

Example of data collection for Italy

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Italy

25/05/2023



Acknowledgment



Outline

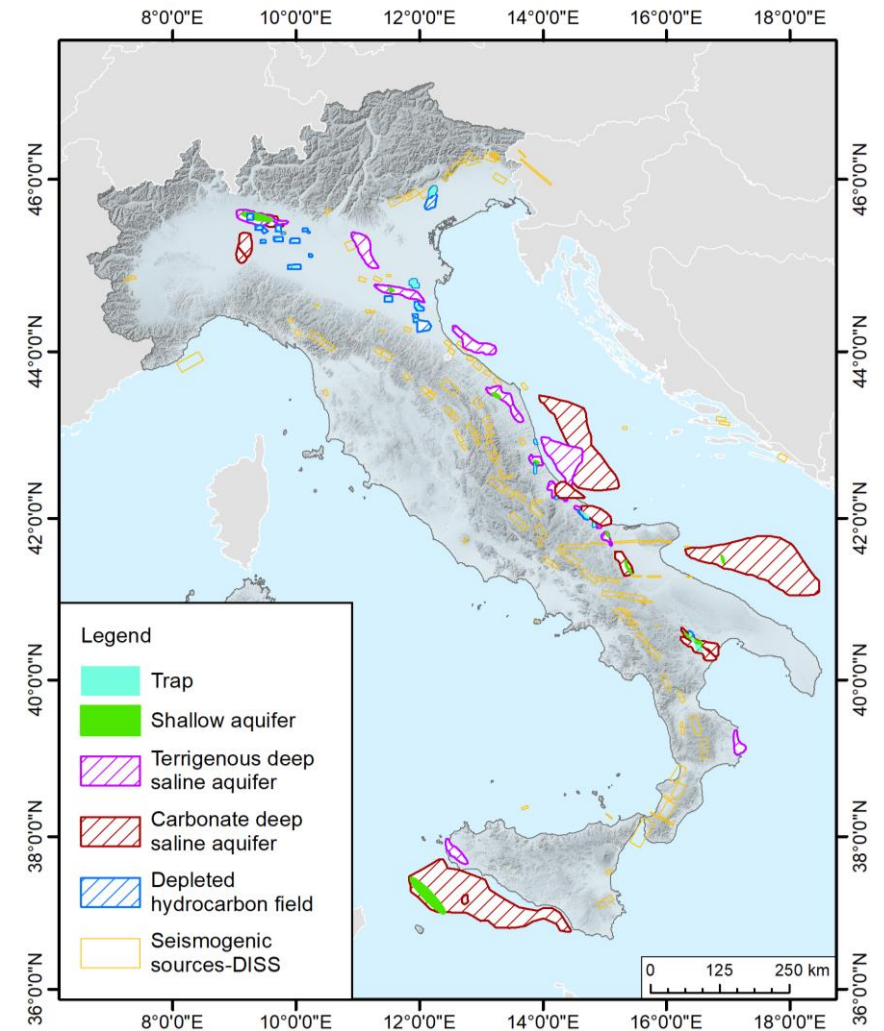
- Data acquisition and methods
- Italy Hystories database
- Remarks

Data collection and methods

Main target: to identify suitable UHS sites in depleted hydrocarbon fields and saline aquifers both onshore and offshore

- Criteria:
- ✓ Idoneous caprock/reservoir systems
 - ✓ Top reservoir depth 500 - 2500 m
 - ✓ Net reservoir thickness of 30 - 100 m
 - ✓ Reservoir extent 0.3 - 60 km²
 - ✓ Not overlay with seismogenic sources (for Italy: Database of Individual Seismogenic Sources - DISS M > 5.5 - INGV)

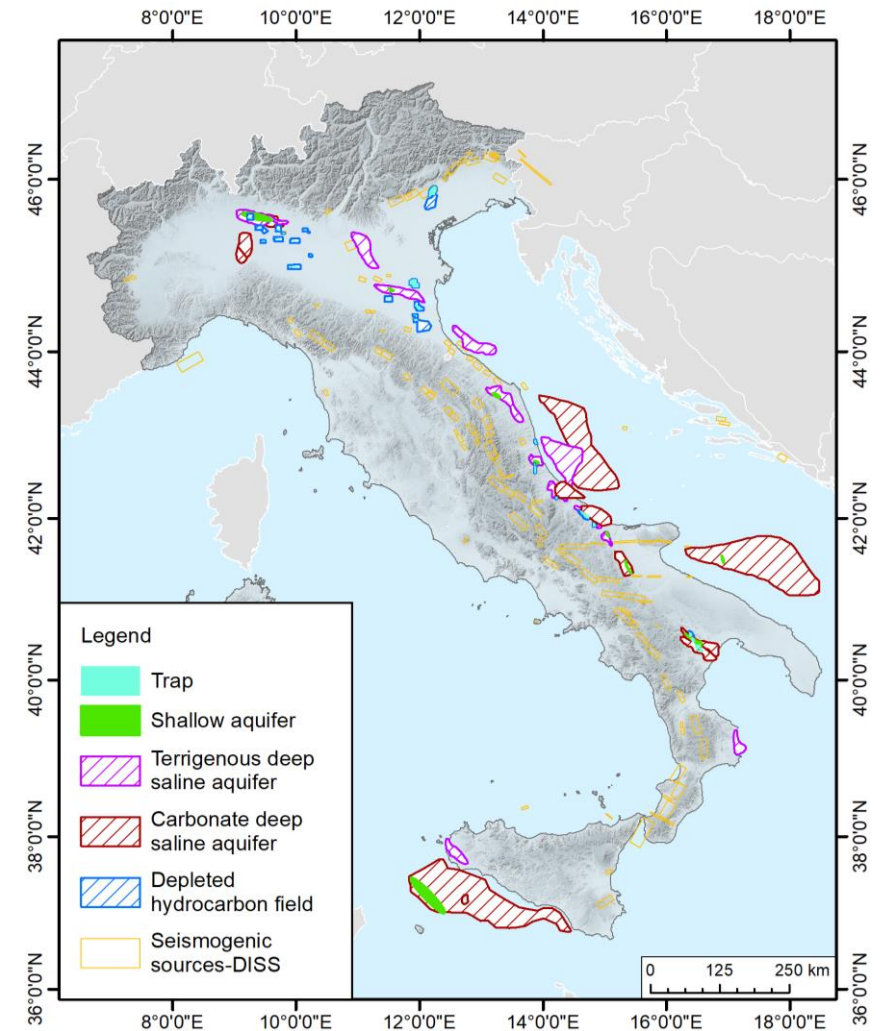
All the data and information used for the characterization of the H₂ storage sites are public and freely available



Modified after Barison et al., 2023

1) Review of previous studies on CO₂ storage

- ESTMAP project (Energy Storage Mapping and Planning)
- CO₂StoP project (CO₂ Storage Potential in Europe)
- Deep carbonate and terrigenous saline aquifers already identified as possible CO₂ storage sites (Civile et al., 2013; Donda et al., 2011)



