Water quality and metabolism dynamics in a lowland urban Mediterranean stream

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The classification of metabolic regimes in aquatic ecosystems is based on gross primary production (GPP) and ecosystem respiration (ER). A recent advancement in sensor technology and modeling capabilities has enabled the metabolic regimes classification to be applied also to stream ecosystems. Current information about stream metabolism exists mostly for temperate climate while data in semi-arid and urban environments remain scarce. In this study, we used long-term high-frequency measurements of water quality parameters in the Yarkon Stream (Israel) to study the dynamics of water quality and metabolic regimes. The Yarkon is a lowland, urban, Mediterranean stream in which about 75% of the discharge consist of tertiary level treated wastewater. A multi-sensor monitoring station was installed in 2019 and includes sensors for measuring turbidity, carbon dioxide, electrical conductivity, nitrate, dissolved oxygen (DO), water level, temperature, and pH. In addition, photosynthetically active radiation (PAR) is measured near the stream. Real-time data can be accessed in the following link: https://tinyurl.com/Yarkon-public-view. Results show a very strong impact of seasonal floods on water quality, however, the stream returns back to pre-flood conditions relatively quickly due to the weak link between the stream and the subsurface. First floods of the winter also exhibit a strong hypoxic response due to the flush of contaminants that are accumulated during the long dry summer. Only weak seasonal patterns were observed in water quality as a result of the dominant fraction of treated wastewater relative to the freshwater in the stream, and the relatively low in-stream nutrient transformations. Preliminary results also show that a clear diurnal cycle in oxygen concentrations is not clearly visible throughout the year. GPP exhibits low values throughout the year, with slightly higher values during spring and summer. The average annual net ecosystem production (NEP) is negative because ER is much higher than GPP throughout the year. The long-term data from the Yarkon Stream provides an insight into the dynamics in water quality and stream metabolism of an urban Mediterranean stream ecosystem and allows to compare the dynamic behavior to streams from temperate climates.