



# Scuola estiva di Geologia Marina

## CARTOGRAFIA GEOLOGICA DELLE AREE MARINE



### ISPRA

Dipartimento Difesa del Suolo Servizio CARG,  
Geologia e Geomorfologia Settore rilevamento  
geologico e analisi di laboratorio  
Dipartimento per le Attività Bibliotecarie  
Documentali e per l'Informazione Servizio  
Educazione e Formazione Ambientale

### SGI

Società Geologica Italiana  
Sezione di  
Geologia Marina

*A. Bosman*

## Metodi di rilevamento

### Multibeam

#### Cenni su:

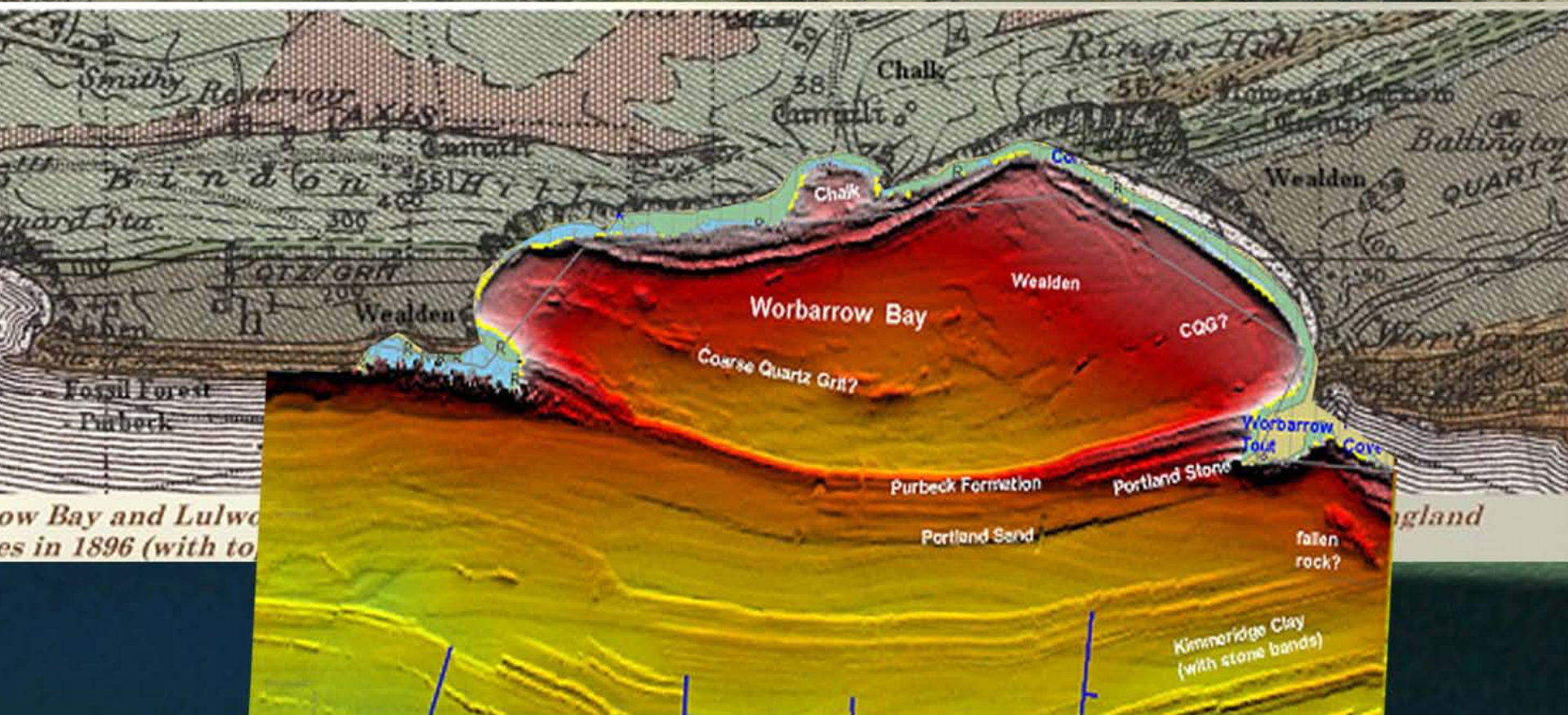
- a) strumentazioni, principi di funzionamento e di elaborazione
- b) Integrazione backscatter /DTM a diversa risoluzione
- c) Interpretazione di dati multibeam con uso di software specifici

Roma, 25 10 2010

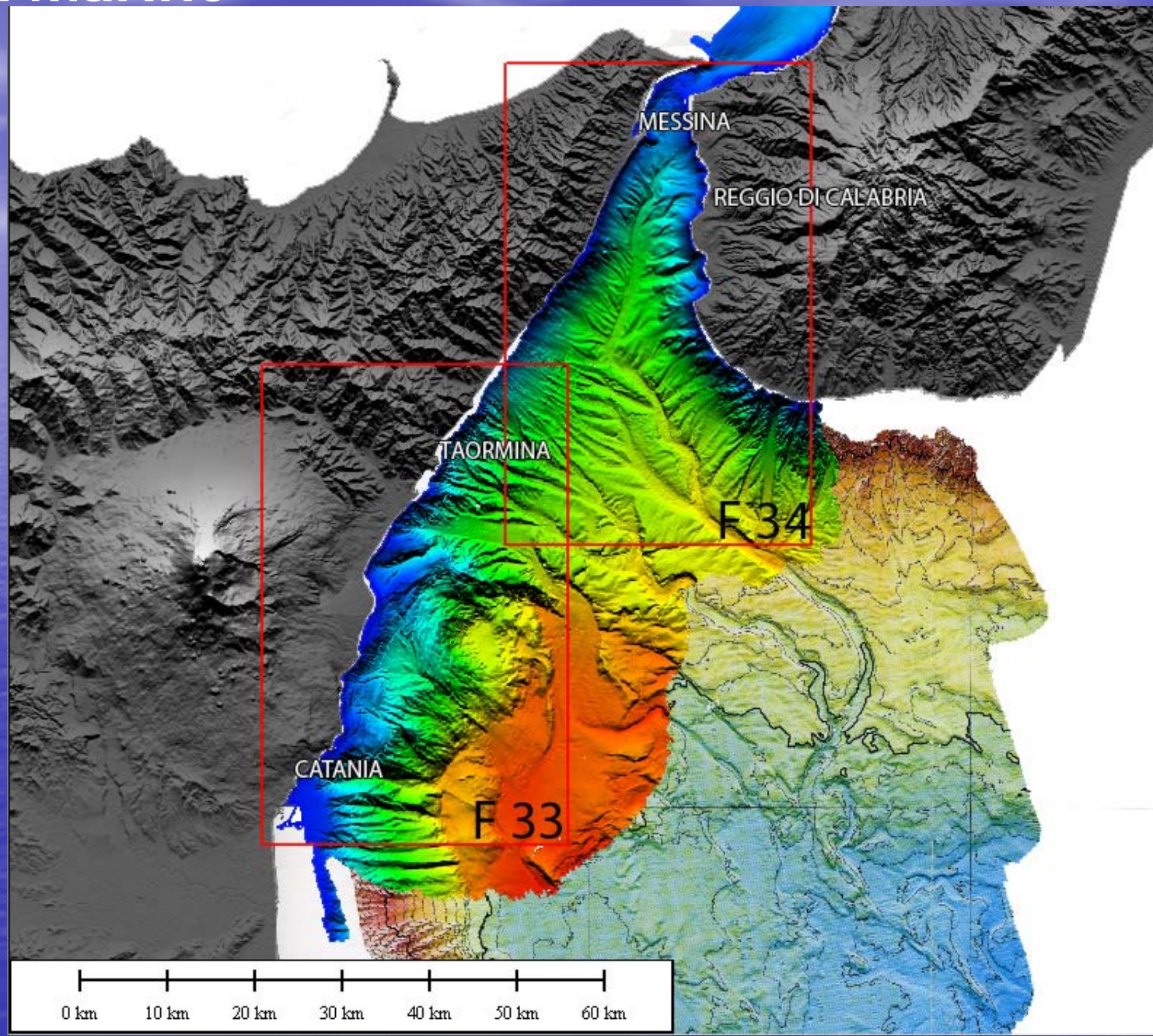
Distance	5.58 m
Bearing:	300.97°
Elevation:	-0.02°

# Importanza delle indagini morfobatimetriche

- Dato di cartografico di base per il rilevamento geologico (CTR)
- Assetto geologico dei fondali condiziona il tipo d'indagine geofisica
- Aree vulcaniche (complessi insulari)
- Alti strutturali
- Aree con assenza di piattaforma (elevate pendenze)
- .... morfologie articolate



