

Venice, 6th December 2019



MoST

Monitoring Sea-water intrusion
in coastal aquifers and
Testing pilot projects
for its mitigation



*MITIGATION STRATEGIES TO
REDUCE SALTWATER INTRUSION*





C.N.R. - Istituto per lo Studio della Dinamica delle Grandi Masse



Città di Chioggia Assessorato all'Ambiente



Consorzio di Bonifica Adige Bacchiglione



Consorzio di Bonifica Bacchiglione Brenta



Consorzio di Bonifica Delta del Po Adige



Magistrato alle Acque per la Laguna di Venezia



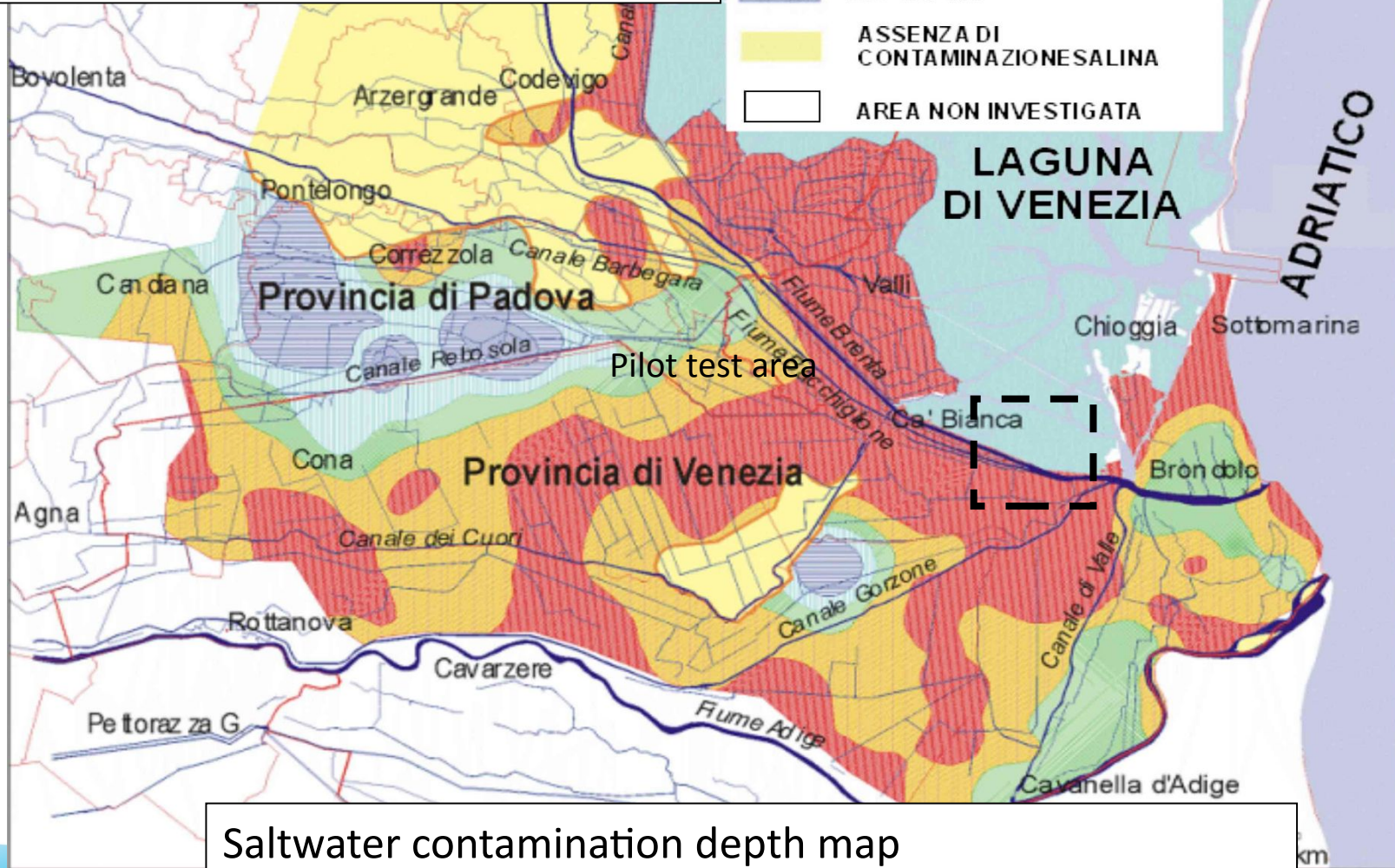
Provincia di Padova Assessorato all'Ambiente



Provincia di Venezia Assessorato alla Protezione Civile

ISES PROJECT (Saltwater Intrusion and Land Subsidence) year 2003

- 0-5 m alta criticità
- 5-10 m alto rischio
- 10-15 m medio rischio
- 15-20 m
- 20-25 m
- 25-30 m
- ASSENZA DI CONTAMINAZIONE SALINA
- AREA NON INVESTIGATA



