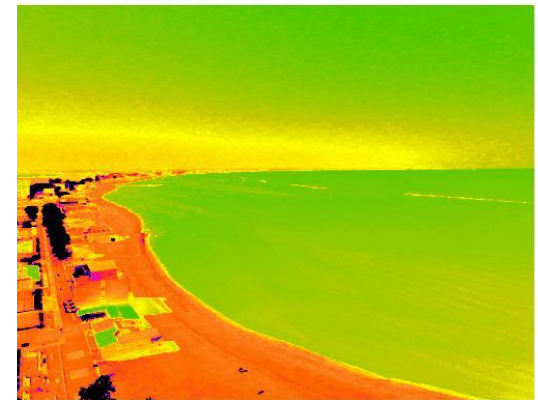
NDWI Image



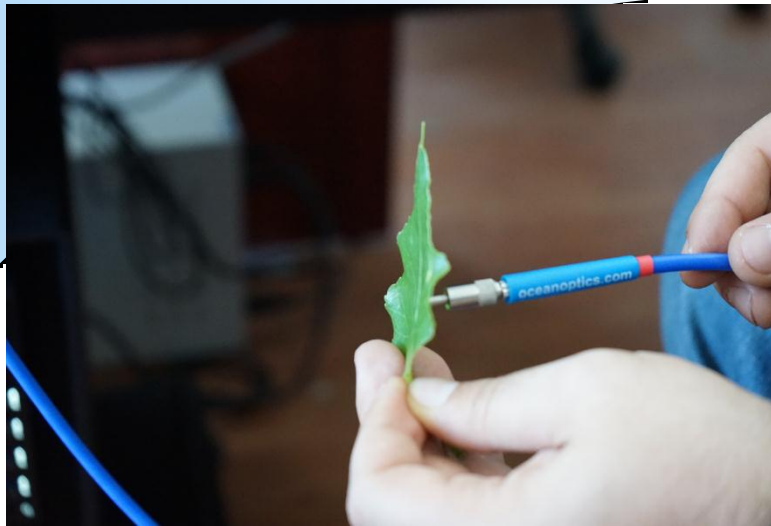
NDVI Image



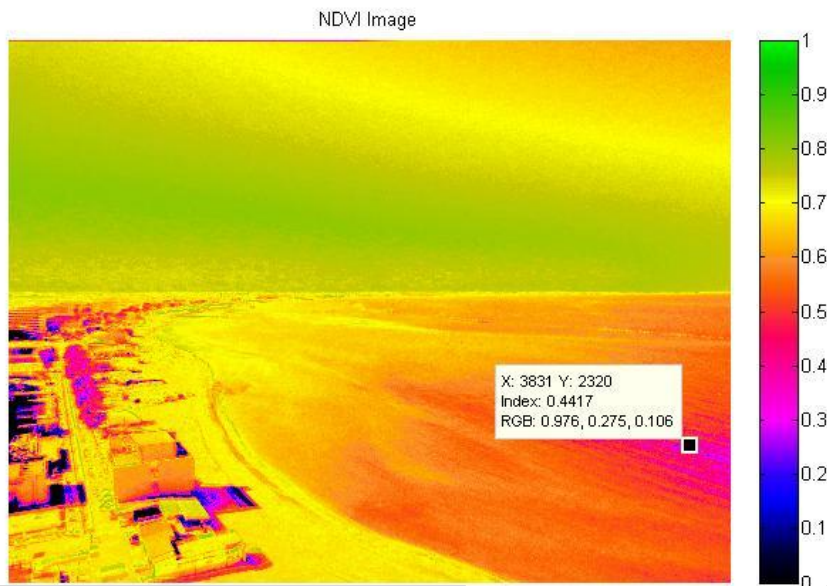
NDVI Image



Calibrarea spectrometrului STS VIS



Investigatii asupra Vegetatiei (veg. psanofila/macro-alge)