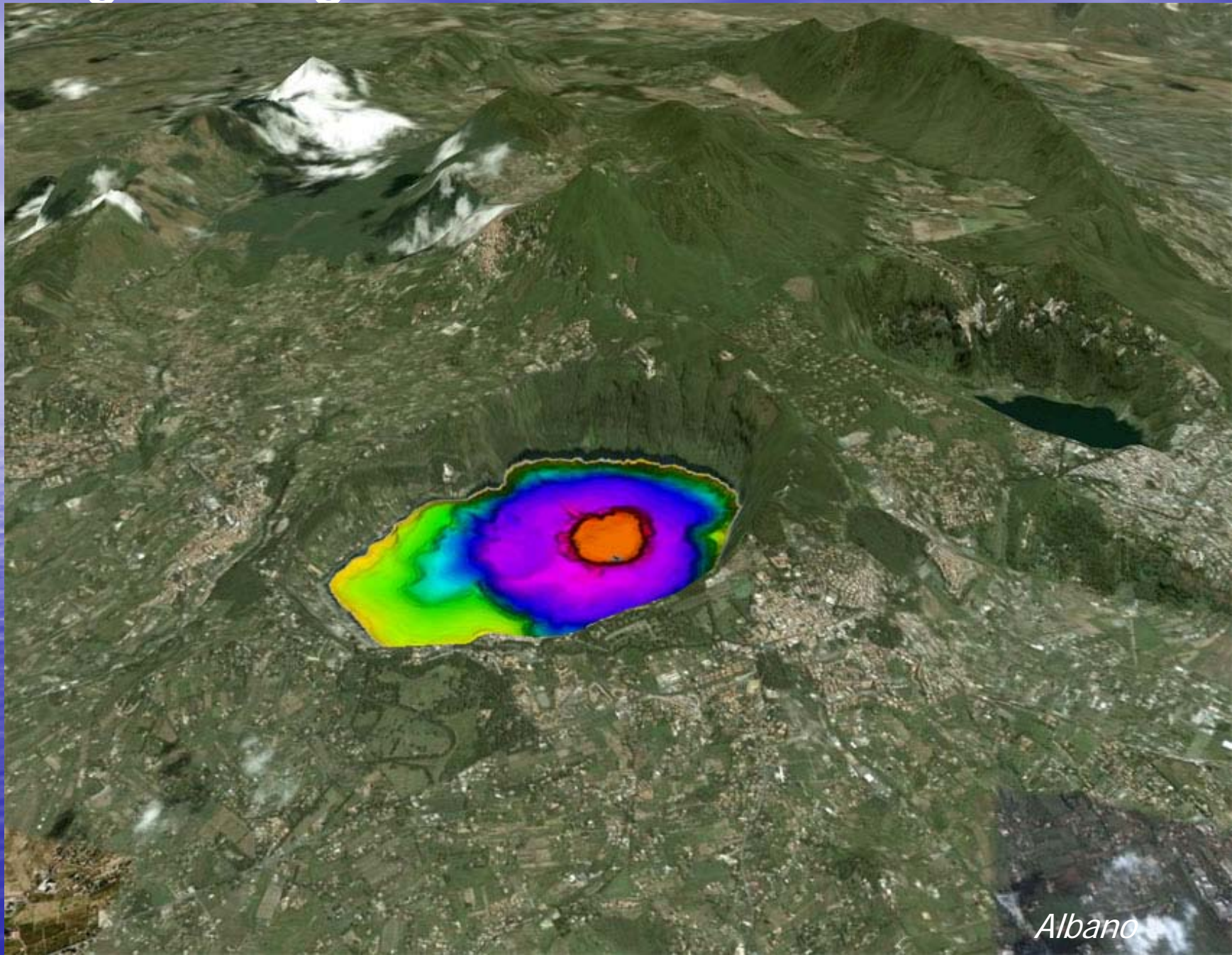
# Indagini Marine



# Indagini in aree fluviali



# Indagini in laghi





9001



8101



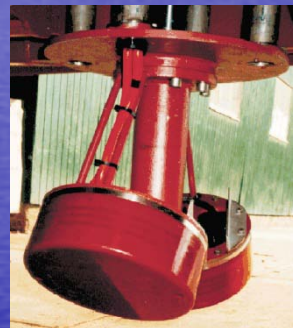
8111



EM1002



8125



EM3000



1050



EM121



7125



EM 2040

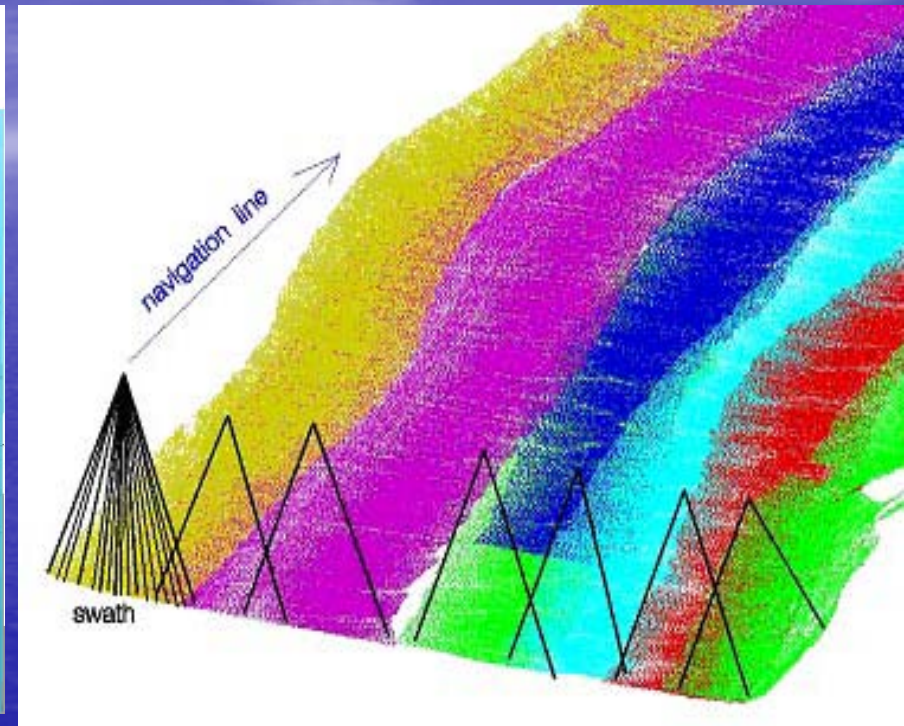
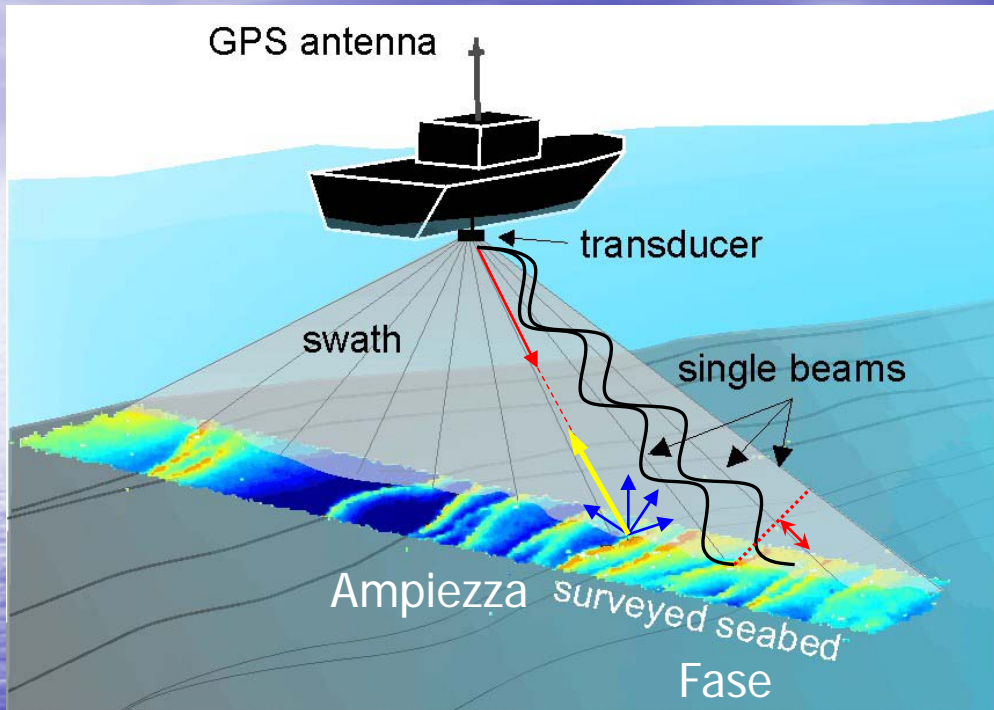