Saltwater contamination depth map



European Regional Development Fund



EUROPEAN UNION



National Research Council of Italy



CONSORZIO DI BONIFICA ADIGE EUGANEO



REGIONE DEL VENETO



UNIVERSITY OF SPLIT, FACULTY OF CIVIL ENGINEERING, ARCHITECTURE AND GEODESY

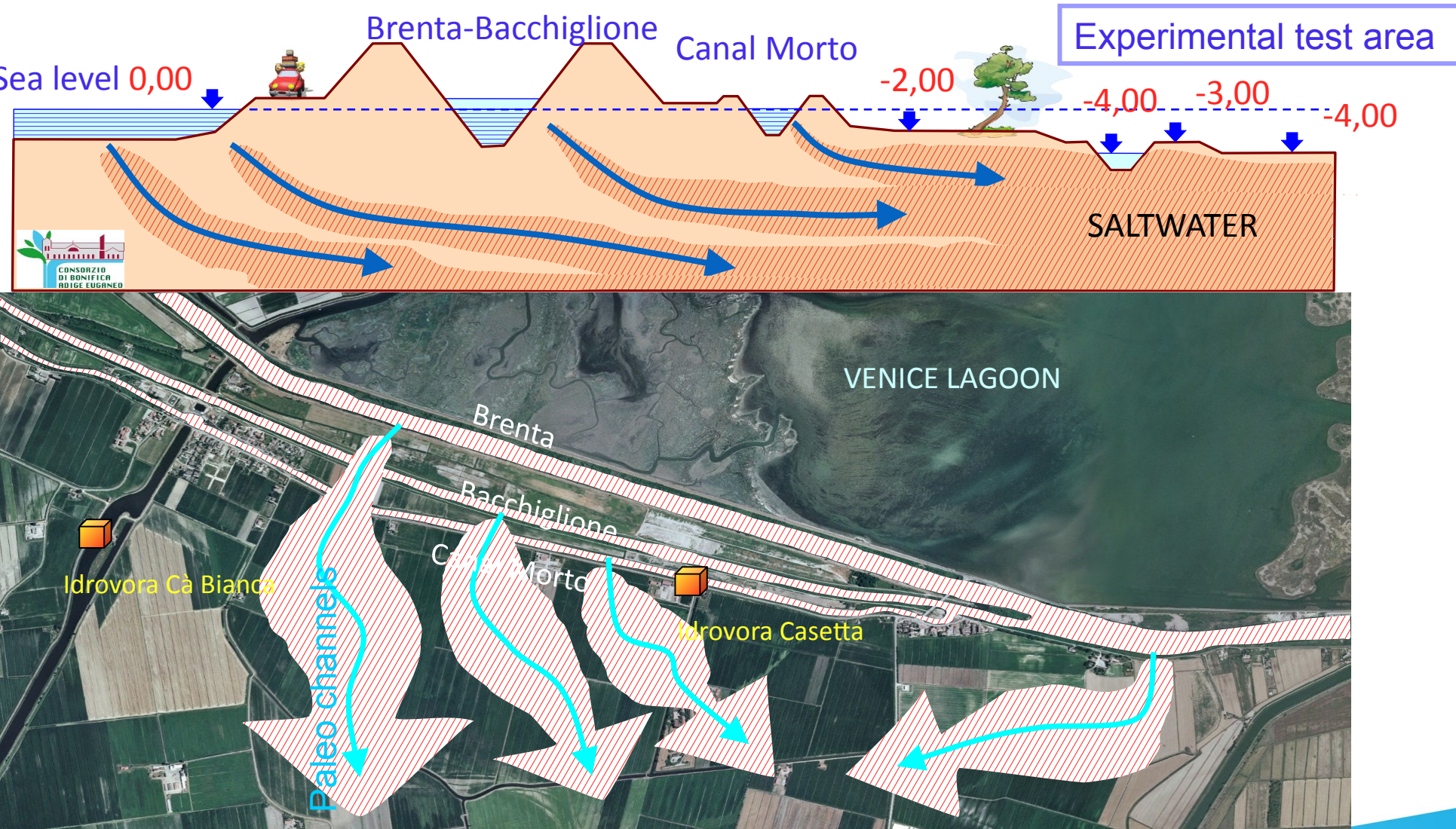


HRVATSKE VODE

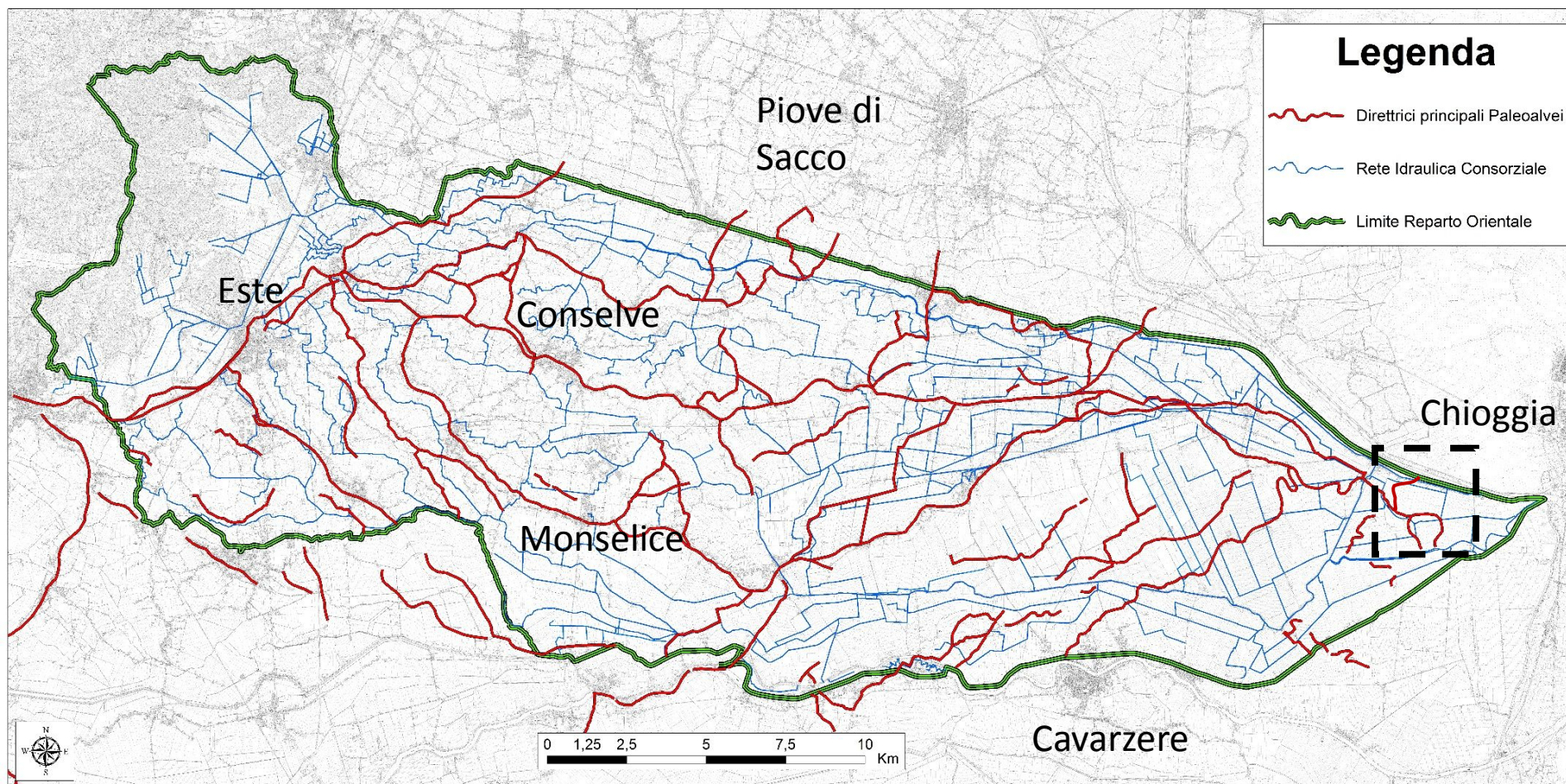


DUBROVNIK-NERETVA REGIONAL DEVELOPMENT AGENCY

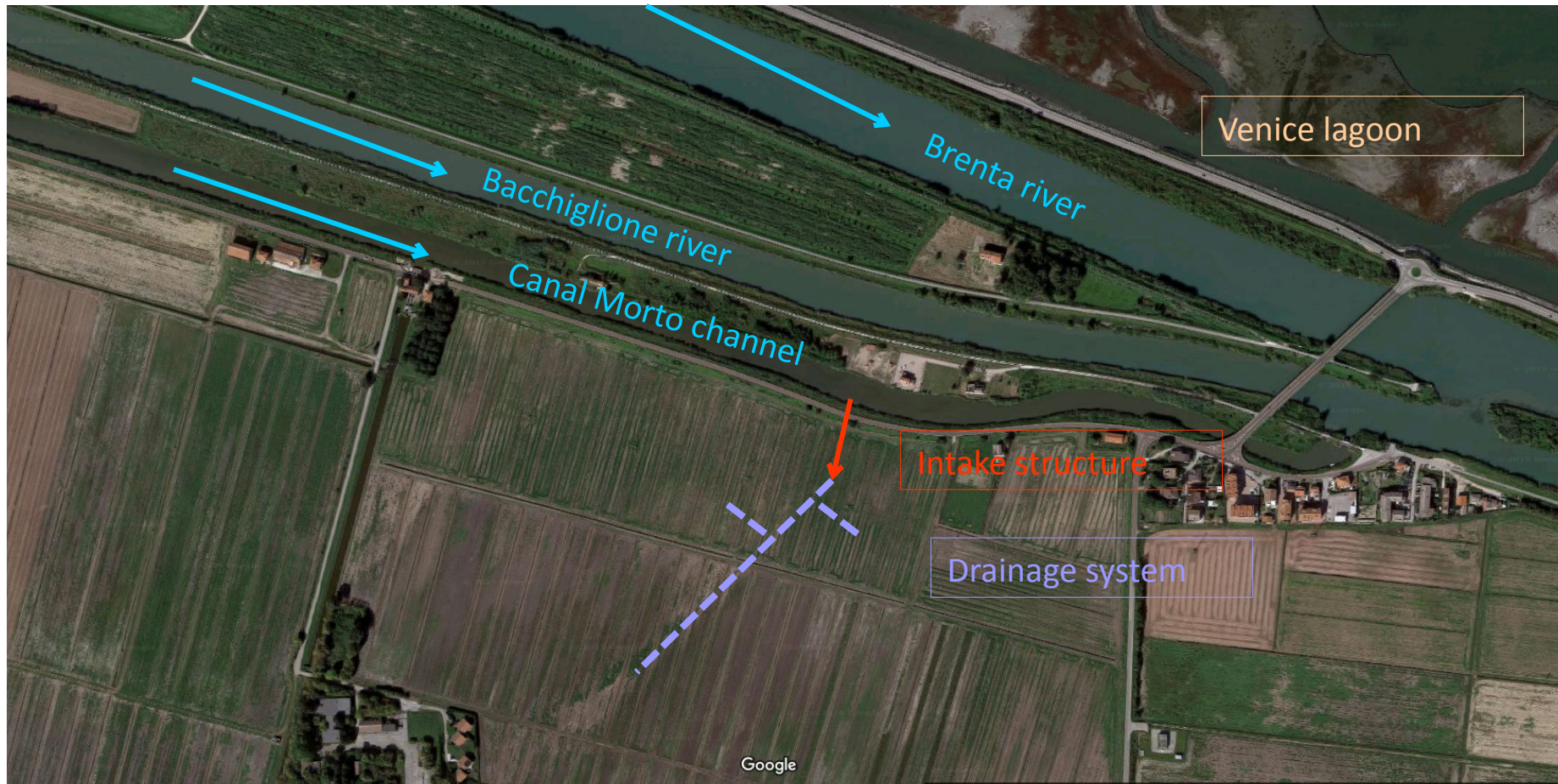
Saltwater flows from venice lagoon to test study area basin



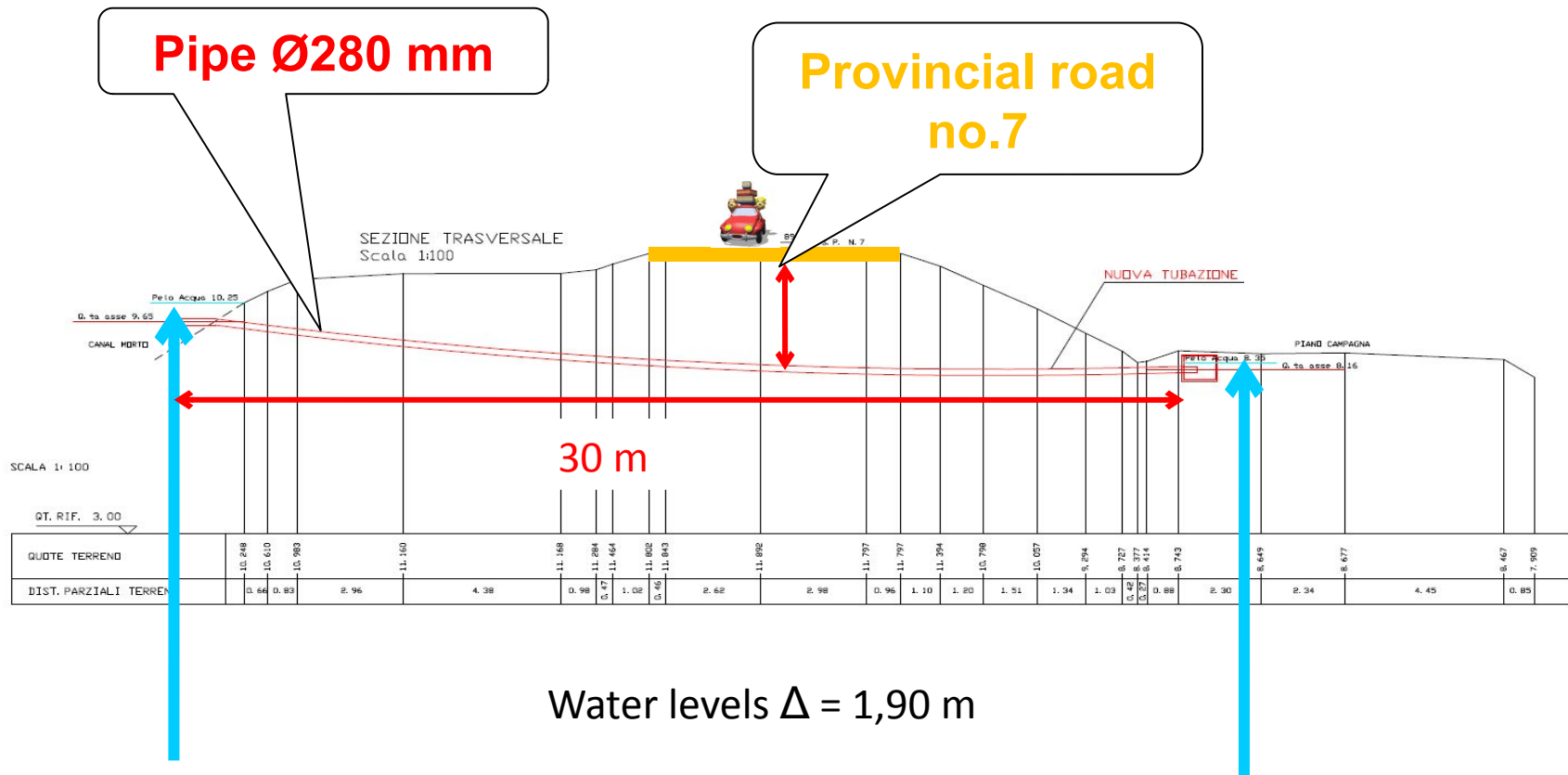
THE MAIN PALEO-RIVERS OF ADIGE AND PO



EXPERIMENTAL SITE



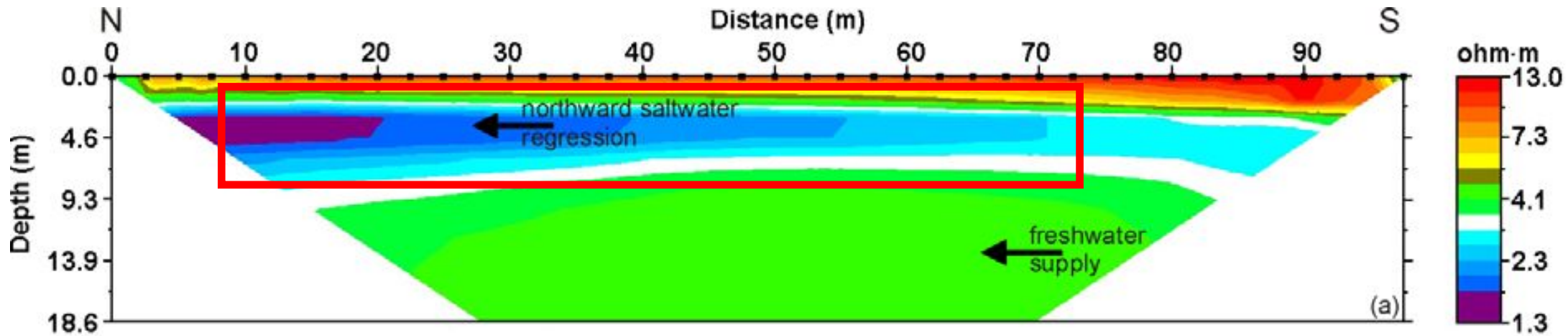
INTAKE STRUCTURE



Canal Morto river water level
10,25 m
Pipe intake level 9,65 m

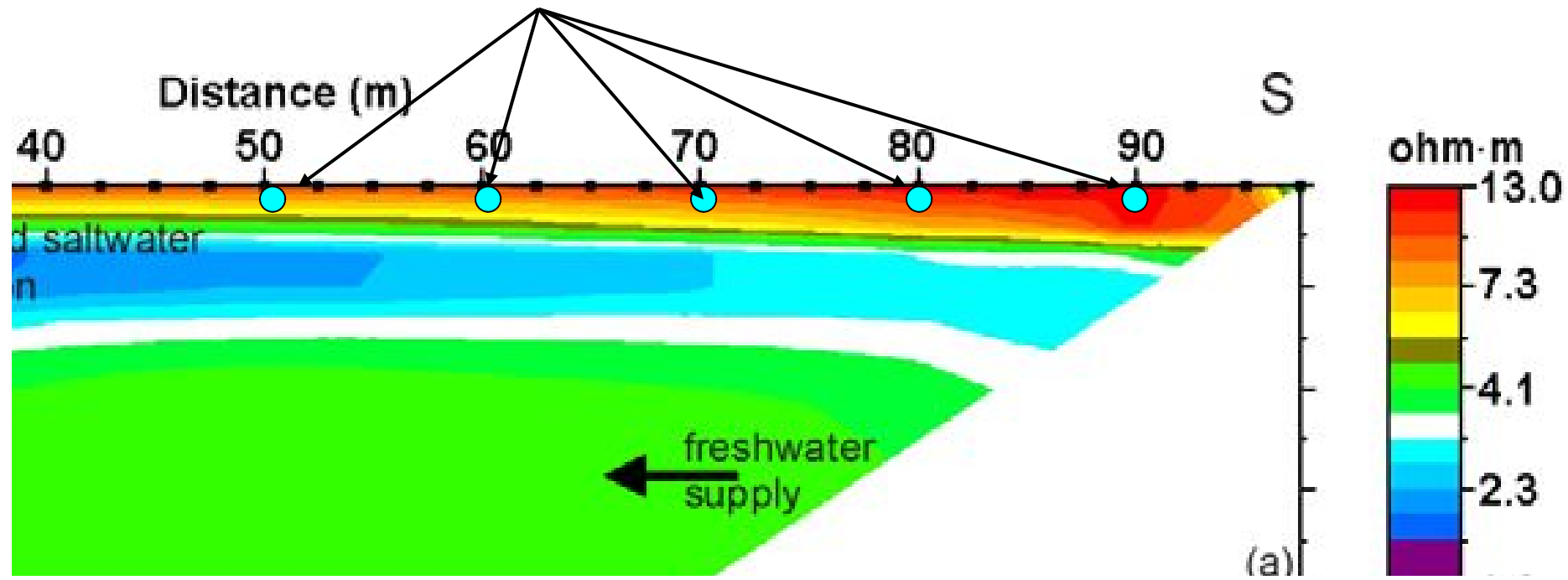
Outflow level 8,35 m
Pipe out take level
8,16 m

