PREPARE
Innovative integrated tools and platforms for radiological emergency preparedness and post-accident response in Europe
Euratom for Nuclear Research and Training Activities: Fission 2013: 323287

"PREPARE DISSEMINATION WORKSHOP: INNOVATIVE INTEGRATIVE TOOLS AND PLATFORMS", Bratislava, 20 - 22 . 01. 2016

Overview of WP5. The updated version of the watershed - river modeling chain RETRACE-RIVTOX and 2D reservoir model COASTOX in JRODOS- HDM , the implementation studies

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WP5: Extension of aquatic dispersion and consequence modelling in Decision Support Systems, on the basis of recent experiences and technological advances

The objective of the PREPARE activities in WP5 was to extend the Hydrological Dispersion Module of DSS JRODOS (RODOS-HDM), that nowadays is a tool for the prediction of short-term radionuclide dispersion in river systems, by further development of this software module with new functionalities:

- modelling of radionuclide transport in coastal waters driven by the atmospheric fallout from RODOS ADM and/or by direct releases into marine environment for the post accidental real-time forecasting and for the analyses of long term contamination of the marine environment including marine biota

WP5: Extension of aquatic dispersion and consequence modelling in Decision Support Systems, on the basis of recent experiences and technological advances (2)

- modelling of long-term fate of radionuclides in freshwater systems for predictions of the radiation doses via aquatic exposure pathways, analyses of the efficiency of countermeasures to diminish such doses after an accident.

- validation of the HDM models for the water bodies in the fallout zone of the Fukushima Daiichi NPP and HDM implementation for forecasting of the behaviour of radionuclides in water bodies of Fukushima Prefecture with the assessment of the efficiency of the countermeasures.

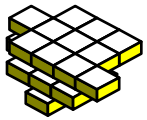
Hydrological Dispersion Models (HDM) of EC Decision Support System for Nuclear Emergency- RODOS implementing at Fukushima

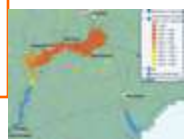
Models of radionuclide washoff from watersheds

1-D river flow, sediments and radionuclide transport models

2-D reservoirs, floodplains and coastal areas model (unstructured grid)

3D model for deep river reservoirs, lakes and marine environment





HDM

RETRACE-RUNTOX

RIVTOX

COASTOX

THREETOX

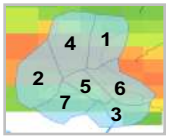
MOIRA

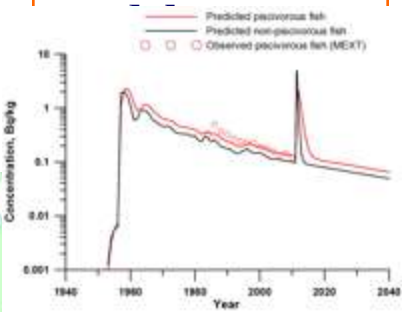
FDMA

POSEIDON

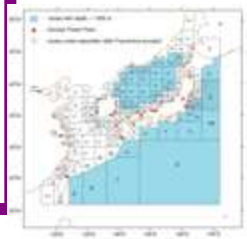
Longterm prediction and management model

Freshwater Food Chain and Dose

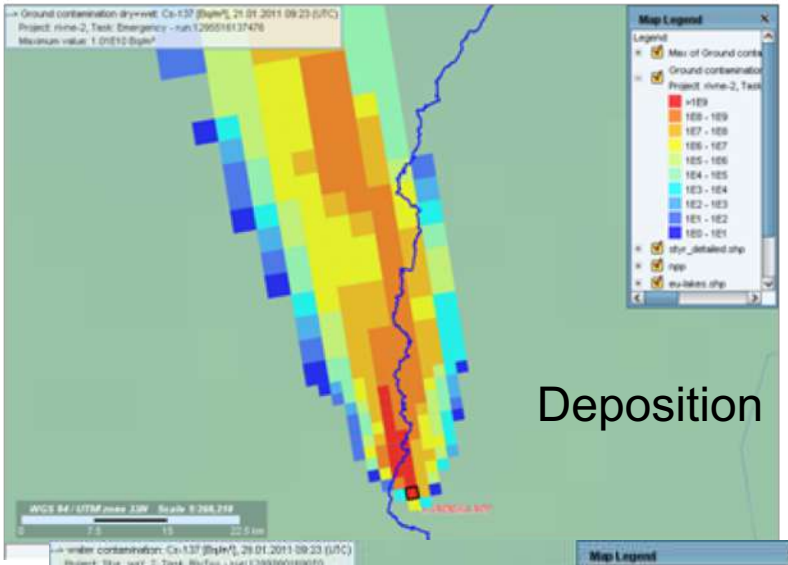




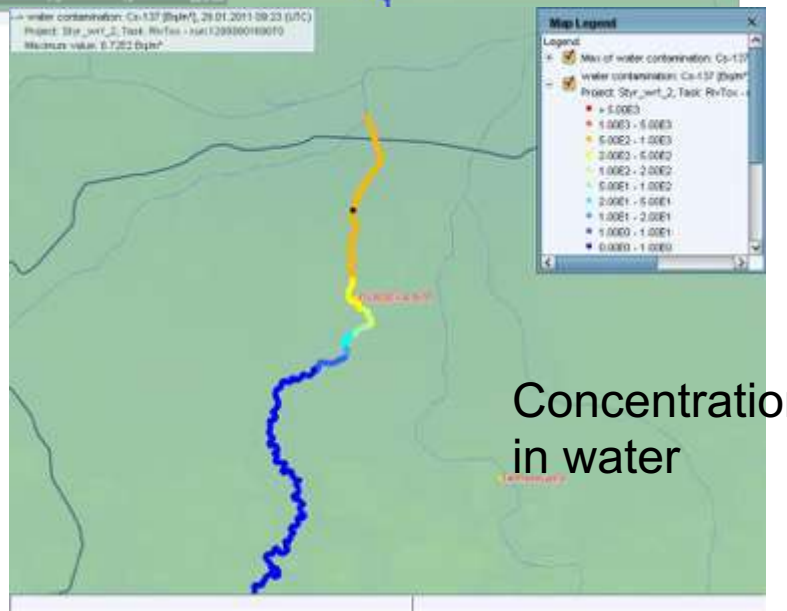
Marine food chain and dose model



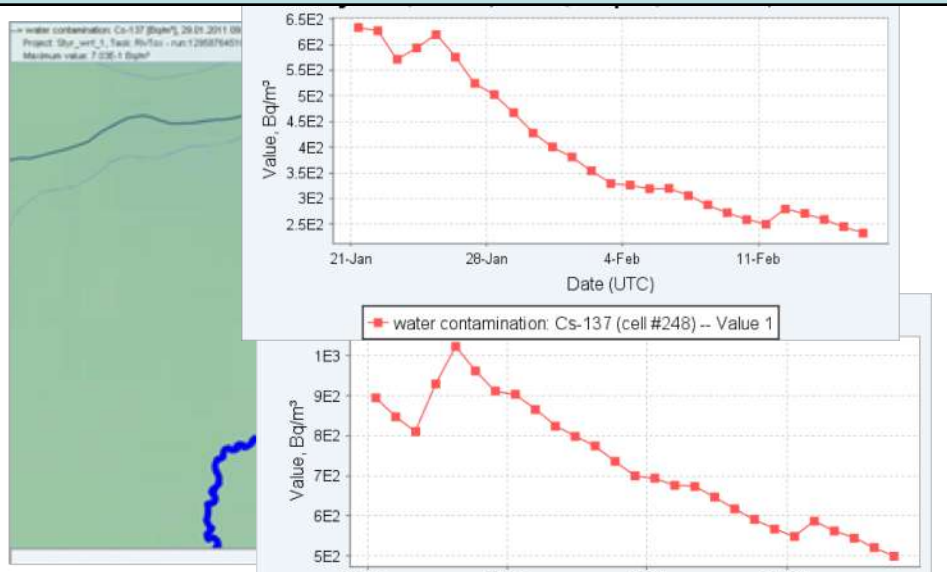
HDM 1D River model RIVTOX – – Cs137 transport in Styr River near Rivno NPP ("old" HDM)

