



Università degli studi di Trieste

LAUREA MAGISTRALE IN GEOSCIENZE

Classe Scienze e Tecnologie Geologiche

Curriculum: Esplorazione Geologica

Anno accademico 2021 - 2022

Analisi di Bacino e Stratigrafia Sequenziale (426SM)

Docente: Michele Rebesco

Modulo 1.1

Presentazione reciproca

OGS

Laura Bassi

Università di Parma: Emiliano Mutti

Pubblicazioni scientifiche

Il mestiere del geologo

Geoscience Canada: David Mosher

EOS: percorsi di carriera

Introduzione ai bacini sedimentari

Concetti base di Basin Analysis

Struttura del corso

PRESENTIAMOCI: CHI SONO IO E CHI SIETE VOI?



Name:	Michele Rebesco (mrebesco@inogs.it)
Education:	Phd in Earth Sciences in 1996 @University of Parma
Years of experiences :	30 years following M.Sc. Degree in geological sciences
Current job title:	Senior researcher, geophysics department
My job in a few words:	geological exploration of polar continental slopes

Research and Academic or professional Experiences

- 30 years of experience as marine geologist in deep sea clastic sedimentary processes
- Editor-in-Chief of the journal "Marine Geology" since 2014 and previously editorial board member
- Professor at the University of Trieste for the Marine Geology course and Earth Science PhD course
- Chair of the Scientific Liaison Panel of the EU ARICE "Arctic Research Icebreaker Consortium"

An achievement I am willing to share

- Understanding along-slope versus down-slope and interacting sedimentary processes
- Evaluation of scientific manuscripts, research proposals and applications for marine survey and drilling

my personal interests outside work

- Travelling, Trekking, Climbing, Swimming, Reading...



Istituto Nazionale
di Oceanografia
e di Geofisica
Sperimentale

National Institute of Oceanography and Applied Geophysics

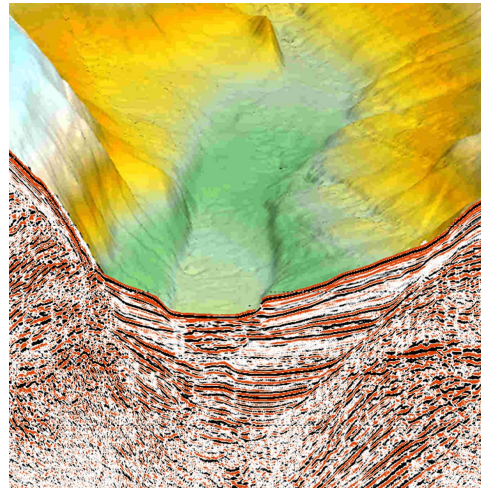


Nicola Casagli, President

OGS institutional activity



Oceanography
physical, chemical,
biological and
geological

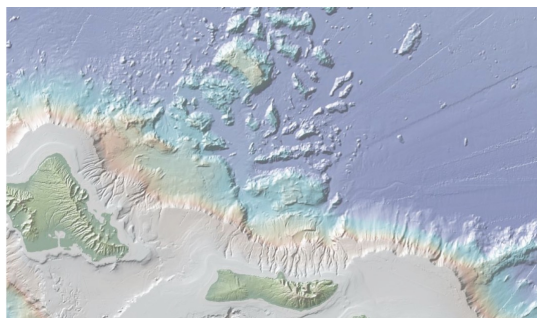


Geophysics
experimental and
exploration



Seismology
and Engineering
Seismology

R&D missions



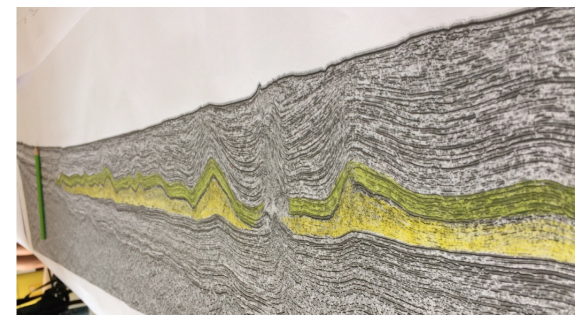
Seas & Oceans



Polar Areas



Natural Hazards



Earth Interior

NODC - National Oceanographic Data Center
ISTITUTO NAZIONALE DI OCEANOGRAFIA E DI GEOFISICA Sperimentale

HOME ABOUT PROJECTS METADATA DATA

Welcome to the National Oceanographic Data Center

OGS is recognised as the Italian National Oceanographic Data Centre (OGS-NODC) within the International Oceanographic Data Exchange System of the UNESCO Intergovernmental Oceanographic Commission (IOOC) since 27/6/2002.

OGS as part of the IOC's network of National Oceanographic Data Centres has designated responsibility for the coordination of data and information management at national level. The oceanographic database covers the fields of marine physics, chemical, biological, underway geophysics and general information on Italian oceanographic cruises and data sets.