DRAINAGE SYSTEM



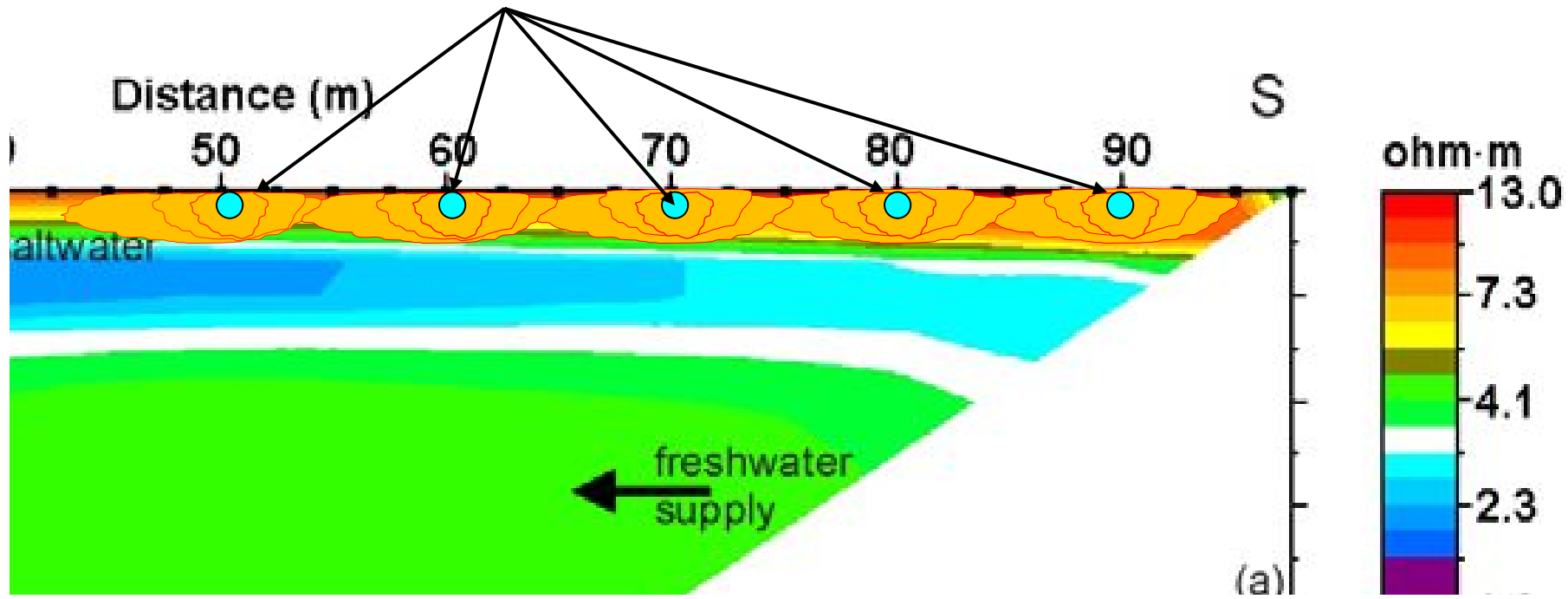
DRAINAGE SYSTEM

Injection of freshwater with drains

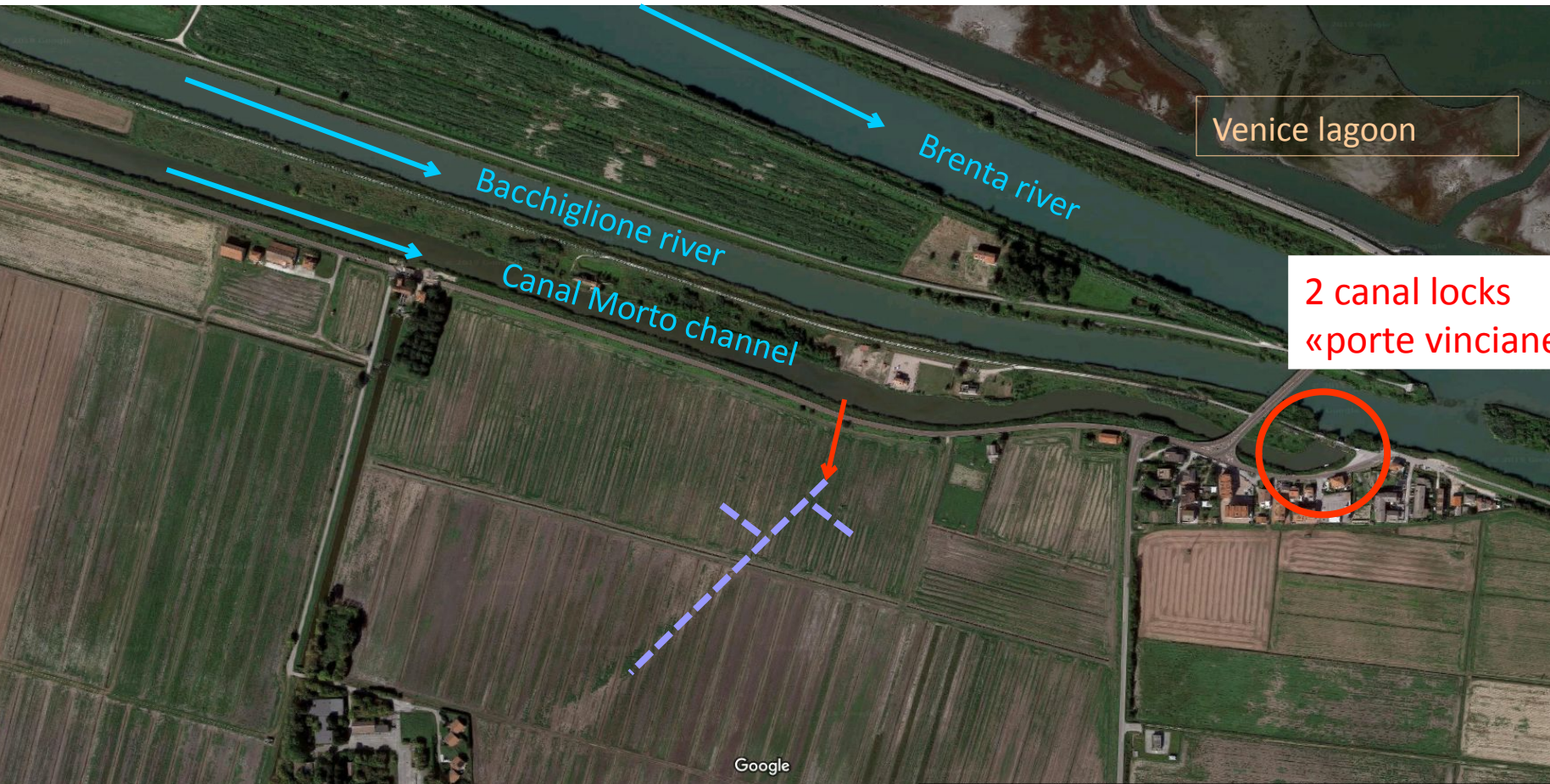


DRAINAGE SYSTEM

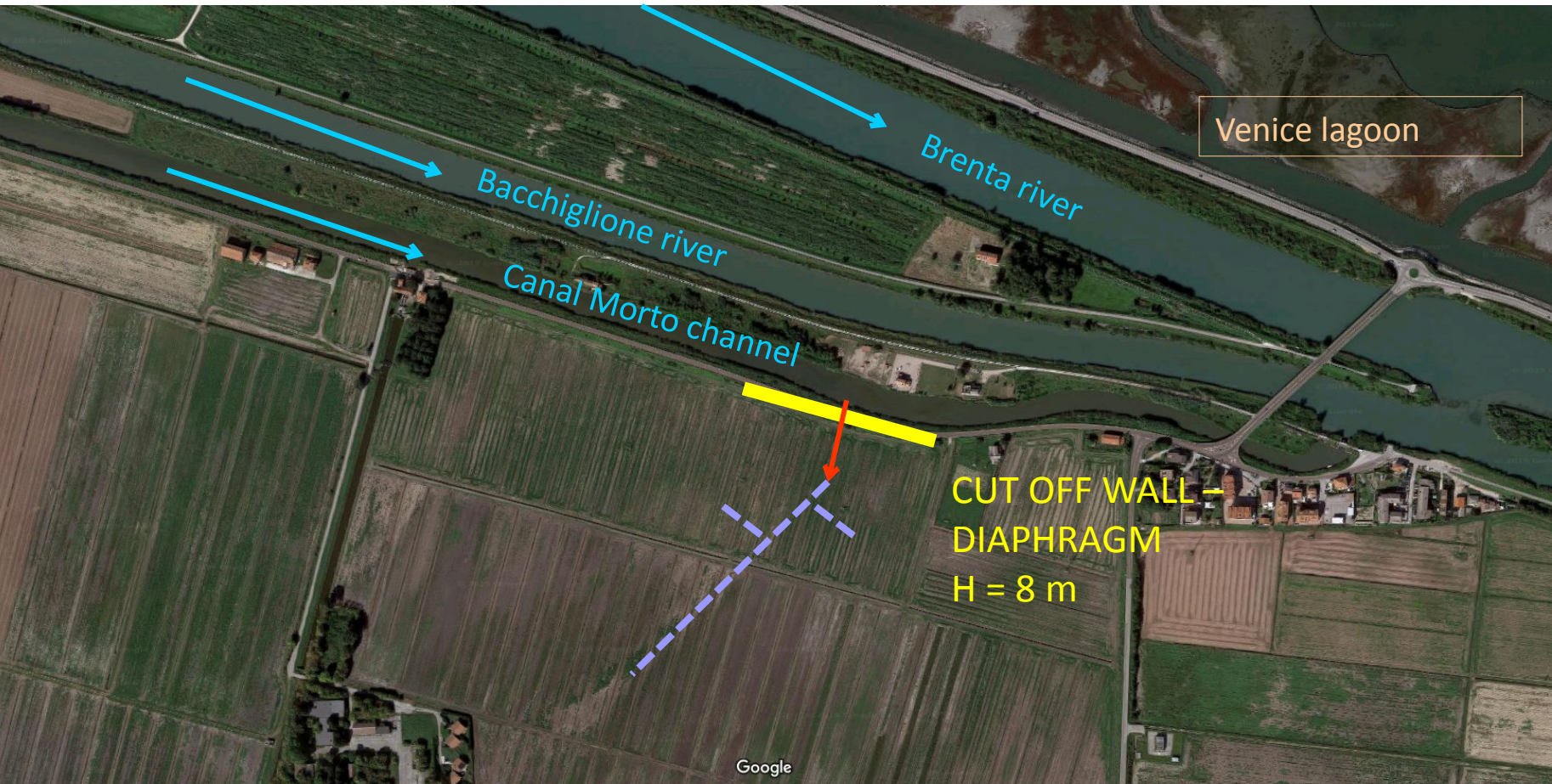
Injection of freshwater with drains



CANAL LOCKS «PORTE VINCIANE»