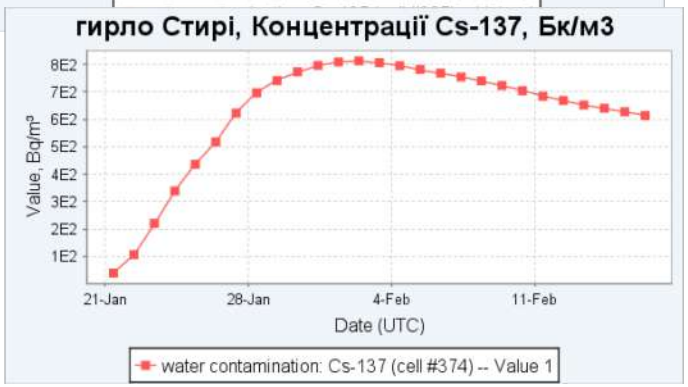


Deposition

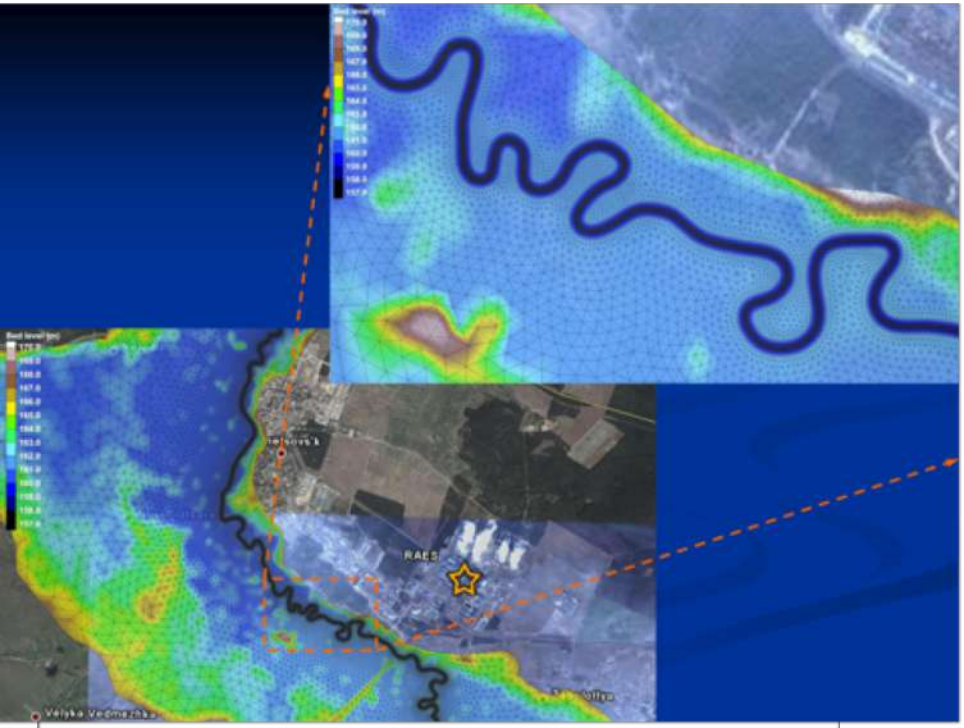


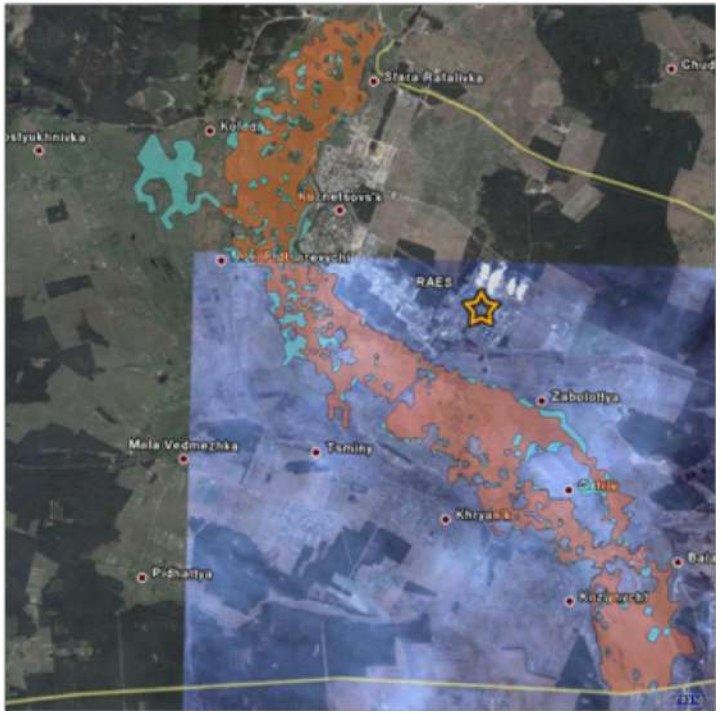
Concentration in water





2D Model COASTOX





2D COASTOX for Sozh River floodplain at Rivno NPP: computational grid, flooded area during two highest floods, the fluxes of Cs-137 at the downflow crossections in solute and with suspended sediments for two scenarios of atmospheric releases

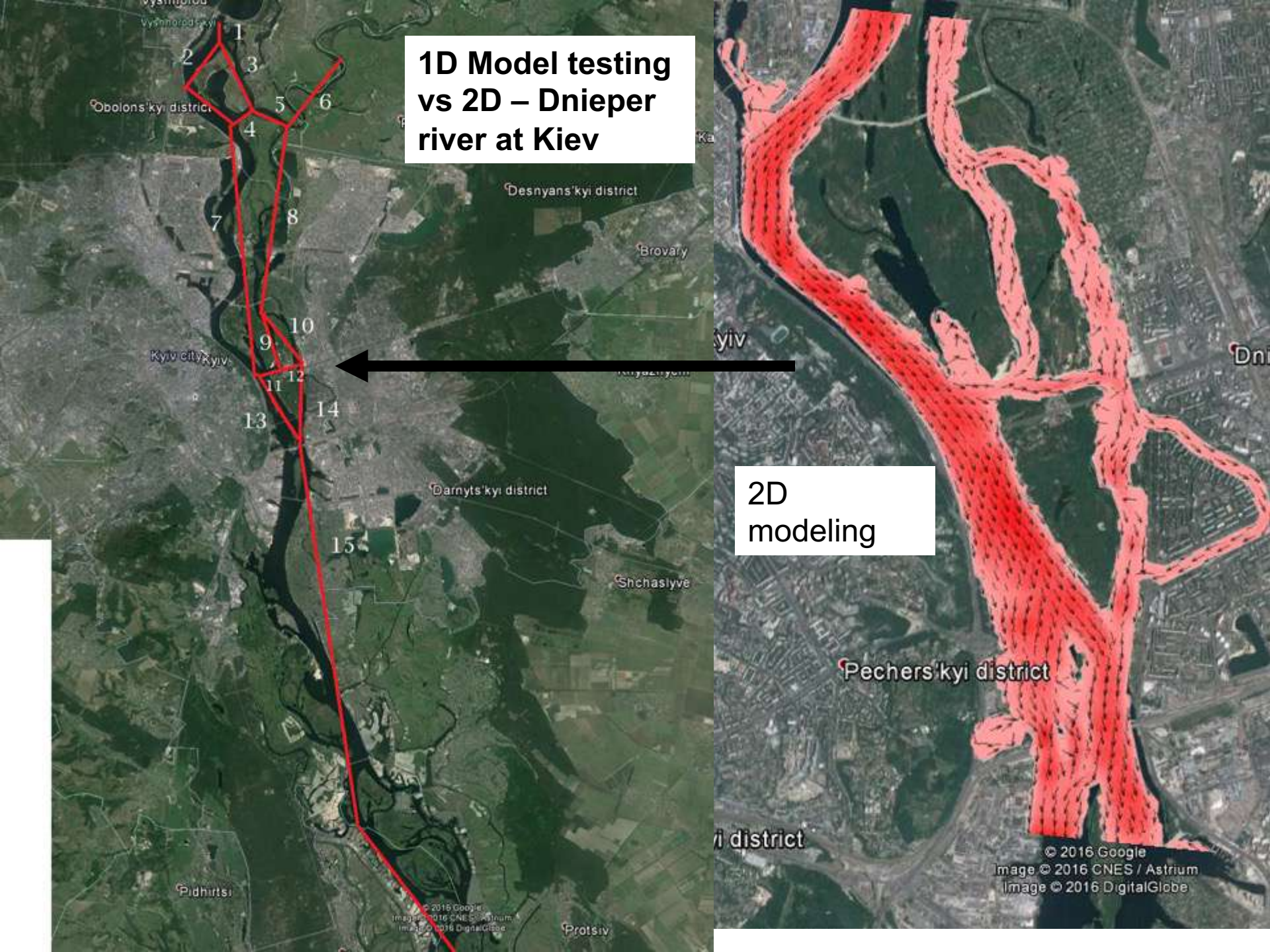
Update of the computational engine of 1-D river model RIVTOX coupled with the raifall-runoff model RETRACE – R:

