

Modelling physical processes affecting atmosphere - living organism interaction

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Abstract

The main goal of this study is to broaden our understanding of processes describing biosphere-atmosphere interaction and its application in agriculture. Achievement of this goal is based on full coupling of experiment, theory, modeling and practice.

Study experimental base consists of atmospheric and biological measurements. Atmospheric data sources are: a) ECMWF ERA5 reanalysis and weather forecast, b) weather database of Forecasting and Warning Service of Serbia in plant protection (PIS) (Serbia), c) ZAMG database (Vienna, Austria), d) Harvard forest database (Harvard, MA, USA) and e) Jungle research group experiments (SUNY, Albany, USA). Biological observations and measurements are classified according to organism of interest on: a) mosquito surveillance conducted by PFNS (Novi Sad, Serbia) and Biotechnical Faculty (Podgorica, Montenegro); b) plant and harmful organism monitoring within PIS (Serbia) network, c) Harvard forest data base (Harvard, MA, USA), d) monitoring of fruit trees development performed by PFNS (Novi Sad, Serbia) and e) COMBIRISK data bank (a research project of the Austrian Climate and Energy Fund).

So far obtained results can be summarised as follows:

- a) seasonality of plant development is clearly seen in energy, gas and momentum fluxes exchange, aerodynamic characteristics of plants and intensity of turbulent transfer between plant canopy and atmosphere;
- b) short-range weather forecast is efficient in forecasting harmful organism appearance while monthly and seasonal forecast can be used in plant development forecasting;
- c) air temperature and precipitation are the main factors limiting the establishment of invasive mosquito species and driving their seasonal activity and abundance.

Keywords: biosphere-atmosphere interaction, weather data, modelling, harmful organism, plant development dynamic.