Calclarea imag. NDVI

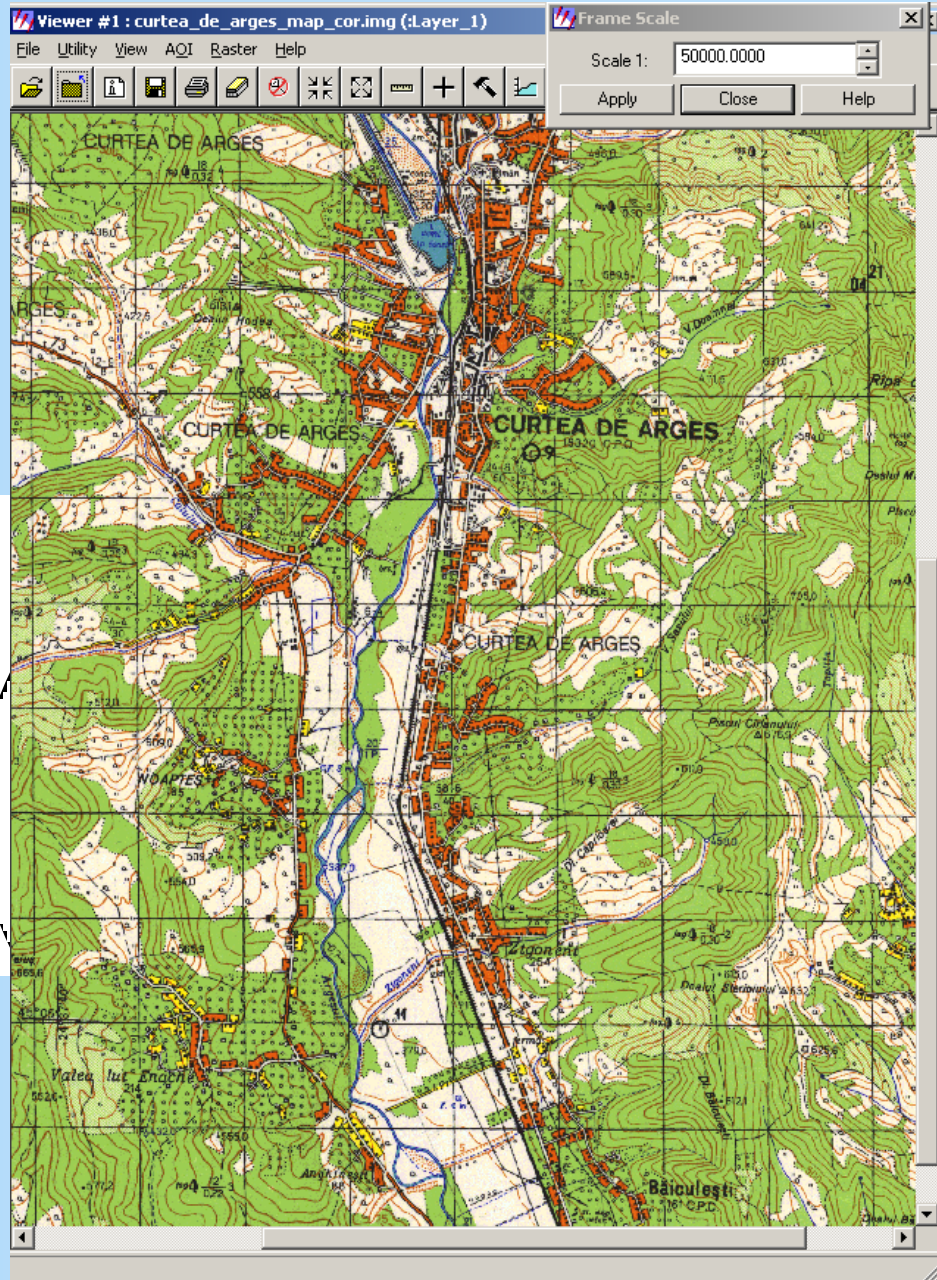
$$\frac{(RGB-IR)}{(RGB+IR)}$$

iarba

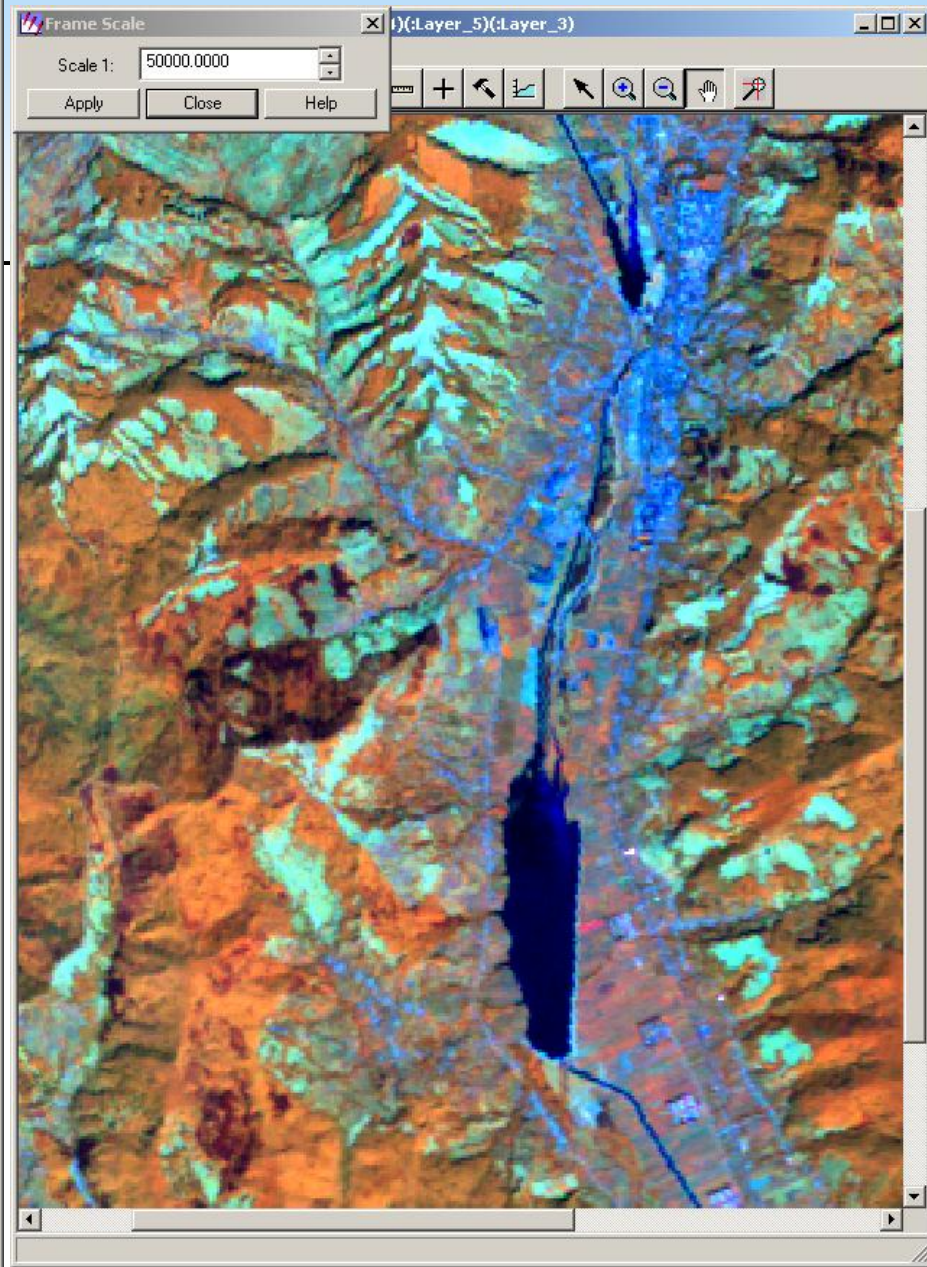
salcam

alga

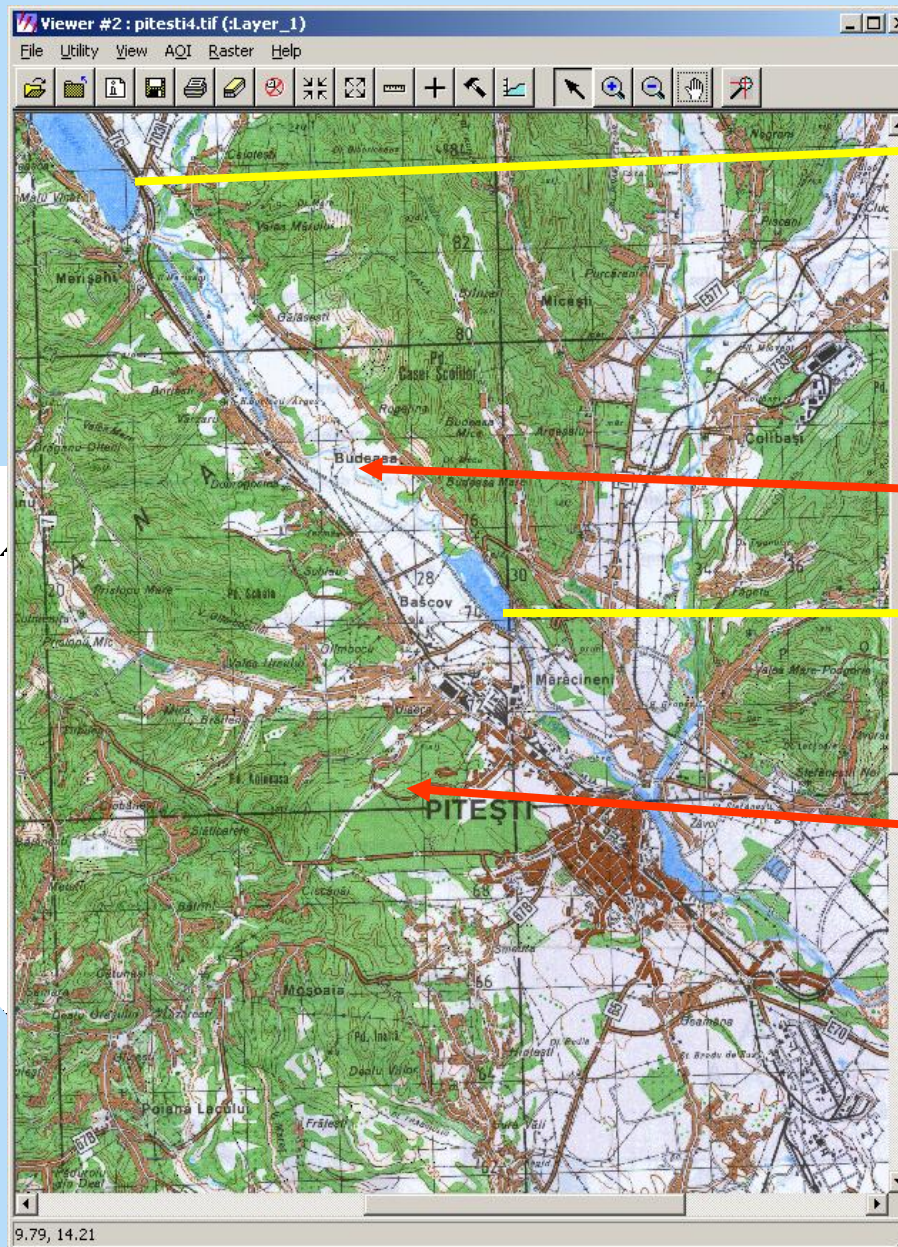
Actualizarea hartilor dupa imagini satelitare



