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Water-level monitoring in a wetland: Does the optimal hydrometric network change with time?

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Hydrometric monitoring of wetlands requires a combined system of surface water and groundwater gauges. The monitoring network can be optimized by means of statistics. As the time dependence of the optimal monitoring set-up is often not captured by investigations, it was our aim to evaluate this dependence, focusing on the seasonal scale. For this purpose, we used data from our monitoring site at the Spreewald wetland in north-east Germany. The 5 groundwater and 10 ditch water level gauges were ranked with the help of a Shannon entropy-based algorithm, that maximizes information while minimizing redundancy. To reveal the time dependence of these rankings, we shifted the period under investigation (at most 3 months) throughout the year. In a second approach, we successively prolonged the period, to evaluate if and when convergence is reached. The results show that the optimal monitoring network may be subject to changes in the course of the year. While the first and the third positioned gauges were nearly constant, most other stations frequently changed their rank, i.e. their importance to gather information varied. Also, neither the information provided by the hydrographs nor the rankings did converge within the total period of 11 months. Furthermore, surface water gauges were of higher importance than groundwater gages. Especially high ranks were assigned to stations at the inflows of the study area and to those with high anthropogenic influence, since their information is not derivable from other sites. In conclusion, the study underlined that the question of where to measure is dependent on the (transient) prevailing conditions at the site to be monitored. As those conditions are hardly foreseeable and frequent changes of monitoring locations are uncommon, monitoring tends to be suboptimal for at least parts of the year.