

## ***Interactive comment on “Modelling the water budget and the riverflows of the Maritsa basin in Bulgaria” by E. Artinyan et al.***

### **Anonymous Referee #2**

Received and published: 18 March 2007

HESSD 2006-0154 Artinyan et al. Modelling the water budget and the riverflows of the Maritsa basin in Bulgaria.

General: This is an interesting paper about the use of the ISBA SVAT model combined with the macro-scale distributed hydrological model (MODCOU) in the 34,000 km<sup>2</sup> Maritsa basin in Bulgaria. Although these two models have been well documented elsewhere and have been used in various applications in France the present application is of interest because the modeling approach has been modified, there were major obstacles to overcome with getting the climatic data in the right format, and the Maritsa basin offered a new climatic environment with both Mediterranean and continental influences. Need for modeling as distinct from statistical and climatological approaches is well explained as is the need for real time evaluation of surface and groundwater

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

resources

The paper's major contributions are: (1) including two additional reservoirs to account for slow runoff/ drainage flow; (2) accounting for the effect of twelve major reservoirs in the hydrological model simulations; (3) acquiring the two year's of meteorological data; (4) using spline surfaces and kriging interpolation techniques for obtaining maps of all atmospheric parameters; (5) implementation of the model, involving calibrations and validations using streamflow, snow depth, snow water equivalent and soil moisture content data.

I recommend acceptance for HESS following attention to the major and minor comments made below.

Major comments: (1) The paper is rather long and can be shortened especially in the descriptive sections. Although the acquisition of the necessary land surface and meteorological data must have been formidable challenges, its description in 4.3 and 4.4 does not add much to the present paper. The link between soil texture and vegetation (through "tables of correspondence"; see 4.3) is unclear and Figure 5 is not very informative. Similarly Tables 1 and 2 are not absolutely essential.

(2) Re. Equation (3), why is the shape parameter dependent on altitude?

(3) The comparison of two years of computed Penman and observed pan evaporation (see 4.4.4) can hardly be described as a "validation" of the atmospheric forcing data.

(4) Section 4.1 refers to the calibration of the groundwater module for storage coefficients and transmissivity for eight sub-regions of the unconfined underground layer. It does not describe how this was done nor does it indicate over which period and for which parts of the basin.

(5) Data for 12 dams are available for the first year of simulation: October 95-September 96 but not available for 96-97). Table 4 indicates that the modified model (with the two additional soil reservoirs) is calibrated twice over October 95-September

**HESSD**

4, S99–S104, 2007

Interactive  
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

96: first, with 56 stream gauges and second, using 68 stations (56 stream gauges + 12 dams). It would have been nice to have had more detail on these calibrations and especially on the “imposition” of the dam data. These calibrations yielded values for C1, C2, &#61537;, h1max and h2max for each of 68 sub-catchments. Does Table 3 refer to the first or the second calibration? Why not validate for 1996/97 (in Table 4) with the result of the second calibration as well? Can the spread in parameter values referred to in 5.2 and Table 3 be related to topography, soil texture, land use, vegetation etc.?

(6) The validation of the modeling results for October 96-September 97 [for river flow; snow depth; snow water equivalent; soil moisture content] are encouraging. In order to appreciate Figure 12(b), it would be necessary to give some background information on the climatological methods used by Vekilska (1982) a publication which is not easily accessible to HESS readers.

(7) The paper needs a substantial amount of editorial work. For example Lines 22-25 on p. 487 requires rephrasing. Similarly, the use of some terminology needs to be tightened up and lines 4-8 on p. 498 rephrased. The reference to the water stress (line 8, p. 499) is also not clear. Careful editing of the headings to Tables 1, 2 and 6 is needed. Clarify basin-range and country-range in Figure 12. Also note the use of gages and gauges; precipitations vs. precipitation; the valley vs. the valleys or the low lying areas; (mis)use of the term “aquifer” and “water table”; the studied area vs. the study region.

Minor and editorial comments p.476: line 2: delete “in order”; line 9: replace “versus” by “and”; lines 15 and 17: use “gauges” throughout the m/s; line 20: “in this region”; line 23: inter-annual; line 26: The energy budget p. 477: line 3: replace “appear to be” with “have become”; line 9: cover a large number; line 20: It is particularly important; line 26: in three basins p. 478: line 3: with a pronounced dry period; line 10: the Tundzha and the Arda; line 11: of the land surface of..; line 17: Therefore, the Maritsa basin..; line 21: in the North and..; line 23: Mediterranean climate influences prevail p.