New version of the hydraulic model of RIVTOX based on the full Saint- Venant equation to the simulate the complicated branched river networks (instead of diffusive wave approximation) and new sediment-radionuclide transport model (Rivtox-SV) – *S Kivva*

Testing of new 1 D model hyraulic in comparison with measurements and 2 D modelling results, Danube case - *S Kivva, O.Mikhalsky, M Sorokin, D Gheorghiu*

Coupling of Rivtox-SV with runoff model Retrace- R – *O.Boyko*

JRODOS interfaces for 1D and 2D Model – *I.Ievdin, D.Trybushny*


1D Model testing vs 2D – Dnieper river at Kiev
2D modeling
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Obolons'kyi district
Desnyans'kyi district
Brovary
Kyiv city
Kyiv
Darnyts'kyi district
Shchaslyve
Pechers'kyi district
Pidhirtsi
Protsiv
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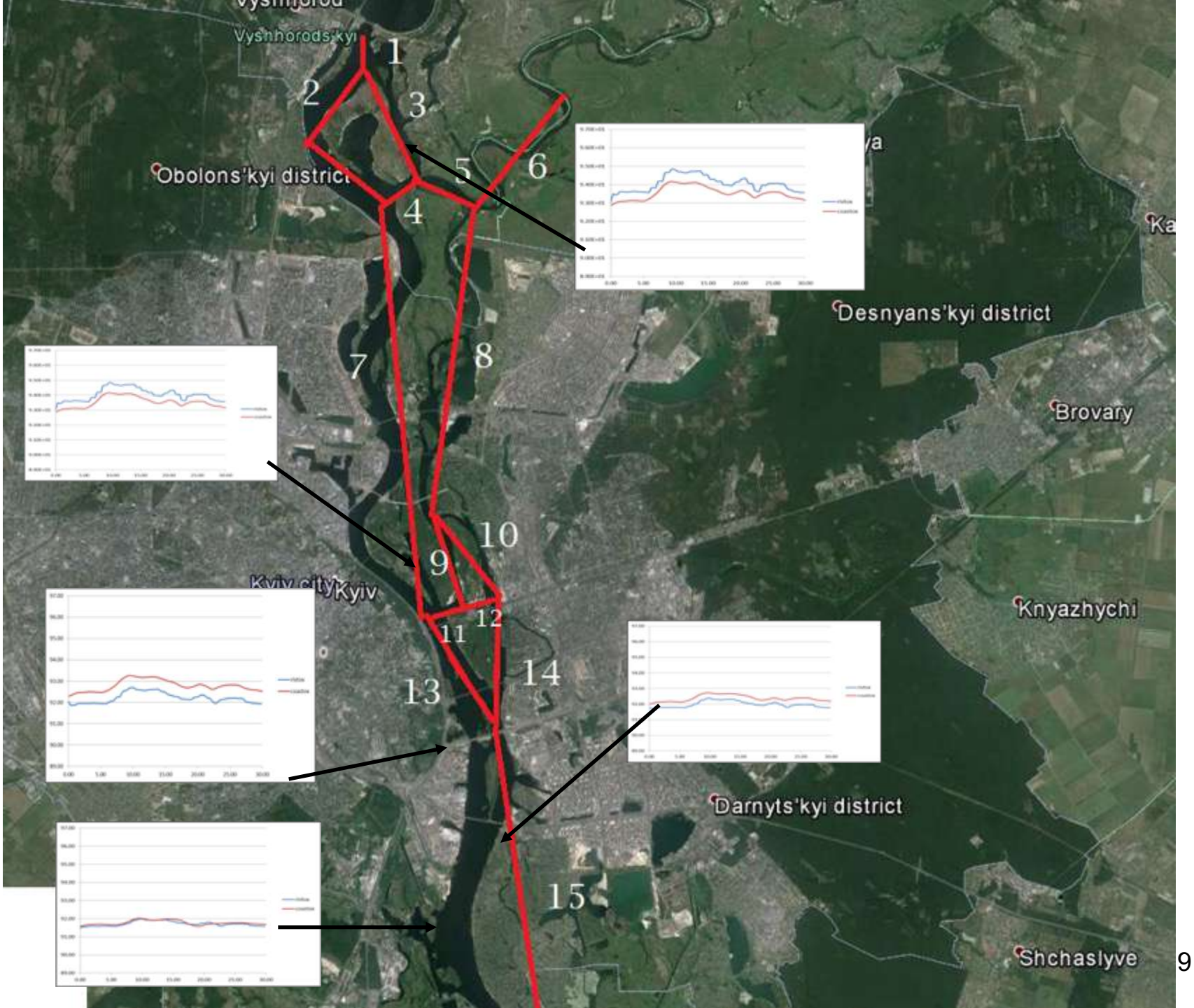
Vyshhorods'kyi
Obolons'kyi district
Desnyans'kyi district
Brovary
Kyiv city
Kyiv
Knyazhychi
Darnyts'kyi district
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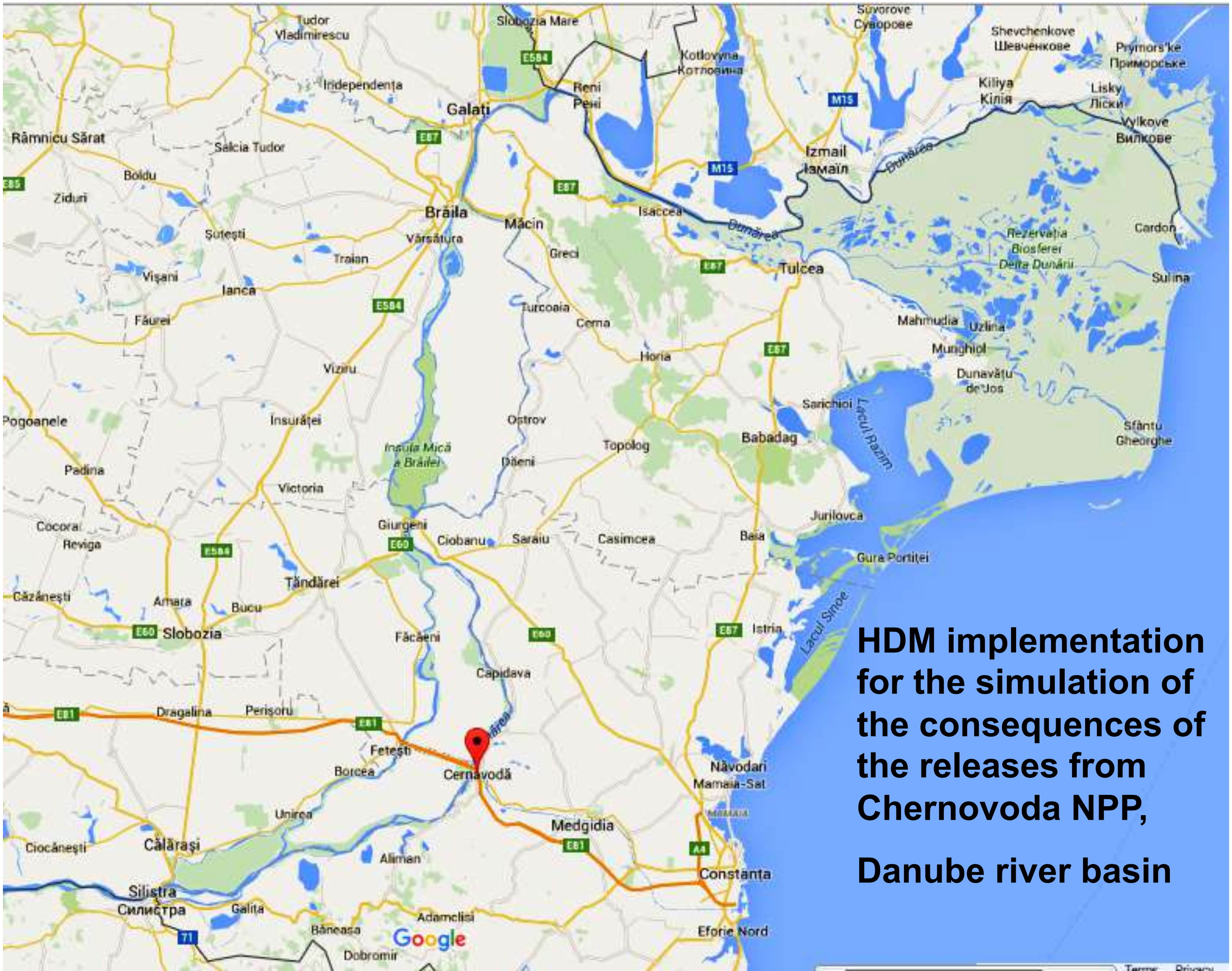
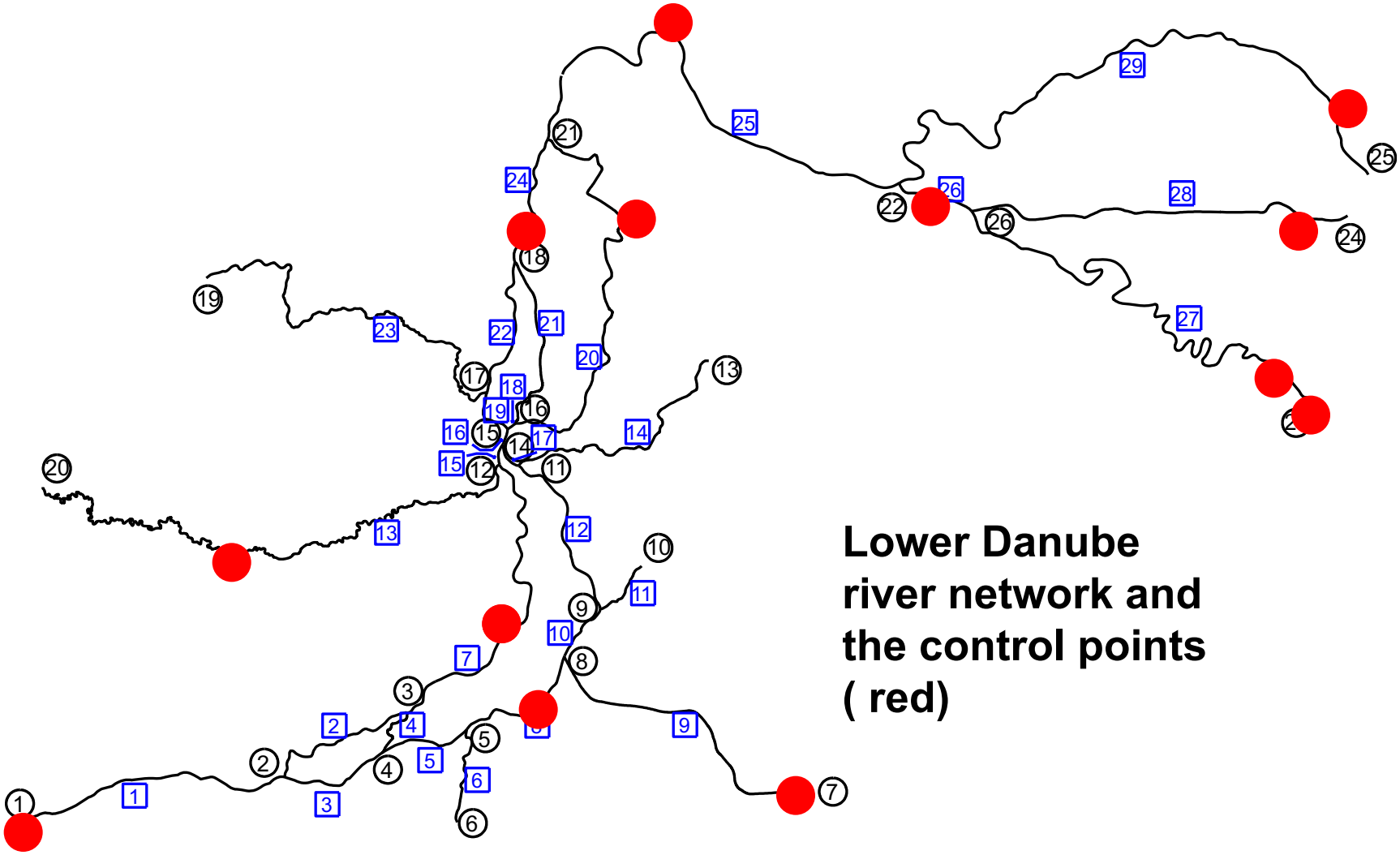