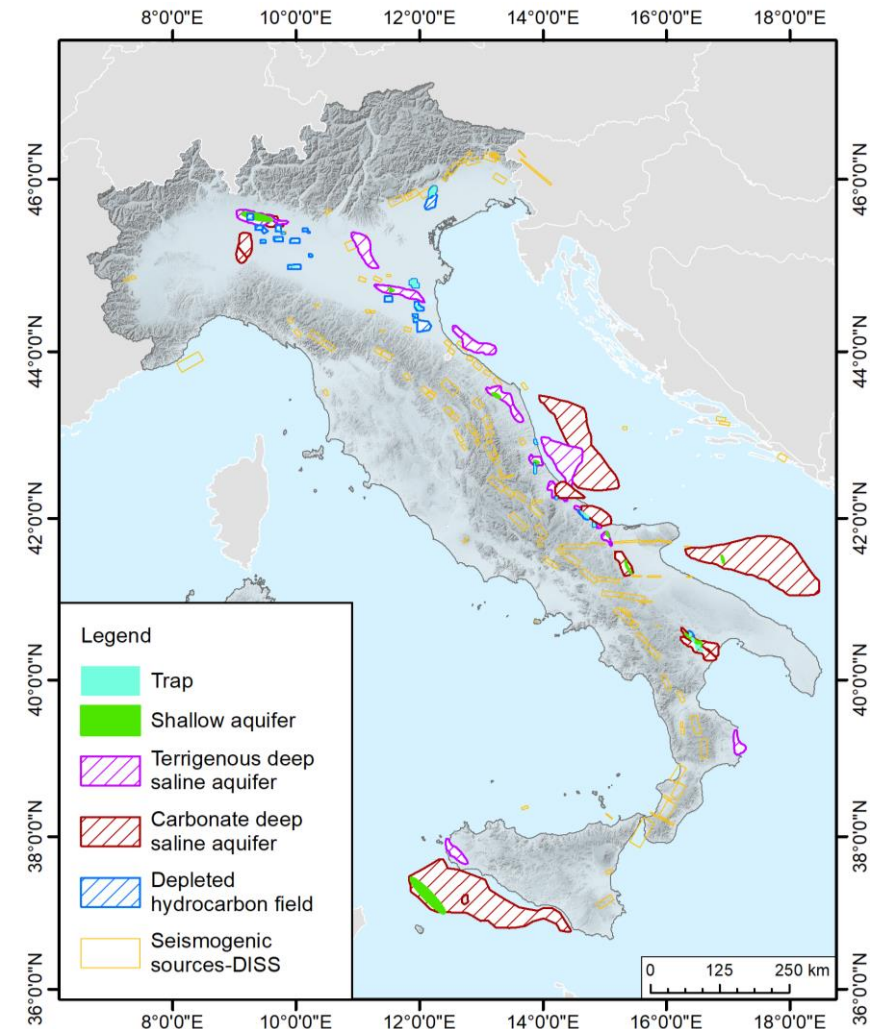
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2) Well log analysis

Deep carbonate and terrigenous saline aquifers already identified as possible CO₂ storage sites (Civile et al., 2013; Donda et al., 2011)

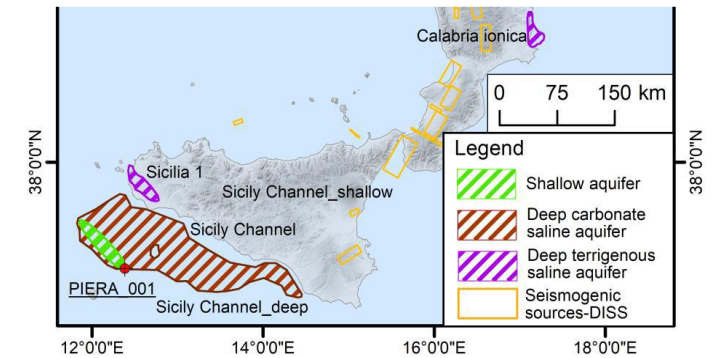
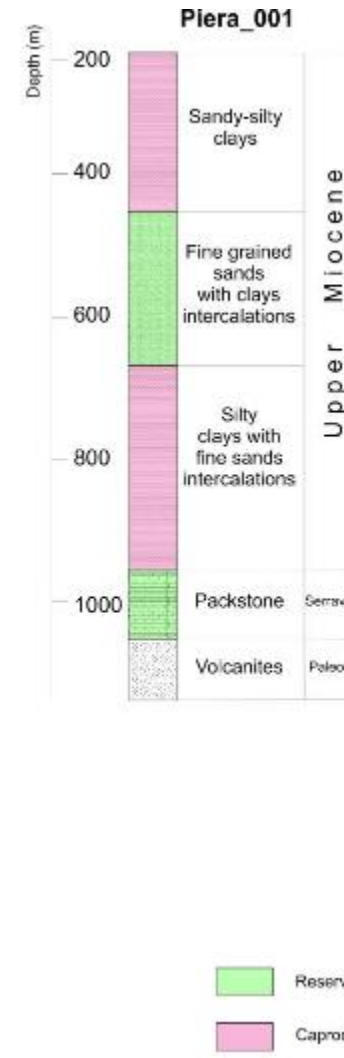
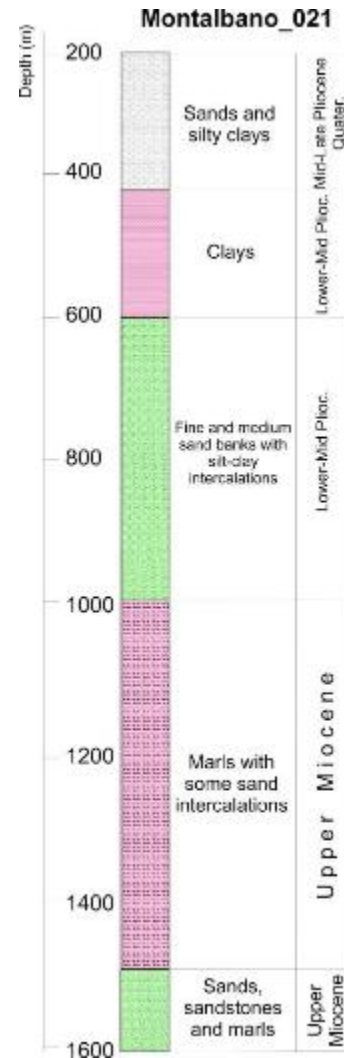
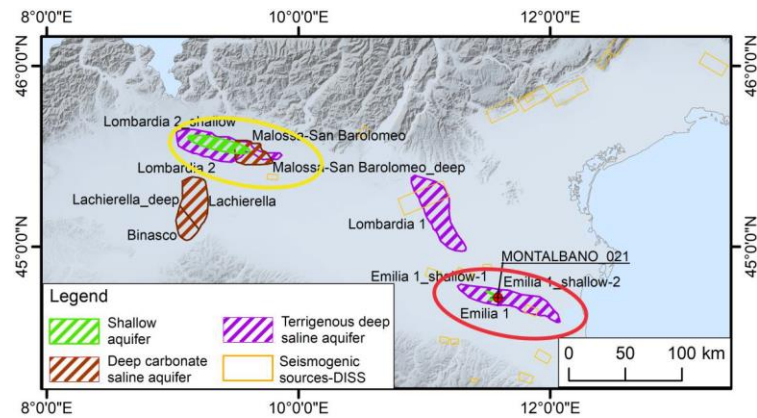