Open Science

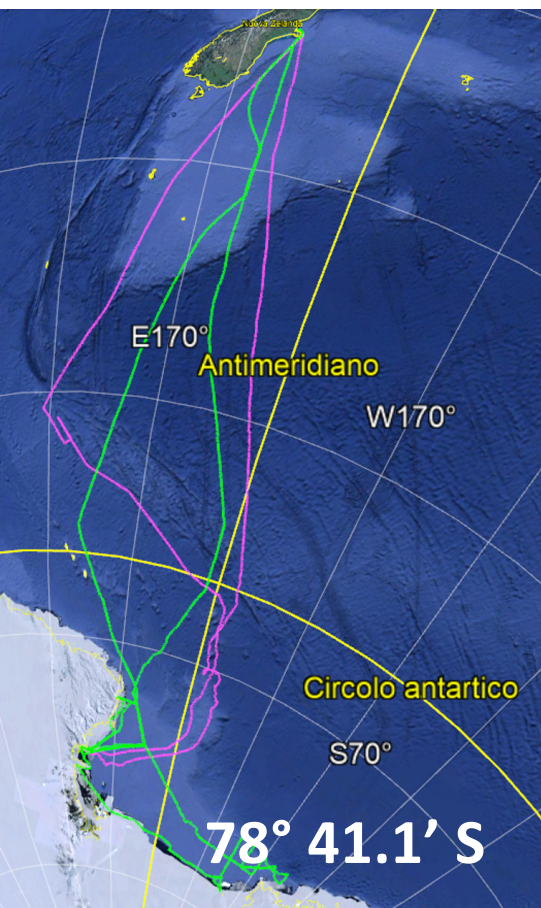
R/V Laura Bassi



Eurofleets⁺

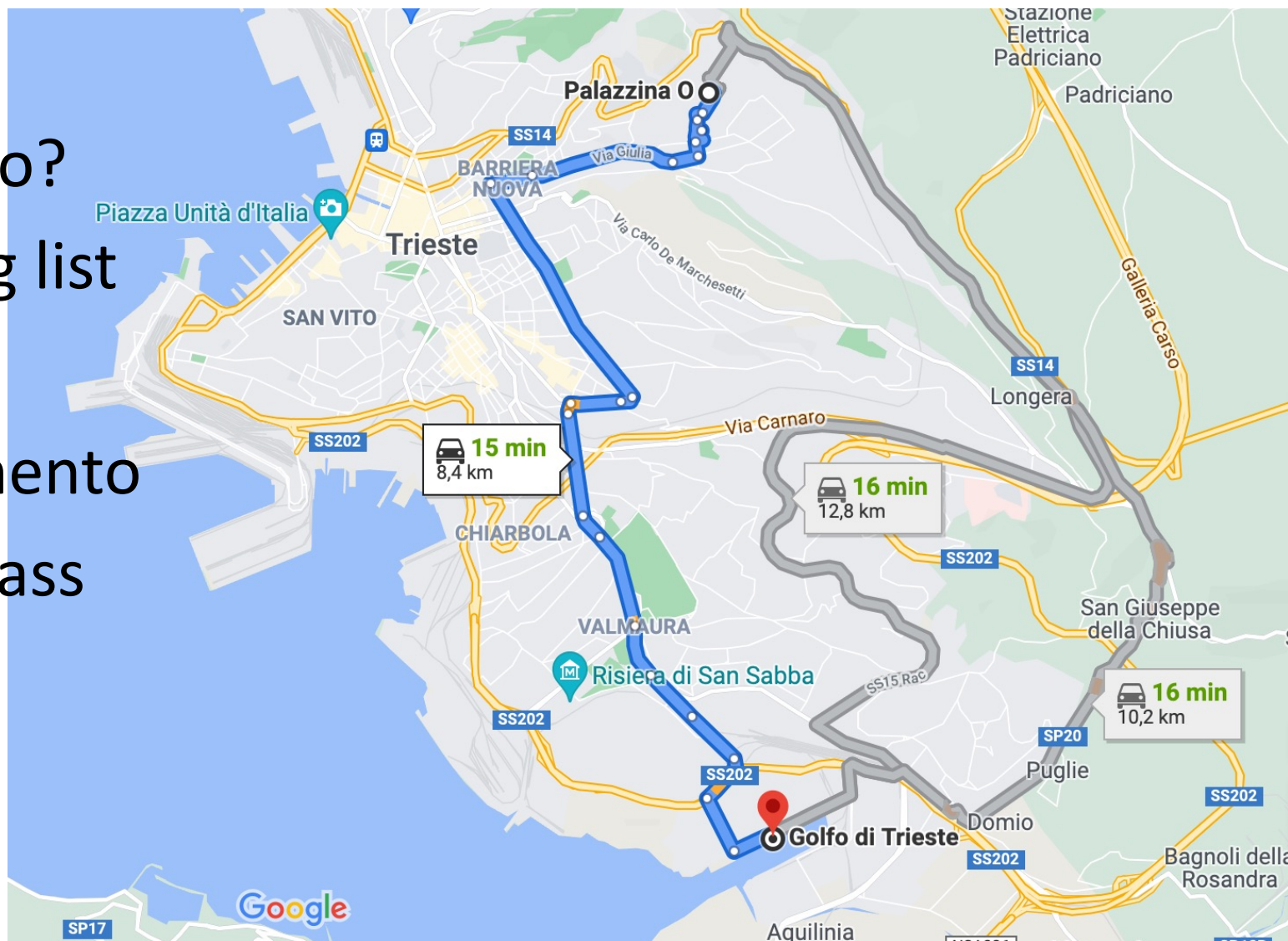
An alliance of European marine research infrastructure
to meet the evolving needs of the research and industrial communities

Antarctic missions 2019-2021



VISITA ALLA LAURA BASSI

- Quando?
- Mailing list
- auto
- Documento
- Gren Pass



European Research Infrastructures

coordinated by OGS
on behalf of the Italian government



International program that uses
profiling floats to observe oceans
www.euro-argo.eu



The European CCUS Research Infrastructure



European Carbon Dioxide Capture and
Storage Laboratory Infrastructure
www.eccsel.org