R2 SONIC



8160

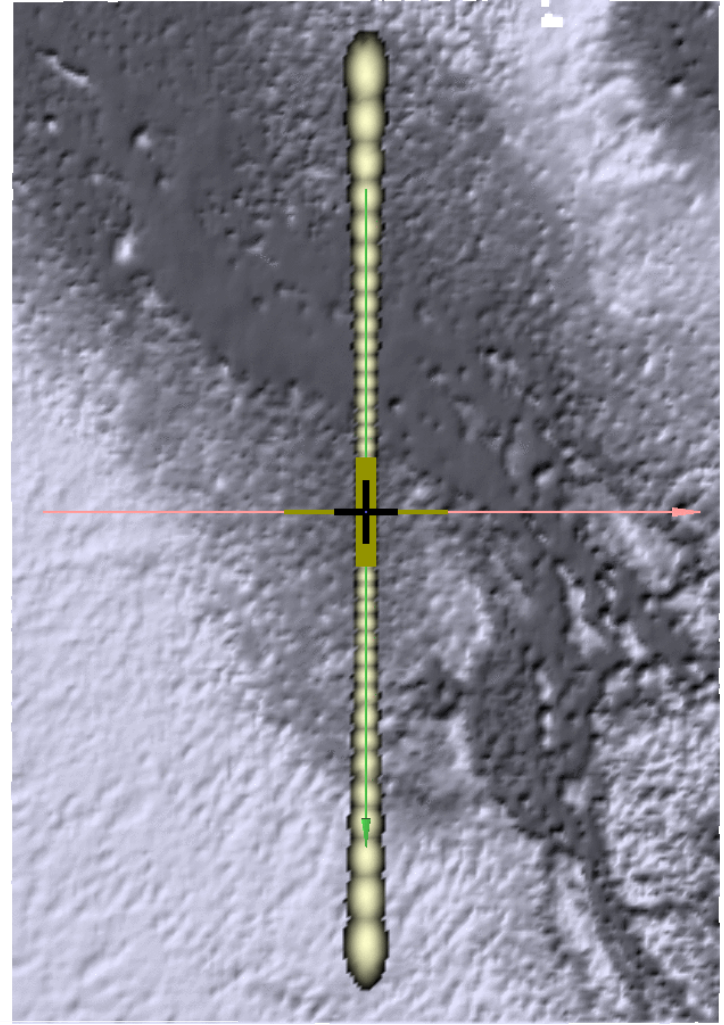
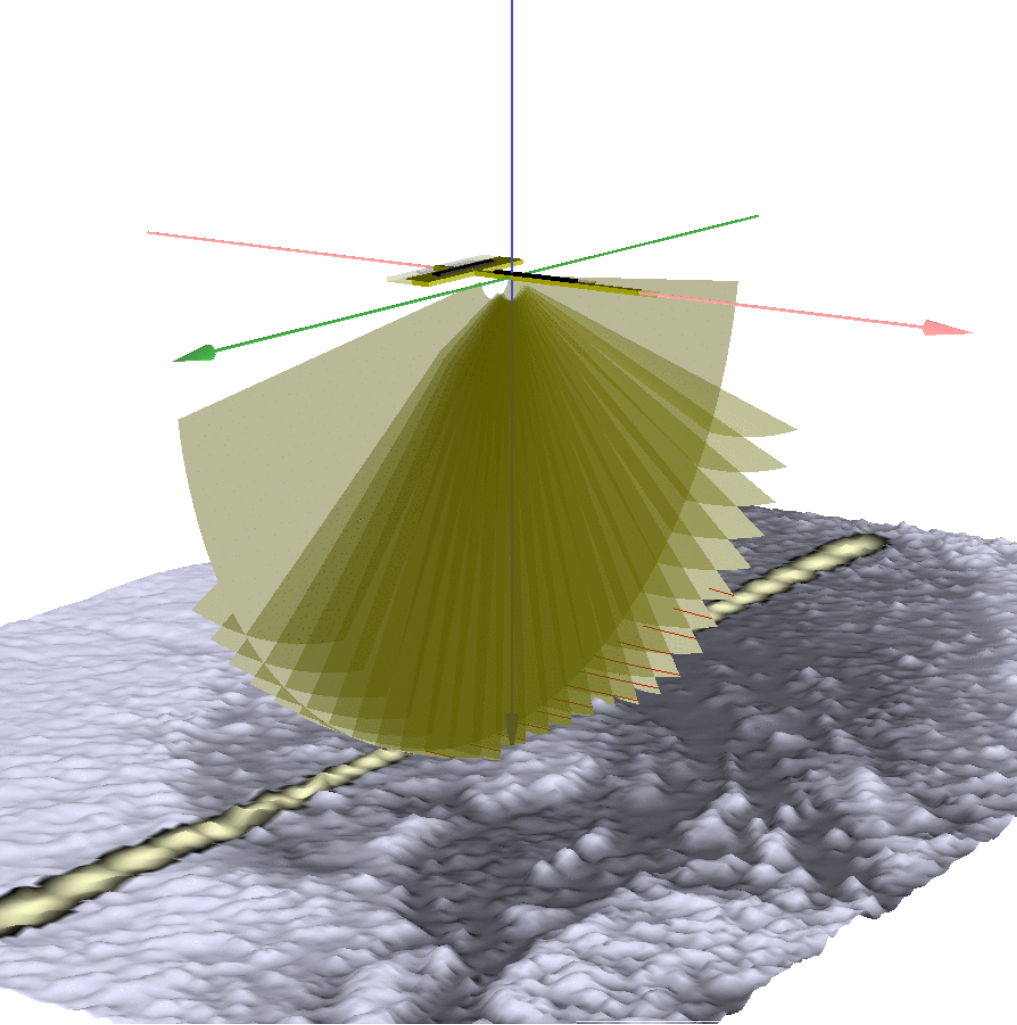
# Principi di funzionamento



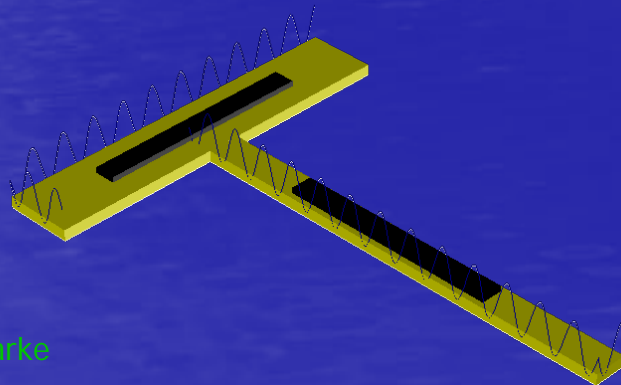
- impulso emesso
- impulso diffratto
- impulso di ritorno



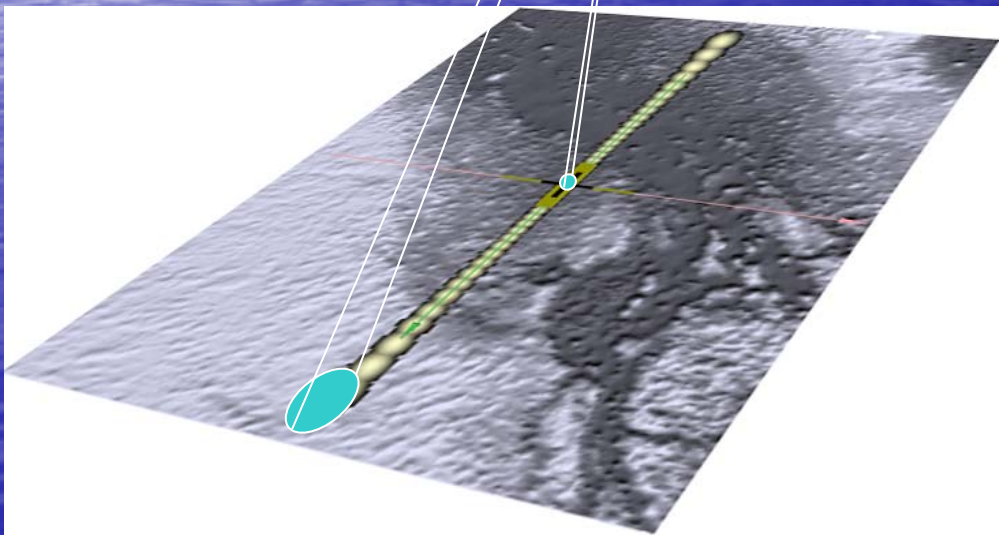
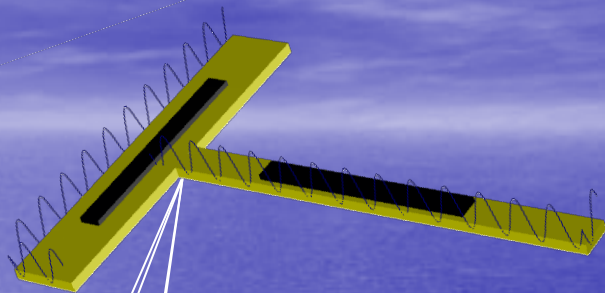




