

Evaluation of water surface dynamics of the Manta and Beleu lakes

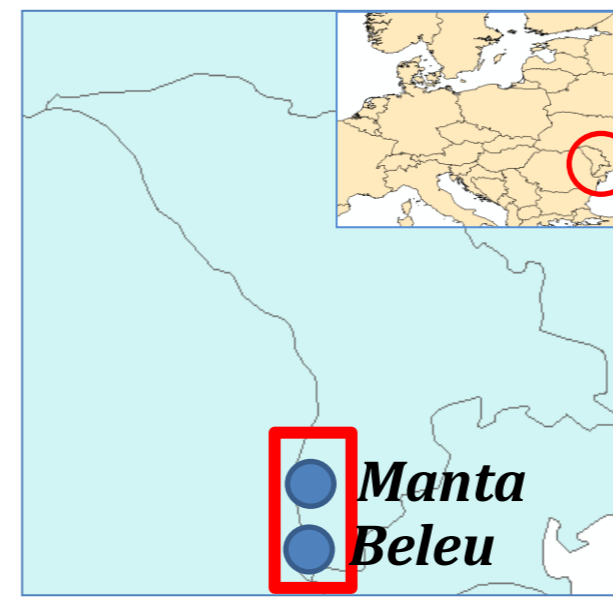
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INTRODUCTION & AIM

The study is dedicated to evaluation of water surface dynamics of the largest and the most important natural lakes of the Republic of Moldova: Manta and Beleu. Lakes areas represent the main natural ecosystem of the country and is a shelter to thousands of animals and plant species being included in protected areas network. The lakes are situated in the lower Prut floodplain, main water sources being Prut, water being delivered through channels, as well as groundwater and precipitation. Regulation of Prut river, climate change and increasing frequency of droughts and floods have a certain impact on water surface dynamics.

METHOD



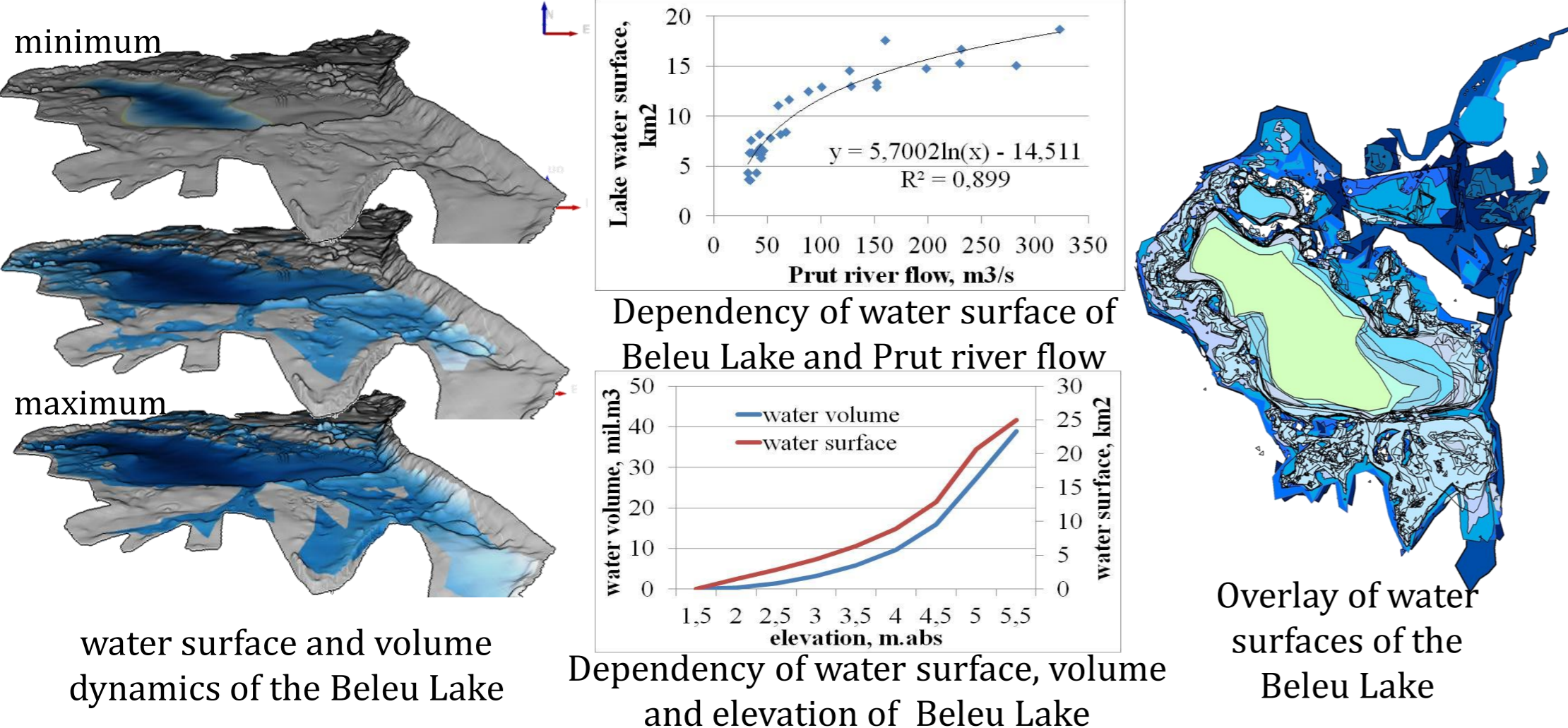
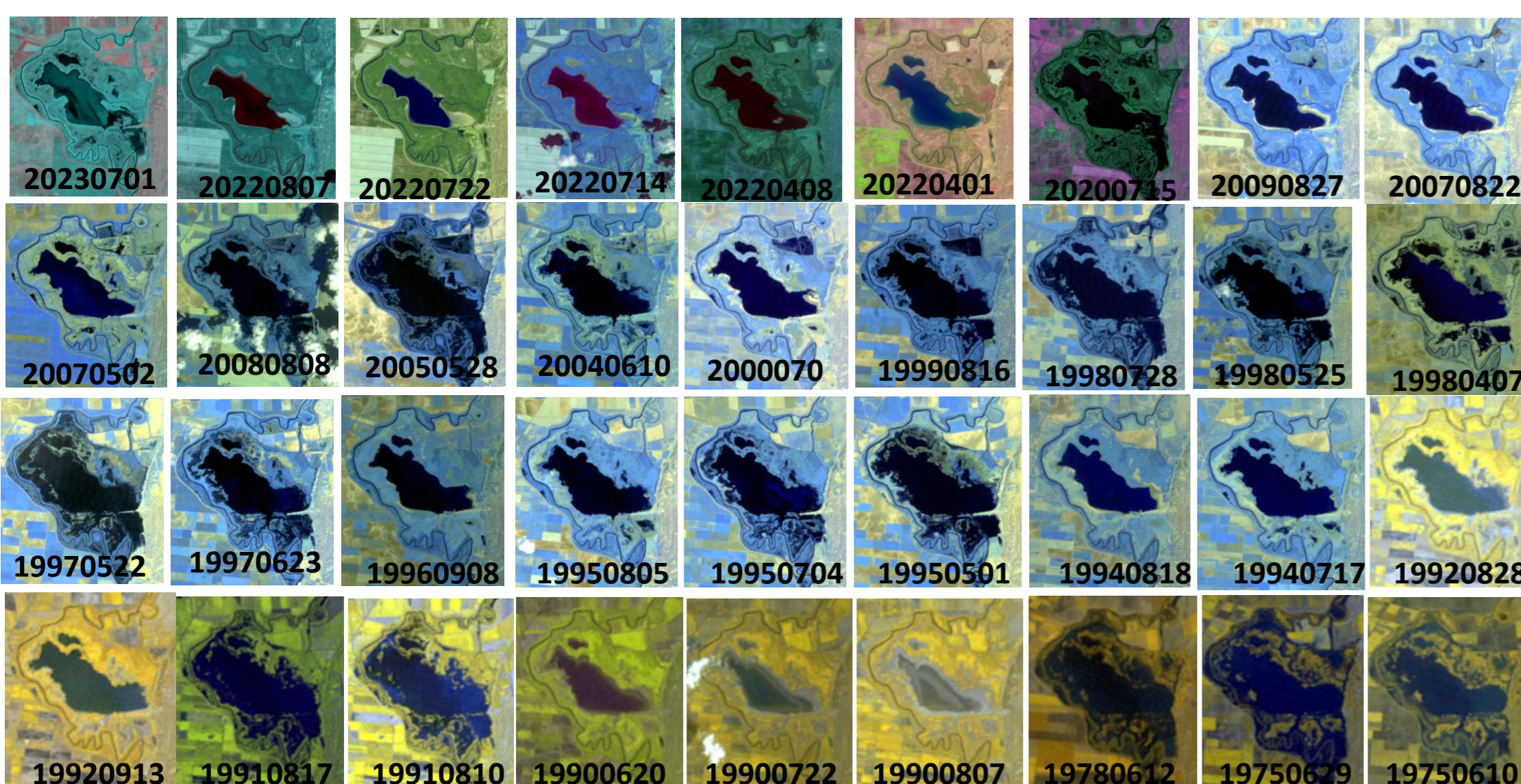
Main methods used to evaluate the lakes extension dynamics are analysis of satellite images and application of NDWI index and its variations. Main satellite images used for the study are Landsats, that were identified from 1975 till present. Thus, estimation of water surfaces was performed for different decades. Also, using available topographic maps, digital elevation models for the two lakes were performed and volume variation was evaluated and analysed.