Partnership for Advanced
Computing in Europe
www.prace-ri.eu



European Strategy Forum on Research Infrastructures

ESFRI

Other research infrastructures

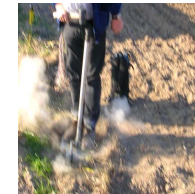
- **Research aircraft**

Piper PA-34-220 T Seneca III marche I-LACA



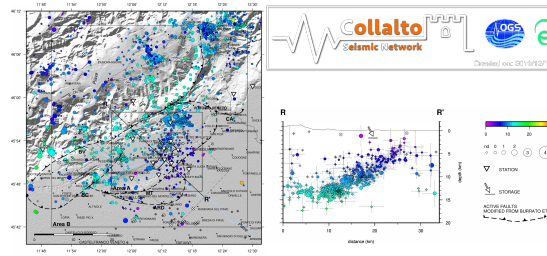
- **Exploration geophysics infrastructure**

- seismic surveys
- georesistivity
- magnetometry
- georadar
- multi-beam echo sounders
- sub-bottom-profilers (chirp and boomer)
- side-scan-sonar
- GNSS receivers



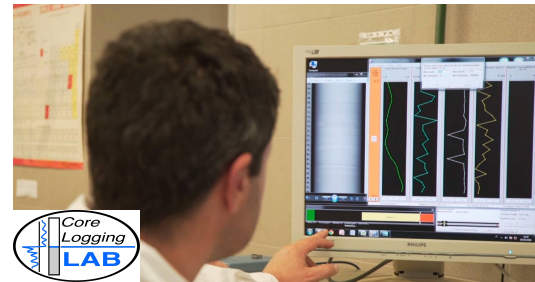
Observatories

- Antarctic Seismographic Argentinean Italian Network (ASAIN)
- Seismic Mobile Lab
- Seismic monitoring of industrial activities
- GNSS monitoring of landslides
- Deep-sea observatory SAILOR/E2-M3A
- Trieste Gulf Observatory
- Radar Observatory of Capo Granitola
- Glider station



Test sites and laboratories

- Geophysical test site of Piana di Toppo (PITOP)
- Multi-Sensor Core Logger Lab
- SEISLAB Virtual Lab
- BioMarine Lab
- Oceanography Labs
- Earth and Marine Geology Labs



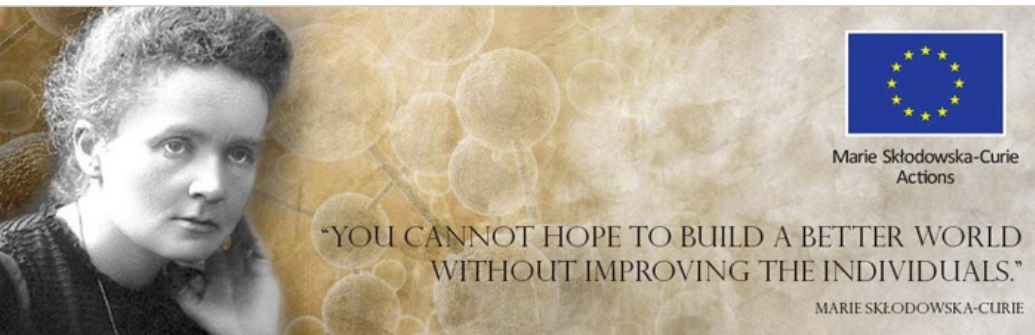
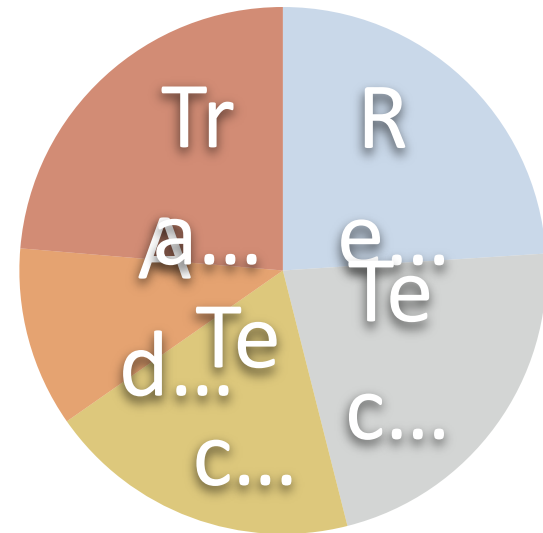
Calibration and test centers

- Oceanographic Calibration and Metric Centre (CTMO)
- Seismologic Calibration Center
- Glider Calibration Center



Human Resources

- 317 people in total
- 202 with permanent position
- 40 temporary position
- 75 are young trainees (fellows and doctoral students)



Da dove vengo: università di Parma



<https://www.youtube.com/watch?v=E3Lg0UQwuQU>

Emiliano Mutti - Eni Award 2016



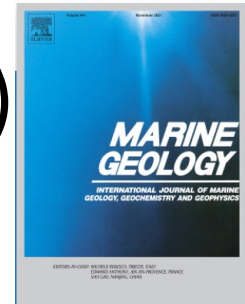


Cosa faccio?

- Per la prima volta questo corso



- 30 anni ai poli (6 volte Antartide, 2 Artico)



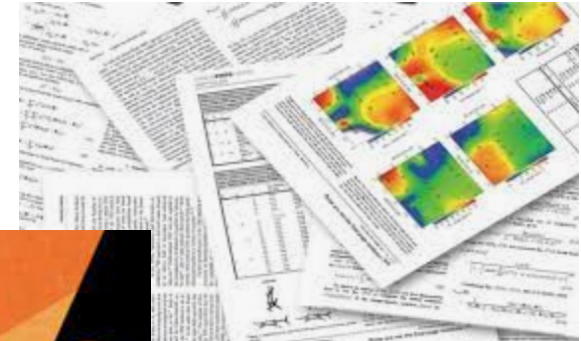
- Da 7 anni Editor-in-Chief di «Marine Geology»

- Vice-coordinatore GEV VQR 2015-2019

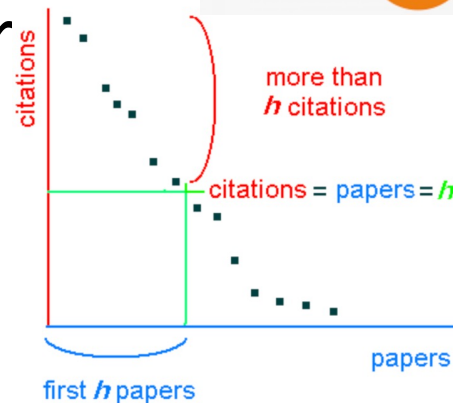


Produzione scientifica

- Articoli scientifici
- ORCID
- Peer review
- Plagiarismo
- Banche dati
- Open Access
- Impact Factor
- H-index



Scopus



2020 JIF =

$$\frac{\text{Citations in 2020 to items published in 2018 + 2019}}{\text{Number of citable items published in 2018 + 2019}}$$

Esempio di citazione:

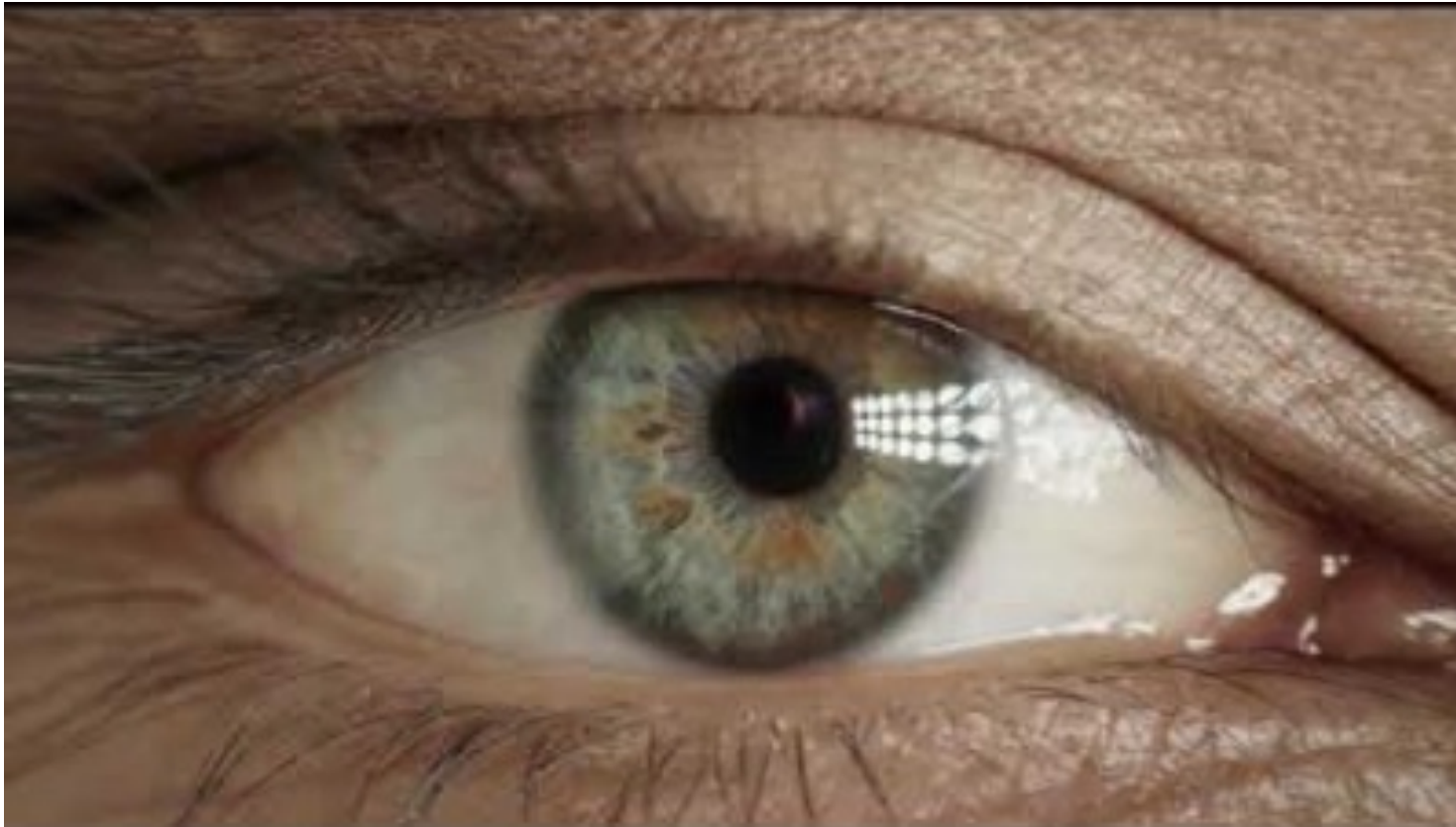
Rebesco, M., Camerlenghi, A., Munari, V., Mosetti,
R., Ford, J., Micallef, A., Facchin, L.
(2021)

Bottom current-controlled Quaternary
sedimentation at the foot of the Malta Escarpment
(Ionian Basin, Mediterranean).

Marine Geology 441, 106596

Esercizio per casa: trovarlo!

...torniamo ai geologi...



David Mosher

Penso che lo geoscientista sia in una posizione unica per quanto riguarda le pressioni che la società deve affrontare oggi, come il cambiamento climatico e la carenza di risorse. Comprendiamo più di altri come funziona la Terra e cosa ha sopportato fino ad ora.



Affrontando problemi tettonici, strutturali e stratigrafici, impariamo a pensare non solo in 3 dimensioni (poche altre professioni, come l'architettura possono fare lo stesso), ma impariamo a pensare anche nella quarta dimensione: il TEMPO. Nessun'altra professione lo fa come noi. Come dice John McPhee negli Annals of the Former World, "*... con le loro menti quadridimensionali e i loro modi interdisciplinari, i geologi possono divincolarsi da quasi tutto*".

Penso che questa conoscenza e queste capacità ci permettano di creare soluzioni. Come disse Wendell Barry, autore americano, "La Terra è ciò che tutti abbiamo in comune".

<https://csegrecorder.com/interviews/view/interview-with-david-mosher>

**WE LEARN GEOLOGY THE
MORNING AFTER AN
EARTHQUAKE**

RALPH WALDO EMERSON

Charting the Paths to a Scientific Career

In our special issue on STEM careers, meet 17 scientists who've forged creative paths to a rewarding pursuit of Earth and space science



<https://eos.org/agu-news/charting-the-paths-to-a-scientific-career>



Fushcia-Ann Hoover è quella piccola imprenditrice che ha preso la sua formazione in scienze e ingegneria e la sua passione come "maker" e li ha usati per lanciare un'organizzazione che offre consulenza alle comunità sulle infrastrutture verdi urbane

Kristel Chanard sognava le spedizioni himalayane.

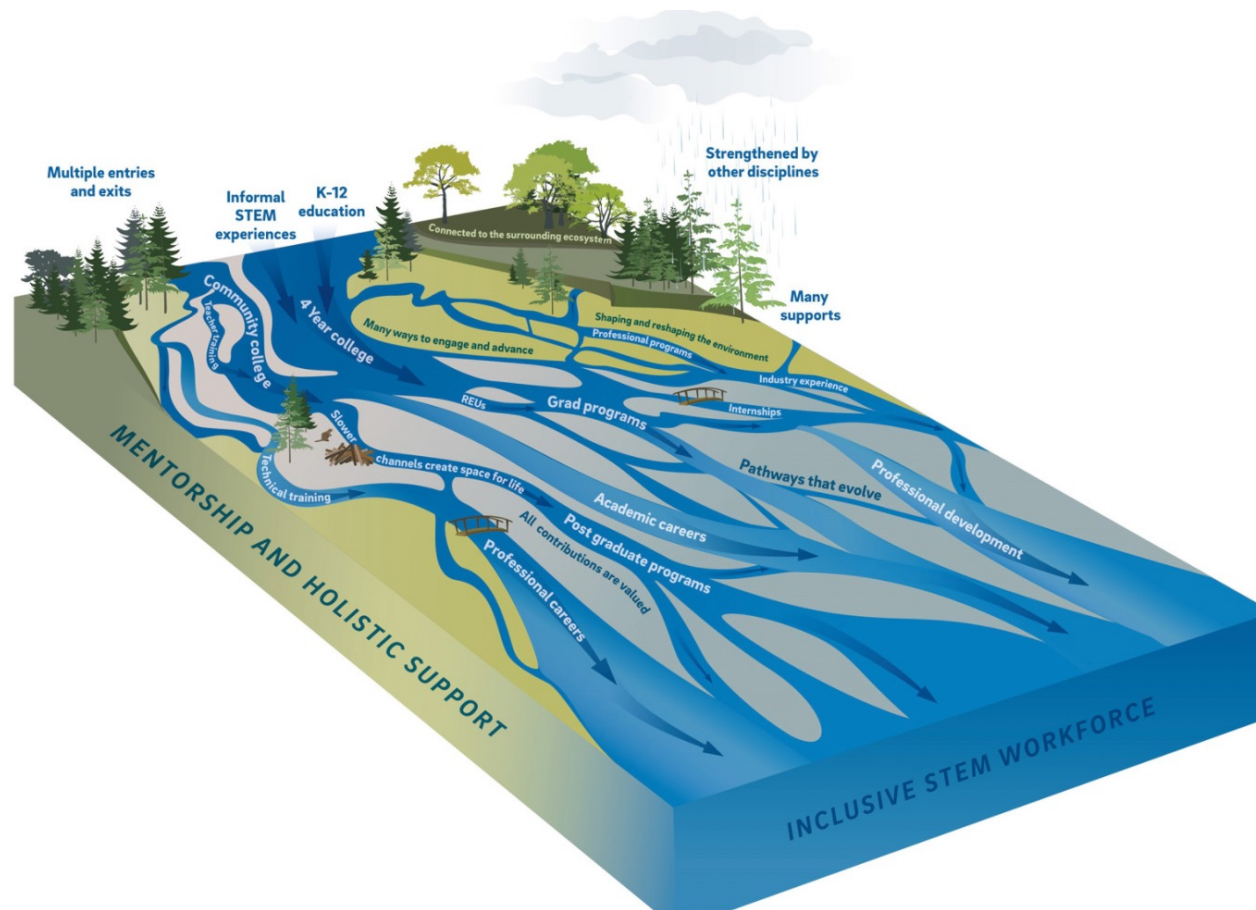
Oggi ha al suo attivo l'Himalaya, le Alpi francesi e tante altre vette dove conduce il suo lavoro di ricerca geofisica per un istituto a Parigi



Zdenka Willis, la nostra veterana militare, era attirata dalla sfida di far passare la Marina Militare alle carte nautiche digitali ed è diventata presidente di una società internazionale che riunisce aziende, politici, educatori e altri per far progredire le tecnologie marine.



A braided river system illustrates a new, holistic STEM workforce career development model.



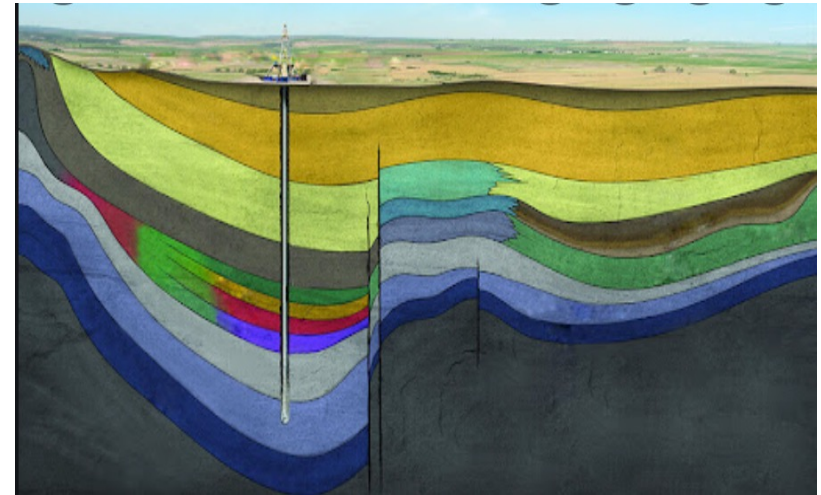
Credit: Jennifer Matthews

<https://eos.org/opinions/reimagining-stem-workforce-development-as-a-braided-river>

Applicazioni (geologia in generale, ma soprattutto analisi di bacino):

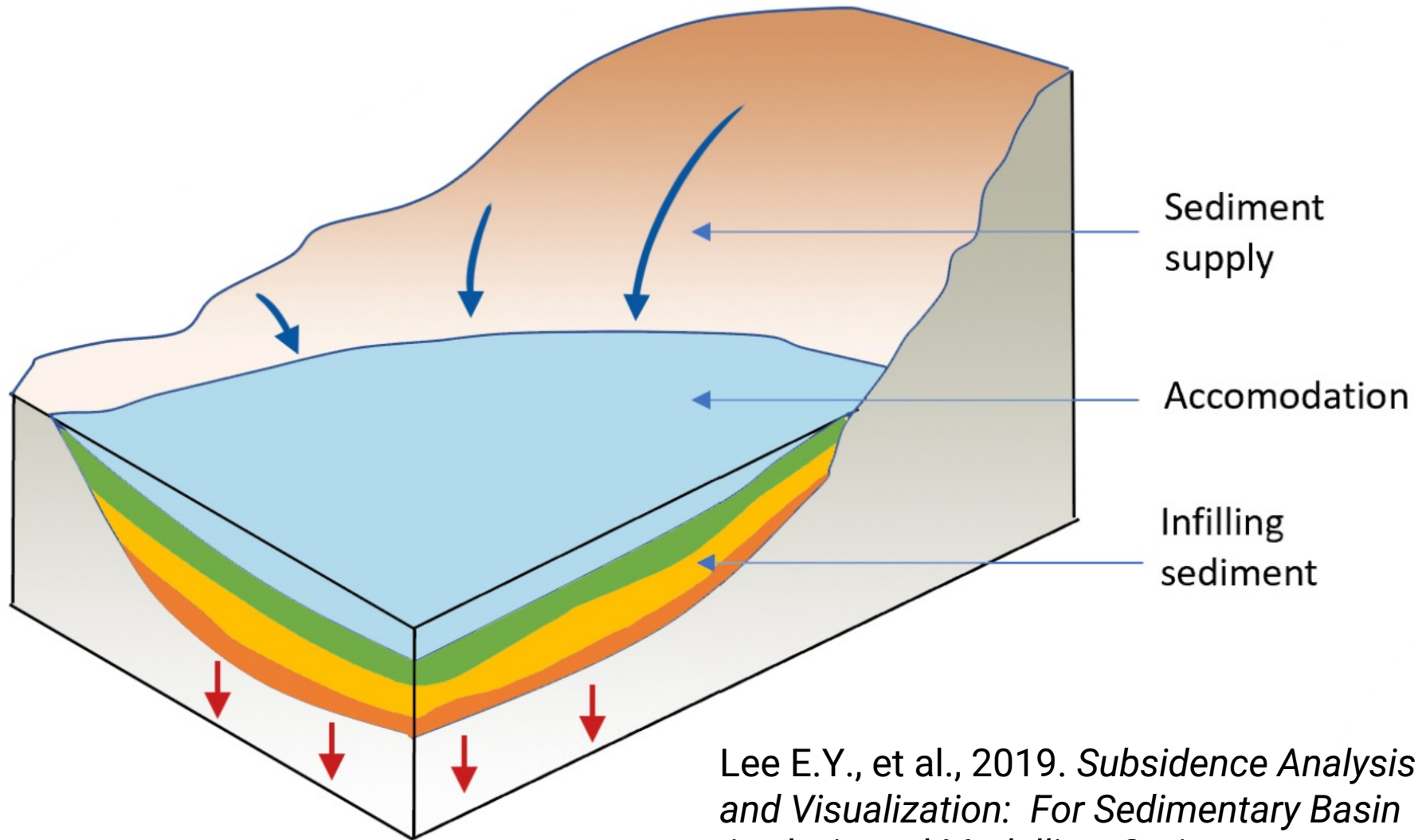
ricostruzione paleoambientale,
sfruttamento delle risorse

- idrocarburi,
- Energy storage
- Geotermia
- Deep-Sea mining
- cattura e stoccaggio geologico del carbonio,
- ...



In Cina ad es. stanno investendo molto in corsi di laurea in geologia. Per lo sviluppo, i pericoli del territorio, etc...

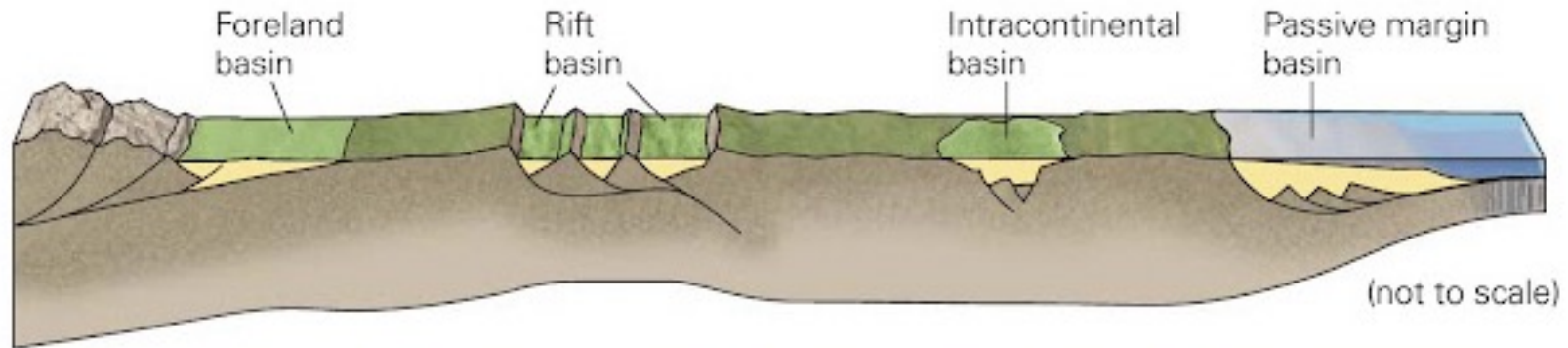
Bacini sedimentari



Lee E.Y., et al., 2019. *Subsidence Analysis and Visualization: For Sedimentary Basin Analysis and Modelling*. Springer

Meccanismi di formazione dei bacini (1 lezione), Emanuele Lodolo

Categories of Basins in the Context of Plate Tectonics Theory



Weight of the mountain belt pushes down the crust's surface.

Downward slip on faults produces narrow troughs.

The basin forms in the interior of a continent, perhaps over an old rift.

Subsidence occurs over thinned crust at the edge of an ocean basin.

The geologic setting of sedimentary basins.

Credits: Stephen Marshak (Essentials of Geology)

<http://geologylearn.blogspot.com/2016/03/sedimentary-basins.html>

Sedimentary basin analysis *(from Wikipedia)*

Sedimentary basin analysis is a [geologic](#) method by which the formation and evolution history of a [sedimentary basin](#) is revealed, by analyzing the [sediment](#) fill and [subsidence](#).

Aspects of the sediment, namely its [composition](#), primary structures, and internal architecture, can be synthesized into a history of the basin fill. Such a synthesis can reveal how the basin formed, how the sediment fill was [transported](#) or precipitated, and reveal sources of the sediment fill.

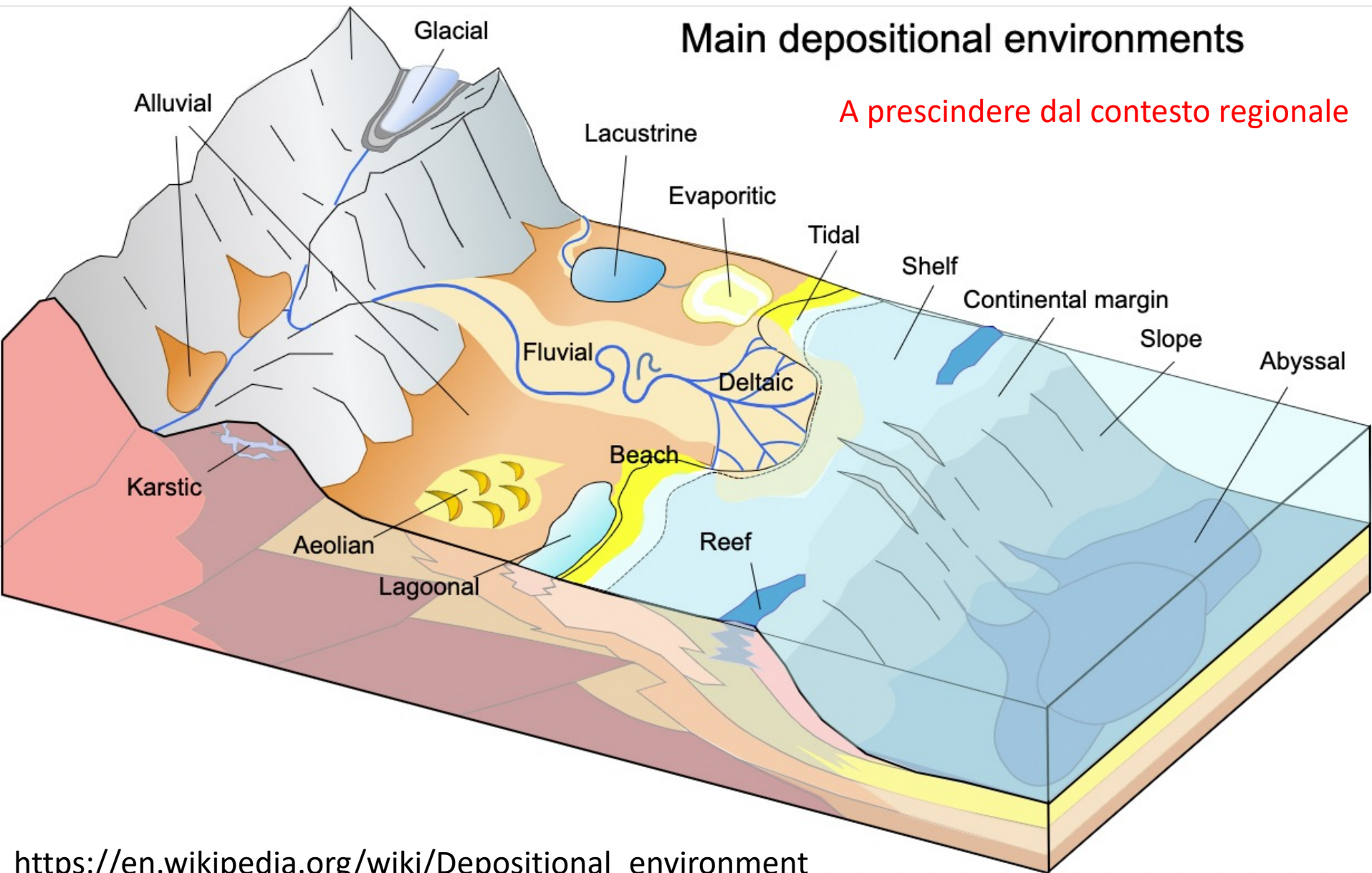
[Petroleum industry](#) basin analysis is often conducted on subterranean basins through the use of [reflection seismology](#) and data from [well logging](#).