Prodotto finale



# Risoluzione orizzontale: footprint



# Footprint Risoluzione



8160 50 kHz 1.5°x1.5°  
across at nadir

8125 450 kHz 1°x0.5°  
across at nadir

# Profondità e risoluzione: footprint

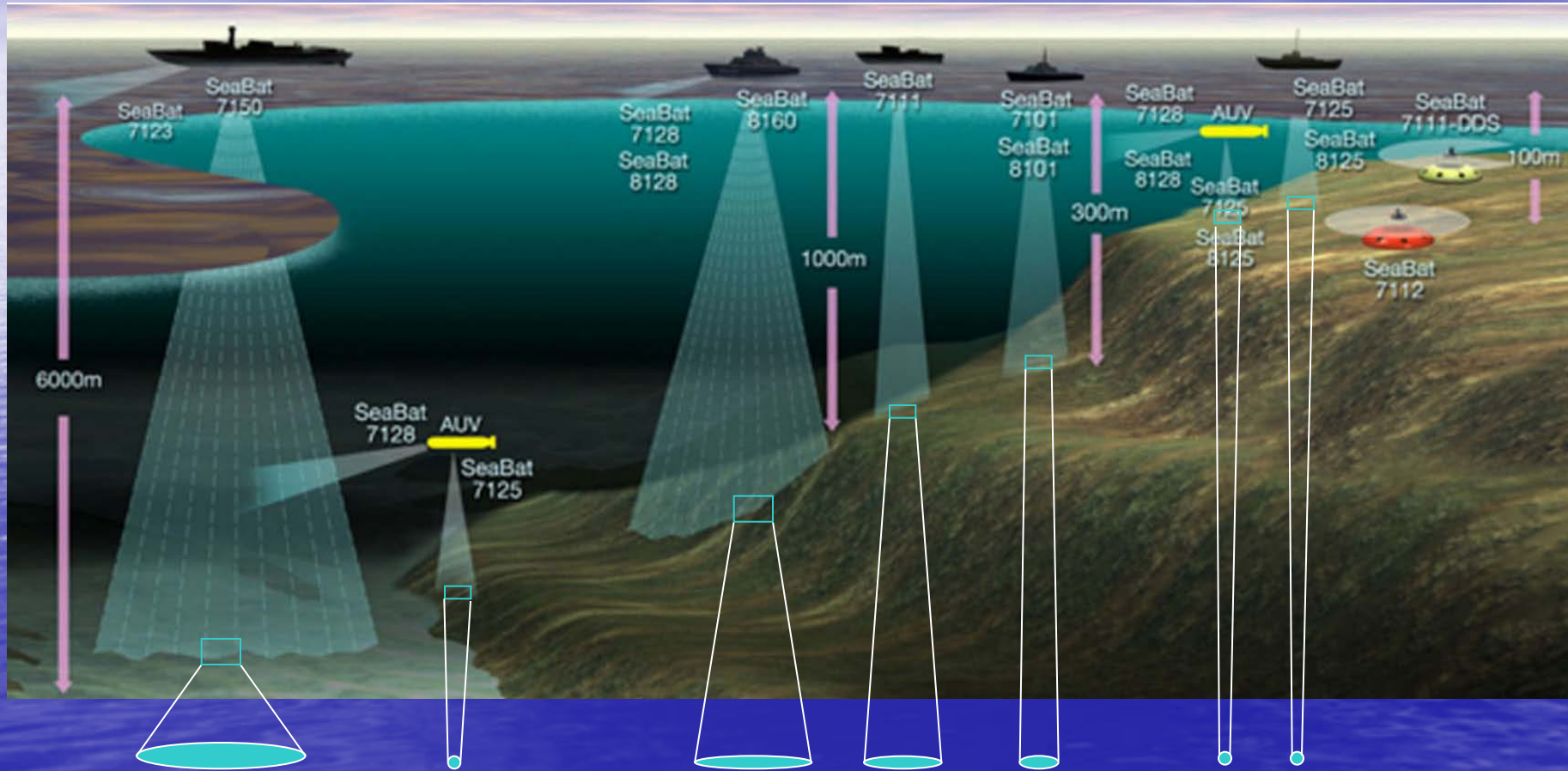
12- 24 kHz

50 kHz

100 kHz

200 kHz

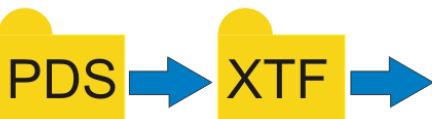
400 kHz





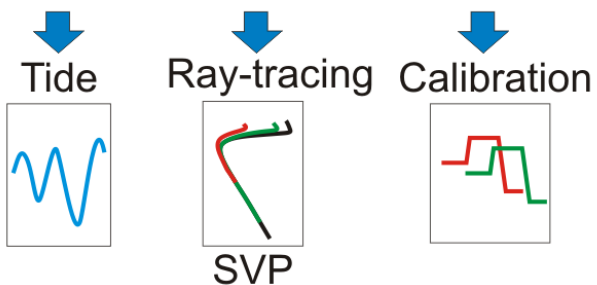
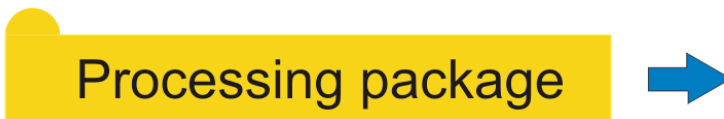
# Principi di elaborazione dati MBES

## Pre-processing



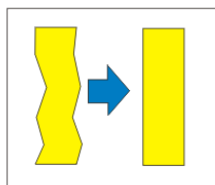
Conversion and import

## Processing



Despiking

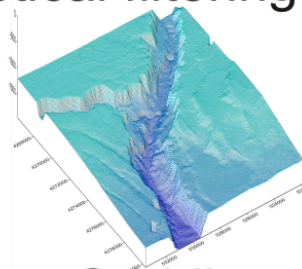
Geometrical and statistical filtering



Editing



Mosaicking

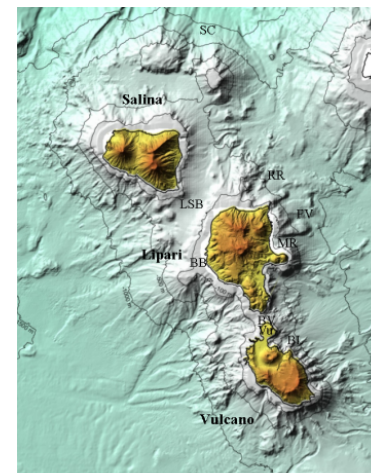


Gridding

## Post-processing



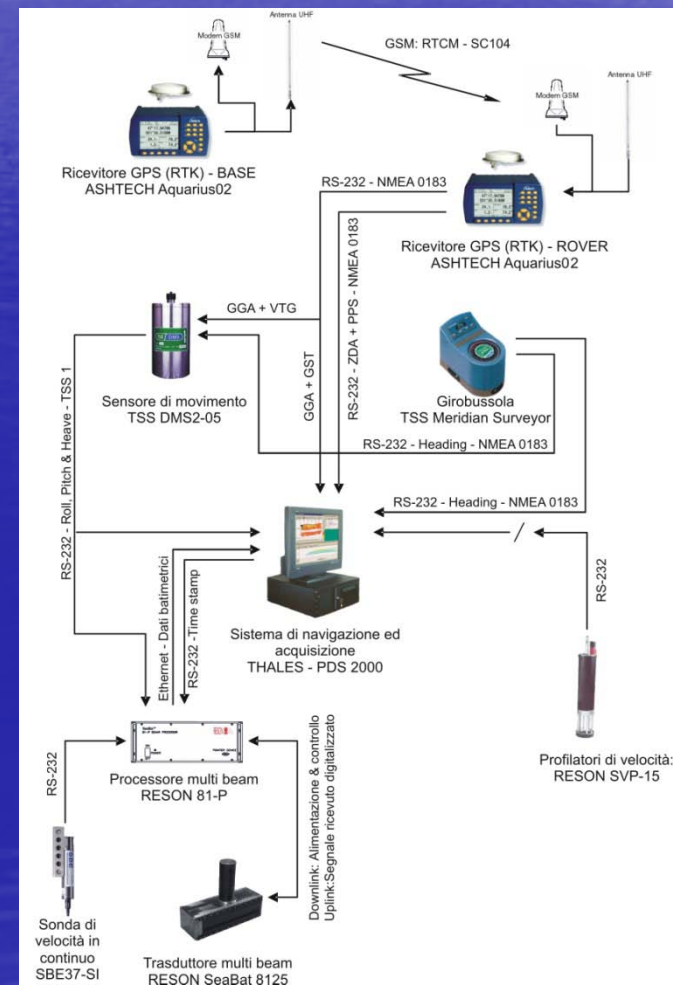
DEM Resolution { high: 0 - 100 m depth  
medium: 100 - 500 m  
low: 500 - 2000 m



Bathy-morphological map

# Fonti di errore

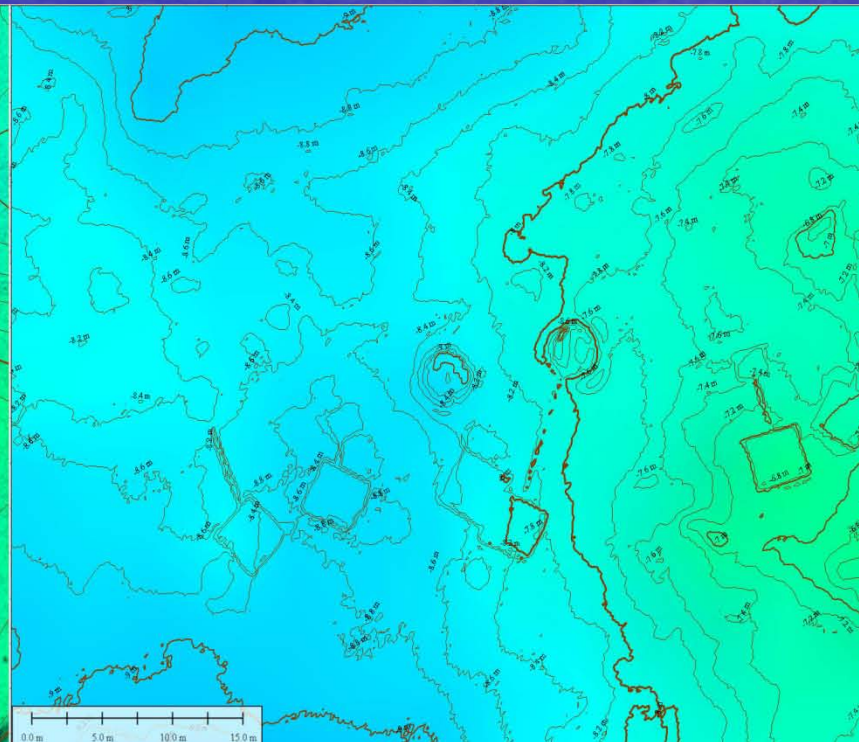
- ✓ **SISTEMI DI POSIZIONAMENTO (NAVSTAR)**
- ✓ **CALIBRAZIONE DEI TRASDUTTORI MULTIBEAM**
- ✓ **VELOCITA' DEL SUONO LUNGO LA COLONNA D'ACQUA E ALLA TESTA DEL TRASDUTTORE**
- ✓ **CORREZIONI MAREOGRAFICHE**
- ✓ **OFFSET STRUMENTALI**
- ✓ **COMPENSAZIONE DEI PARAMETRI INERZIALI RMU**
- ✓ **CONDIZIONI METEOROLOGICHE**



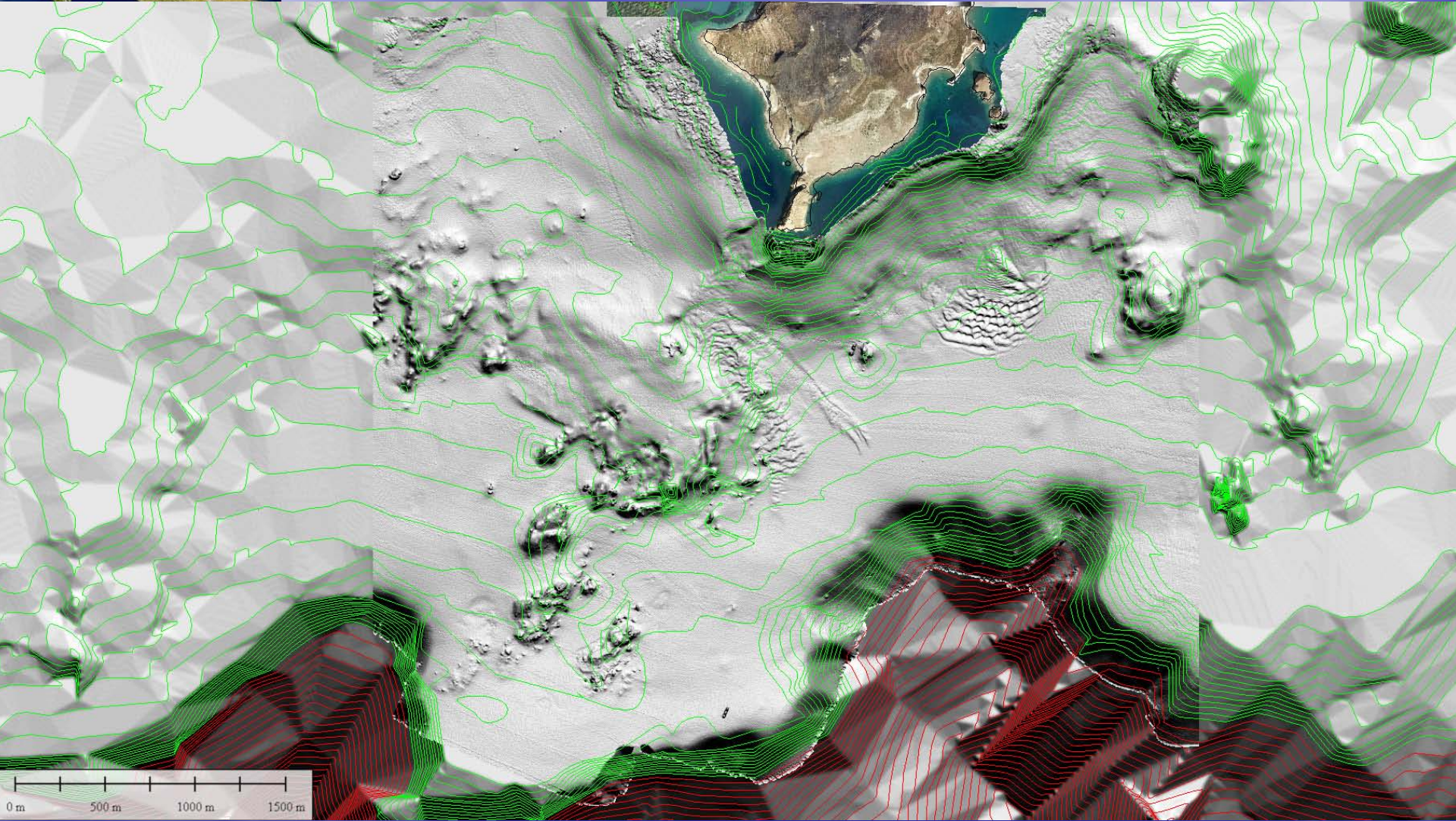
# Grid e risoluzione spaziale

## Sottocampionare?

*Risoluzione: 0.1 m, 0.5m, 1m, 2m, 5m con isobate eq. 10cm*



# Esempi d'indagini e comparazione dati single-multibeam



*Dati IIM (grafici scandagliamento)*

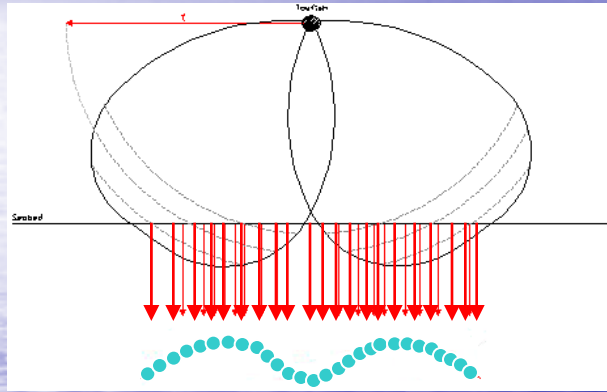


## - Principali elementi morfologici –

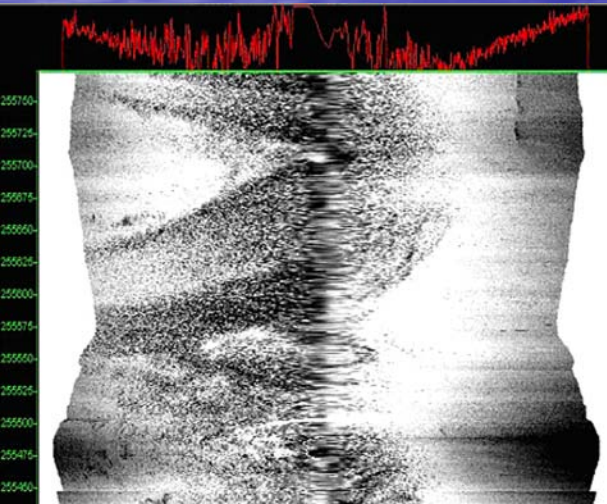
- Bordo della piattaforma
- Linee di riva (terrazzi e spiagge sommerse)
- Linee di drenaggio
- Assi principali dei canyon
- Frane
- Aree di instabilità gravitativa
- Conoidi
- Rotture di pendio – Grotte
- Orlo di Cratere
- Orlo bordo calderico
- Altra forma vulcanica significativa
- Sand wave, ripple, barre sommerse
- .....