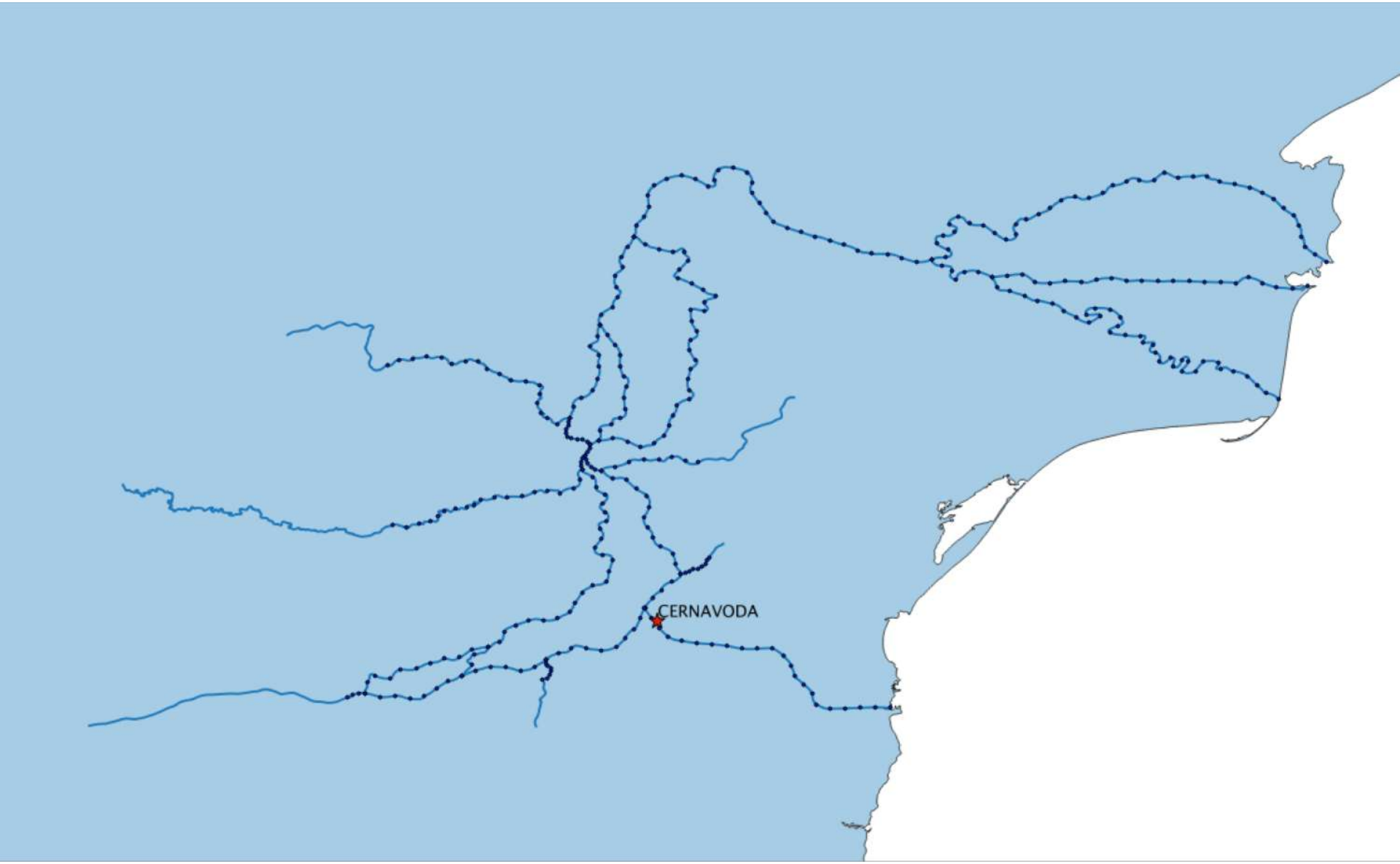
HDM implementation for the simulation of the consequences of the releases from Chernovoda NPP,

