# On the relationship between soil, vegetation and severe convective storms: A case study

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## I. INTRODUCTION

Representation of water transfer in soil and vegetation is of crucial importance in modeling of the interaction between land-surface processes and convective storm events. Numerous papers discussed this problem (Pielke, 2001; Chang and Wetzel, 1991; Segal et al., 1989; Pan et al., 1996; Chen and Dudhia, 2001), nevertheless, such studies, where problem of the parameterization of transpiration is discussed, are still rare. Transpiration is altered on two ways: by changing either soil hydro-physical parameter values or parameterization of soil moisture availability function $F_{ma}$. The effects are compared and analyzed by MM5 Modeling System.

## II. PRESENTATION OF RESEARCH

Our research tool is the Penn State-NCAR MM5 Modeling System (Fifth-generation Mesoscale Model). Our case study refers to 7th August, 2006. The storm event analyzed was located in north-eastern part of Hungary on the Hungarian/Romanian border. The soil was wet. Wheater conditions were determined by a through and associated cold advection on 500 hPa level causing convective instability. Along this instability line, thunderstorms developed which moved slowly enough to be influenced by local effects such as soil conditions. Simulation is started at 9.00 UTC.

To be able to do comparative analysis, three runs are performed. The conditions used in runs are presented in TABLE I. Run 2. is the reference run. Comparing results of run 1 and 2 (1. comparison), we get insight into how important are soil parameter differences. Comparing results of run 2 and 3 (2. comparison), we can analyze how important is the parameterization of $F_{ma}$. Finally, we can compare how large are the differences obtained in 1. and 2. comparison.

| Run type | Description of conditions | |
|---|---|---|
| Run 1 | Original parame-terization of $F_{ma}$ | USA soil para-meters (USA) |
| Run 2 | Original parame-terization of $F_{ma}$ | Hungarian soil parameters (HU) |
| Run 3 | Altered parame-terization of $F_{ma}$ | Hungarian soil parameters (HU) |

TABLE I. Brief description of the runs used in study

## III. RESULTS AND CONCLUSIONS

Results are analyzed in terms of precipitation fields. Results referring to the 1. and 2. comparison are presented in Fig. 1. and 2., respectively. The precipitation fields are presented at 17 UTC. The largest differences in precipitation fields (Fig. 1) are

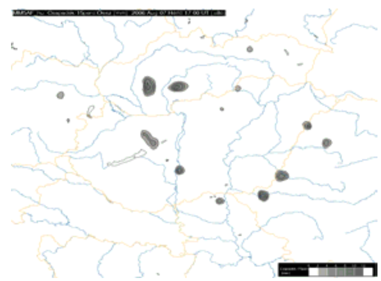

Fig 1a.: Precipitation fields [mm ·15 minute$^{-1}$] obtained by MM5 in the 2. run at 17 UTC.

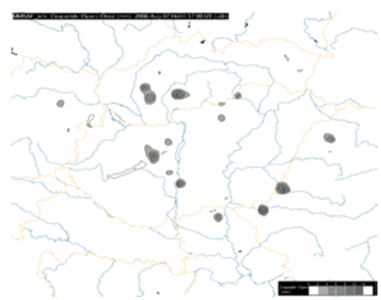

Fig 1b.: Precipitation fields [mm ·15 minute$^{-1}$] obtained by MM5 in 1. run at 17 UTC.

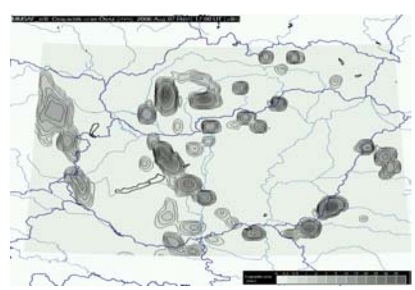

Fig 2a.: Precipitation fields [mm ·h$^{-1}$] obtained by the MM5 in the 2. run at 17 UTC.

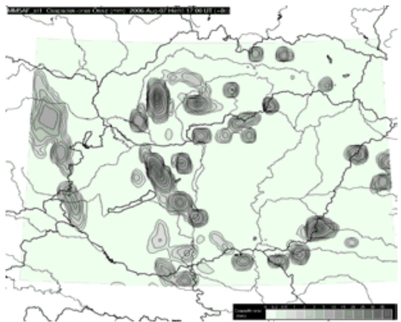

Fig 2b.: Precipitation fields [mm $\cdot h^{-1}$] obtained by MM5 in the 3. run at 17 UTC.

at the hungarian/romanian border, where the differences between USA and HU soil parameters are the largest. Precipitation field differences caused by different parameterizations of $F_{ma}$ can also be observed (see, for instance, the same storm at north-eastern part of hungarian/romanian border), but they are not so pronounced as the differences in the former case. Note that differences are obviously larger at meso-$\gamma$ than at meso-$\beta$ scale (Orlanski, 1975).

## IV. AKNOWLEDGMENTS

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