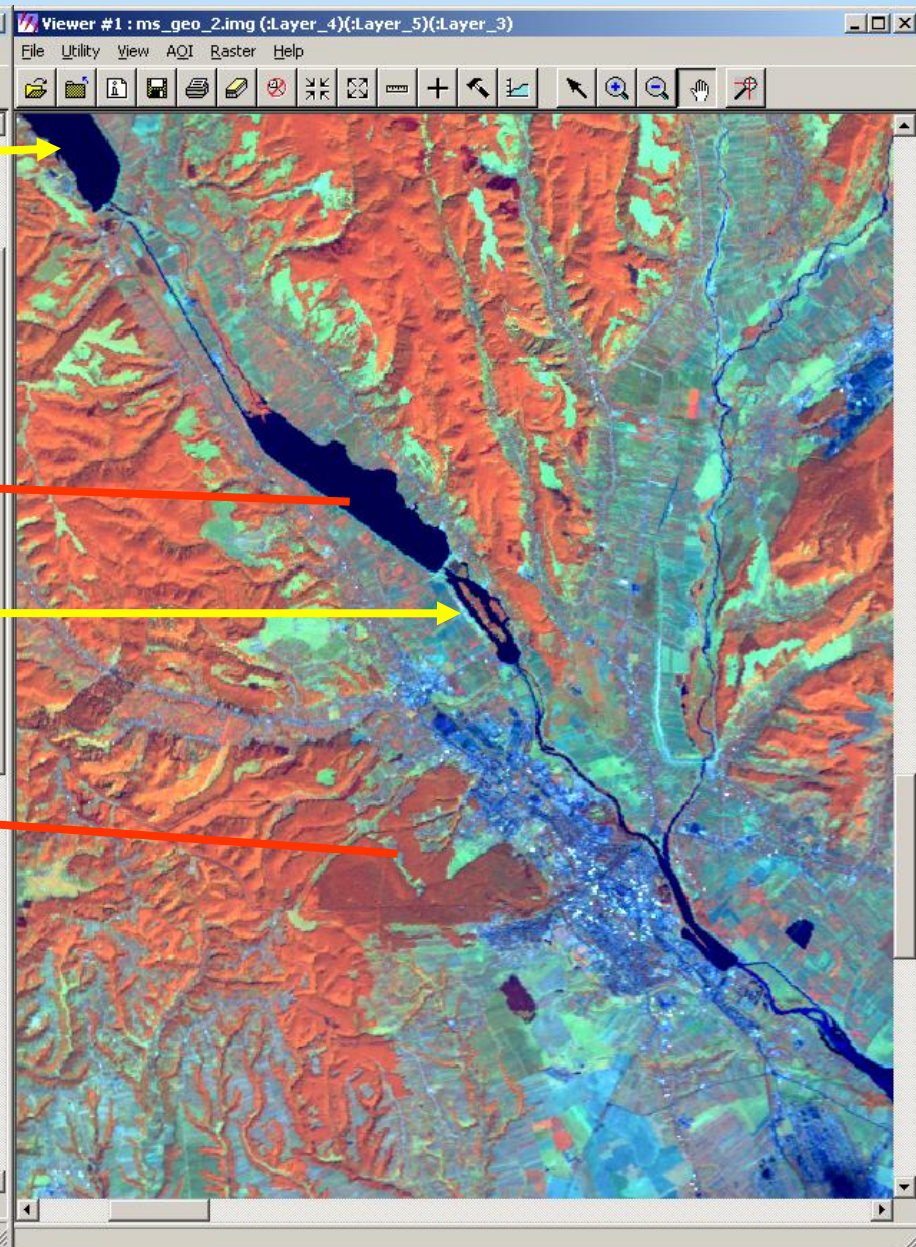
DTM Actualizata 1969



Landsat ETM+ 2001

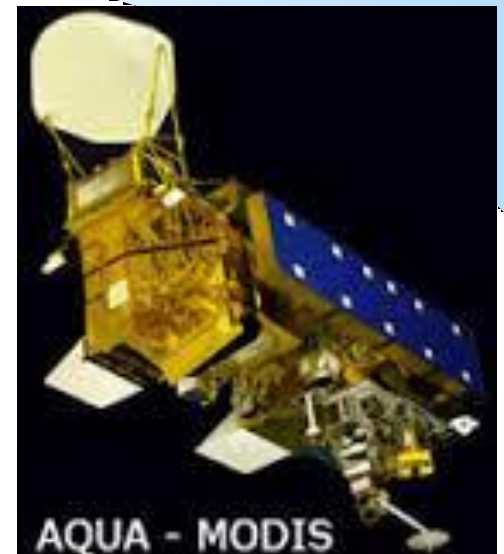
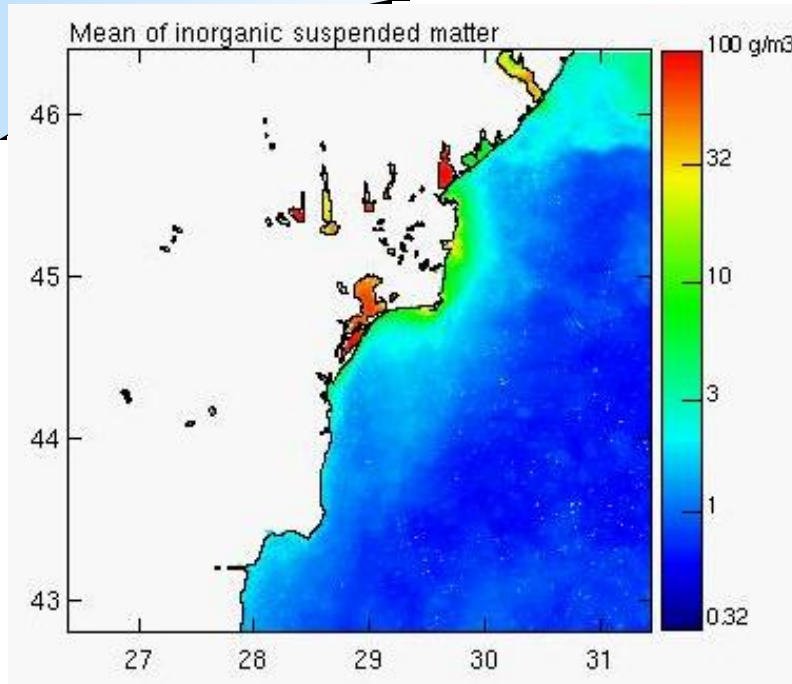


DTM 1996

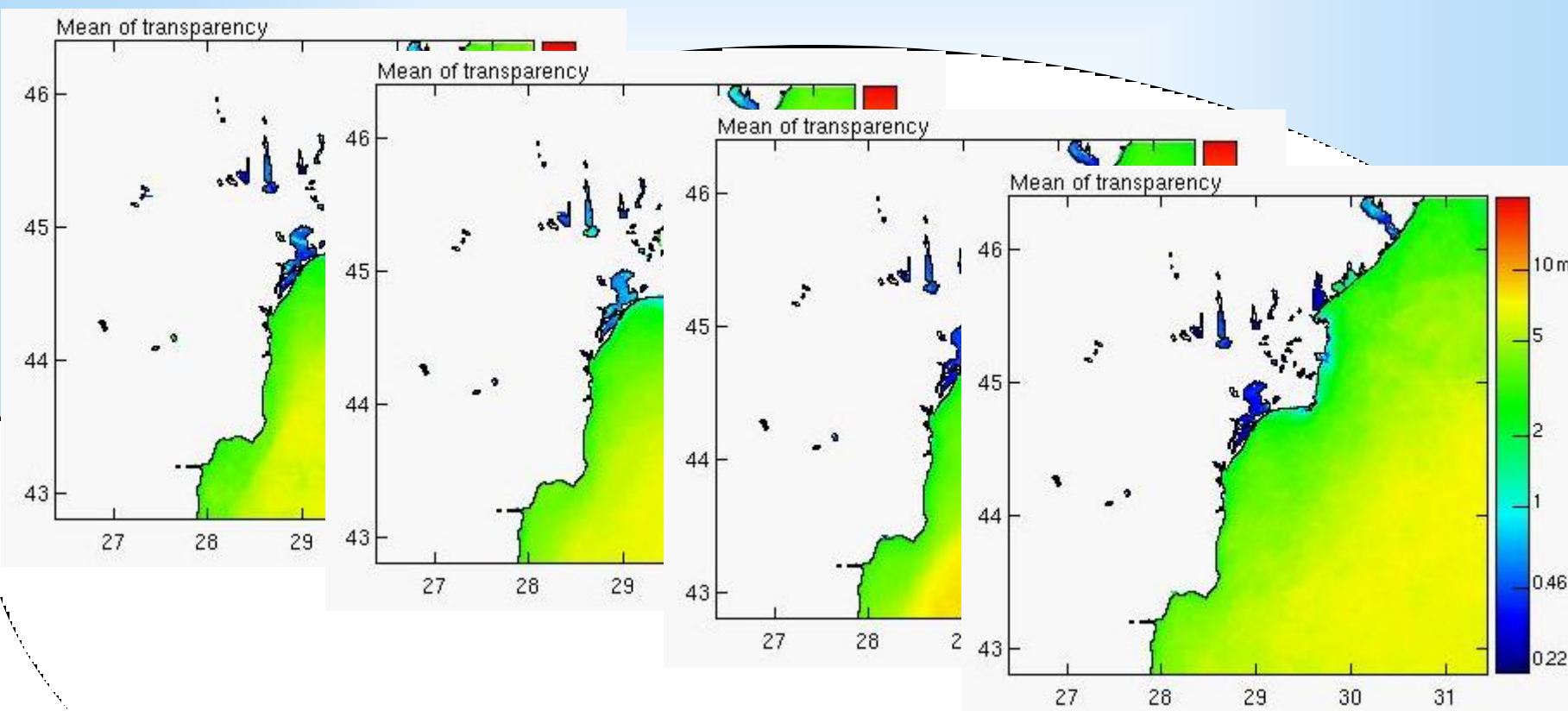


Landsat ETM+ 11+08+2001

Ocean Optics



Parametri de calitate a apei

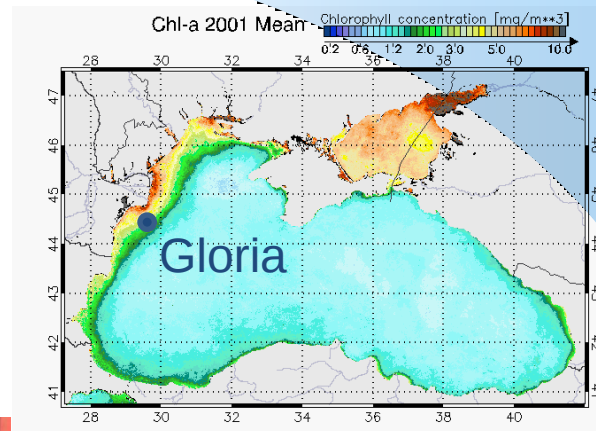


Transparenta

SeaPRISM



Gloria Platform



Site: Gloria

Location: Black Sea

Water type: Case-2 (sed. dom.)

Water depth: 50 m (height: 30 m)

Distance: ~20 nm

Period: 2010-present



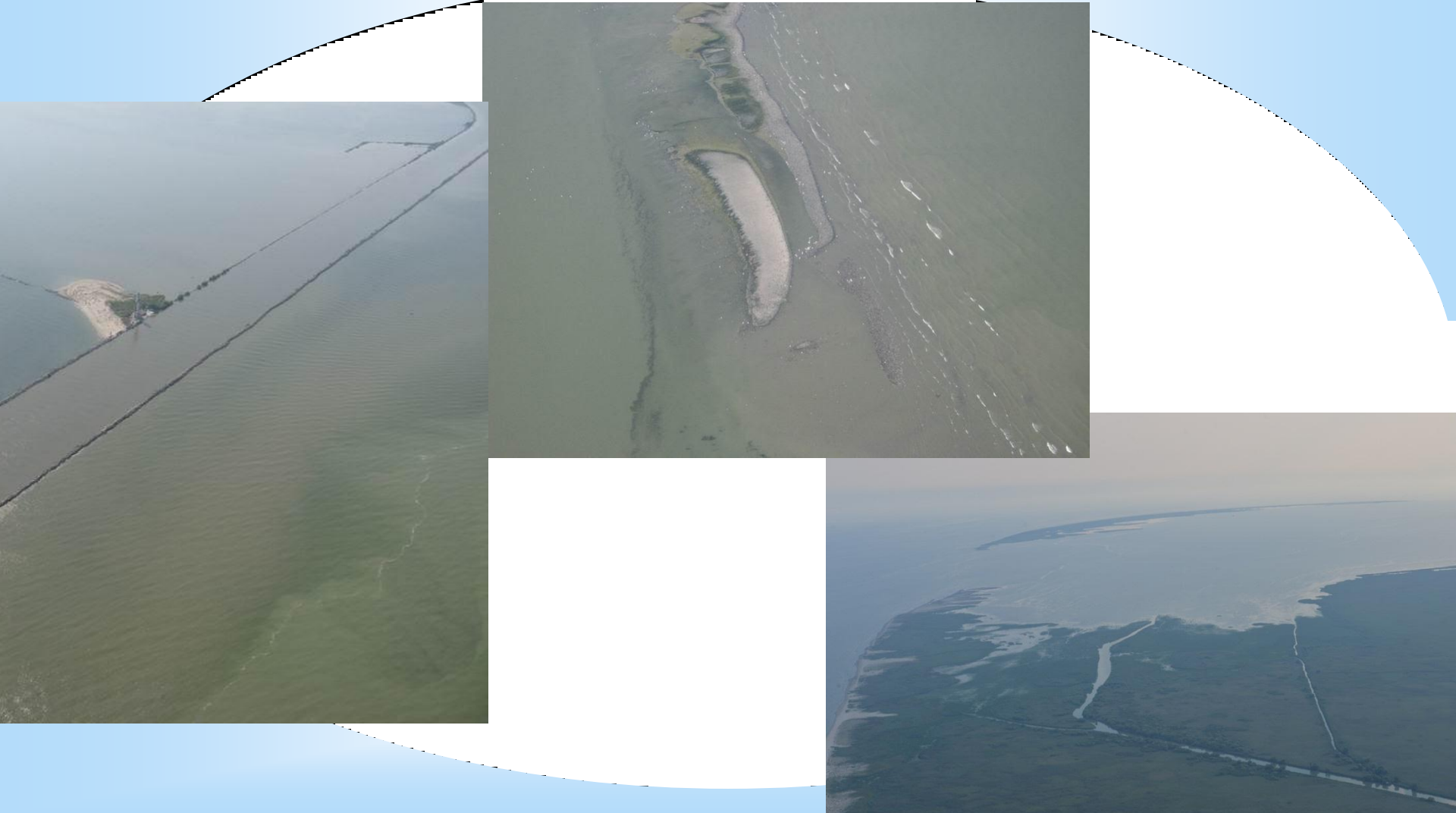
**Complex Logistics supported by
OMV - PETROM**

***Aplicațiile utilizării aeromodelelor
automate***

UAV (unmanned aerial vehicles)

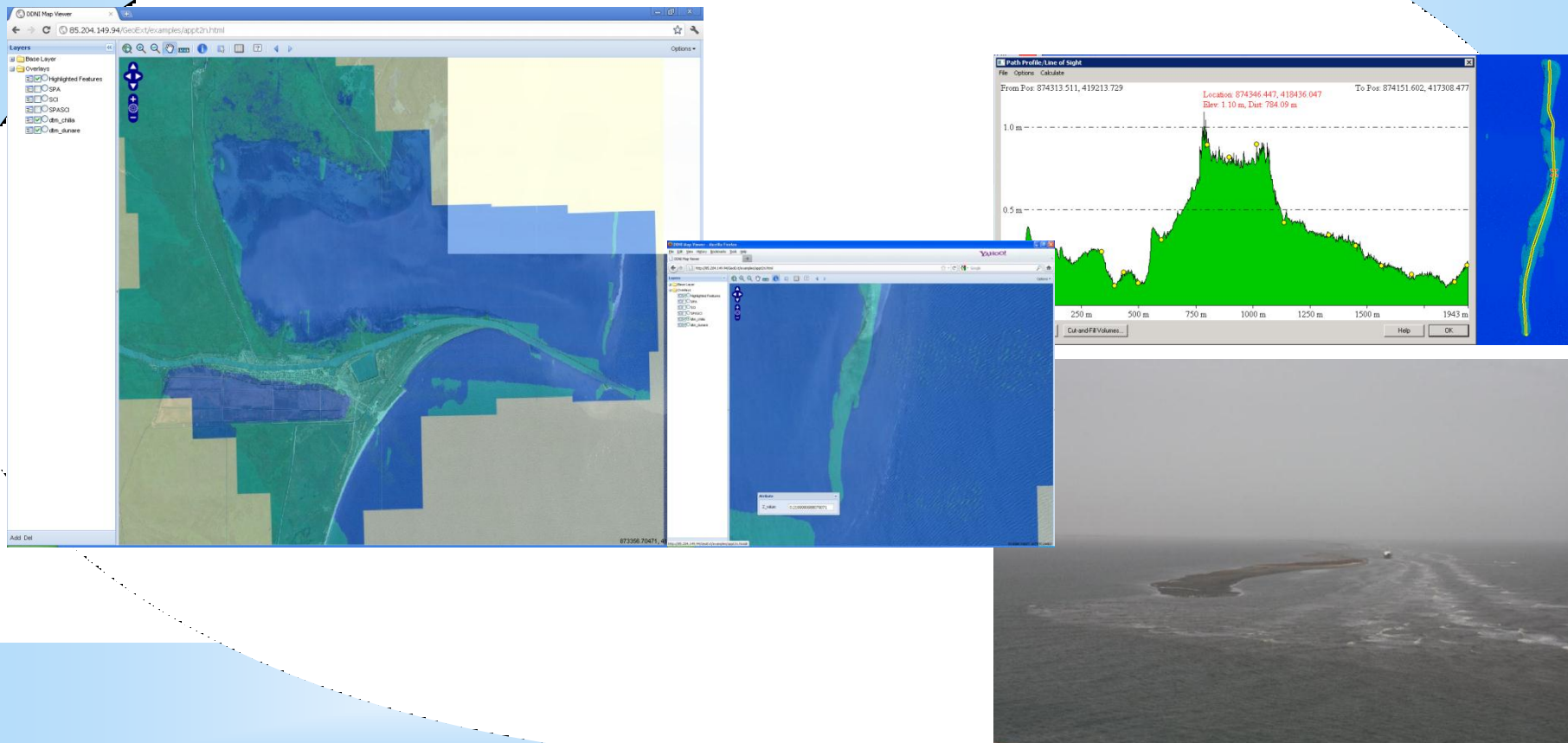
***în investigarea elementelor
geomorfologice***

Investigatii in unitatea nordica a tarmului romanesco: Delta Dunarii

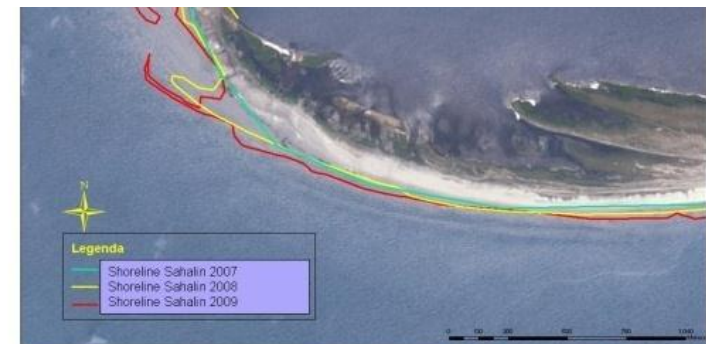
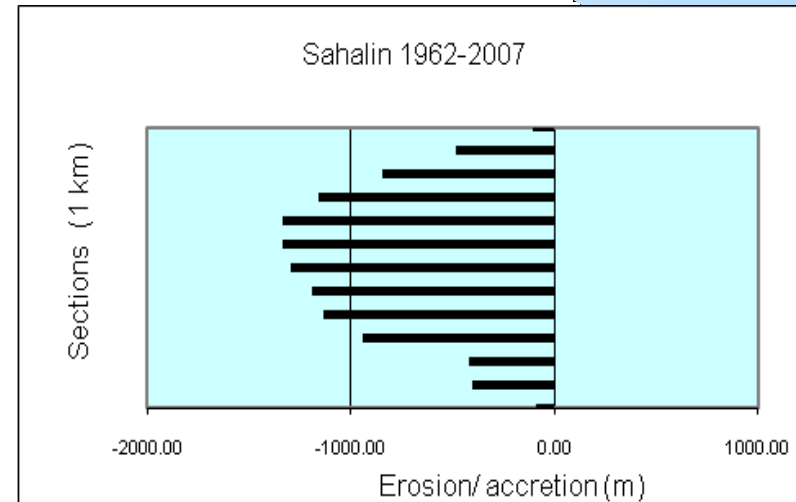
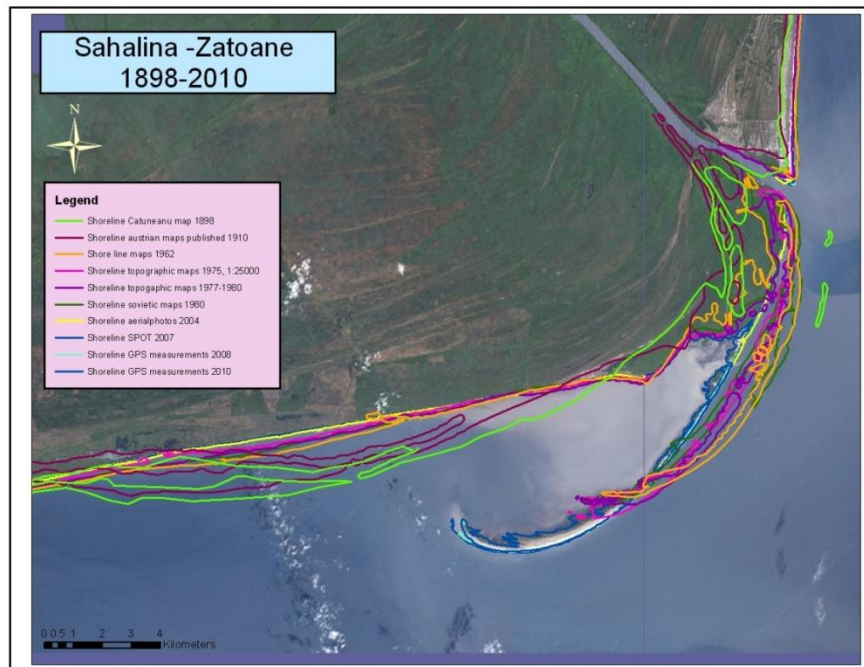


LIDAR

- DTM obținut prin măsuratori lidar: zona Golfului Musura



Cartarea liniei de tarm: masuratori GPS



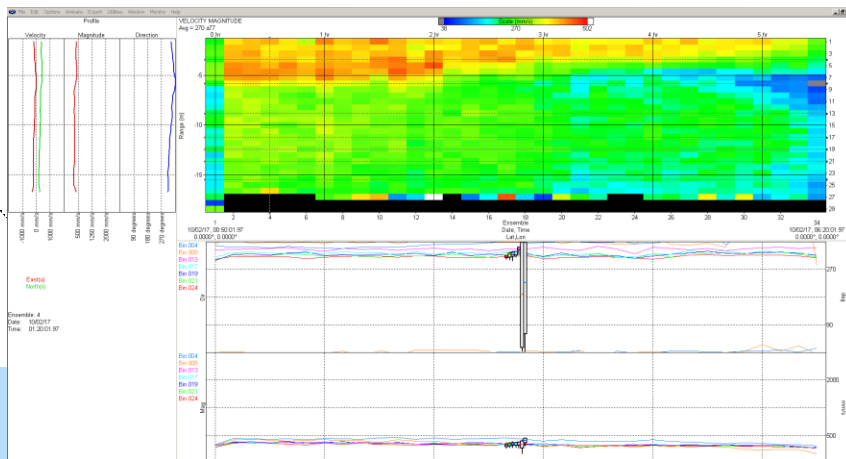
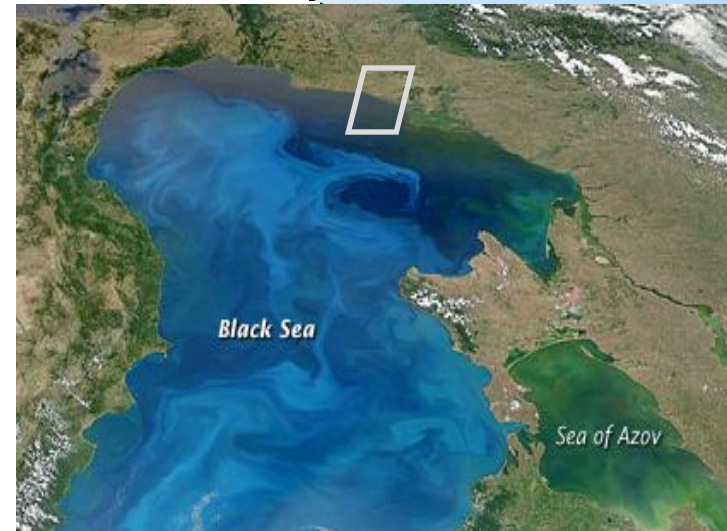
Monitorizarea evenimentelor hidro-morfologice: ruperea Insulei Sahalin in iarna anului 2012-2013



Sahalin Island - may 2013



Investigatii hidrologice masuratori la gurile Dunarii

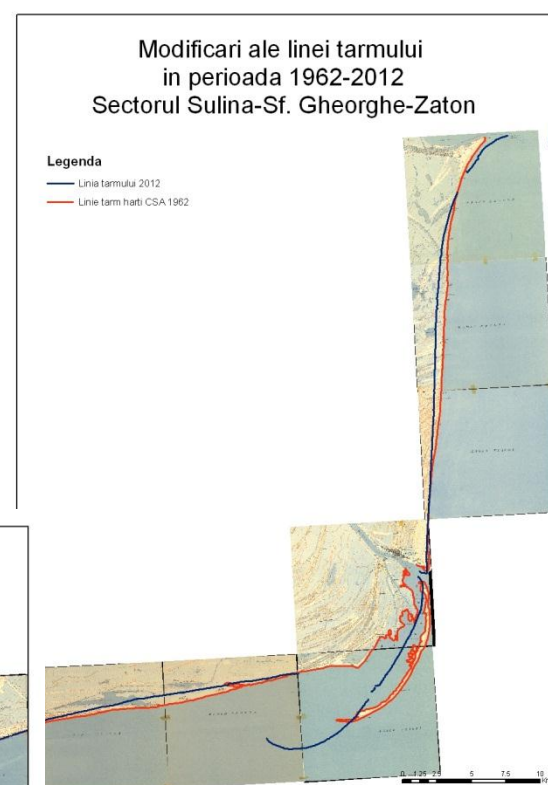
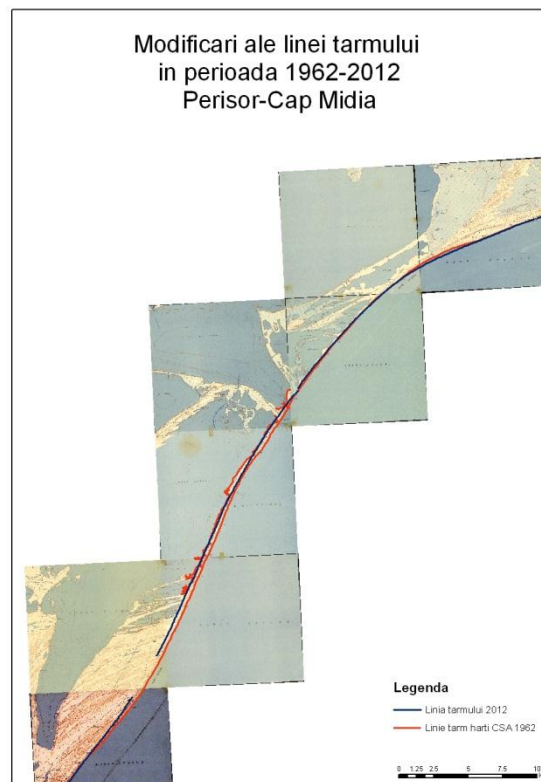


Evaluarea schimbarilor morfologice in intervalul 1962-2012

Metode folosite: vectorizarea hartilor istorice, imagini satelitate, masuratori GPS

Eroziunea extinsa pe 70%,
din lungimea tarmului

- suprafeet erodate 2600 ha
(45 - 55 ha/an).
- suprafete acumulate 350
ha (7 ha/an),
- raport E/A 7.5% (2300 ha
suprafete pierdute)



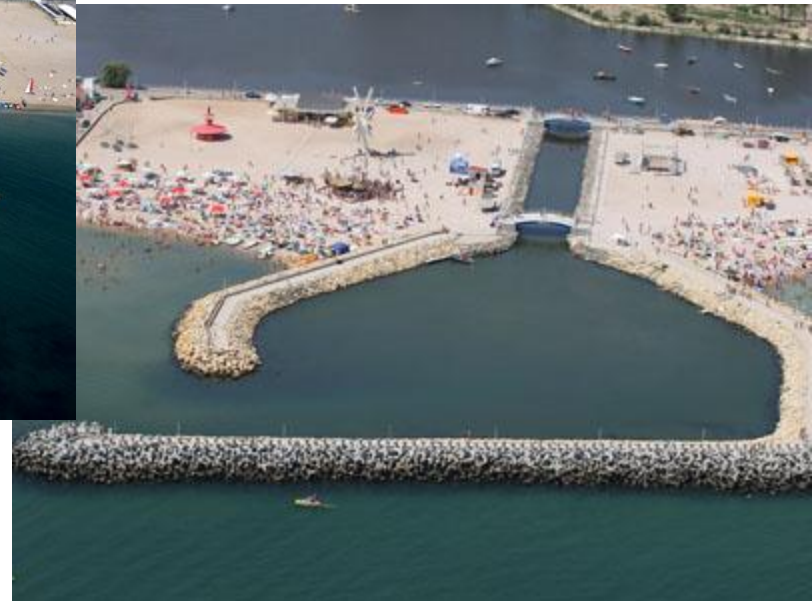
Monitorizarea componentei ecologice



FOTOGRAFIE AERIANA UTILITATEA DRONELOR IN SECTORUL SUDIC

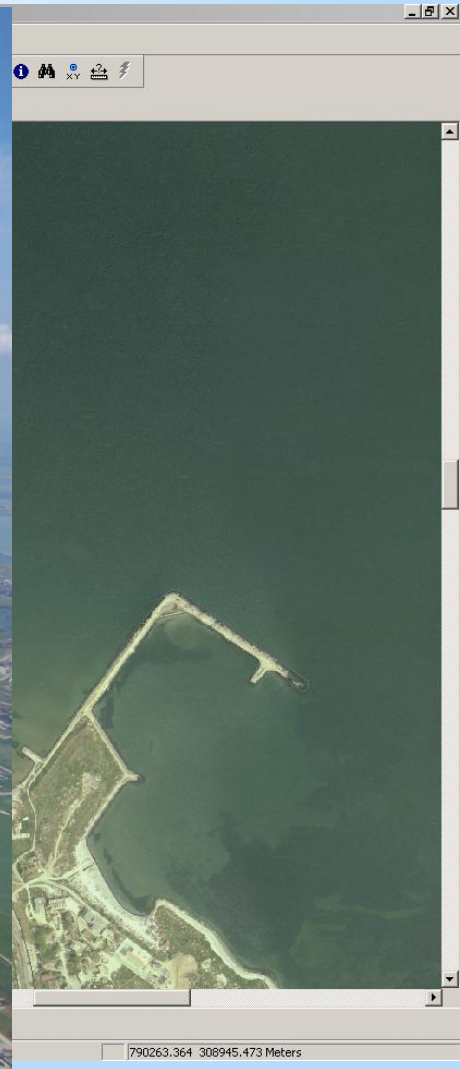


2004

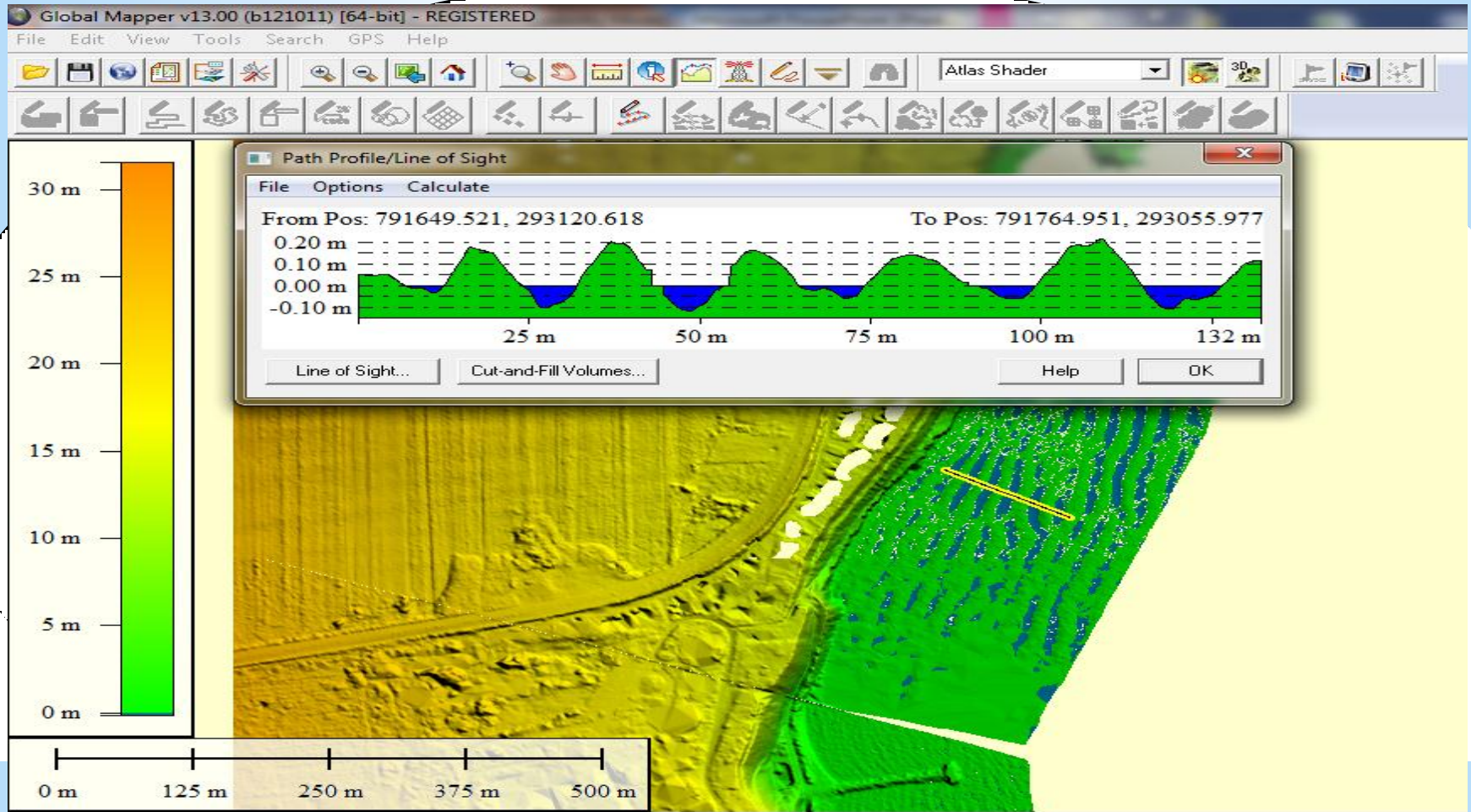


2007

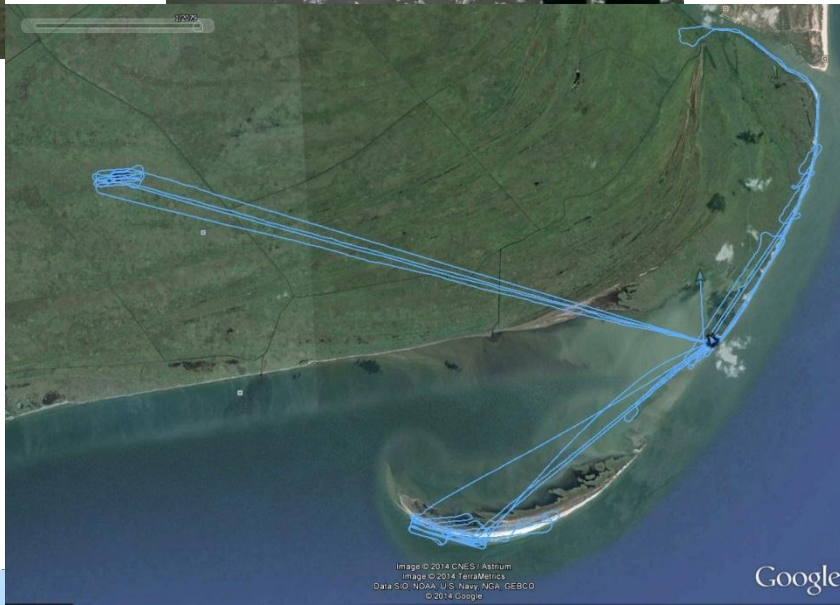
Fotografie aeriana/fotogrametrie



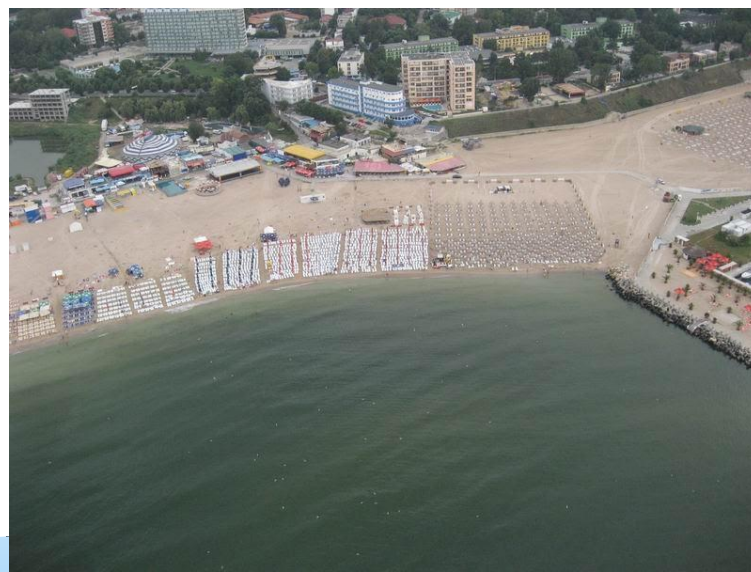
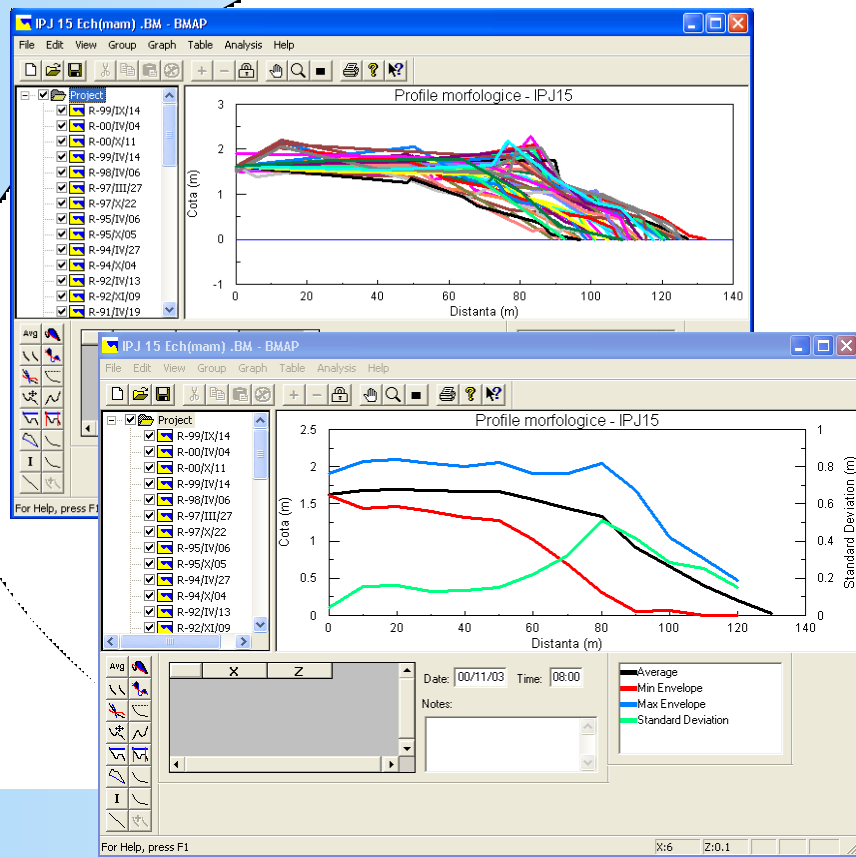
Cartarea elementelor valurilor incidente cu ajutorul LIDAR



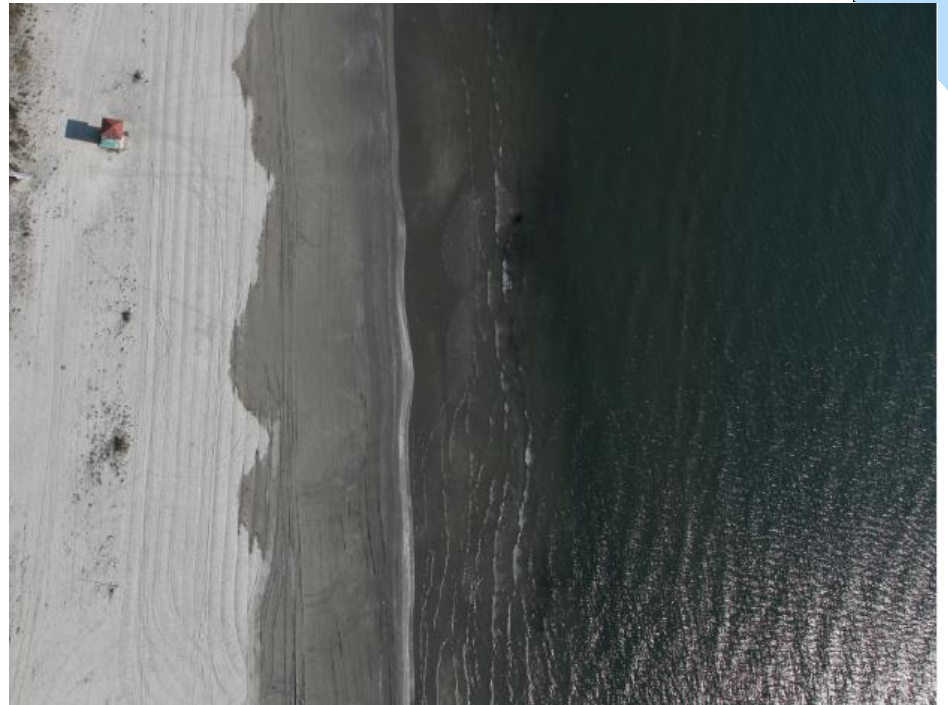
Utilizarea dronelor



Variabilitatea morfometrica/pe sectiuni transversale a plajelor litorale: waves run-up