Danube river basin

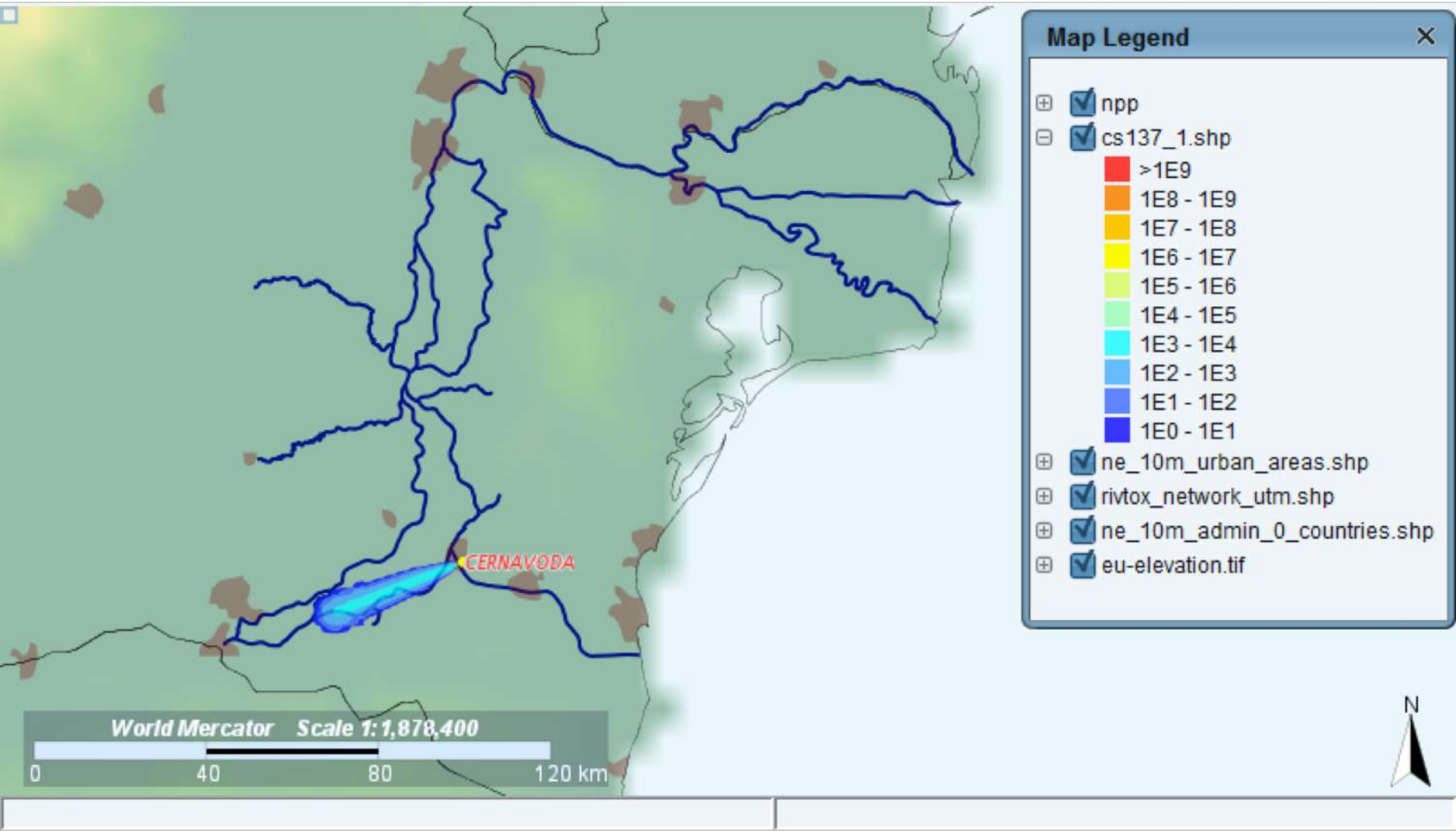


Lower Danube river network and the control points (red)