RESULTS & DISCUSSION

Beleu Lake

Average surface area of the Beleu lake is 7 km². During floods, the inflow from Prut river through the channels supplies the lake and the area increases up to 18-19 km². However, during drought, when connection with the Prut river through channels is, practically, absent, it decreases up to 4 km². Droughts from 1990 and 2022 caused a reduction of surface up to 3.6 km², - recorded minimum, which is twice lower comparing with average .

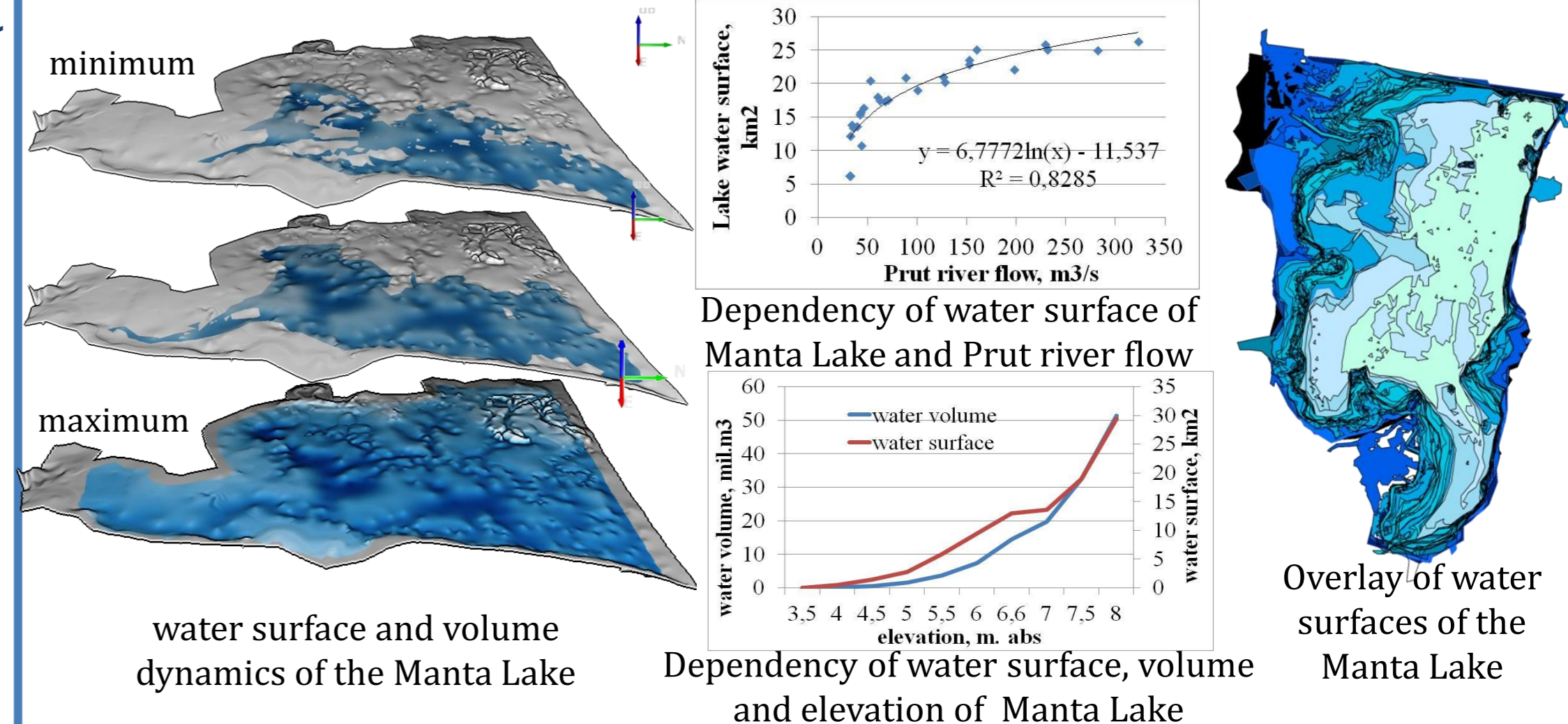
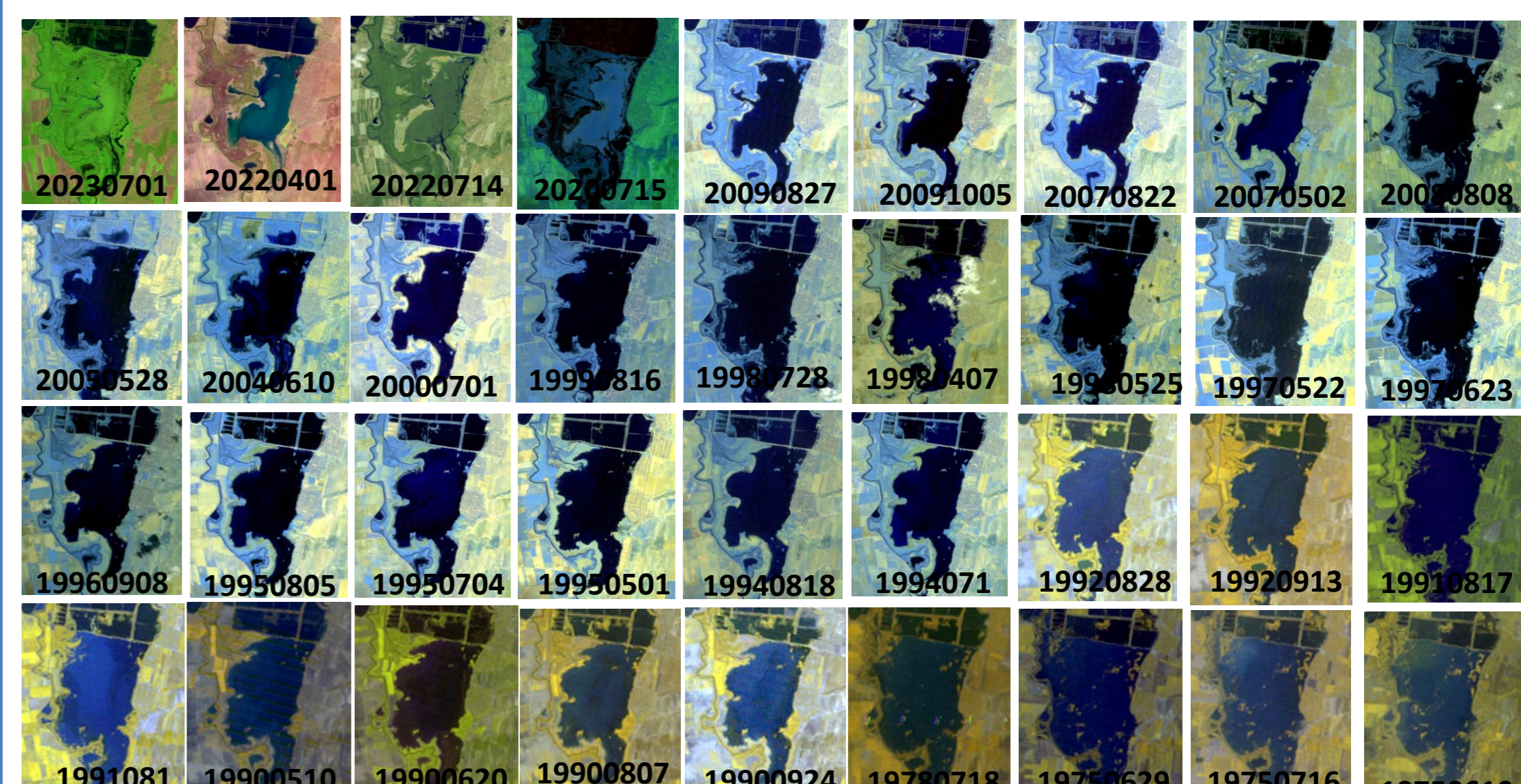
The water volume, estimated indirectly, varies from the minimum 3 mil.m³ to maximum of 35 mil.m³, average being 8 mil.m³. Strong dependencies were identified between Prut river flow and water surface as well as volume, fact that can be used for optimization of lakes area and volume regulation in order to protect the last natural ecosystems of the Republic of Moldova



Manta Lake

Average surface area of the Manta lake is 16 km². Being dependent on the Prut river flow, it increases up to 25-27 km² during floods, water covering the floodplain of the lake and the Prut river. However, during drought, when water connection with the Prut river through channels is, practically, absent, it decreases up to 6 km². Climate change from the last decade shows that increased evaporation during droughts causes greater water losses as in previous decades. Thus, the surface area during droughts from 1990 was about 19 km², while during the one from 2007 it was 13 km², and the last one from 2022, lake area decreased to 6 km² - the minimum registered one.

The water volume, estimated indirectly, varies from the minimum 4 mil.m³ to 44 mil.m³, average being 22 mil.m³.



CONCLUSION

Manta and Beleu lakes are dependent on the Prut river flow. During low flow, about 20-40 m³/s, lakes areas decrease to 6-14 km², and 3.6-7.5 km². Flows of 80-100 m³/s (the Prut averages) increase the water surfaces to 16-20 km² and 7-13 km². The flows over 120 m³/s cause an expansion of water up to 27 km² and 19 km² in the Manta and Beleu lakes. Increasing frequency of drought causes long term low flow in the Prut and in low volumes in lakes, fact that negatively influences the ecosystems the natural protected areas.

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