



Hydrology and physical limnology in Croatia, 2015–2018

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This report presents the research activities in the field of hydrology in Croatia in the period from 2015 to the end of 2018. Several institutions were involved in the hydrological investigations during this period (Faculty of Civil Engineering, Zagreb; Faculty of Civil Engineering, Architecture and Geodesy, Split; Faculty of Civil Engineering, Rijeka; Faculty of Civil Engineering, Osijek; Faculty of Mining, Geology and Petroleum Engineering, Faculty of Science, Zagreb; Croatian Waters; Croatian Meteorological and Hydrological Service). The scientific interest of Croatian hydrologists ranged from local to world-wide hydrology. The scientific work of the scientists involved in the students education is mostly continuation of previous investigation in the field of karst hydrology and hydrogeology. The results of their scientific researches are published and presented through the international conferences and scientific papers in well recognized scientific journals covering hydrological topics (*Journal of Hydrology, Catena, Natural Hazards and Risk, Hydrological Processes, Hydrological Sciences Journal, Hydrology Research, Water, Geoscience, Environmental Earth Sciences, Journal of Hydroinformatics, Theoretical and Applied Climatology, Acta Carsologica ...*).

The hydrological projects were mostly performed by the experts from the Croatian Meteorological and Hydrological Service. The projects are enumerated as follows:

1. CroClimGoGreen – Croatian Climate Variability and Change – From Global Impacts to Local Green Solutions.
2. AdriaMORE – Adriatic decision support system exploitation for integrated MONitoring and Risk management of coastal flooding and Extreme weather.
3. DriDanube – Drought Risk in the Danube Region.
4. Flood Risk Slovenia-Croatia Operations – Strategic Project 1 – Nonstructural Measures (FRISCO 1).

5. EUMETNET: Climate service is currently a rapidly growing area due to different initiatives and additional players (e.g. Copernicus Climate Change Service C3S). Therefore it is necessary that European NMHSs as a EUMETNET members follow up on the associated innovations and development. Moreover interaction between the NMHS and between the NMHS and European organisations and stakeholders, is necessary. This programme aims at supporting the members of EUMETNET in both tasks.
6. PannEx: Regional Hydroclimate Project (RHP) of the World Climate Research Programme (WCRP).
7. HyMeX is an international project which aims at: improving our understanding of the water cycle, with emphases on extreme events by means of monitoring and modelling the Mediterranean coupled system (atmosphere-land-ocean), its variability (from the event scale to the seasonal and interannual scales) and characteristics over one decade in the context of global change, evaluating societal and economical vulnerability and adaptation capacity to extreme meteorological and climate events.