Academic geologists sometimes use petroleum industry techniques, but in many cases they study surficial sedimentary rocks: measuring stratigraphic sections, identifying [sedimentary depositional environments](#) and constructing a [geologic map](#).

(Vedi lezione sui metodi)

Main depositional environments

A prescindere dal contesto regionale



Sequence Stratigraphy *(from Wikipedia)*

An important tool in sedimentary basin analysis is [sequence stratigraphy](#), in which various sedimentary sequences are related to pervasive changes in sea level and sediment supply.

Sequence stratigraphy is a branch of [geology](#) that attempts to subdivide and link [sedimentary](#) deposits into [unconformity](#) bound units on a variety of scales and explain these [stratigraphic](#) units in terms of variations in sediment supply and variations in the rate of change in [accommodation space](#) (relative sea level, the combination of eustatic sea level and tectonic subsidence).

The essence of the method is mapping of [strata](#) based on identification of surfaces which are assumed to represent time lines (e.g. [subaerial unconformities](#), maximum flooding surfaces), and therefore placing stratigraphy in [chronostratigraphic](#) framework. Sequence stratigraphy is a useful alternative to a [lithostratigraphic](#) approach, which emphasizes similarity of the [lithology](#) of rock units rather than time significance.

Introduco questi concetti nella lezione sui metodi e in quella su interpretazione

Mentre la Sequence Stratigraphy è trattata estesamente da Zecchin alla fine del corso

Modulo	Argomento	Docente	Data
1.1	introduzione al corso e argomenti	Rebesco	05/10/21
1.2	metodi (geofisica, affioramenti, geologia marina, ambienti attuali)	Volpi/Rebesco	06/10/21
1.3	Interpretazione sismica, facies e strutture primarie	Rebesco	12/10/21
1.4	meccanismi di formazione dei bacini (geodinamica, tettonica...)	Lodolo	13/10/21
	Martedì 19 Ottobre non c'è lezione		
1.3	Energy storage e CCS	Volpi/Donda	20/10/21
2.1	processi sedimentari eolici, fluviali e glaciali	Rebesco	26/10/21
2.2	maree e onde	Rebesco	27/10/21
	Martedì 2 Novembre non c'è lezione		
	Mercoledì 3 Novembre non c'è lezione		
2.3	gravità e correnti di fondo, trasporto di massa	Rebesco	09/11/21
3.1	pianure abissali (decantazione emipelagica) e margini continentali	Rebesco	10/11/21
3.2	Conoidi sottomarine (flussi gravitativi dalla scarpata continentale)	Lucchi	16/11/21
3.3	Sediment drifts (correnti di fondo lungo la scarpata continentale)	Rebesco	17/11/21
3.4	Mass transport deposits (accenni a risoluzione/penetrazione)	Ford	23/11/21
3.5	piattaforme continentali (onde, tempeste, tsunami)	Rebesco	24/11/21
3.6	calotte glaciali e ghiacciai marini	De Santis	30/11/21
3.7	Delta, estuari e spiagge e ambienti deposizionali carbonatici	Rebesco	01/12/21
3.8	faglie, vulcani e corpi intrusivi	Civile	07/12/21
	Mercoledì 8 Dicembre non c'è lezione		
3.9	fiumi, laghi e deserti	Rebesco	14/12/21
4	esercitazione	Rebesco	15/12/21
5.1	stratigrafia sequenziale	Zecchin	21/12/21
5.2	livello del mare e spazio di accomodamento	Zecchin	22/12/21
	Dal 23 Dicembre al 9 Gennaio non c'è lezione		
5.3	discontinuità e paraconformità e altre superfici significative	Zecchin	11/01/22
5.4	system tracts (apparati deposizionali) e diversi modelli	Zecchin	12/01/22
5.5	applicazioni (es. reservoirs di idrocarburi)	Zecchin	18/01/22
6	visita a CoreLoggingLAB e/o SEISLAB (assieme a Geologia Marina)	Rebesco	19/01/22