479: line 1: ..are used for pasture,Ď; line 8: precipitation, not precipitations. (through-  
out m/s); line 18: reserves of aboutĎ; line20: They have a well developed system..;  
lines 22/23: the average discharges were respectivelyĎ; line 27: replace “evaluated to”  
with “estimated to be” p.480: line 4: replace “is higher than” and “is larger than” with  
“exceeds”; line 5: they usually holdĎ; line 8: what are “derivations”? Explain.; line 9:  
The other main anthropogenicĎ; line 16:Ď the dams’ contributions representĎ p.481:  
lines 3/4: What are the three types of models? Large-scale climate models, mesoscale  
climate models and weather forecast models?; line 7: A representation with two soil  
layers is usedĎ; line 7: a shallow surface layer and a root zone.; line 11:..are computed:  
surface runoff (Qr) and drainage (D); line 15: replace “mesh” with “cell”; line 16: This  
fraction is almost zero when..: line 21: concept, not conception!; line 26: Ďmakes a  
significant contribution to.. p. 482: line 14: extra water leaves the reservoir.; line 14:  
replace “formed” with “expressed”; line 15: Eqs. (1) and (2); line 17: with; line 24:  
may be considered; line 26: by?; line 27: The variability of the parametersĎ p.483:  
line 4:..MODCOU has been used..; line 5: MODCOU considers the surface and un-  
derground layers; line 9: associated with p.484: line4: Existing publicationsĎ; line 5:  
to make a first guessĎ; line 8: of the drainage reservoirsĎ; line 9: “to impose the dam  
release to.” Do you mean: “To add dam release to the simulated streamflow below the  
dam”?; line 15: downstream of the dams or the stream diversion pointsĎ; lines 16/17:  
the impact of these structures on riverflow; line 24: “Instead of that”??; line 28: ..and  
almost 7 mm wasĎ p.485: line 2: from soil texture and vegetation maps using..; line 8:  
The Rock type affects a few grid cells in the highĎ; line 9: A single Forest class is used  
for all forest types; lines 16-19: Not sure about the difference between “soil depth linked  
to the maximum depth of the rootsystem of cultivated crops” and “soil depths derived  
from the vegetation type”; line 24: why does altitude influence the value of b? p.486:  
line 5: calibrated in an earlier publication; line 13: global radiation and atmospheric  
radiation; line 14: Such an analysis systemĎ; line 15:Ďand thus, important work was  
done ; line 17: Such a databaseĎ p.487: lines 1 and 3: data were vs. data was? line  
2: in a mountain location (Rozhen); line 10: The next two sectionsĎ; line25: was not

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

sufficiently correlated with elevation; line 27: kriging; line 27: yielded acceptable results of greater quality than achieved with p.488: line 2: has greater detail; lines 8 and 10: kriging; line 11: Noise analysis; line 12: This has led to the “averaging neighbours” method; lines 25-27: see p. 487, lines 1-3; check the two elevations quoted p.489: line 1: the ratio of the actual duration of bright sunshine to the maximum possible duration of bright sunshine; line 22: does the annual accumulated precipitation include the snowfall? p.490: line 1: in the mountains; line 7: Such a comparison assumes that; line 24: surface? You mean land surface area? p.491: line 7: criterion which is very sensitive; line 18: were chosen; lines 22/23: because, with the value of 0.2, a reservoir of; line 25: with cycles or which cycles? p.492: line 12: about the partitioning; line 15: to estimate the parameters with great accuracy; line 17: in terms of; lines 16 and 18: study area; line 24: Fig. 8a-d p.493: line 9: For the second (validation) year; line 11: less than 20%; line 19: less than 200m.; line 20: “comparing to sites”; line 22: In the second year; line 24: of the snowpack.; line 28: ..the 3-layer snow scheme (s?) p.494: “basin-range”? Do you mean “at the basin scale”? lines 15/16: leading to a lower SWE than the observed one; line 16: mentioned; lines 17/18: rephrase: “of ISBA developments (??) not used in that (??) study” p.495: line 3: valley or valleys; line 9: moisture content; line 15: “or respectively”; line 23: correlated well over time; line 28: the possibility that the values of LAI and VEG were fixed at levels which were too low p.496: line 7: during the second year; line 10:.. and the more significant rainfall at; line 28: exception to that; lines 24/25: maxima p.497: line 19: valleys; line 22: the Arda river; line 24: are not disturbed by; line 26: In comparison or By comparison p.498: line 4: makes a relatively small contribution.; line 20: study area; line 24: vary p.499: rephrase “and consequently with a water stress.”; line 22: As such a system was not.; lines 25/26: “However, much preparatory work was needed in order to extract data from various formats, often as hard copies, and to correct, and interpolate between, point scale observations” p.500: line 5: “as the hydrological model”; line 15: river gauges; line 16: Conclusions; line 17: -1.36 or between 1.36 and 0.92; line 20: will be used in many ways; line 21: It is a first step.; line 24: These events led to. p.504,

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

Table 1: “following the”? Do you mean “number of stations by station type”? “All observations, with the exception of solar radiation measurements, have been obtained with traditional (conventional) instruments”? p.505, Table 2: staff gauge; daily time step; river gauges; reservoir budgets, rain gauges; Streamflow discharge. p.509, Table 6: gauging stations; four water sheds not impacted by human activities. p.511, Figure 2: dark boxes; diamonds p.515, Figure 6: air temperature, global radiation p.520: Figure 11: runoff p.521, Figure 12: “basin-range and country-range”? You mean “at the scale of the entire basin” and “for the country as a whole”?

---

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 4, 475, 2007.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper