

## ***Interactive comment on “Large-scale lysimeter site St. Arnold, Germany: analysis of 40 years of precipitation, leachate and evapotranspiration” by N. Harsch et al.***

### **Anonymous Referee #3**

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#### General Comments

**Aim and Scope:** The paper describes the water balance of three large lysimeters located in St. Arnold, North-West Germany, over a period of 40 years. Daily measured meteorological were annually averaged from 1966 till 2006 and displayed in Fig. 1–3. In addition, air temperature, relative humidity, sunshine duration and precipitation were separately averaged for the summer and winter season half-years. Growth and development of oak/beech and pine forest are also reported. Daily leachate rates under grassland, oak/beech and pine forests were summed up the annual and half-year

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averages. The objectives of the study are (1) the analysis of secular trends of the meteorological measurements, and (2) the evaluation of precipitation in connection with leachate quantities and potential and actual evapotranspiration (p. 2624, l. 6ff.). However, the authors miss both objectives: (1) Only trends of leachate rates are shown, not for the other meteorological records. Regression method is not described. Quality of regression is not evaluated and correlation coefficients are not given (see also comments of other reviewers). (2) Calculation of potential and actual evaporation (equ. 1-4) cannot be reproduced because equations are incorrect and parameters are not quantified. It is recommended to restrict the paper to the first objective OR to improve the evaluation of the water balance considerably by using appropriate model approaches and parameters. In particular, the calculation of evapotranspiration needs mandatory revisions.

Specific comments p. 2624, l. 10-24: Nothing is said about the missing quantities of the water balance: 11% for grassland, 19% for oak/beech and 16% for pine lysimeter. p. 2624, l. 16-19: This statement is trivial. p. 2625, l. 18-24: Cited references describe in detail the climatological trends and water balance of St. Arnold. In particular, Klein (2000) simulates the long-term water balance on a daily basis by taking into account the dynamics of soil moisture, interception, evapotranspiration etc. p. 2630, l. 5: Reference is missing. p. 2630, l. 8: Replace biannual with summer and winter season half-years throughout the whole paper. p.2630, l. 10: Replace infiltration rate with leachate rate. p. 2630, l. 25: Add both references to the literature list. p. 2631, equ. (1): According to the literature, e.g. DVWK (1996, p. 37),  $(e^*-e)$  is NOT divided by L. Please give reference for the equation. p. 2631, equ. (2): According to the literature, e.g. DVWK (1996, p. 53),  $L^*\Delta$  must be added in the denominator. Please give reference for the equation. p. 2631, equ. (3): According to the literature, e.g. Baumgaertner and Liebscher (1996, p. 361), this regression is only valid for open water surface, not for vegetation. How is the wind speed  $u$  [m/s] in 2 m height determined? p. 2632, equ. (4): This equation for  $ET_a$  is only valid for short vegetation. How is  $ET_a$  determined for the two forest lysimeters? How is LAI from Klein (2000) used for calculation of stomata

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resistance? p. 2632, l. 22-23: Schroeder (1989) reported Klein (2000) calculates interception from data measured by Schroeder. Why are these data are not used here? p. 2633, l. 19-21: See my first specific comment. p. 2636, equ. (5): The balance term B is arbitrarily introduced to explain the missing quantities in the water balance. All explanations are not conclusive, except the one that the parametrisation of the AET is inaccurate (p. 2637, l. 4). Fig. 11 and 13: Evapotranspiration depends on changes in soil moisture. Thus, balance sums not up to 100% in summer and winter.

References Baumgaertner and Liebscher (1996), cited in manuscript Schroeder (1989), cited in manuscript DVWK (1996): Ermittlung der Verdunstung von Land- und Wasserflächen. Merkblätter zur Wasserwirtschaft 238/1996, Deutscher Verband für Wasserwirtschaft und Kulturbau e.V. (DVWK), Bonn.

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