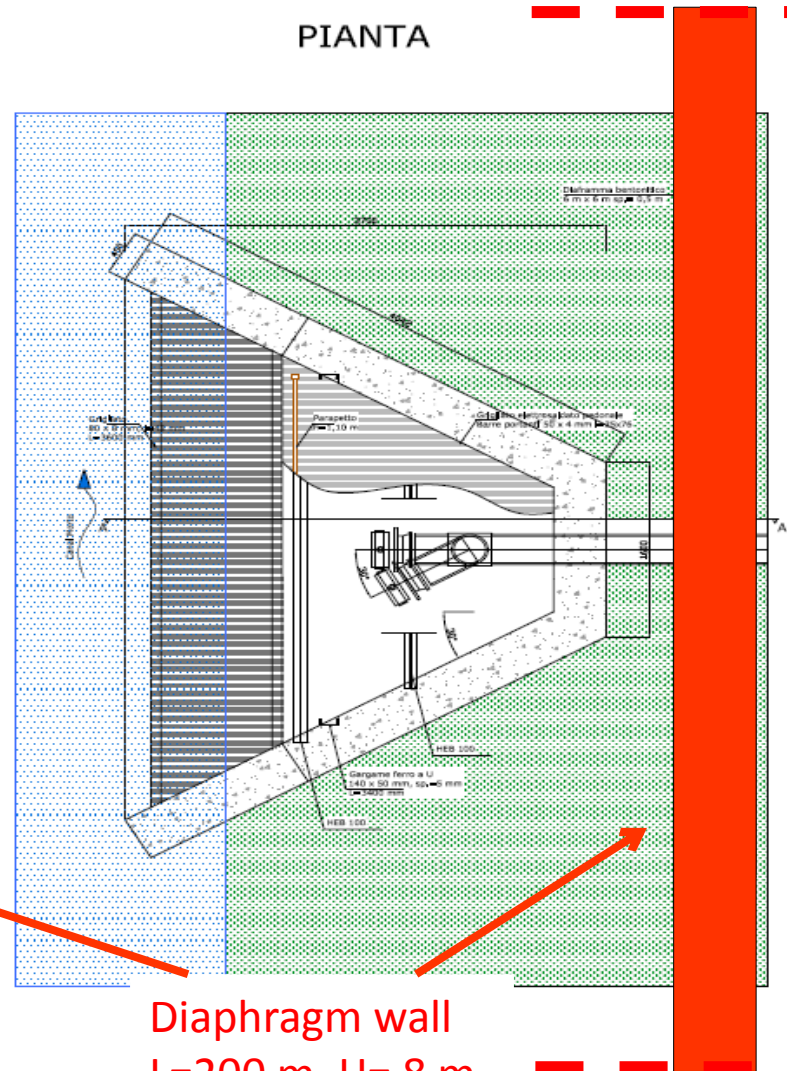
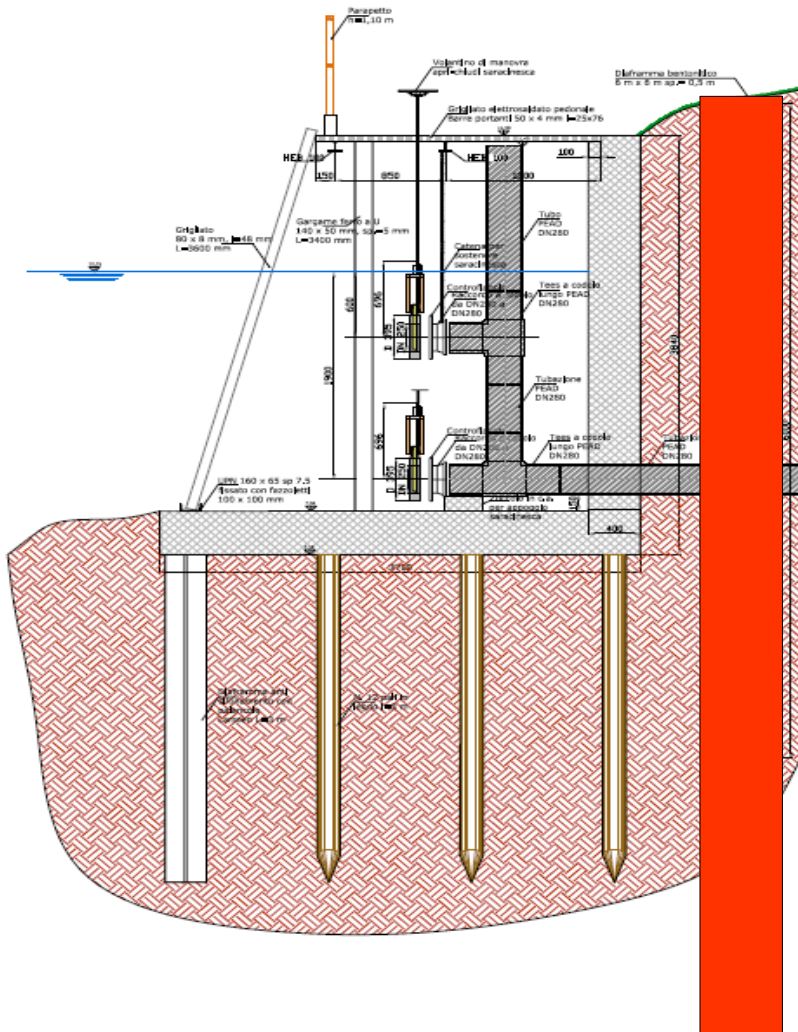
CUT-OFF WALL



CUT-OFF WALL

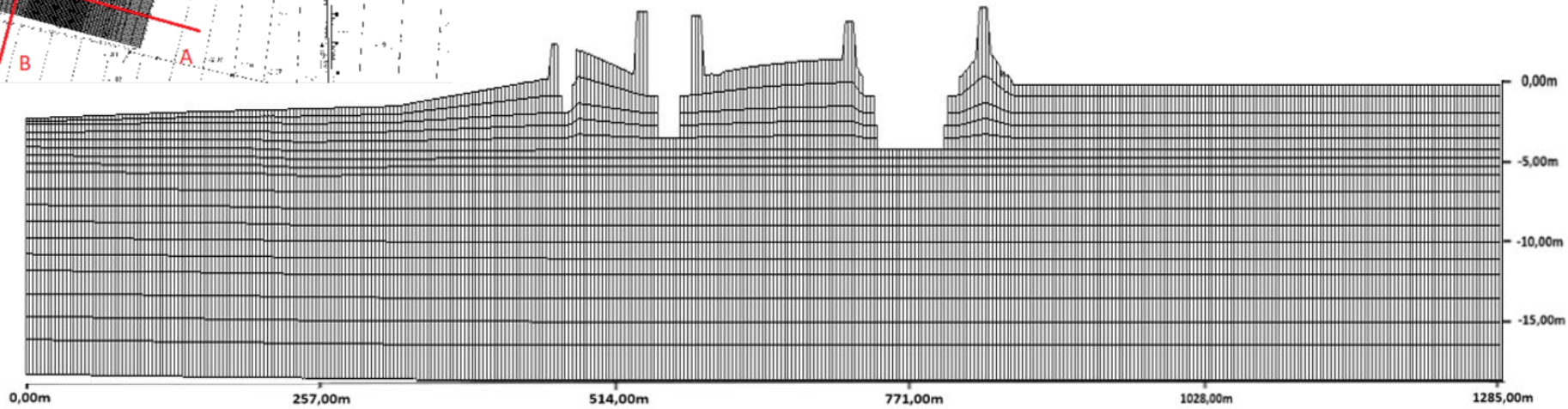
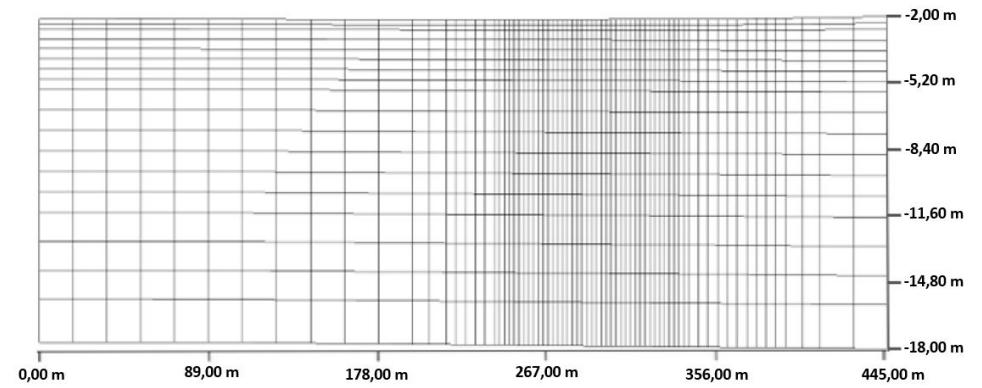
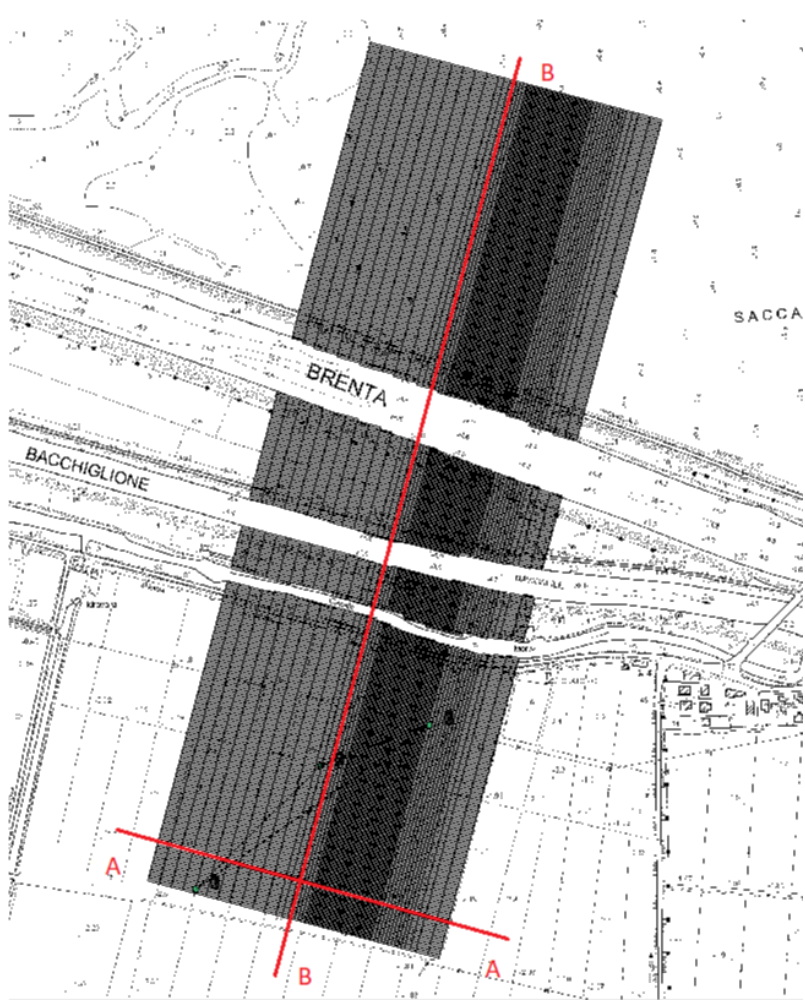
SEZIONE A - A

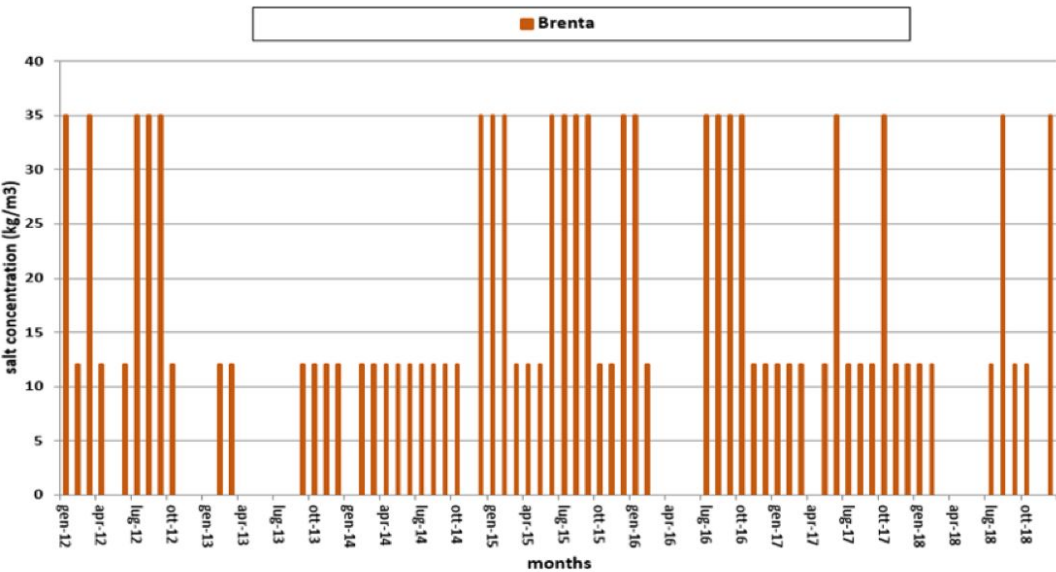
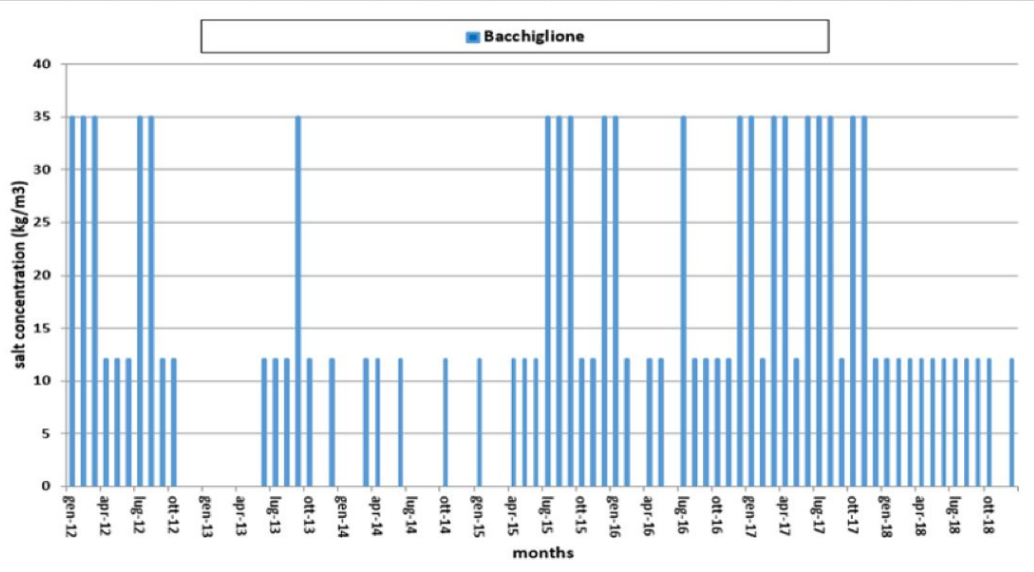
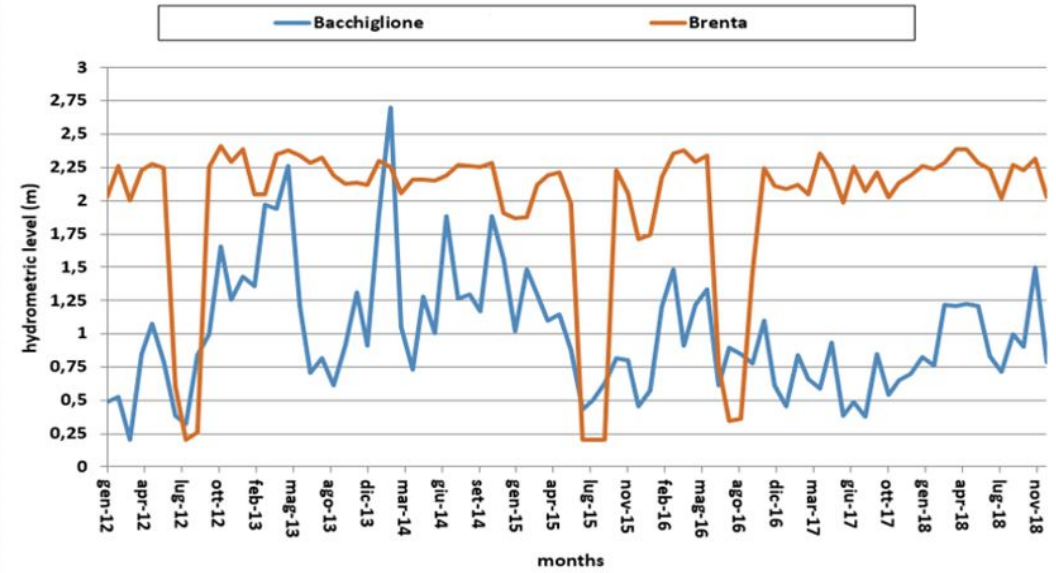
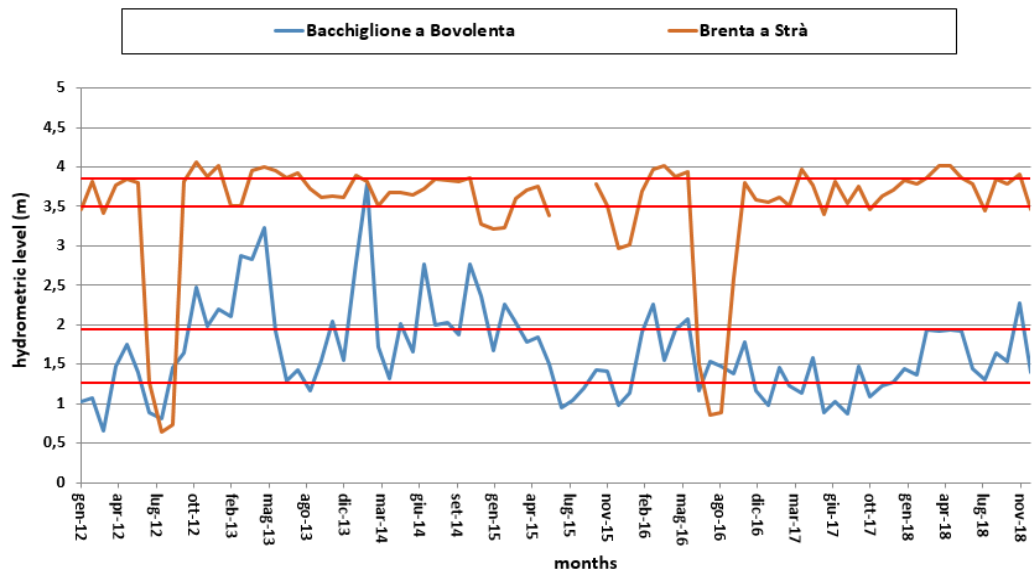
PIANTA



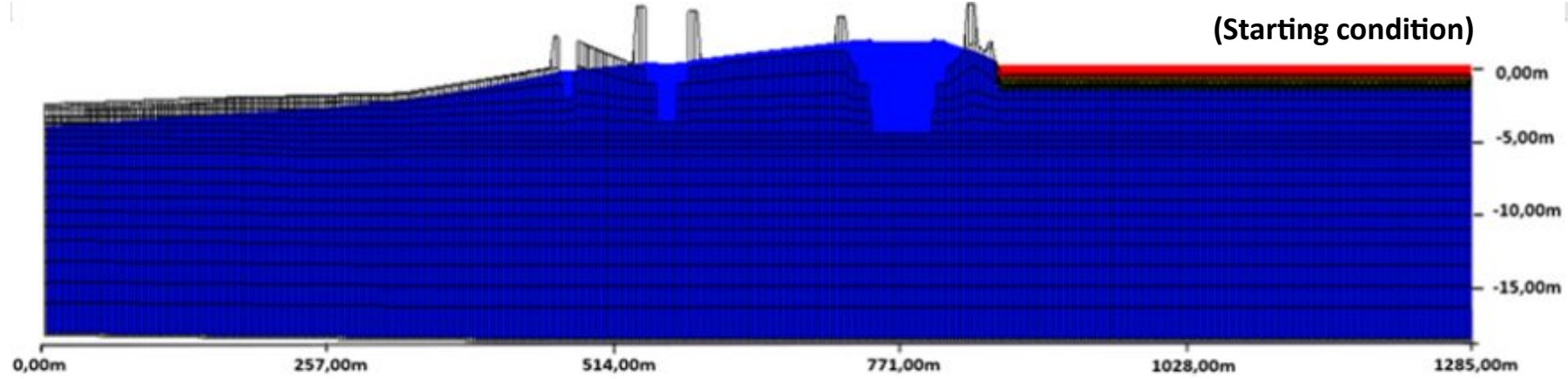
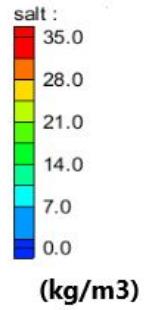
Diaphragm wall
L=200 m, H= 8 m

PRELIMINARY NUMERICAL ANALYSIS

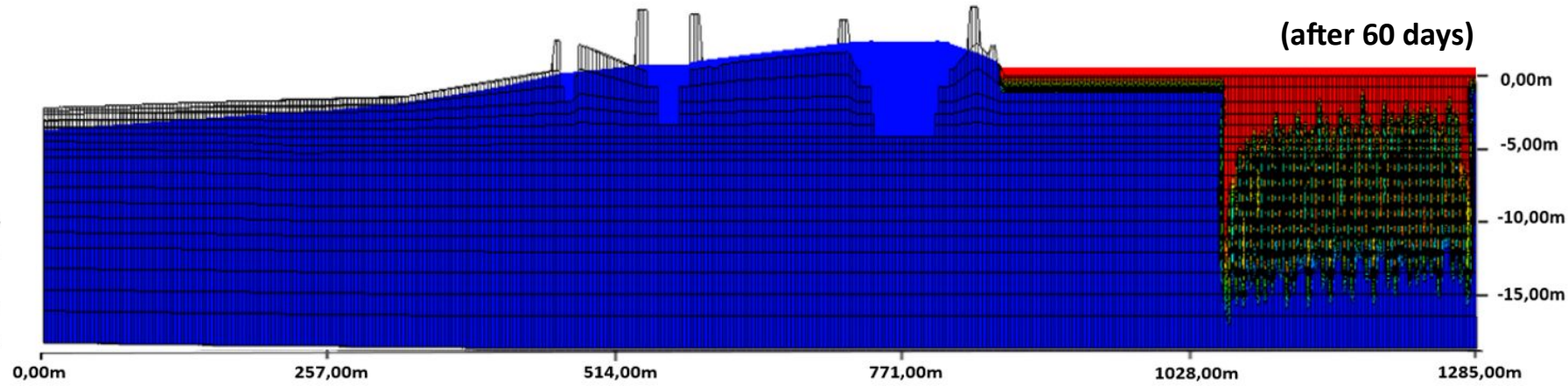




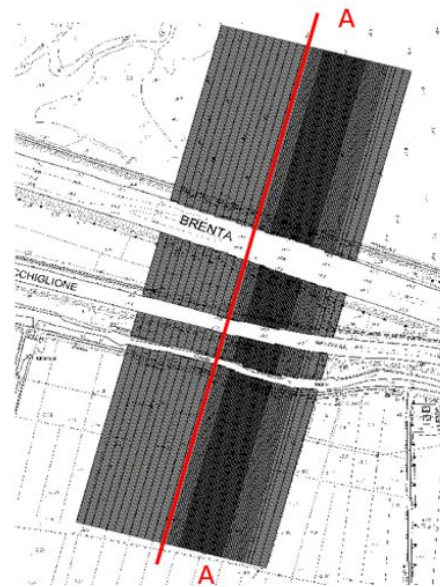
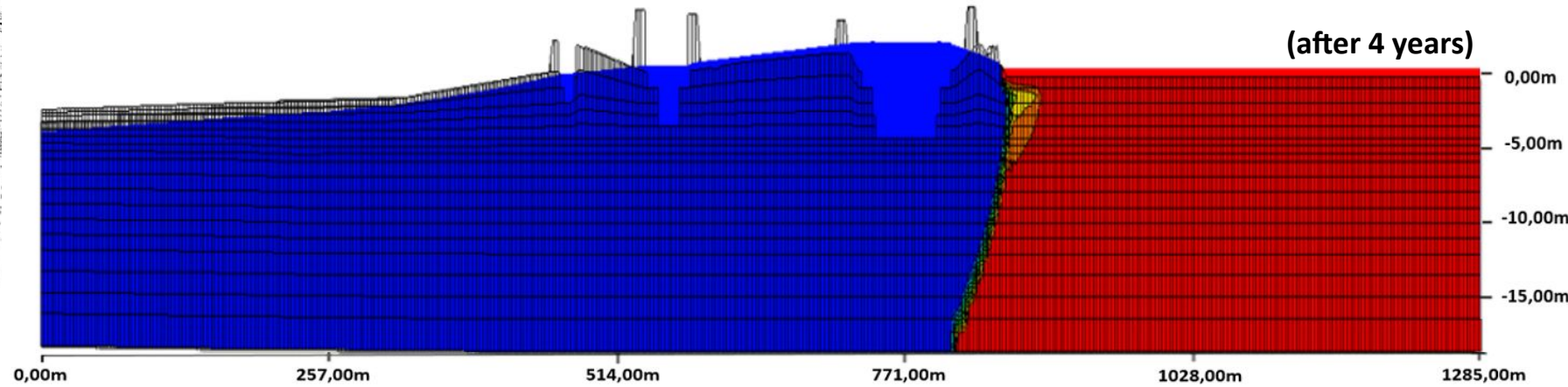
(Starting condition)

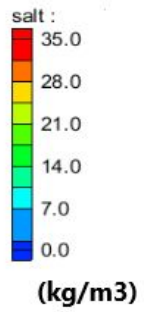


(after 60 days)

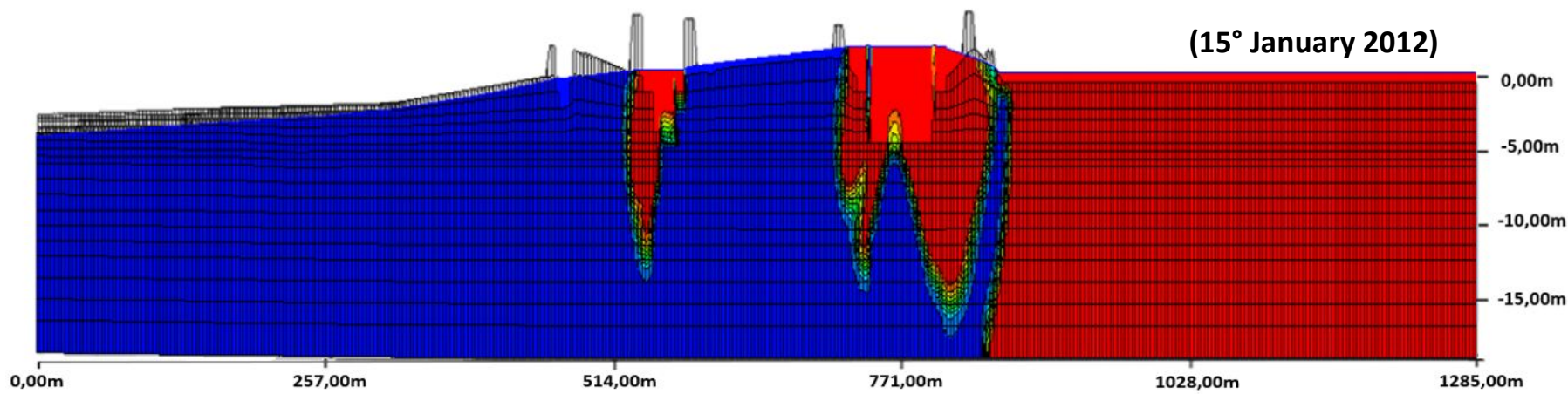


(after 4 years)

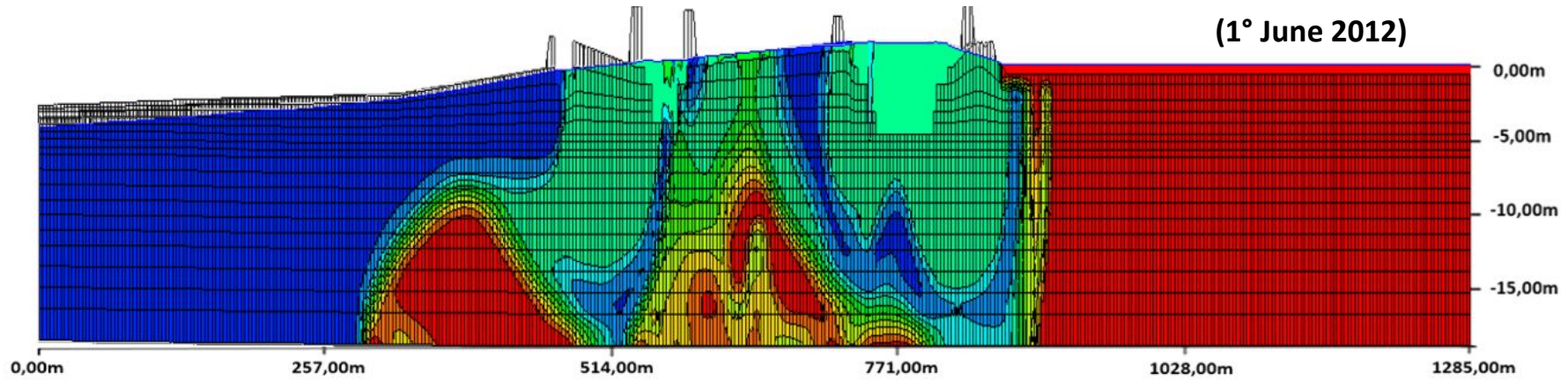




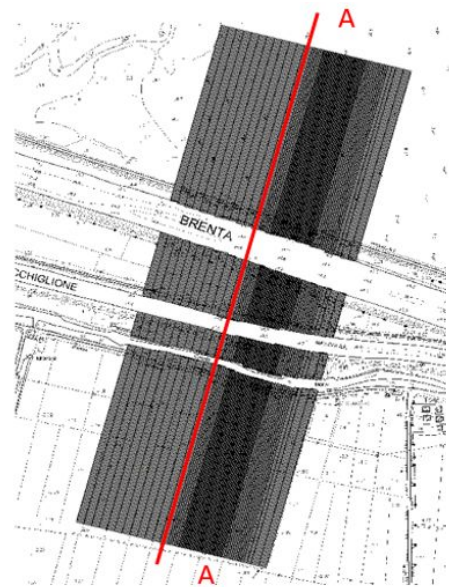
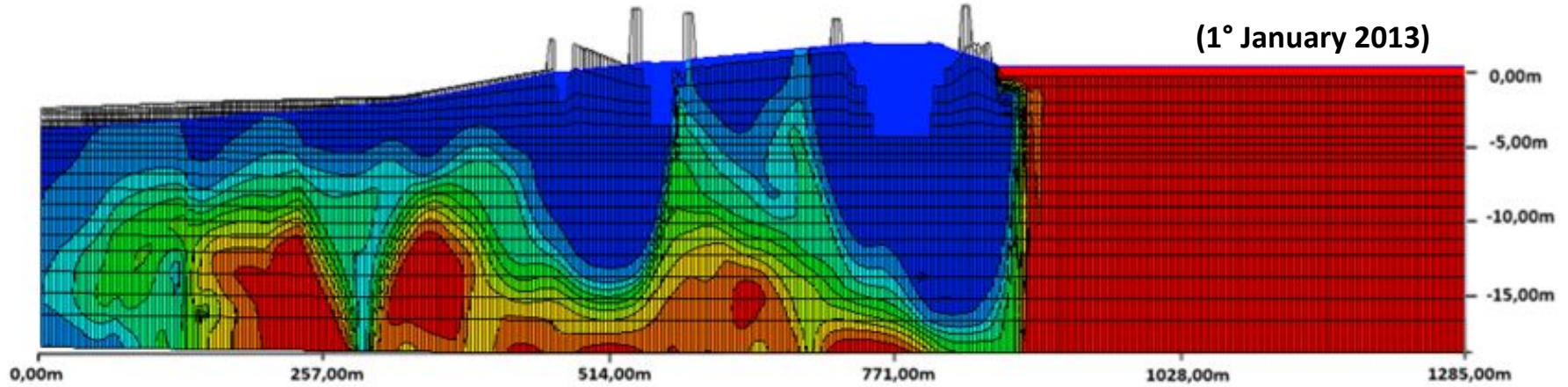
(15° January 2012)



(1° June 2012)

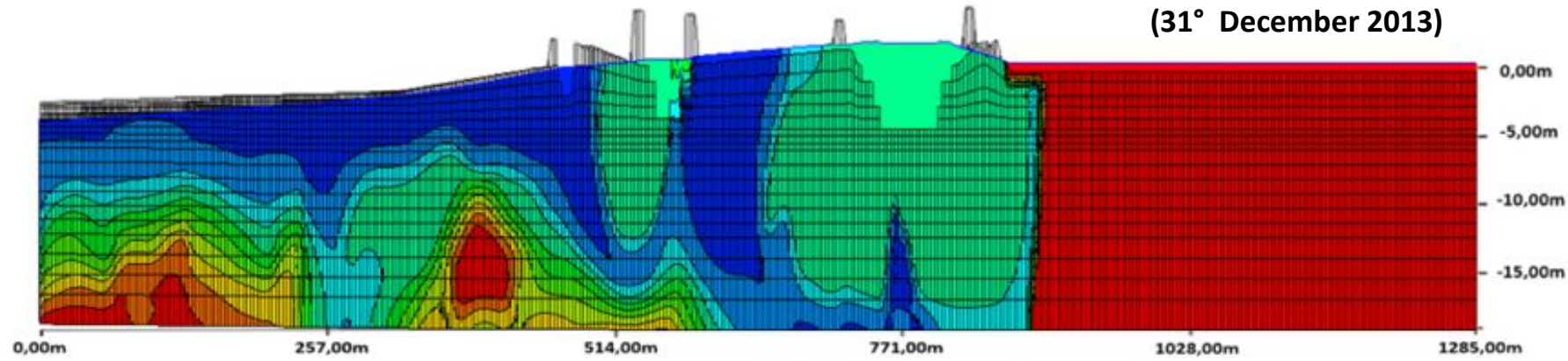


(1° January 2013)

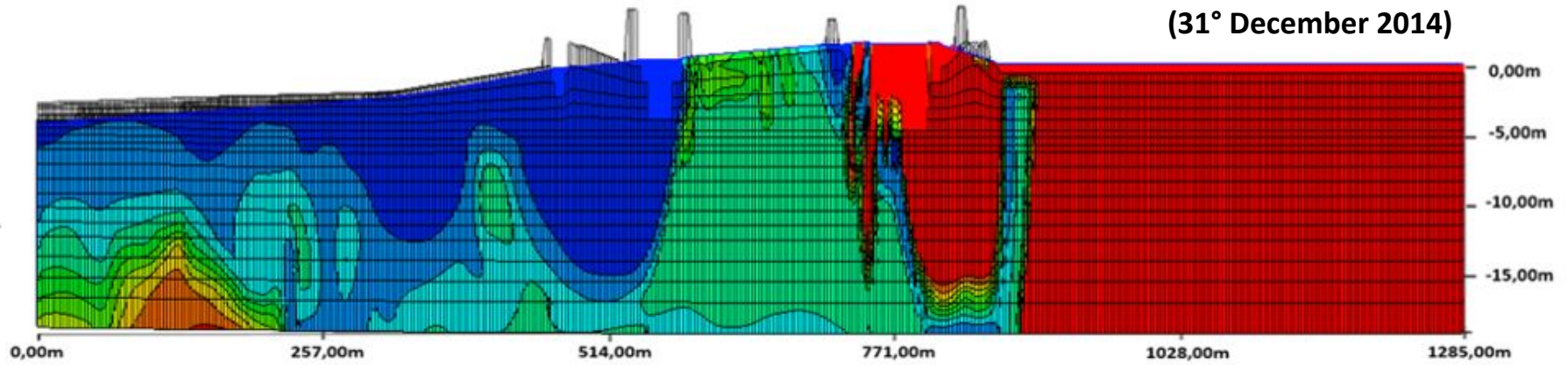


(31° December 2013)

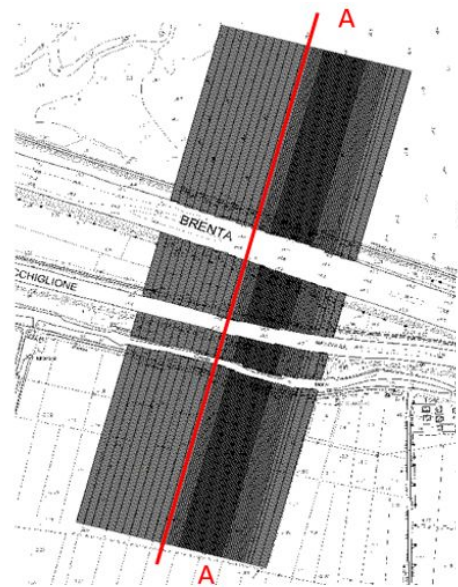
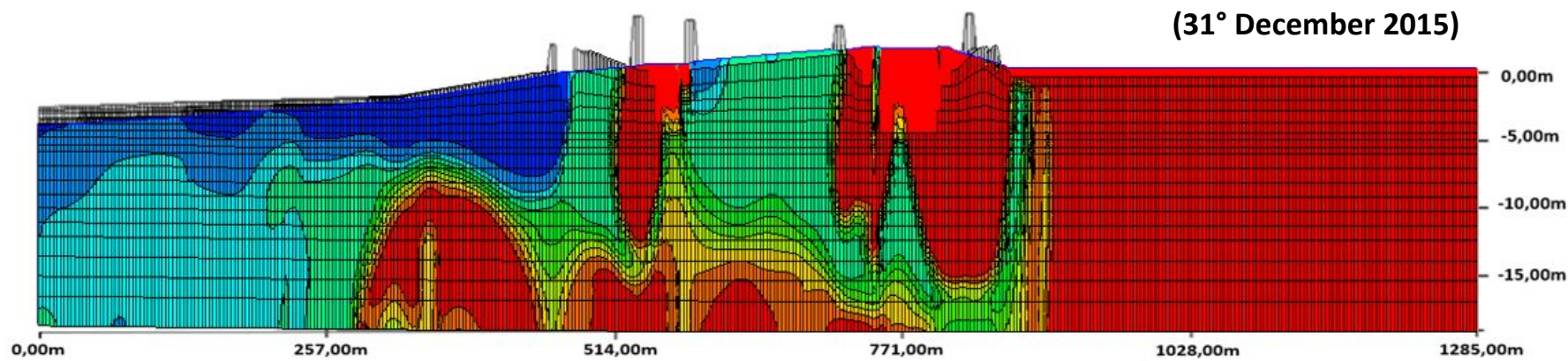
salt :
35.0
28.0
21.0
14.0
7.0
0.0
(kg/m³)



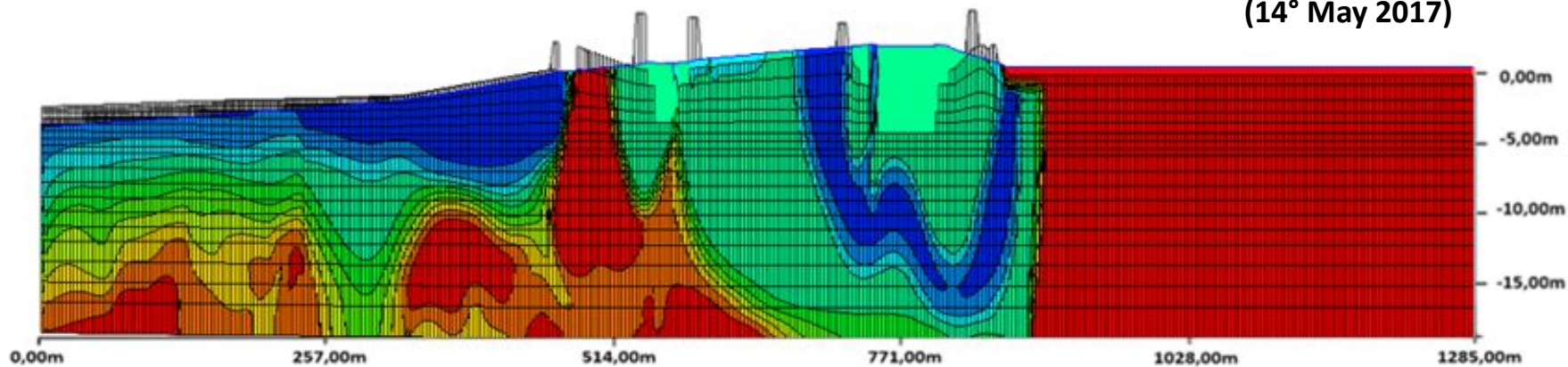
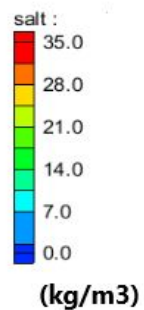
(31° December 2014)



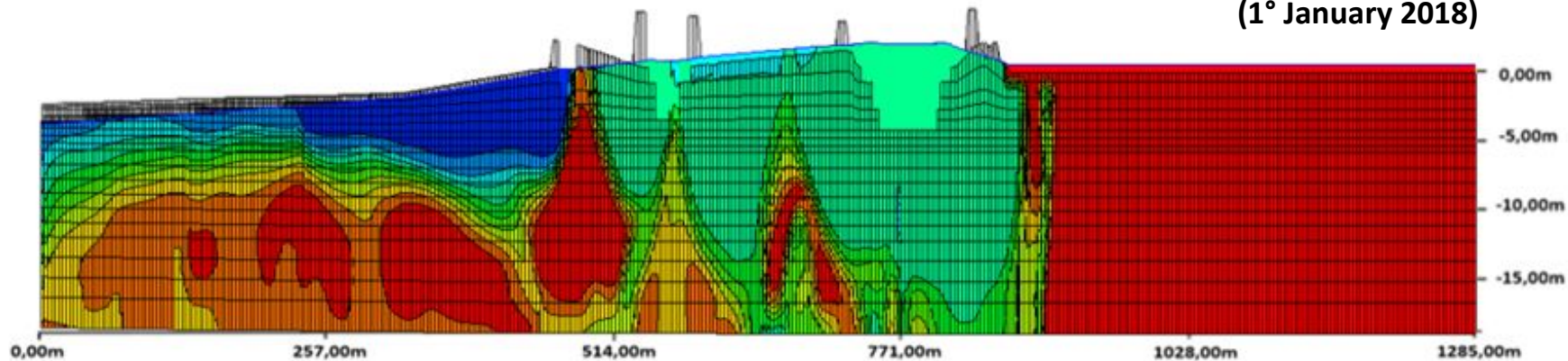
(31° December 2015)



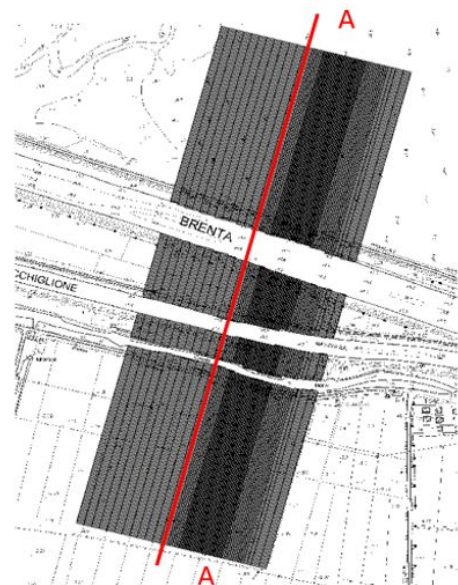
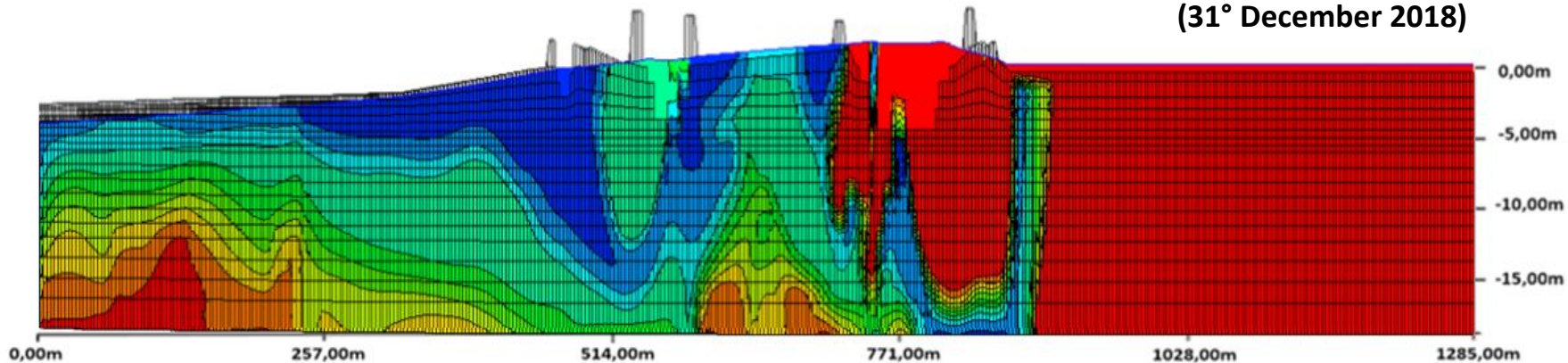
(14° May 2017)



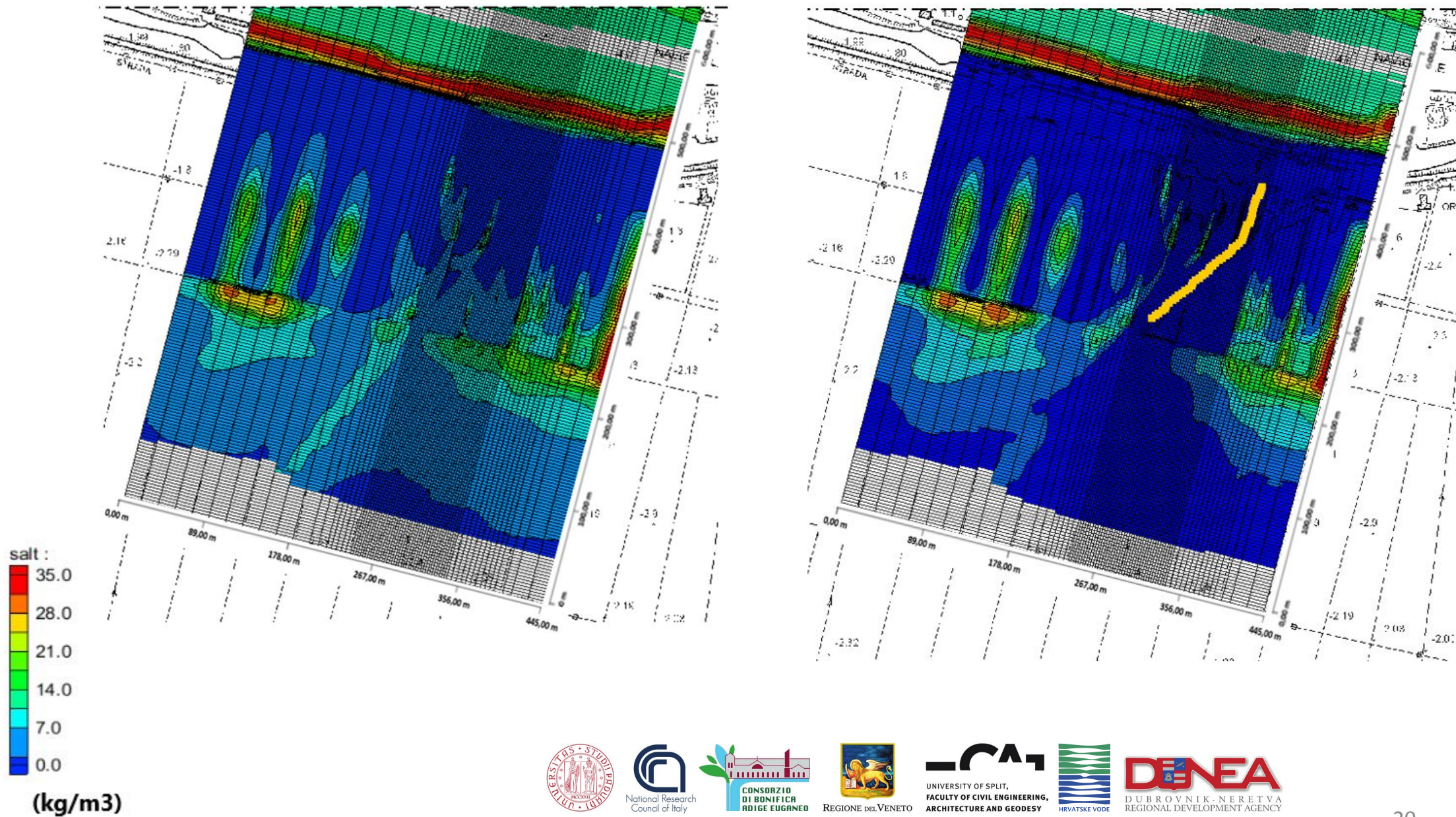
(1° January 2018)



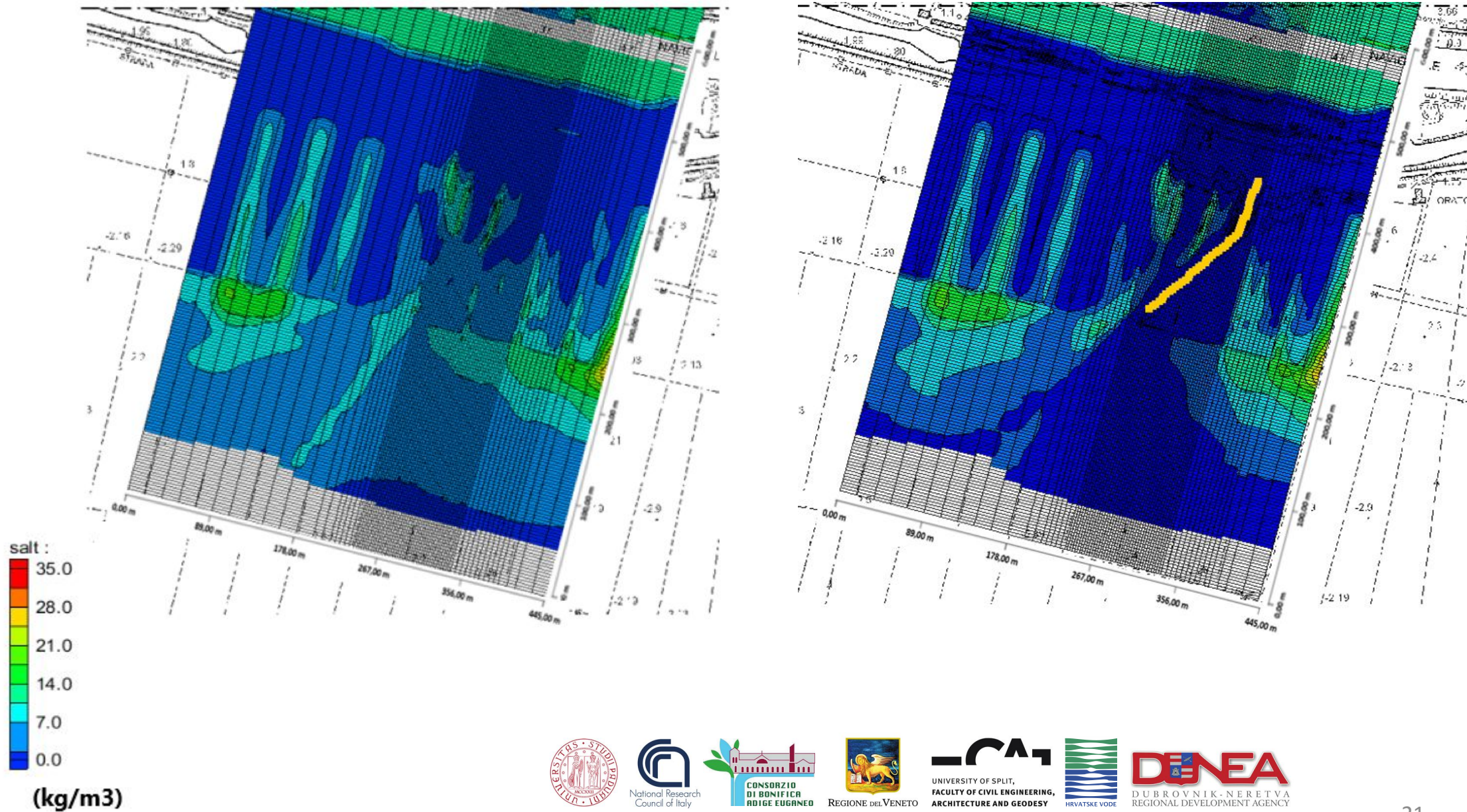
(31° December 2018)



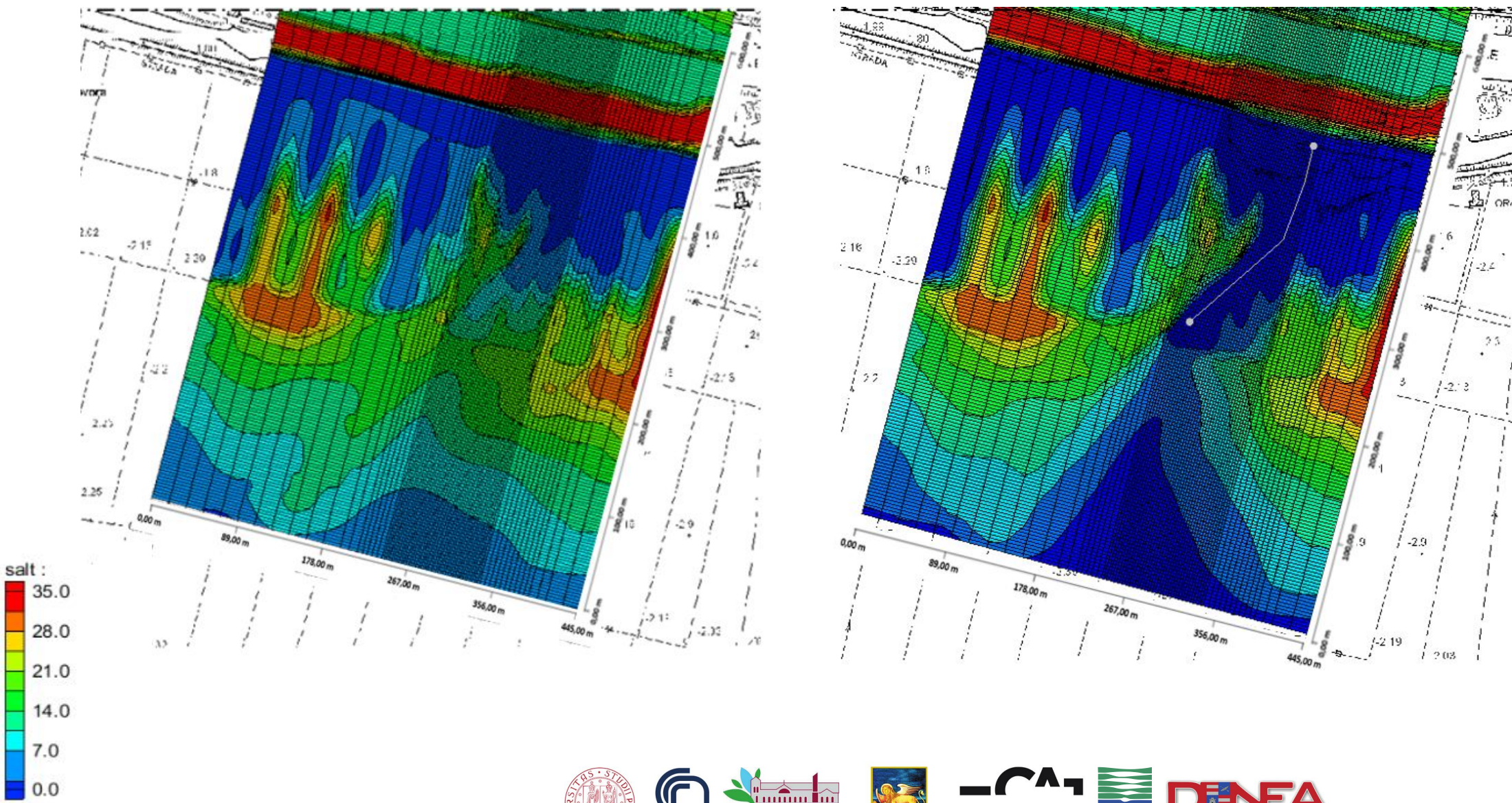
Simulation results after 2 years 1.5 m in depth (reference system -2 m a.s.l) , 1° January 2017



Simulation results after 3 years 1.5 m in depth (reference system -2 m a.s.l), 31° December 2018

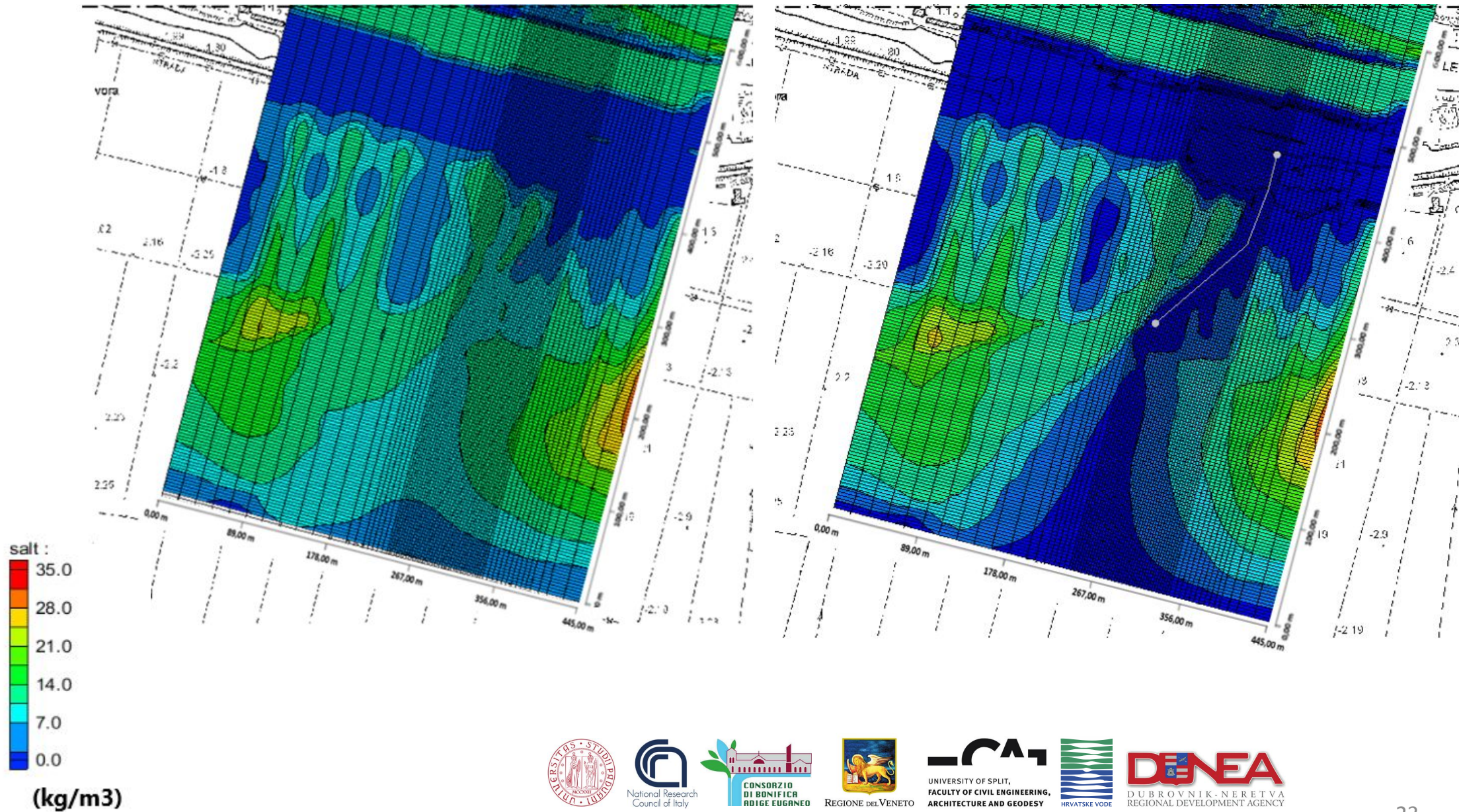


Simulation results after 2 years
 3.5 m in depth (reference system -2 m a.s.l, 1° January 2017)

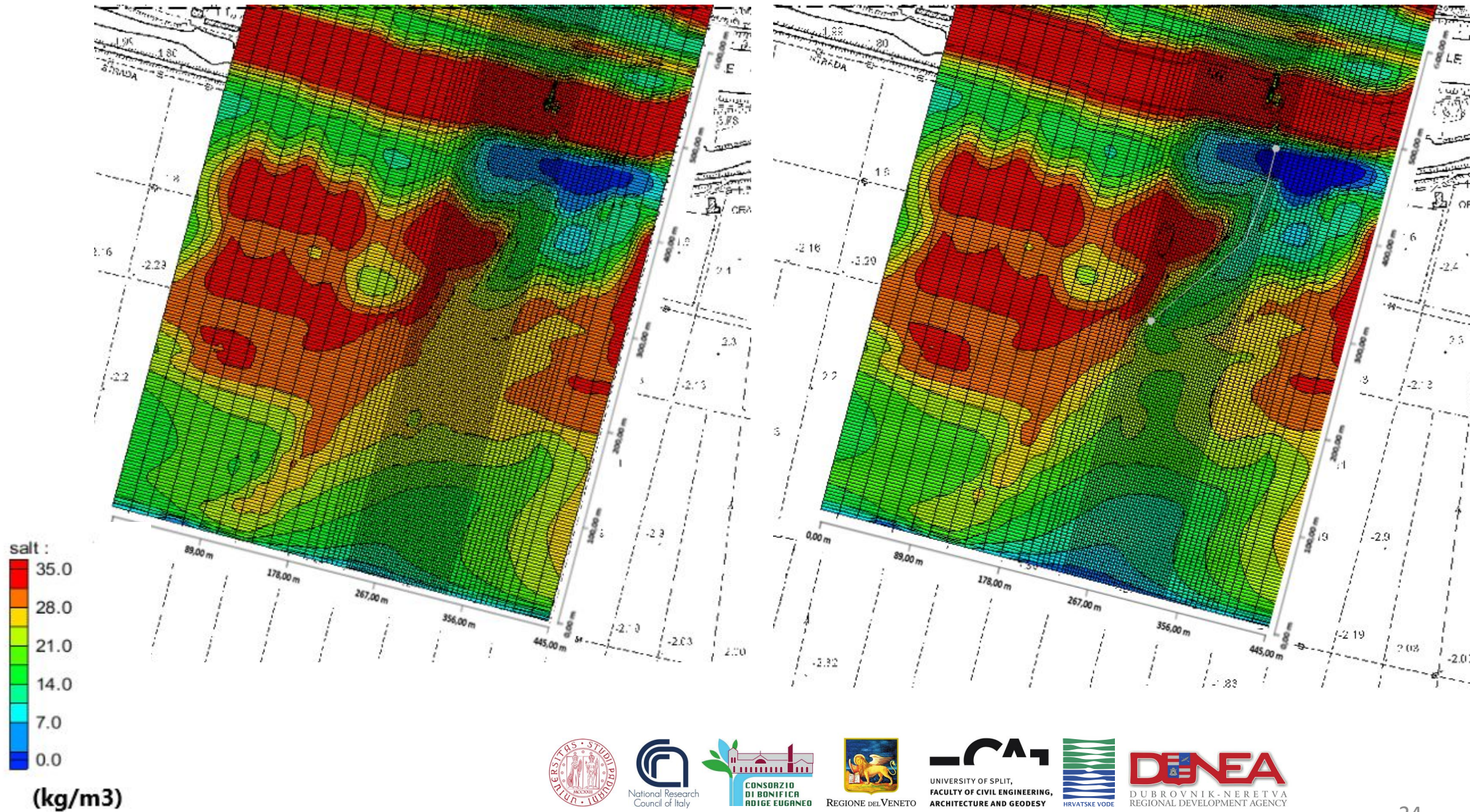


salt :
 35.0
 28.0
 21.0
 14.0
 7.0
 0.0
 (kg/m³)

Simulation results after 3 years
3.5 m in depth (reference system -2 m a.s.l, 31° December 2018)



Simulation results after 2 years 7.5 m in depth (reference system -2m a.s.l, 1° January 2017)



Simulation results after 3 years 7.5 m in depth (reference system -2m a.s.l), 31° December 2018