Shallower aquifers identified from well logs available at the ViDEPI (Visibility of Petroleum Exploration Data in Italy) database (<https://www.videpi.com/>)



Modified after Barison et al., 2023

2) Well log analysis



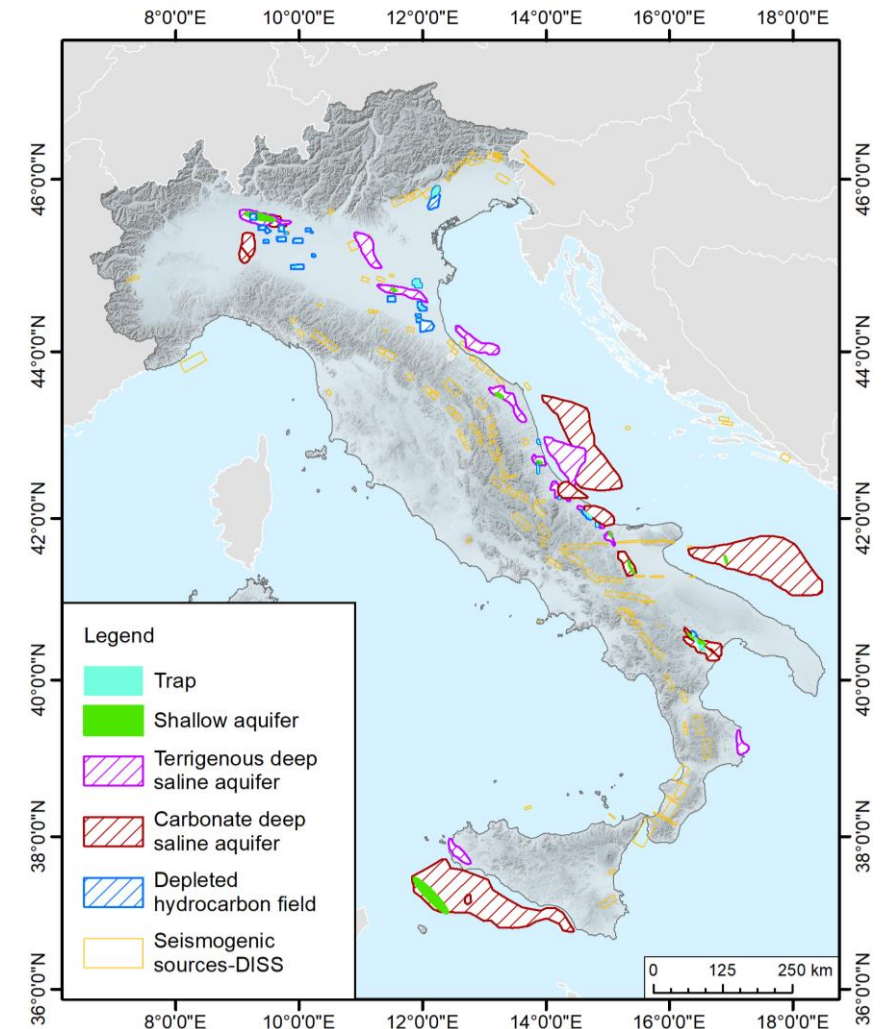
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3) Depleted hydrocarbon fields

(<https://unmig.mite.gov.it/stoccaggio-del-gas-naturale/>)

Some of these sites are currently used for CH₄ temporary storage, but could be considered for UHS in future



Modified after Barison et al., 2023

Data collection and methods

Source name / URL	Description	Version / Date
Videpi https://www.videpi.com/	“Visibility of Petroleum Exploration Data in Italy”	2022 (website is regularly updated)
Ministero dell'ambiente e della sicurezza energetica / Italian Ministry of Environment and Energy Security https://unmig.mite.gov.it/stoccaggio-del-gas-naturale/	Data concerning gas storage sites and hydrocarbon production	2022 (website is regularly updated)
Edison Stoccaggio https://www.edisonstoccaggio.it/it/attivita-e-impianti/i-nostri-impianti/	Information concerning gas storage sites managed by Edison	2022
SNAM https://www.snam.it/it/chisiamo/infrastrutture-snam/stoccaggio/	Information concerning gas storage sites managed by SNAM	2022
Ital Gas Storage https://www.igs.eu/	Information concerning gas storage sites managed by Ital Gas	2022
Gas infrastructure Europe https://www.gie.eu/transparency/databases/storage-database/	Operational data such as working gas volume, injection and withdrawal capacities of storage facilities as well as the under construction and planned storage sites.	2022

Hystories database

- ✓ Identification of Formations, Storage Units and traps
- ✓ Geographical and geological information
- ✓ Reservoir properties (e.g.: thickness, porosity, permeability)
- ✓ Capacity estimation

Hystories Data Viewer

Formations
49

Storage units
66

Traps
26

Gas: 24, Oil: 0, Hydrocarbons: 2, Aquifer: 0

Formation Names

- Abruzzi 1
- Abruzzi 2
- Abruzzi 3
- Abruzzi mare
- Abruzzi offshore

Storage Unit Names:

- Abruzzi 1 SU
- Abruzzi 1 SU SHALLOW
- Abruzzi 2 SU
- Abruzzi 3 SU
- Abruzzi mare SU
- Abruzzi offshore_SU
- Abruzzi offshore_SU DEEP

Trap Names:

- Alfonsine DU
- Bagnolo Mella DU
- Bordolano DU
- Brugherio DU
- Collino DU
- Collalto DU
- Cornegliano DU
- Cortemaggiore DU
- COTIGNOLA DU
- FERRANDINA
- GROTTOLE