Cartarea elementelor campului de valuri pe baza fotografiilor laterale: sun-gliter-ului



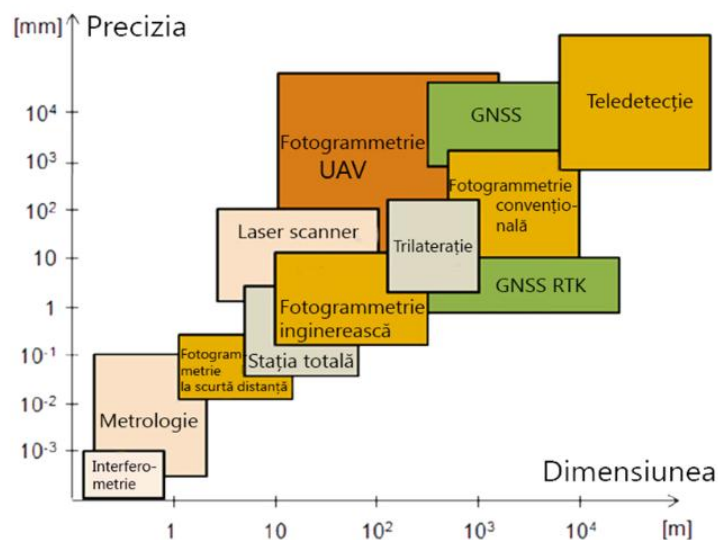
Metodologie

Masuratori topo, GPS,
Folosirea UAV-urilor pentru
obtinerea DTM-urilor si
ortofotoplanurilor



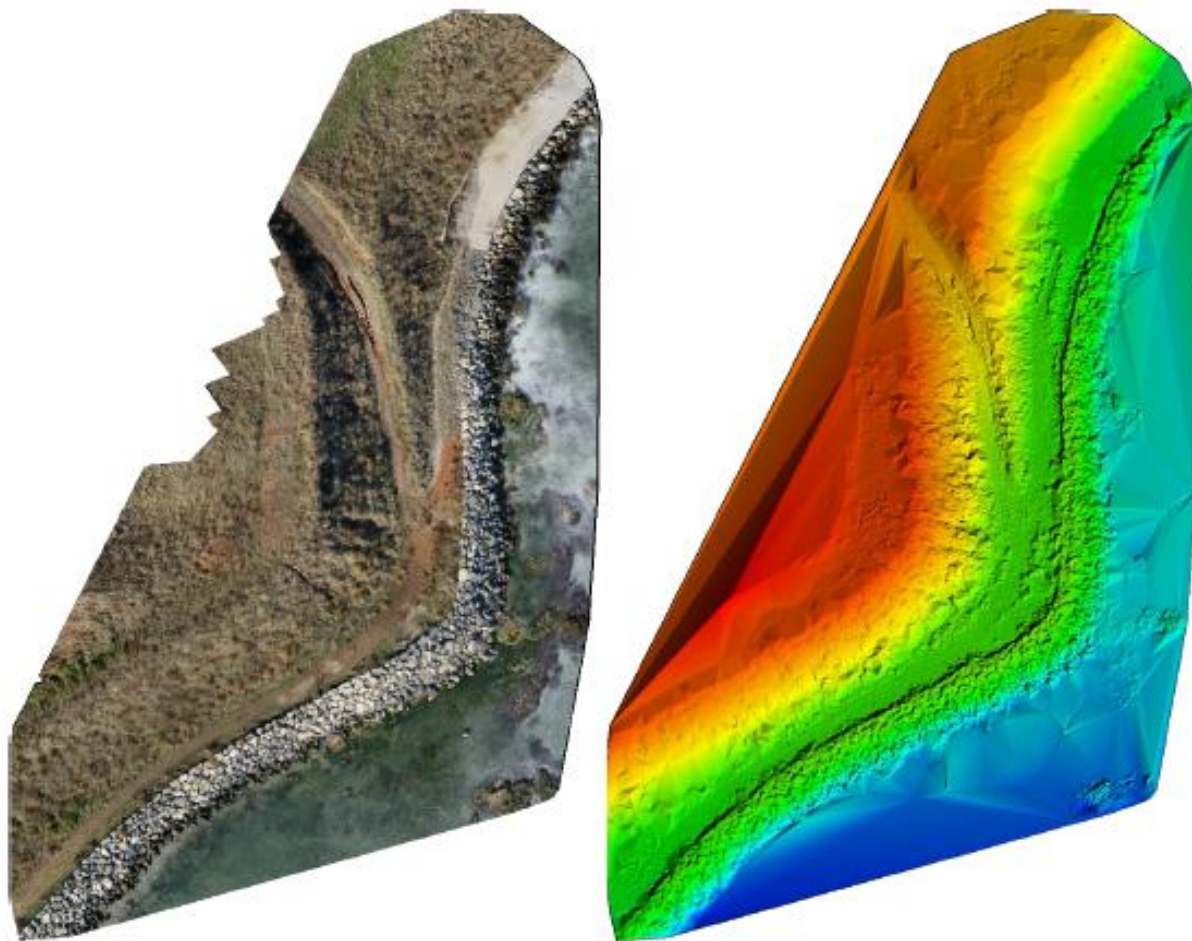
Alegerea tipului de UAV

Tipul platformei	Autonomie	Anduranță	Dependența de condițiile meteo	Manevrabilitate	Sarcină utilă
Avioane cu motor cu elice	++	++	+	+	++
Avioane cu motor cu reacție	++	++	+	+	++
Elicopter cu un singur rotor	+	+	+	++	+
Elicopter cu rotor coaxial	+	++	+	++	++
Quad-coptere	0	0	0	++	0
Multi-coptere	+	+	+	++	+