# BACKSCATTER - MBES

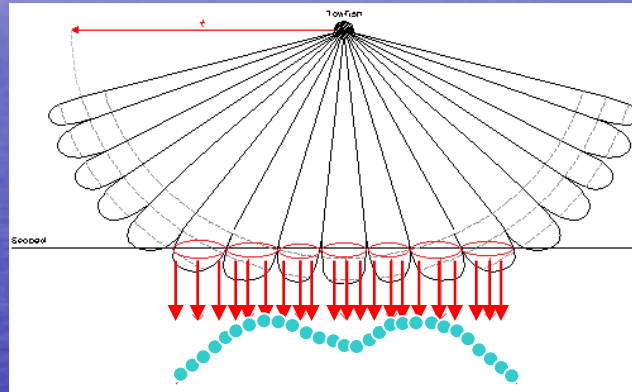
## SONAR



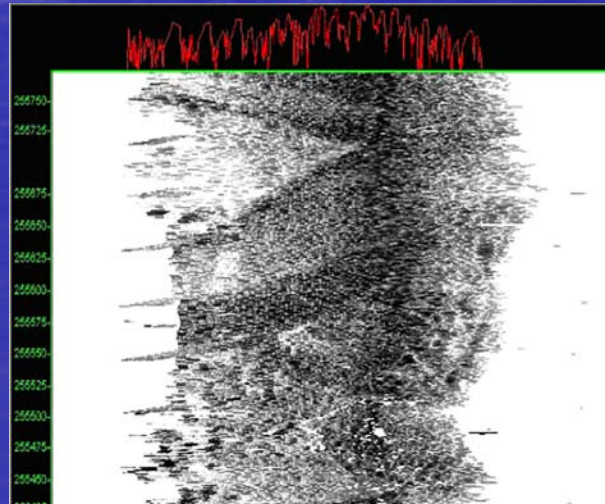
*1500-2500 campioni*



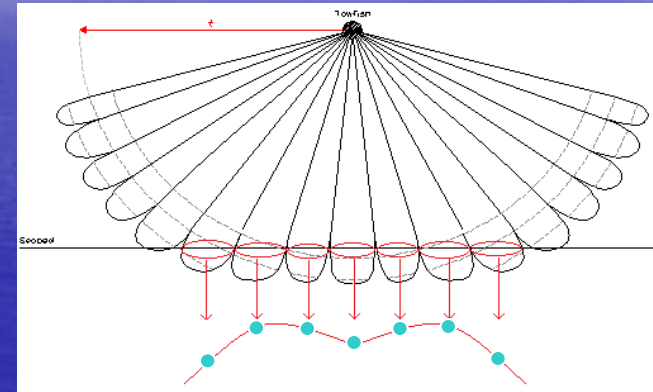
## SNIPPET



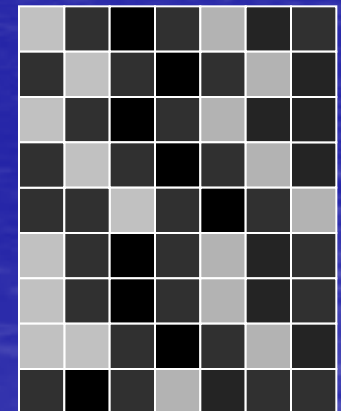
*1500-2500 campioni*



## Beam Intensity

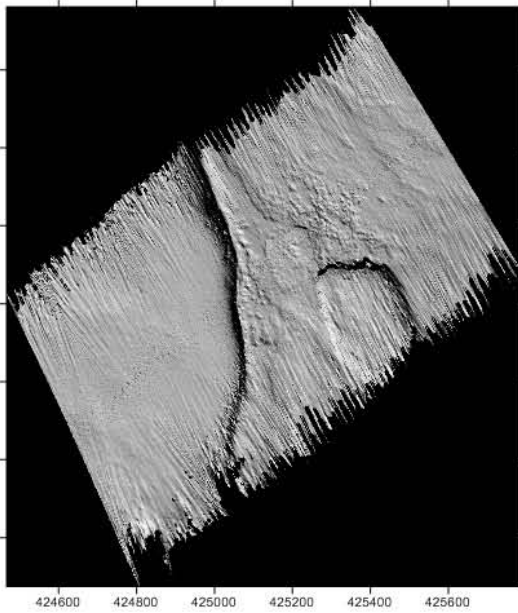


*Numero di beam*

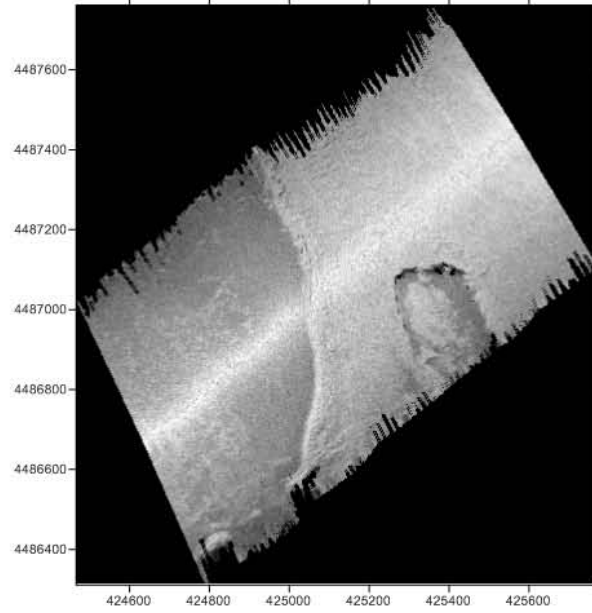


**7111 Sardegna survey (MAGIC Project) [www.magicproject.it](http://www.magicproject.it)**

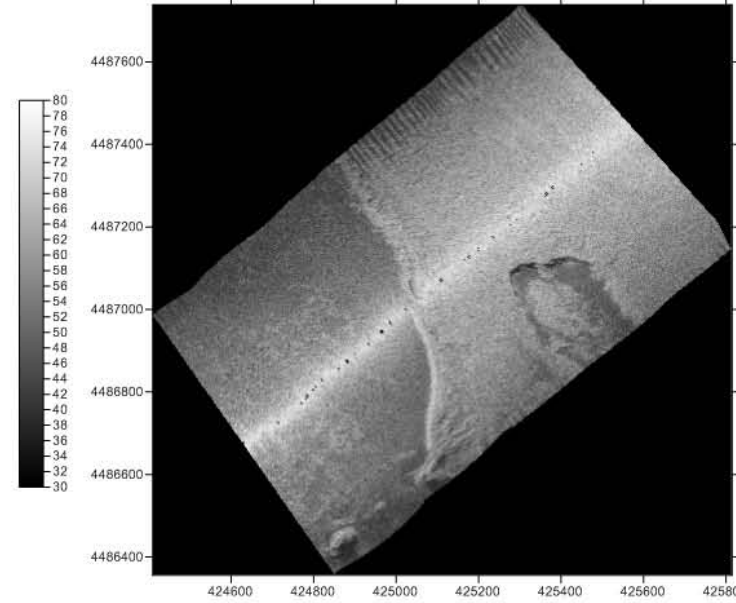
Shaded map line 1m



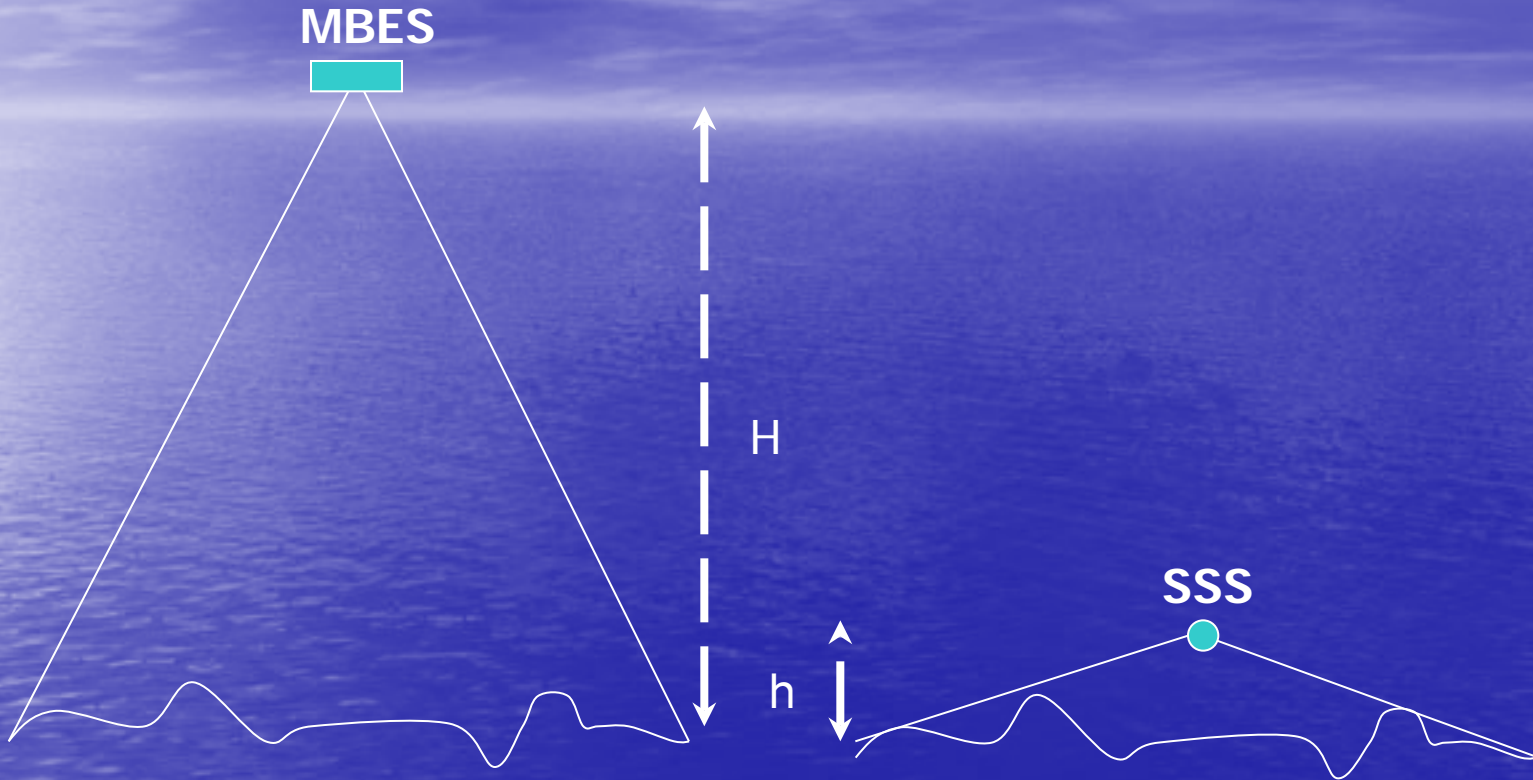
Snippet line 0.5m



Sonar line 0.5m



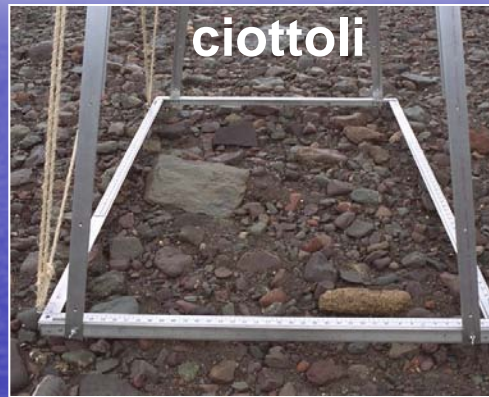
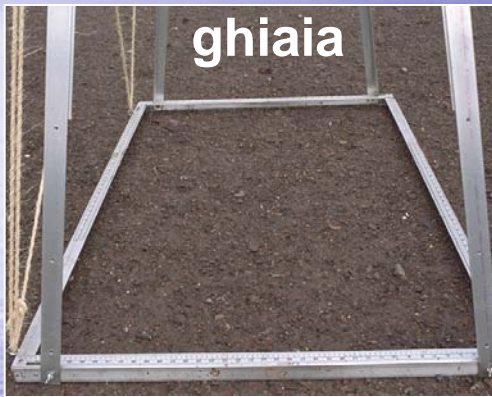
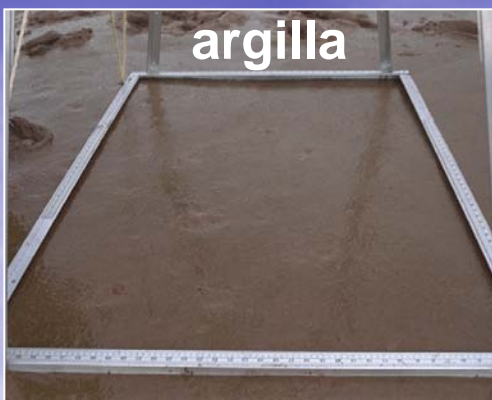
# Backscatter MBES e Side Scan Sonar



Media-Bassa risoluzione  
Punto di osservazione (alto)  
Elevato posizionamento (GPS)  
Elevata velocità di crociera (10kn)



Alta-Altissima risoluzione  
Vista sub-orizzontale (distorsione)  
Basso posizionamento (GPS)  
Bassa velocità di crociera (3kn)



Taratura del backscatter ?