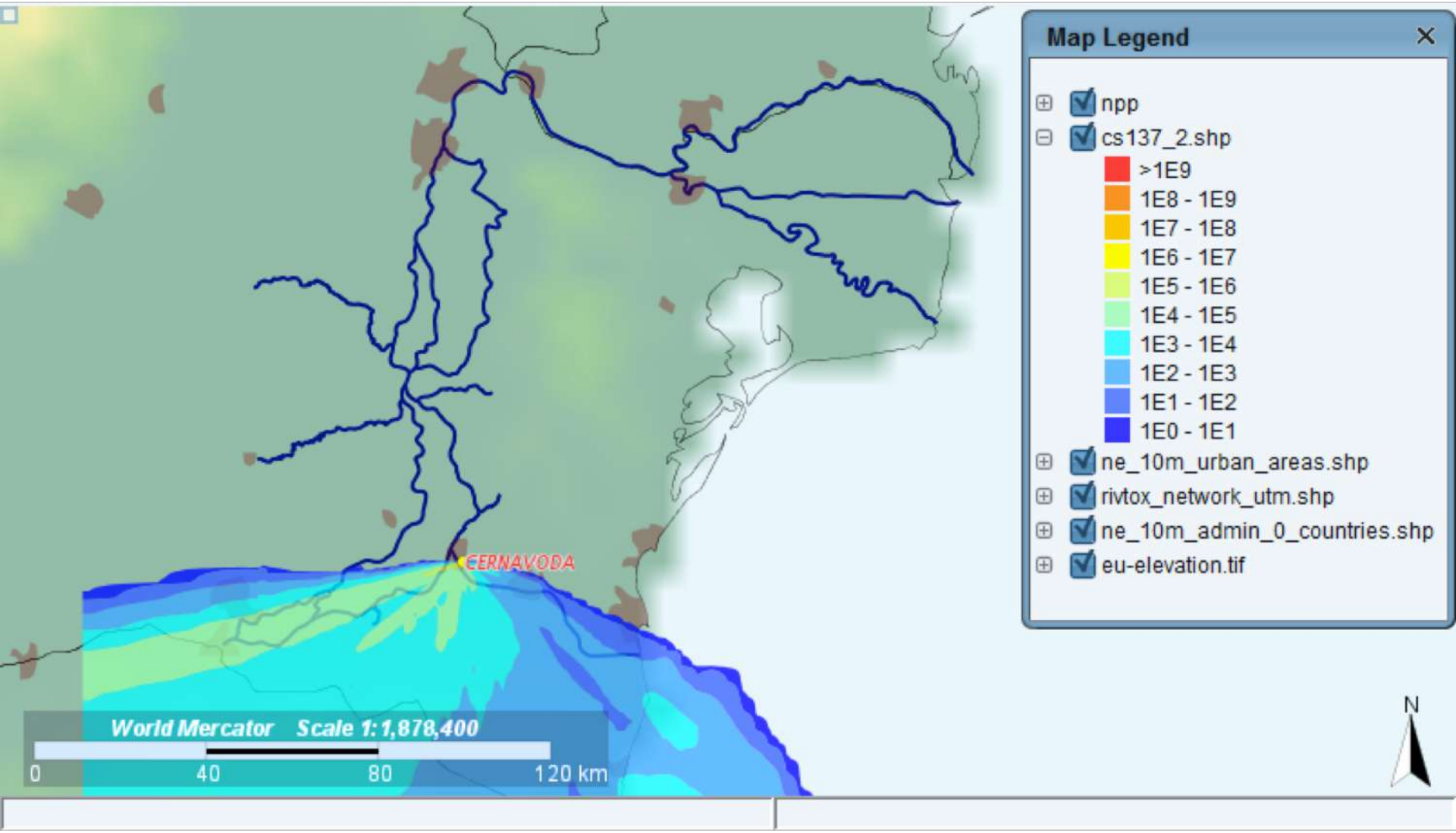
River network



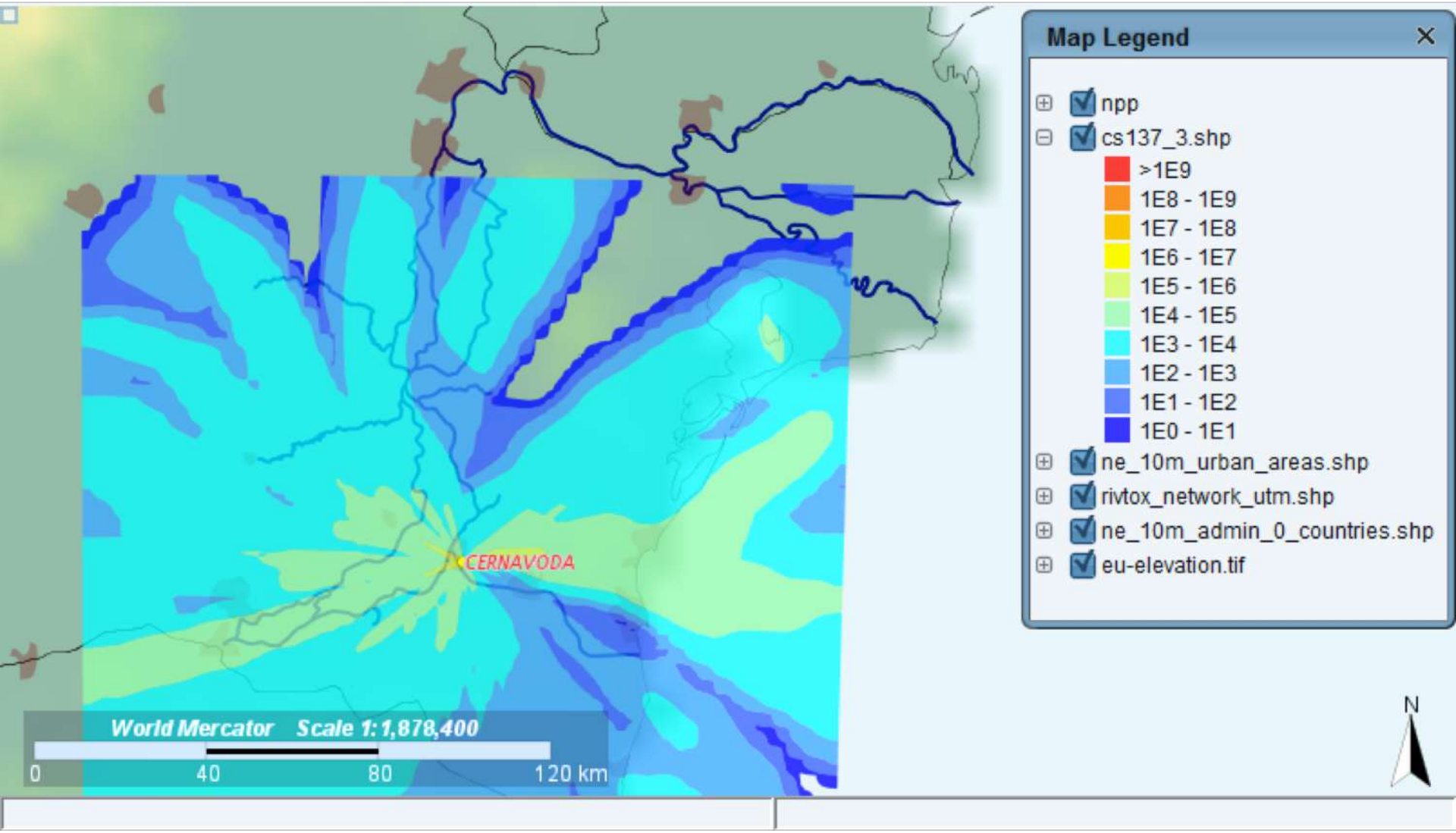
Cs-137 deposition at day 1



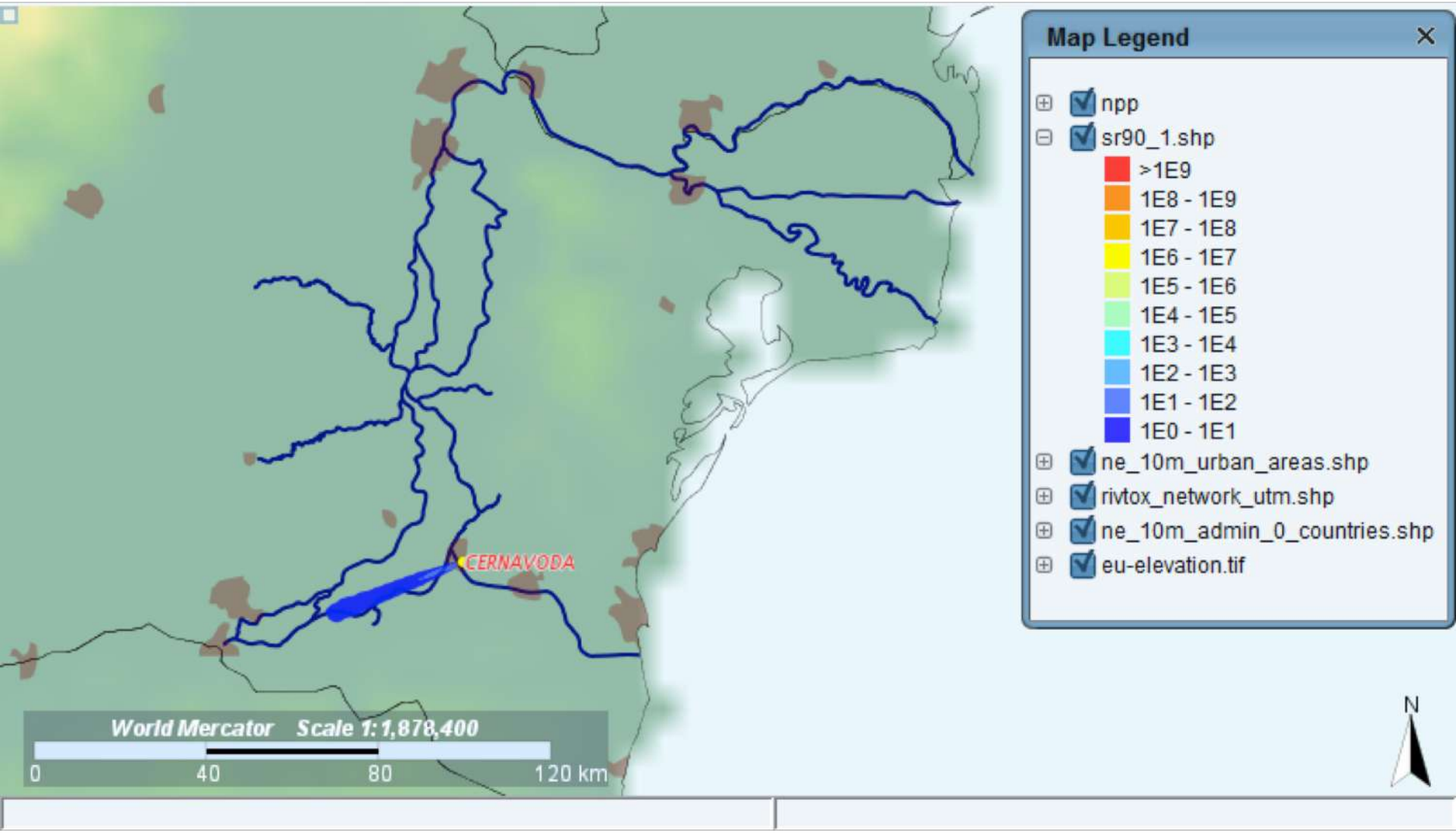
Cs-137 deposition at day 3



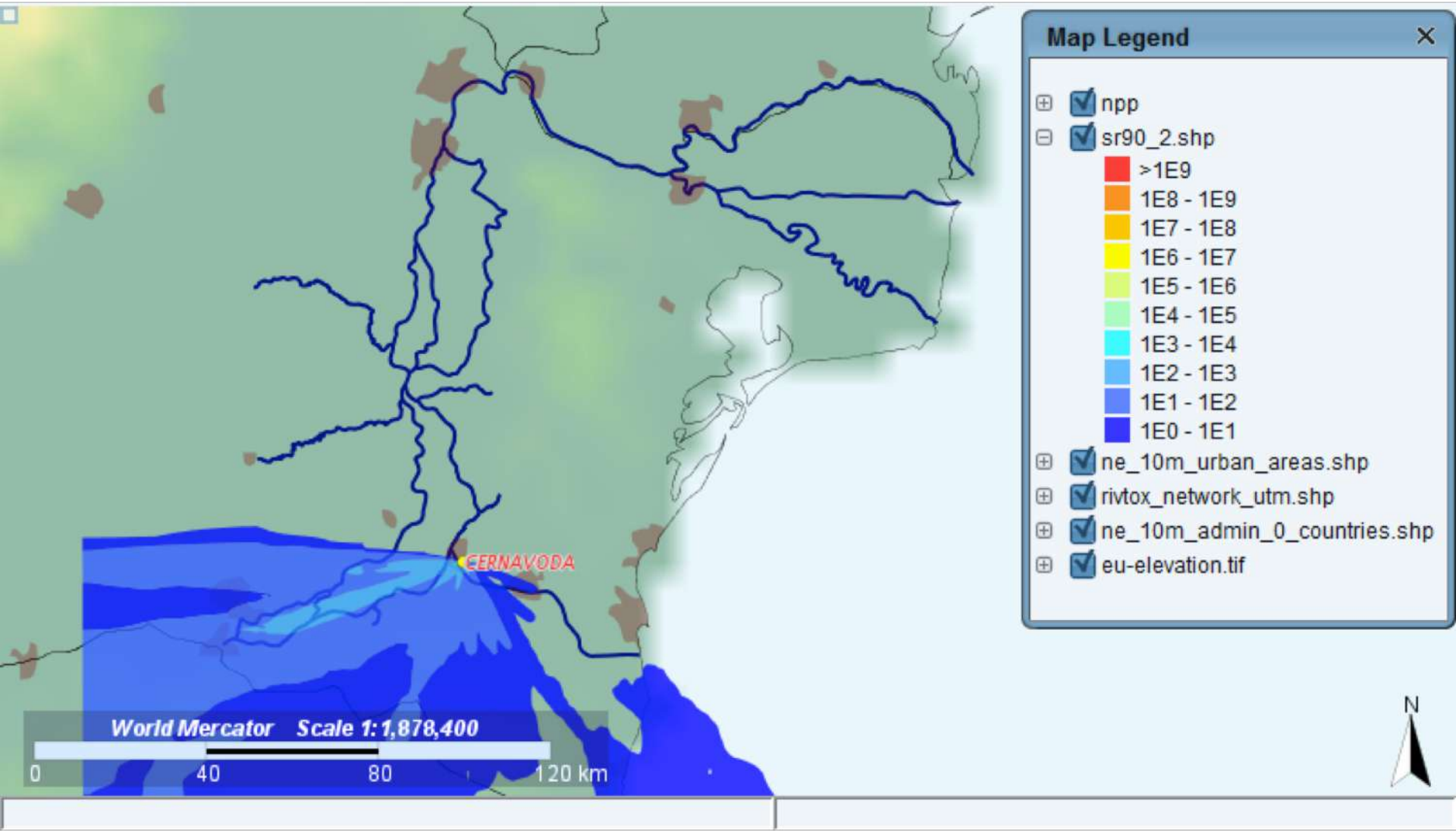
Cs-137 deposition at day 5



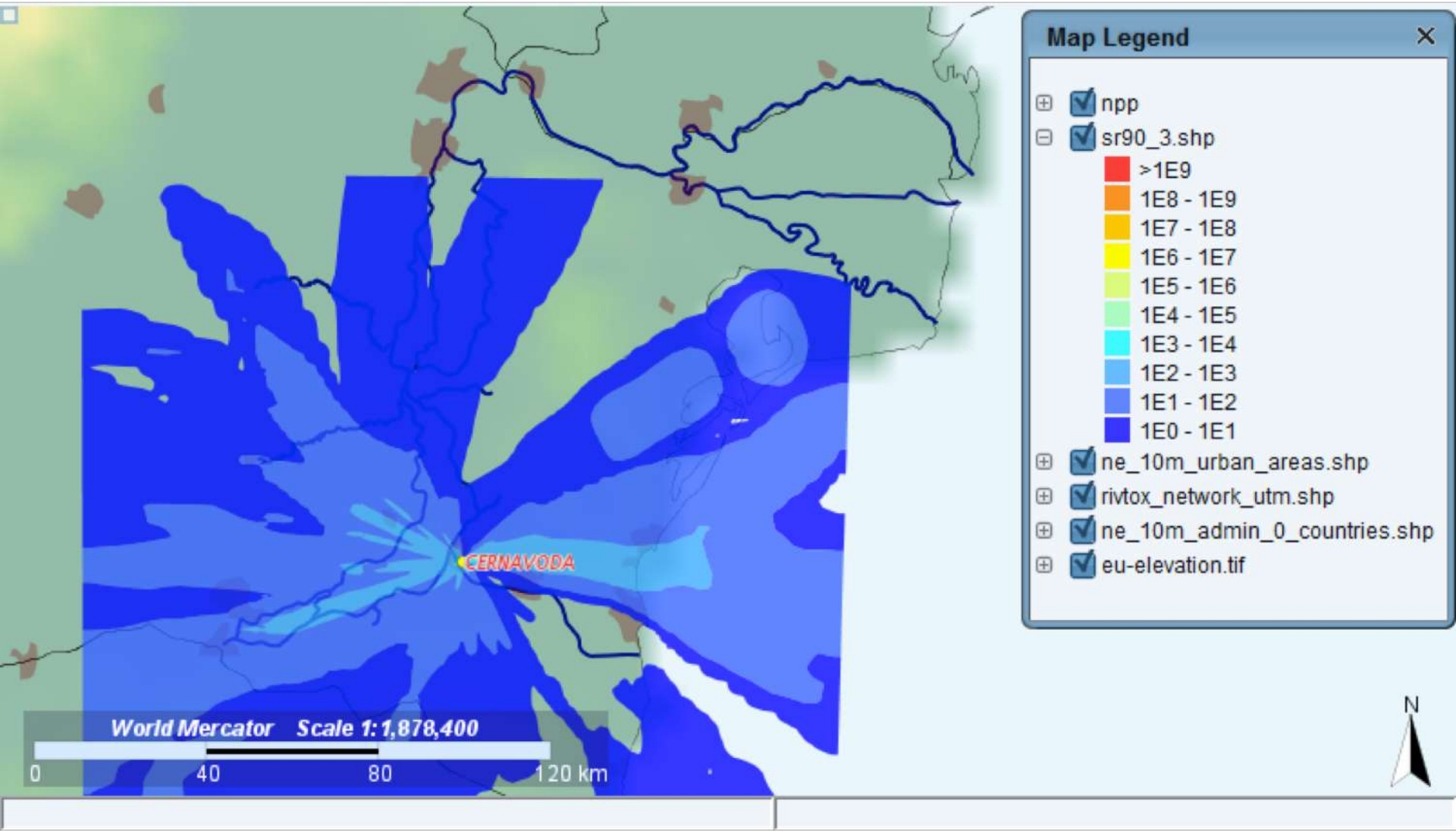
Sr-90 deposition at day 1



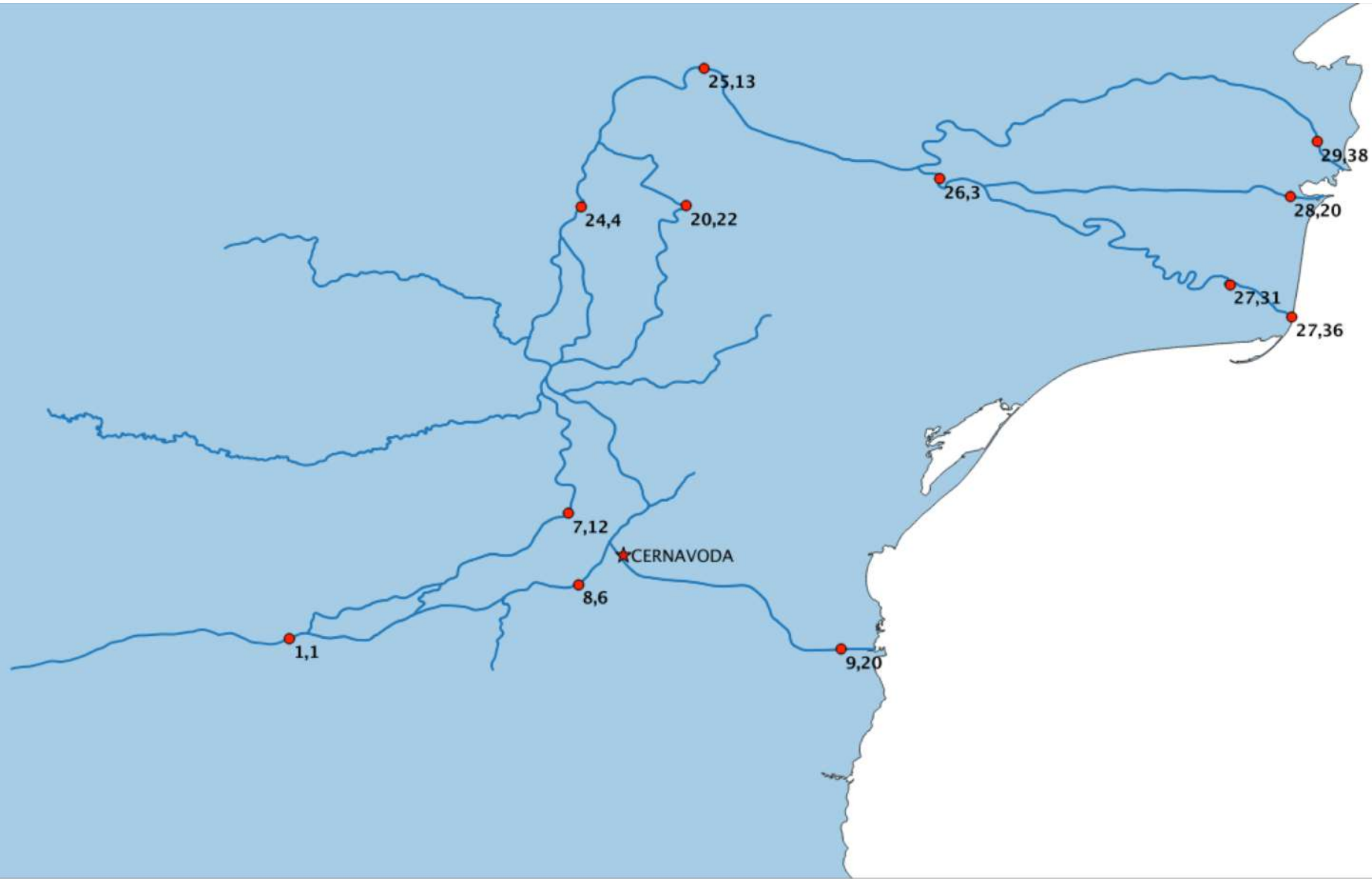
Sr-90 deposition at day 3



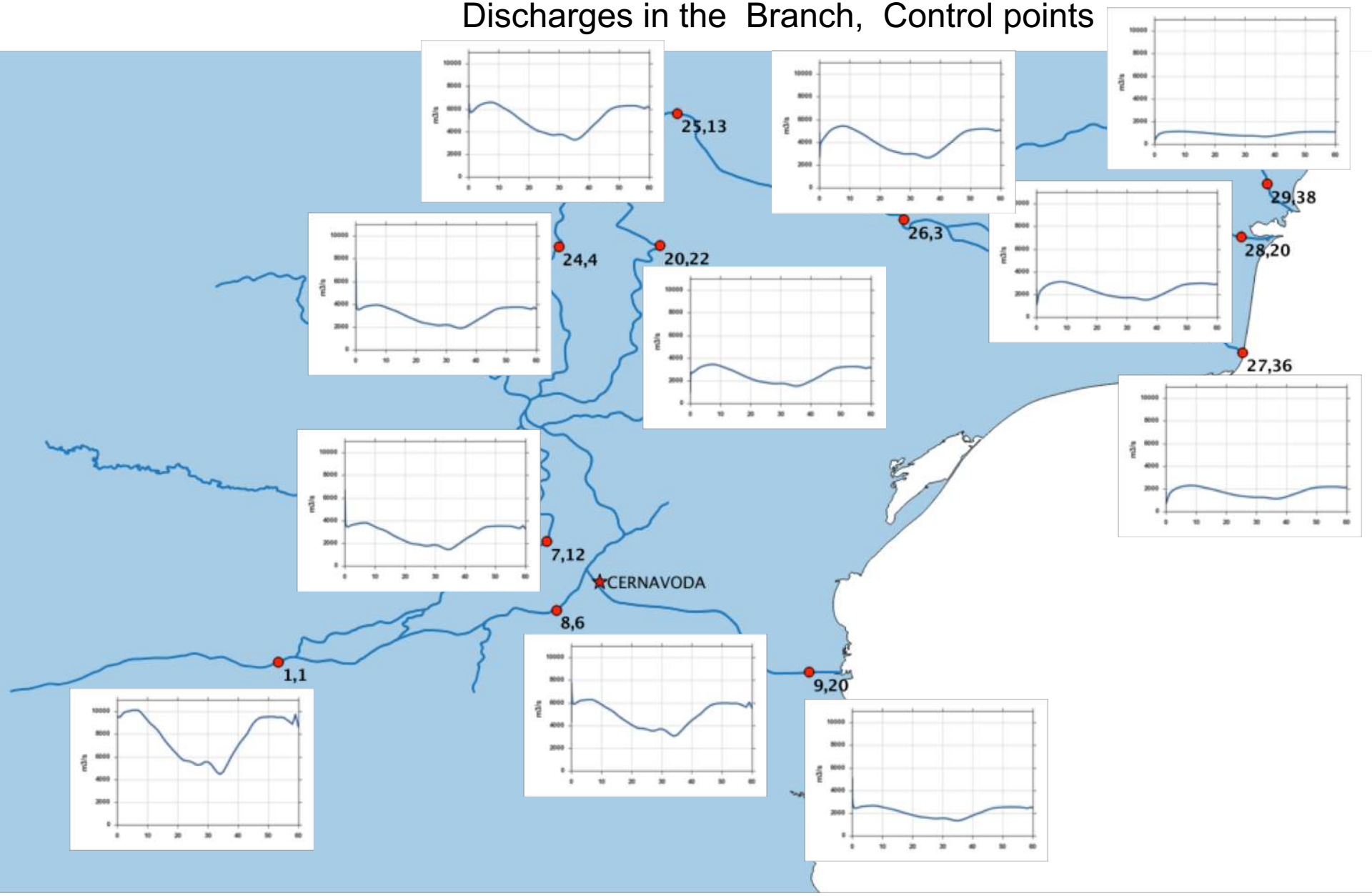
Sr-90 deposition at day 5



Control Points (Branch, Point)



Discharges in the Branch, Control points



Sr-90 concentration in solute at Branch, at control points