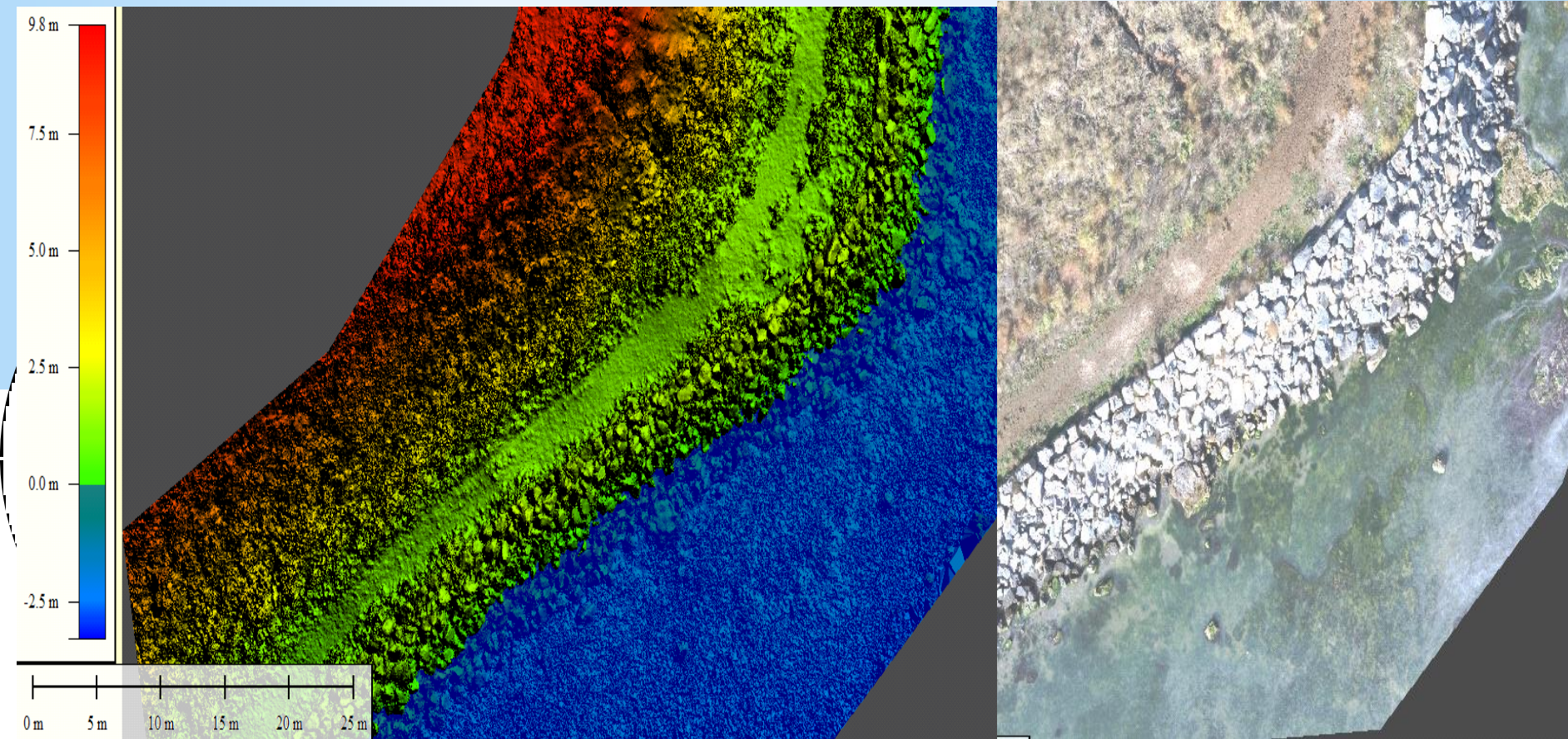


Aplicatii UAV in cartarea falezelor

aplicatie a dronelor in domeniul geodeziei este realizarea Modelelor digitale ale suprafetelor sau ale terenului (DSM/DTM).



Realizarea DSM si a planurilor ortorectificate



Zona Costinesti: Cap SCHITU

diferenta in rezolutie intre orto-mosaic/DTM obtinut cu UAV si ortofotoplan/DTM lidar

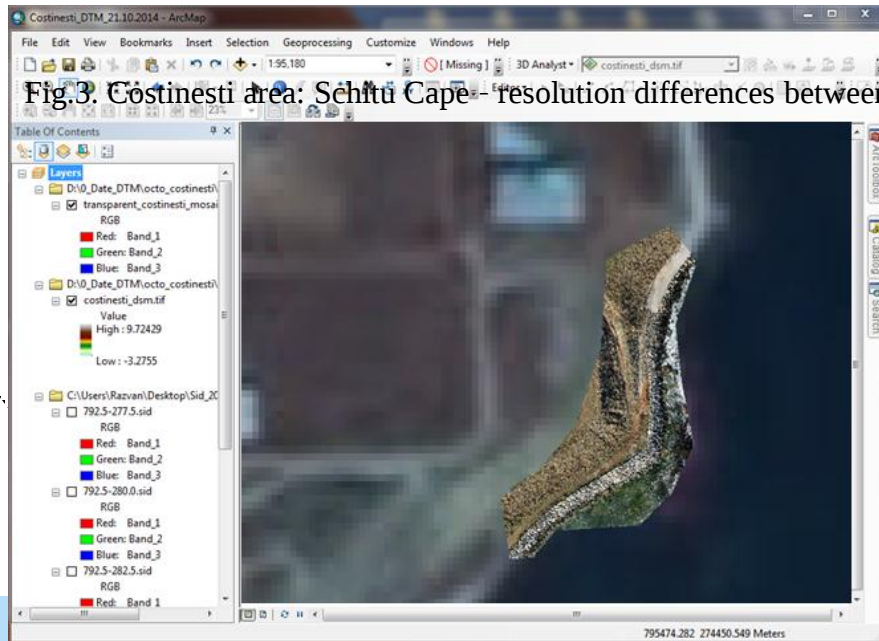
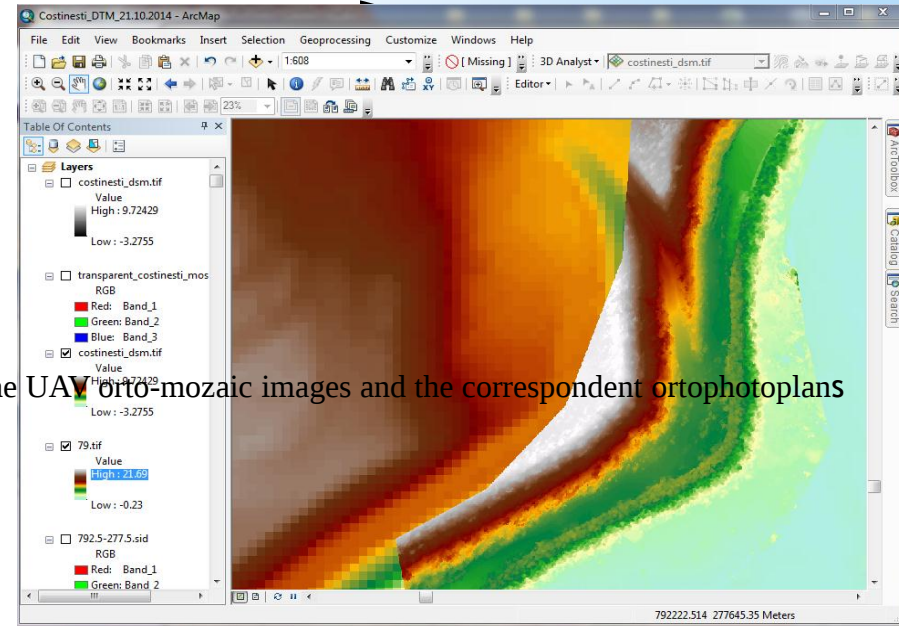


Fig.3. Costinesti area: Schitu Cape- resolution differences between the UAV orto-mosaic images and the correspondent orthophotoplans



Multumim pentru atentie!



http://www.ccrs.nrcan.gc.ca/ccrs/learn/tutorials/fundam/chapter1/chapter1_1_e.html

<http://rst.gsfc.nasa.gov/Front/tofc.html>

<http://www.eurimage.com> (QB, Landsat, SPOT, IRS, ASTER etc)

<http://www.spaceimaging.com> (Ikonos etc.)

<http://www.sensefly.com>

[Http://www.drone.ro](http://www.drone.ro)

Google !!!!