Trap ID	Storage unit ID	Trap name	Remarks	Country	Fie
IT_T_20210715172150234	IT_S_20210708144549710	Ripalta DU	Depleted gas field, presently used as natural gas storage	Italy	STOCCA
IT_T_20210713122404294	IT_S_20210625180012792	Alfonsine DU	Depleted gas or hydrocarbon field, presently used as natural gas storage	Italy	STOCCA
IT_T_202121031102518070	IT_S_202121003174921322	GROTTOLE	Depleted gas or hydrocarbon field, presently used as natural gas storage	Italy	
IT_T_202121031122327520	IT_S_202121003174921322	FERRANDINA	gas	Italy	Geogast
IT_T_20210715165412354	IT_S_20210705121033883	Cortemaggiore DU	Depleted gas or hydrocarbon field, presently used as natural gas storage	Italy	
IT_T_20212103111306552	IT_S_20212103111303505	PIADENA EST DU	gas	Italy	
IT_T_20210714161156323	IT_S_20210702174439029	Cornegliano DU	Depleted gas or hydrocarbon field, presently used as natural gas storage	Italy	Ital gas st
IT_T_20210830175004792	IT_S_20210830173702105	COTIGNOLA DU		Italy	Edison
IT_T_20210830174433212	IT_S_20210830173702105	S.POTITO DU		Italy	Edison st

Porous media (Hystories)

Traps

- Aquifer
- Gas
- Hydrocarbons
- Oil

Storage units

Formations

P10 - Possible Volume (MMSm³)

P90 - Proved Energy

Select a trap from List

Select a trap from List

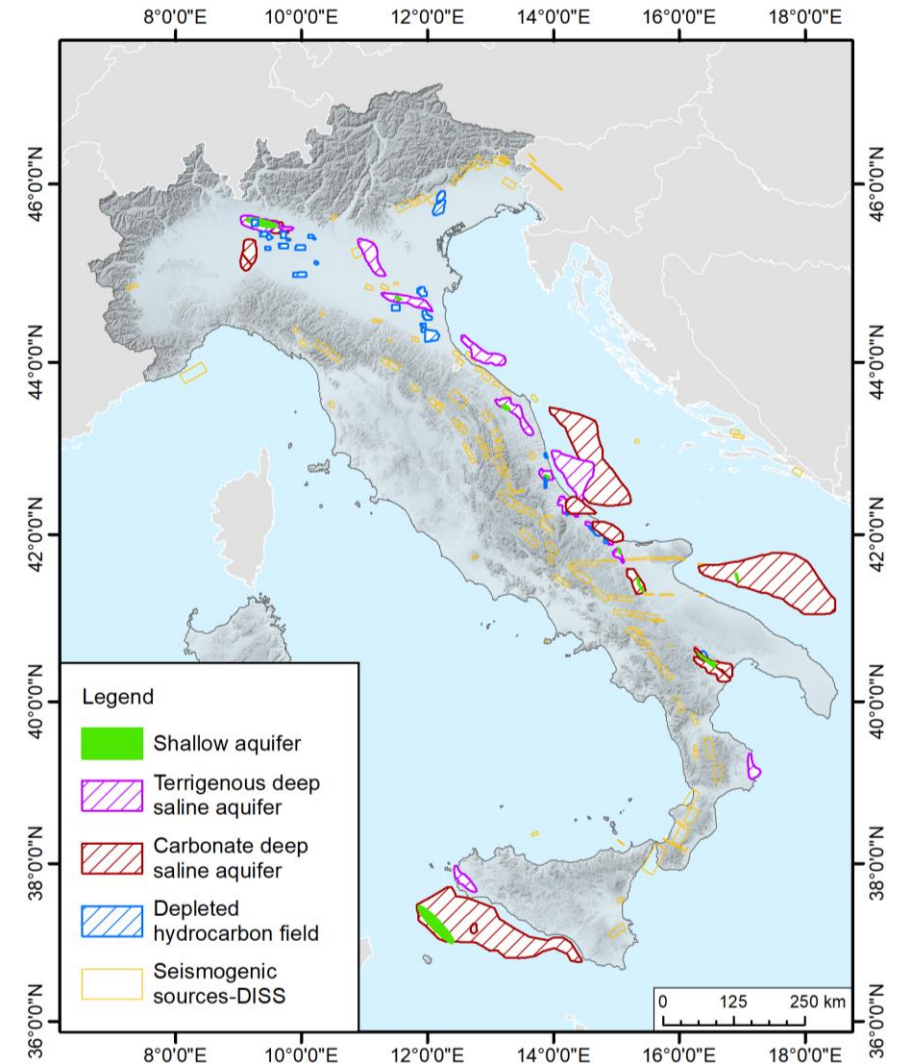
Volume Energy Energy Volume

Country specific copyright:
Italian borehole data is copyright of the Ministry of Environment and Energy Security. All other Italian data is copyright of OGS.

Salt Deposits copyright:
Salt deposit data are copyright of the Solution Mining Research Institute (SMRI), who kindly authorised Hystories to display the data produced in SMRI Research Report: Horváth, P.L., Mirau, S., Schneider, G.S., Bernhardt, H., Weiler, C., Bodeker, J., Wipacich, M., Tangermann, T., Ratigan, J., 2018. Update of SMRI's Compilation of Worldwide Salt Deposits and Salt Cavern Fields - SMRI Research Report U2017-5, April 2018.

Hystories database - Storage Units

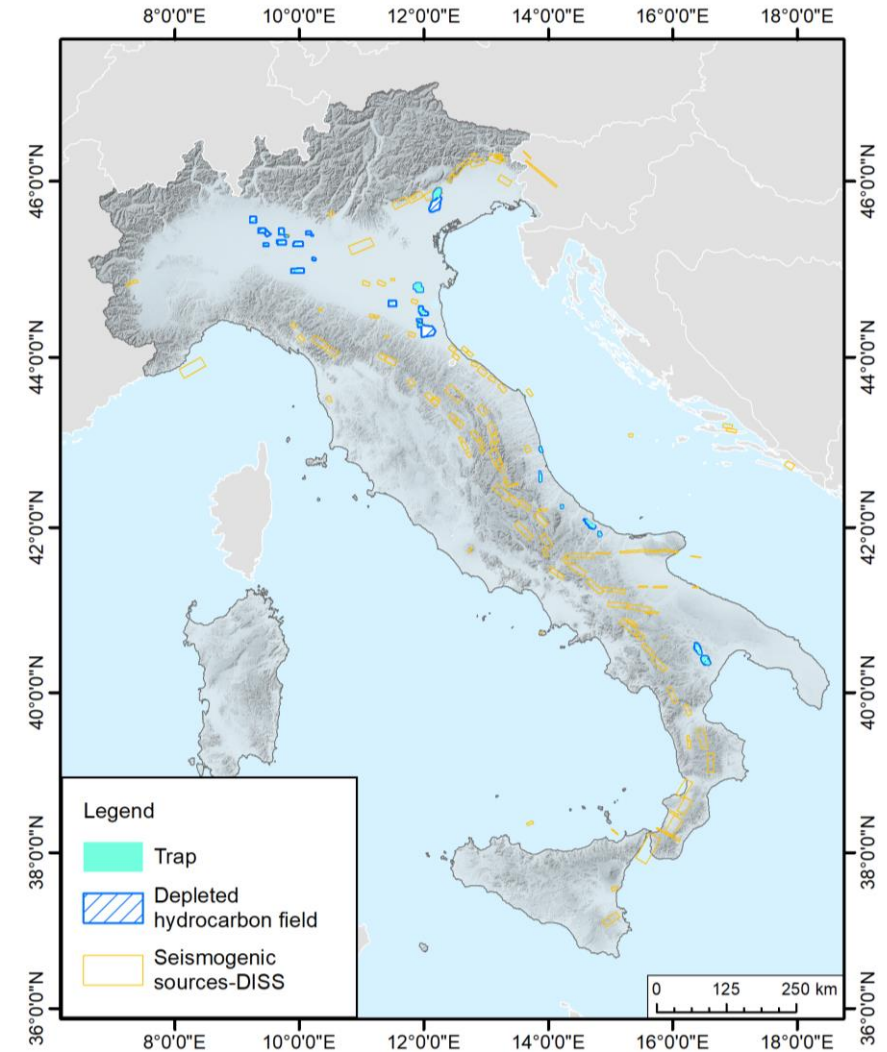
Reservoir type	Onshore	Offshore	Both onshore / offshore	Quantity
Shallow aquifers (500-800 m)	11	2	-	13
Deep Carbonate aquifers (>800 m)	9	3	2	14
Deep Terrigenous aquifers (>800 m)	10	2	1	13
Depleted hydrocarbon fields	26	0	-	26
TOTAL	56	7	3	66



Modified after Barison et al., 2023

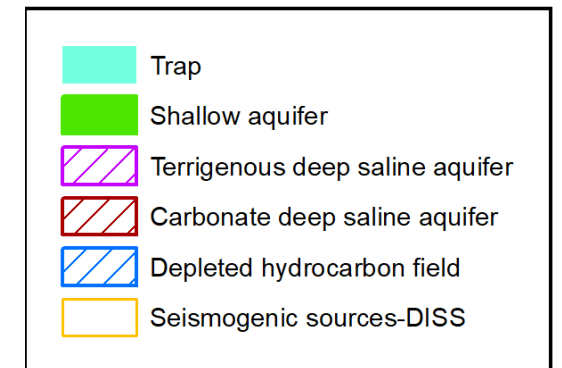
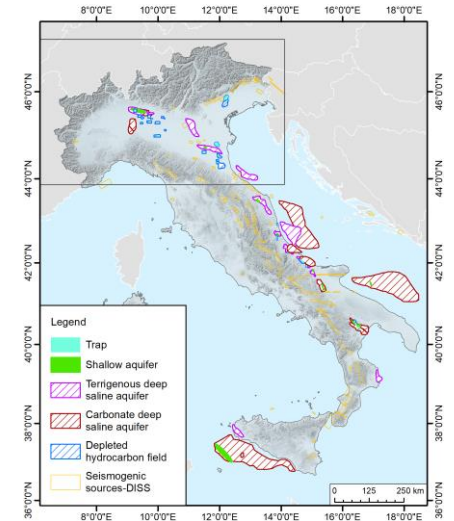
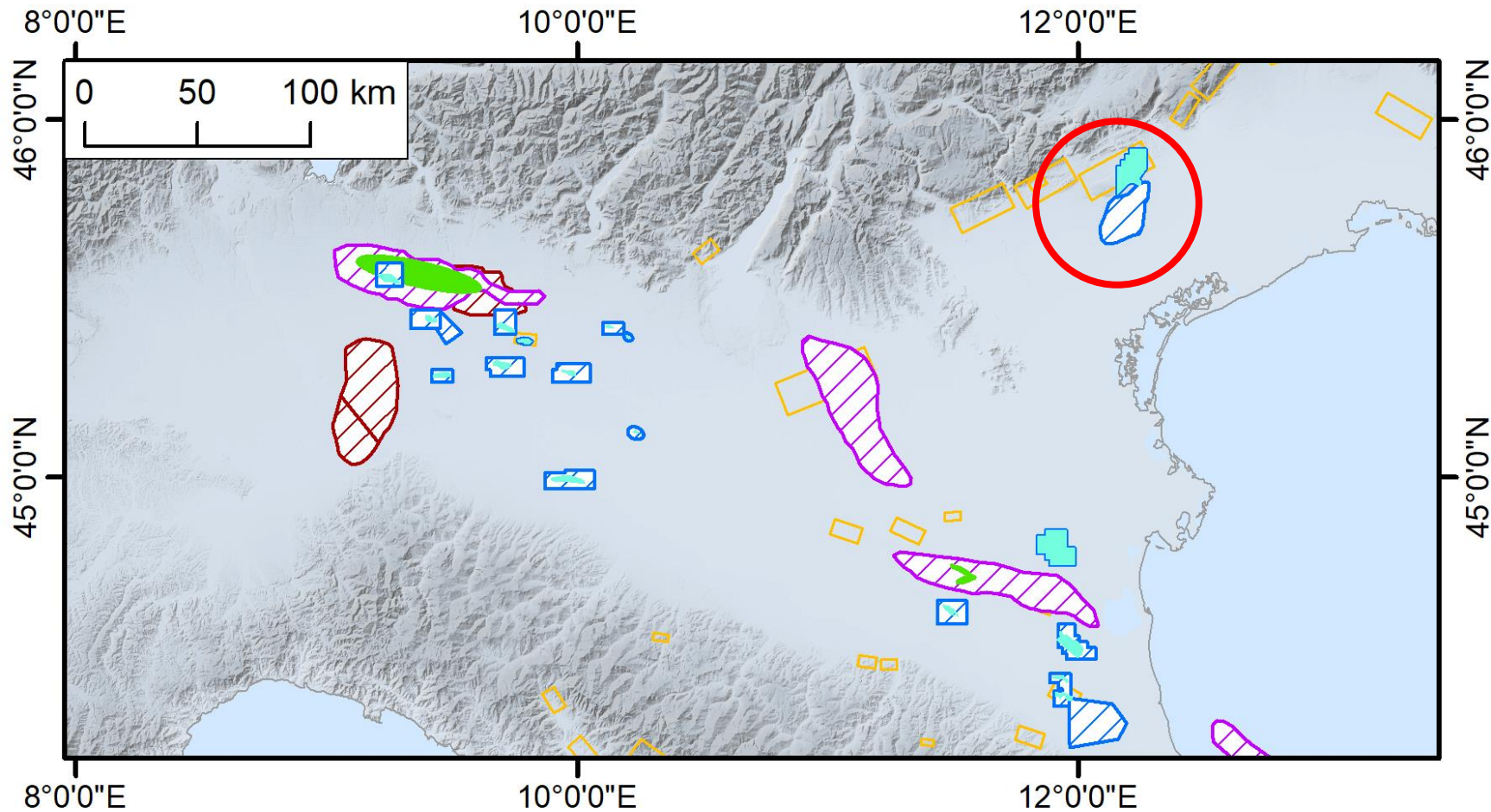
Hystories database - Traps

- ✓ Identified 26 traps in depleted hydrocarbon fields storage units
- ✓ Information from technical reports available at VIDEPI database and from companies websites



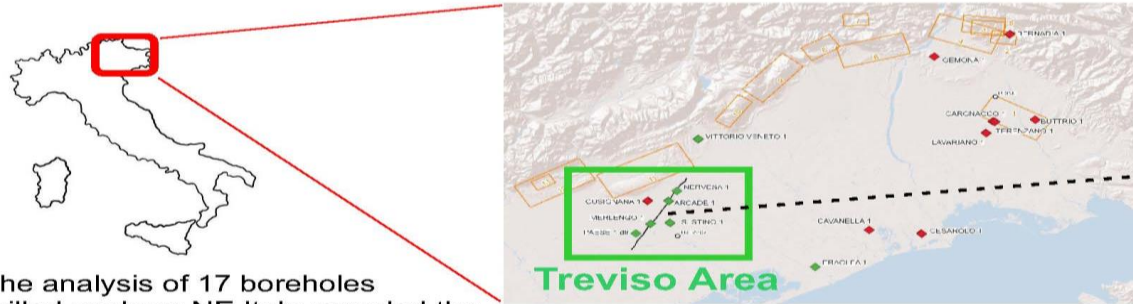
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Hystories database - Northern Italy

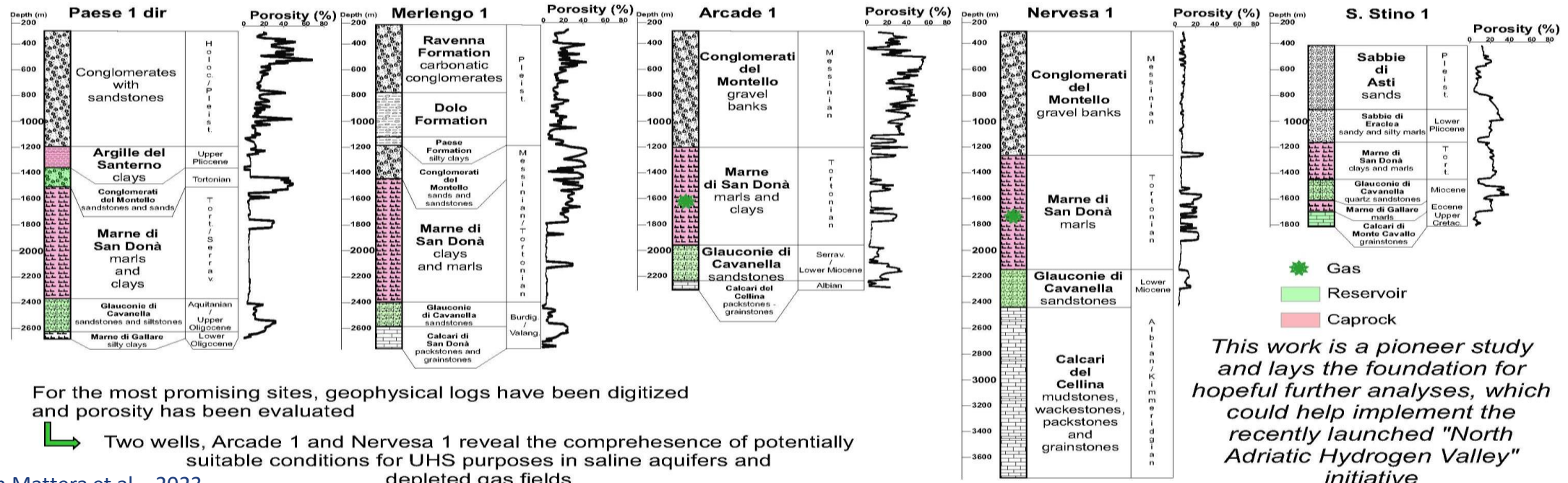
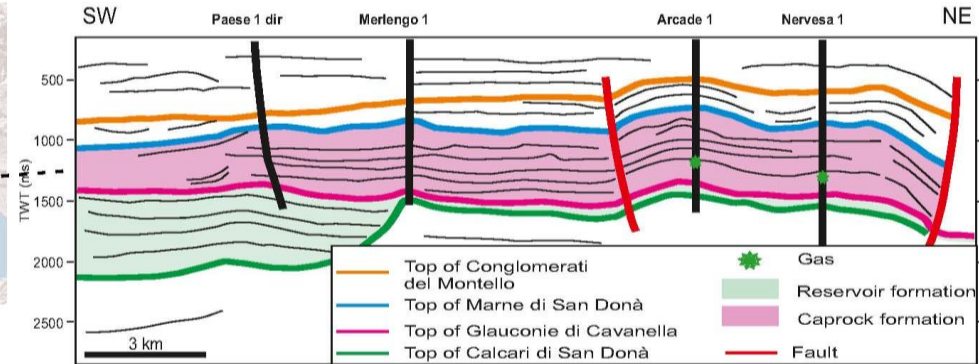


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FIRST ASSESSMENT OF AN AREA POTENTIALLY SUITABLE FOR UNDERGROUND HYDROGEN STORAGE IN ITALY



The analysis of 17 boreholes drilled onshore NE Italy revealed the occurrence of a promising area for UHS, i.e. the so called Treviso Area

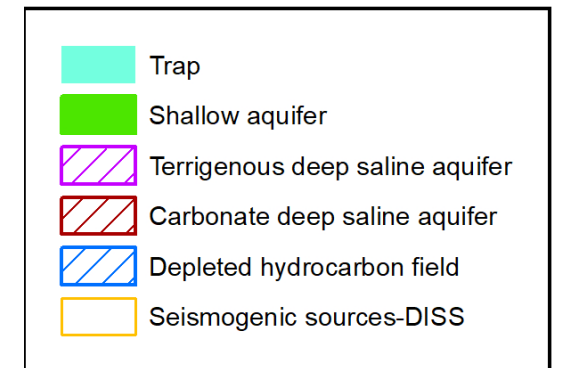
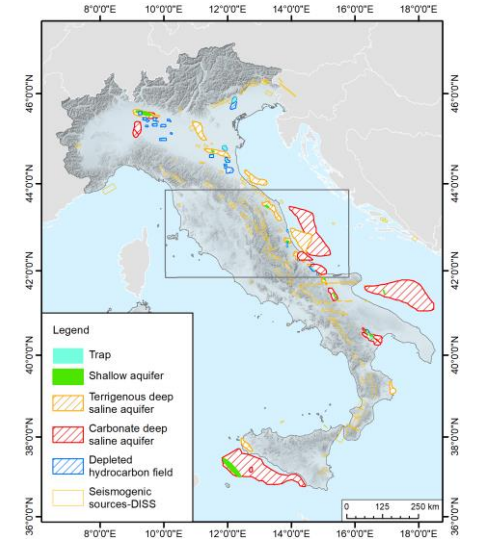
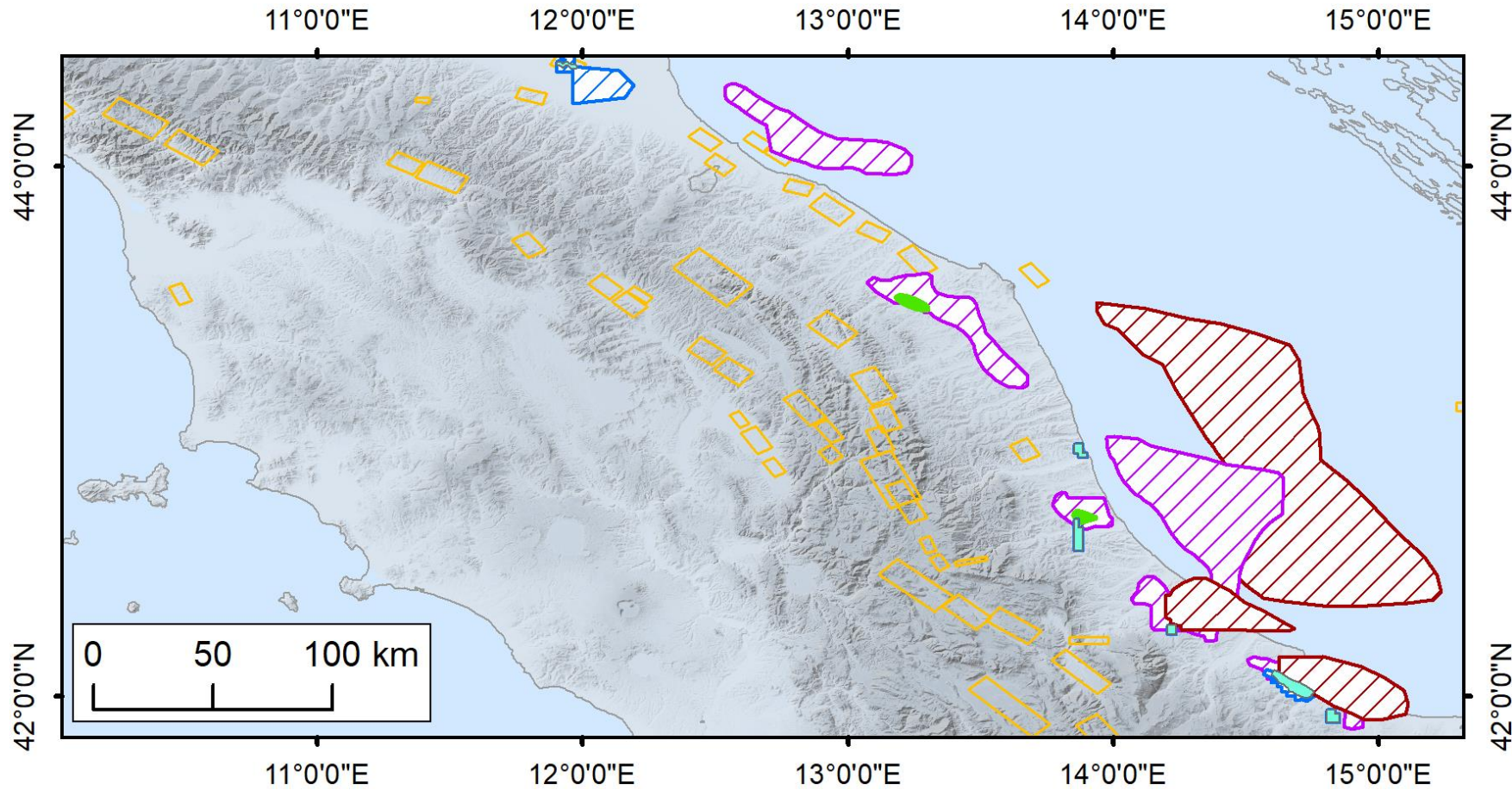


For the most promising sites, geophysical logs have been digitized and porosity has been evaluated

Two wells, Arcade 1 and Nervesa 1 reveal the comprehesence of potentially suitable conditions for UHS purposes in saline aquifers and depleted gas fields

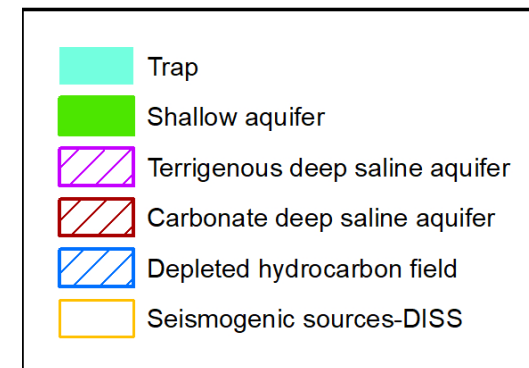
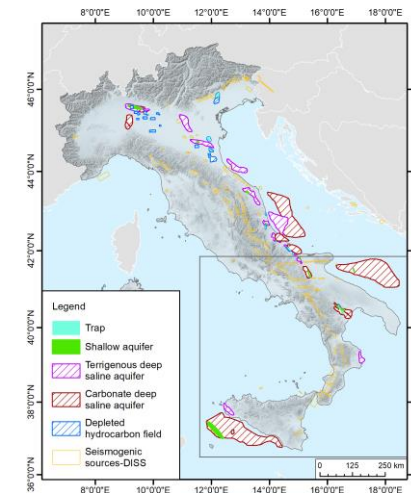
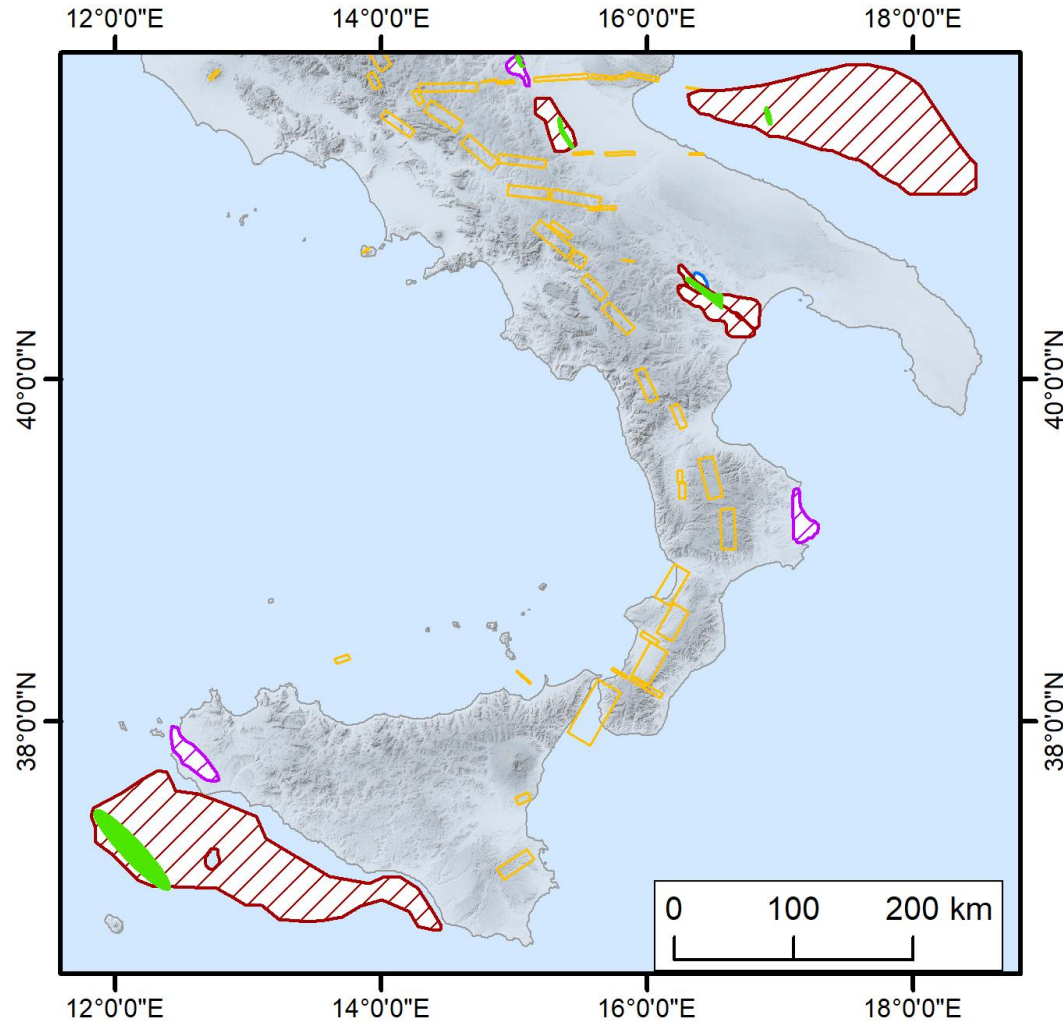
This work is a pioneer study and lays the foundation for hopeful further analyses, which could help implement the recently launched "North Adriatic Hydrogen Valley" initiative

Hystories database - Central Italy



Modified after Barison et al., 2023

Hystories database - Southern Italy



Modified after Barison et al., 2023

Hystories database - Capacity estimation

Reservoir	Hydrogen Static Volume (MMSm ³)	Hydrogen Static Volume (TWh)
Ripalta stoccaggio SU	2073	6,6
Sergnano SU	1878	5,9
Cugno le Macine SU (Grottole)	800	2,5
Romanengo SU	340	1,1
Alfonsine SU	1868	5,9
Bordolano SU	1966	6,2
Bagnolo Mella SU	679	2,2
Cornegliano SU	149	0,5
Minerbio SU	2132	6,7
Settala SU	2063	6,5
S. Potito - Cotignola SU (Cotignola)	340	1,1
Collalto SU	340	1,1
San Benedetto	541	1,7
Poggiofiorito SU	172	0,5
Sinarca stoccaggio SU	336	1,1
Cugno le Macine SU (Ferrandina)	828	2,6
Fiume Treste SU	195	0,6
Sabbioncello SU	1722	5,5
Brugherio SU	1722	5,5
Cortemaggiore SU	1722	5,5
Italian Capacity	21876	69,2

The hydrogen capacity V_{H_2} (Sm³) is estimated with the following equation:

$$V_{H_2} = A * NT * \phi * E_{H_2} / B_{H_2}$$

Where:

A = area of the trap (km²),

NT = net thickness (m) of the porous and permeable formation,

ϕ = average porosity of the trap,

E_{H_2} = storage efficiency of hydrogen,

B_{H_2} = volume factor for hydrogen (Rm³/Sm³) (the volume change between storage pressure and temperature conditions, and surface conditions).

Thanks to Yann Le Gallo (Geostock)

1. In Italy, there are potentially **suitable conditions for H₂ storage in aquifers** both onshore and offshore.
2. We also considered **depleted gas fields**, as they have remarkable potential as H₂ storage and could be converted into H₂ storage sites in the future.
3. Our analyses show that there are ideal areas for UHS from a **geological and stratigraphical** point of view.
4. These results need to be considered as a starting point for **further investigations at a site-specific scale**, such as well-log correlation and comprehensive petrophysical characterization, integrated with geophysical data, such as seismic lines, to define the extension of the reservoirs and understand their **true hydrogen storage potential**.



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INTERNATIONAL JOURNAL OF HYDROGEN ENERGY XXX (XXXX) XXX

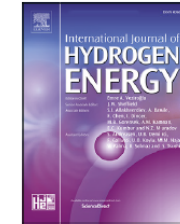


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First assessment of an area potentially suitable for underground hydrogen storage in Italy

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C. Vincent ^c



sustainability



Article

An Insight into Underground Hydrogen Storage in Italy

Erika Barison ^{1,*}, Federica Donda ¹, Barbara Merson ¹, Yann Le Gallo ² and Arnaud Réveillère ²

Barison E, Donda F, Merson B, Le Gallo Y, Réveillère A. 2023. ***An Insight into Underground Hydrogen Storage in Italy. Sustainability.*** 2023; 15(8):6886.
<https://doi.org/10.3390/su15086886>

Civile D., Zecchin M, Forlin E., Donda F., Volpi V., Merson B., Persoglia S., 2013. ***CO₂ geological storage in the Italian carbonate succession*** – Int. J. Greenh. Gas Con., 19, 101-116. <https://doi.org/10.1016/j.ijggc.2013.08.010>

Donda F., Volpi V., Persoglia S., Parushev D., 2011. ***CO₂ storage potential of deep saline aquifers: the case of Italy.*** Int. J.Greenh. Gas Con., 5, 327-335.
<https://doi.org/10.1016/j.ijggc.2010.08.009>

Mattera S., Donda F., Tinivella U., Barison, Le Gallo Y., Vincent C. 2023. ***First assessment of an area potentially suitable for underground hydrogen storage in Italy.*** International Journal of Hydrogen Energy, 48 (47), 17940-17956, <https://doi.org/10.1016/j.ijhydene.2023.01.192>.

Hystories project consortium



Acknowledgment

This project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking (now Clean Hydrogen Partnership) under Grant Agreement No 101007176. This Joint Undertaking receives support from the European Union's Horizon 2020 Research and Innovation program, Hydrogen Europe and Hydrogen Europe Research.



The Project is co-funded by European Union



Thank you !