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Application of the high resolution regional climate change modelling for local impact study upon the hydrological regime in the Buzau and Ialomita river basins

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This paper is a subject of a stage within the scope of European Project 037005 STREP FP6 - CECILIA („The assessment of impact and vulnerability of climate changes in the Centre and Eastern Europe"). The aim of this project is to assess the impact of climate changes from the regional scale to local scale of Centre and Eastern Europe area, pointing up very high climate resolution usefulness for catching the effects due to the field complexity of study area.
The analysed Buzau and Ialomita river basins from Romania covering an area of 14392 km^2 are situated outside the Curvature Carpathian Mountains, into a zone where the altitude varies from 2500 m to 50 m. In conformity of altitude, the annual precipitation varied from 1400 mm/year, in the mountainous area to 400 mm/year in the plane area and the evapotranspiration between 500 mm/year in the high area to 850 mm/year in the plane area. However, due to a very high variability of weather conditions, droughts as well as excessive humidity periods occur in the course of a year.
For the impact study of the possibly climate changes on the runoff in the Buzau and Ialomita river basins, the WatBal model was used, which have been calibrated through the runoff simulation in 17 cross-sections for the reference period 1971 – 2000.
WatBal model has two main components. The first is the water balance component that uses continuous functions to describe water movement into a conceptualised basin and the second is the component that allows the calculation of potential evapotranspiration using the Priestly-Taylor equation.
For the calculation of changes in the main climatic parameters (atmospheric precipitation, air temperature, relative humidity, solar radiation and wind speed), used in the analysis of the climate change impact on the hydrological regime, there were used the simulations accomplished with a regional climatic model (regCM3), elaborated by ICTP (Trieste), implemented in Romania and used for monthly, seasonal and climate scenarios numerical simulations, at a high spatial resolution of 10 km.
Determination of the grid network nodes of the regional climate model regCM3 related to sub-basins from the Buzau and Ialomita river basins was accomplished with a methodology based on obtaining a digital map of river basins, together with related sub-basins. Overlapping this digital map over the network nodes of the grid was made by georeferencing.
The changes were calculated for the periods 2021-2050 and 2071-2100 towards the reference period, for each month, like the differences between the values of the climatic parameters corresponding to the two periods.
The monthly mean discharges at 4 gauging stations from the Buzau river basin and 13 gauging stations from Ialomita river basin, in the above mentioned hypotheses, are estimated.
Study revealed the following changes in the components of the hydrological cycle due to the climate change:
- The increase of the evapotranspiration, especially in the summer months, due to the increase of the air temperature.
- The reduction of the depth and duration of snow cover due to the increase of the air temperature during winter time.
- The variation of the annual mean runoff recorded an increase from the plain to the mountains, standing out a tendency of smoothing during the year in parallel with a global decrease of these.
- The early occurrence of the floods and the reduction of the mixed spring floods (snow and rain) by the desyn-

chronisation of the snow melting with the rainfall occurrence.
- The reduction of the annual mean runoff on rivers due especially to the increase of the evapotranstpiration.