# Cenni di Elaborazione DATI BACKSCATTER MBES

## Pre-processing



## Processing



## Post-processing



Conversion and import

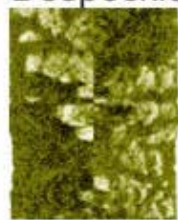
Slant Range



TVG



Despeckle



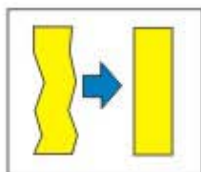
RASTER Resolution

- high: 10 - 50 cm
- medium: 1 - 5 m
- low: 5 - 25 m

Equalization



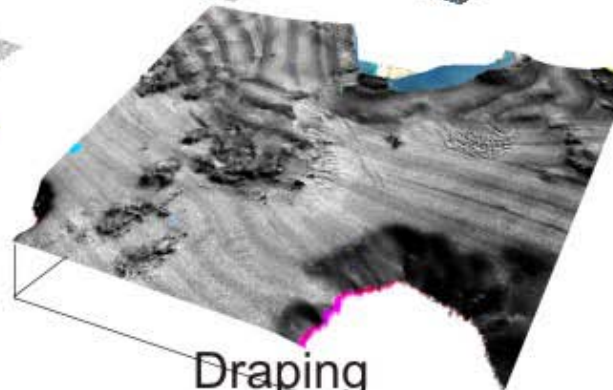
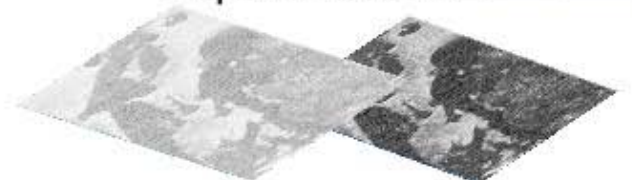
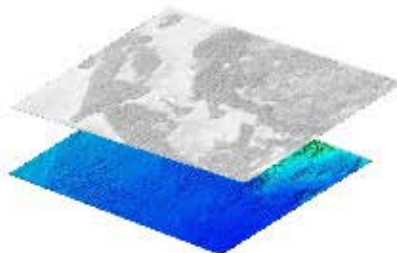
Mosaicking



Editing



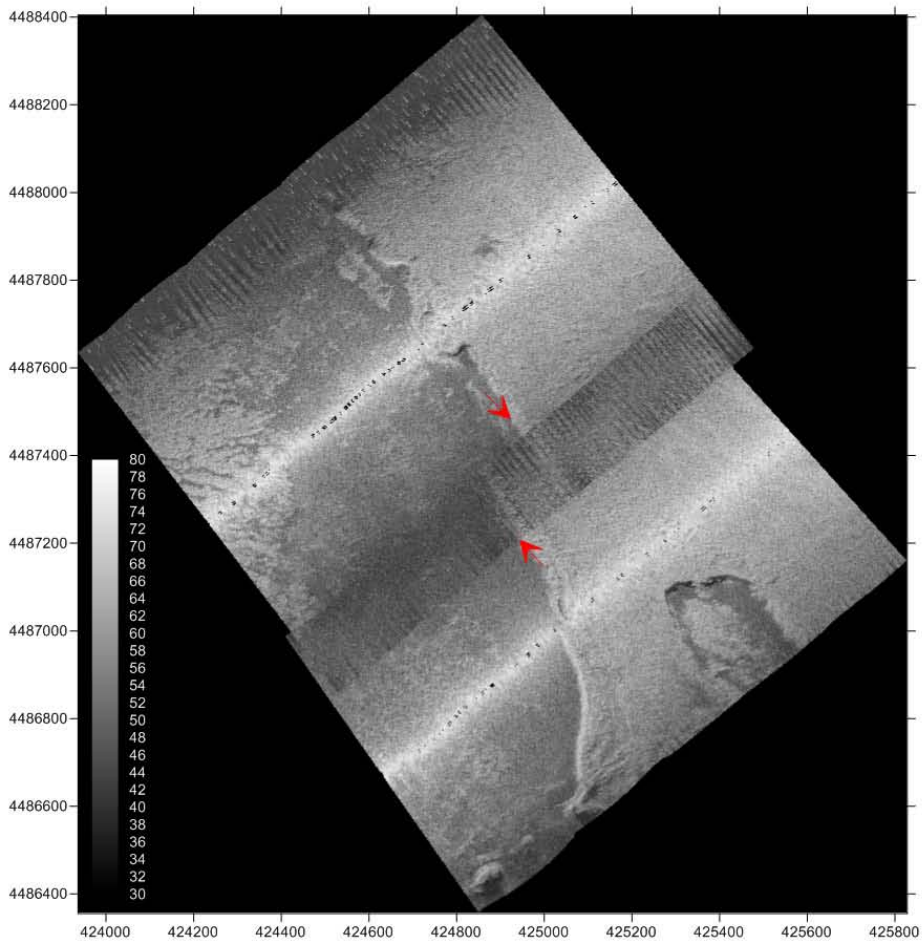
Stenciling



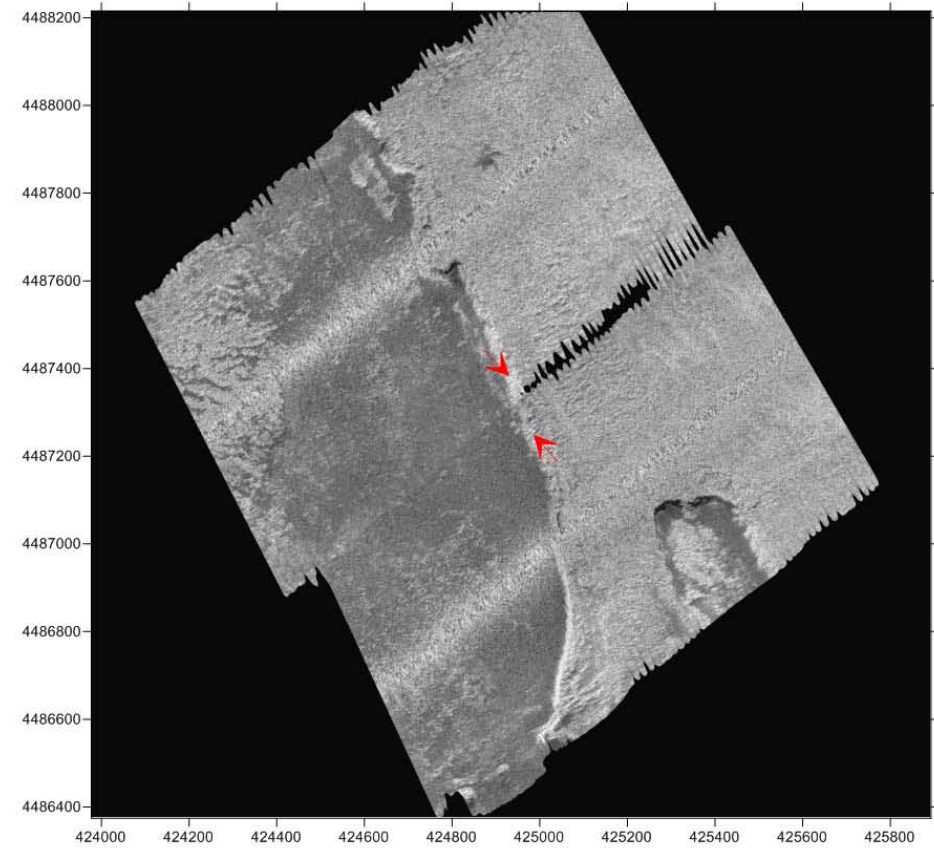
Draping  
(SSS over Bathymetry)

# Correzione geometrica con calibrazione

Sonar Mosaic from PDS2000



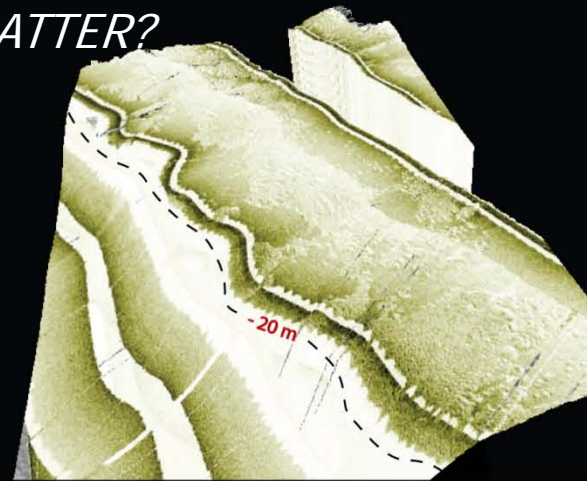
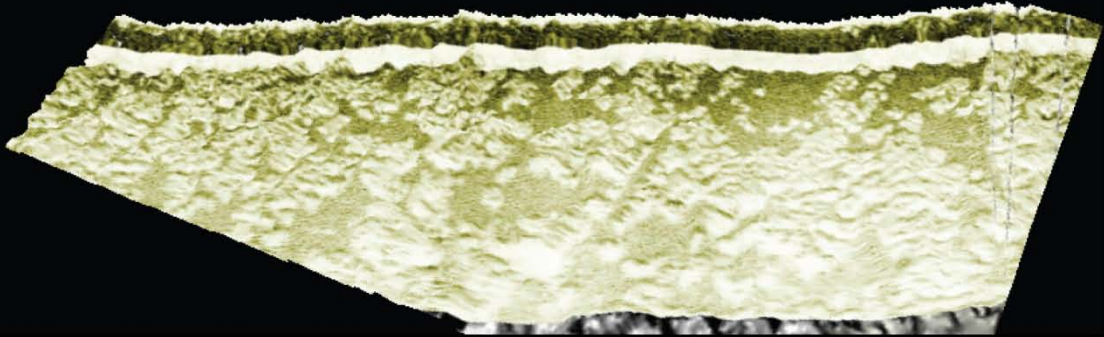
Sonar Mosaic from Caris H&S 6.1