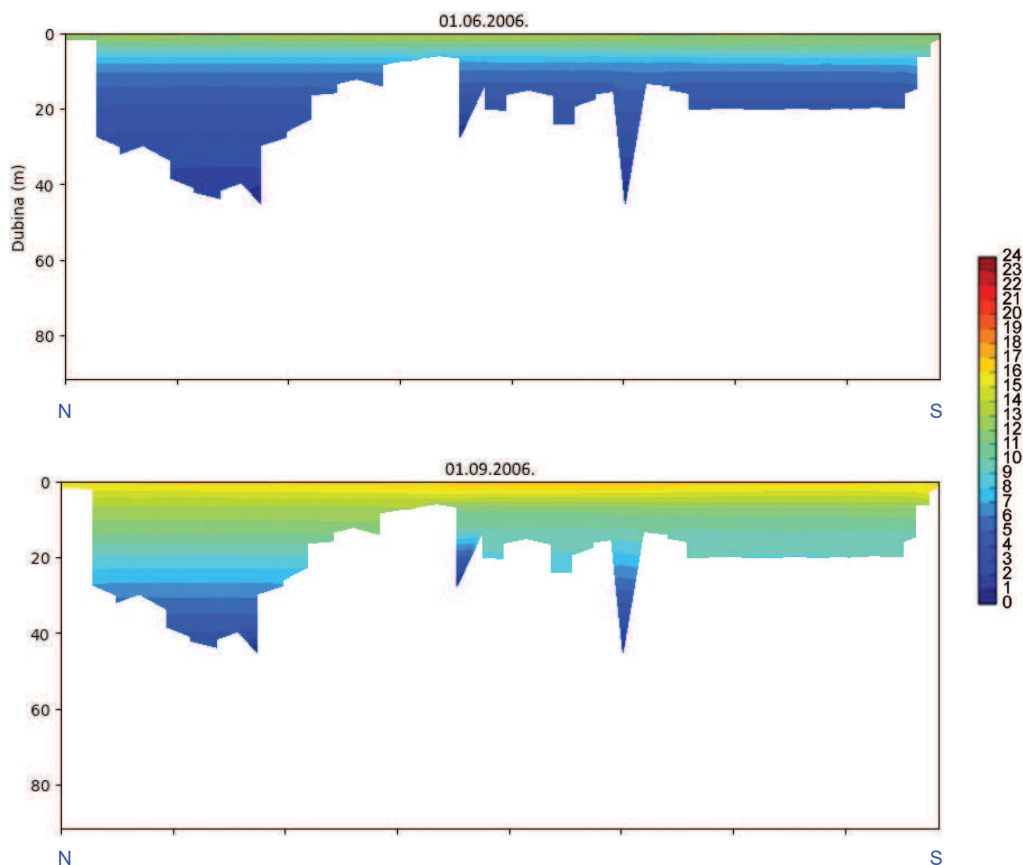


Figure 1. Modeled north-south vertical profile of Kozjak Lake temperature for 1 June 2006 and 1 September 2006 (*up* and *down*, respectively). Temperature values ($^{\circ}\text{C}$) are indicated by a colorbar, while ordinate shows the depth (m).

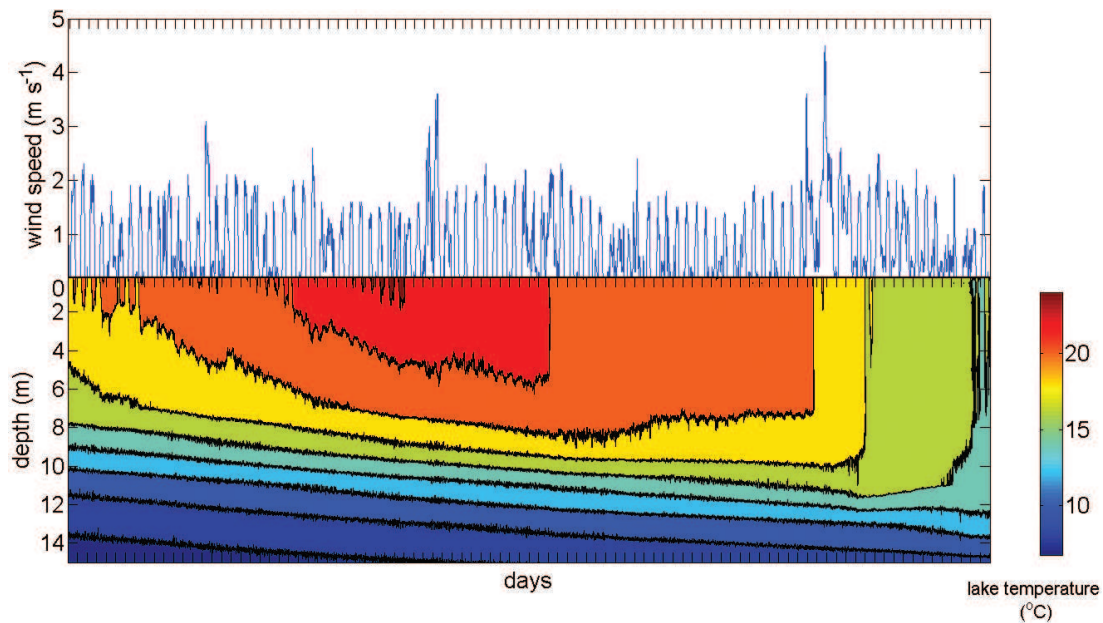


Figure 2. Observed wind speeds and concurrent Kozjak Lake temperatures for the period from 6 July to 10 October 2018. Wind and lake temperature data were recorded at resolution of 1 h and 2 min, respectively.

Considering physical limnology, during the reporting period one study of surface seiches was performed (Pasarić and Slaviček, 2016) and an ongoing research project (*Hydrodynamic modeling of Plitvice Lakes system*, funded by Plitvice Lakes National Park, Croatia) was initiated. The project is interdisciplinary and collaborative between three institutions: Department of Geophysics (Faculty of Science, University of Zagreb), Faculty of Civil Engineering (University of Rijeka) and Faculty of Geotechnical Engineering (University of Zagreb). It encompasses meteorology, hydrology, physical limnology and hydrogeochemistry. The main goal is to establish coupled atmosphere-lake numerical model for prediction of lake temperatures, currents and water levels, while the main challenge is the complex setup of sixteen karstic lakes, which are interconnected by cascades and waterfalls. This is the first-ever research project performed in Croatia which focuses on physical limnology (Klaić et al., 2018). So far, some preliminary modeling (Fig. 1) and experimental results (Fig. 2) are obtained.

Croatian scientists from other institutions have been included in activities of numerous international and national conferences and a number of scientific papers were published covering theoretical and practical topics in hydrology. Mostly, the papers are related to the numerical modelling, rainfall-runoff modeling in karst areas, water balance modelling, time series analysis, hydrometry of uninvestigated area in karst and the determination of hydrogeological properties of a complex Dinaric karst catchments. Also, the 6th Croatian Water Conference with international participation, named Croatian Waters on the Investment Waves, was organized in Opatija (2015).

The whole scientific work regarding hydrology in Croatia is documented in the publications the list of which is attached to this report. The list contains scientific papers published in Croatian and international journals.

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List of publications

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