Sonar image correlated to bathymetry

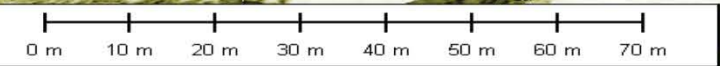
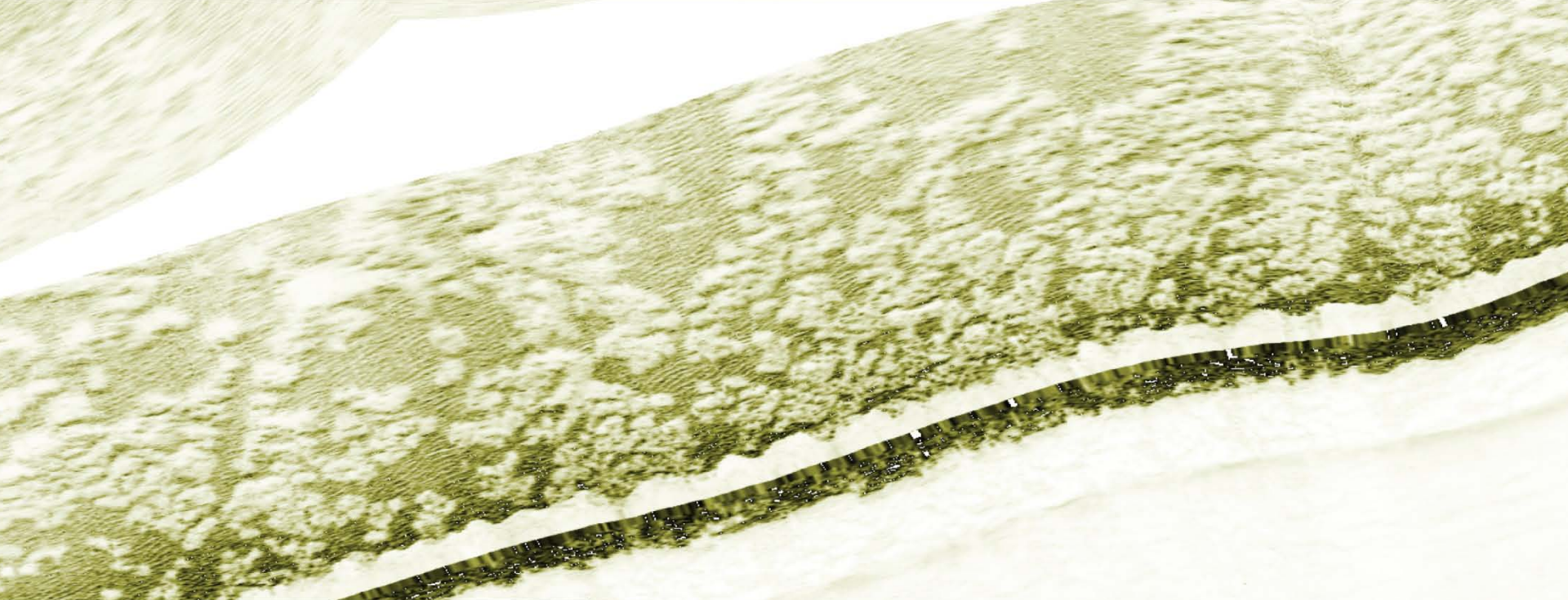


# Interpretazione..... MBES O BACKSCATTER?



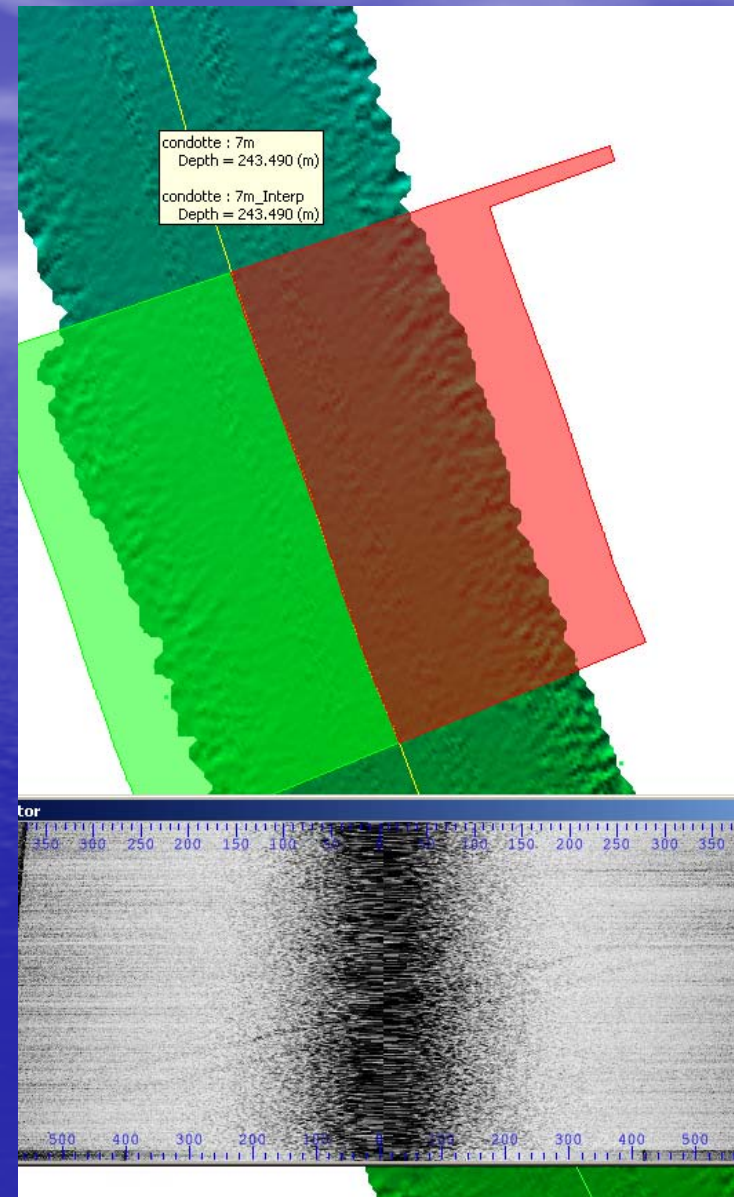
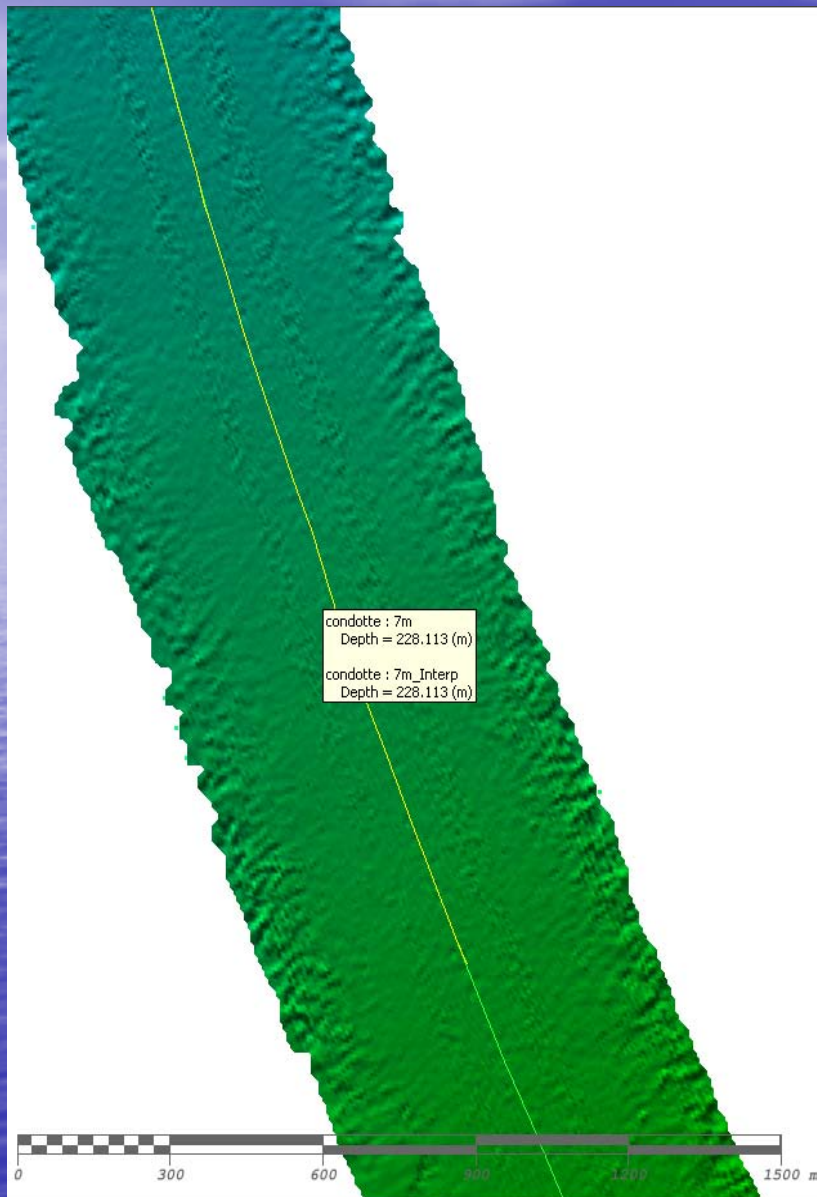
Global Mapper - REGISTERED (CRISTIAN - STR-RIPCURRENT.GMW)

View Tools Search GPS Help





# Interpretazione..... MBES O BACKSCATTER?



Comparazione strisciata MBES e SSS (condotte di Favazzina)

# Interpretazione di dati MBES con uso di Global Mapper software

The screenshot displays the Global Mapper software interface. The title bar reads "?Global Mapper ? Magic Project? v10.00 - REGISTERED". The menu bar includes File, Edit, View, Tools, Search, GPS, and Help. The toolbar contains various icons for file operations, navigation, and rendering, with a dropdown menu currently set to "HSV Shader".

## Global Mapper

- Open Your Own Data Files**  
(Menu Command: File->Open Data File)
- Find Data Online**  
(Menu Command: File->Find Data Online)
- Download Free Maps/Imagery from Online Sources**  
(Menu Command: File->Download Online Imagery/Topo Maps)
- Display Settings/Projection**  
(Menu Command: Tools->Configuration)
- Manage Loaded Data**  
(Menu Command: Tools->Control Center)

MARINE GEOHAZARDS ALONG THE ITALIAN COASTS  
PROGETTO  
MAGIC  
[www.magicproject.it](http://www.magicproject.it)

**Mapping Help**  
(see also the Help Menu)

1:???

*BUON LAVORO!!!*

