Interactive comment on “Technical note: Pitfalls in using log-transformed flows within the KGE criterion” by Léonard Santos et al.

J Ding
johnding_toronto@yahoo.com
Received and published: 27 July 2018

Re-ranking the transformations

The NISR (negative inverse square-root) transformation can be generalized to a NIR (negative inverse root) one defined below:

\[ J_N(Q) = \frac{-1}{N\sqrt{Q}} = -\frac{1}{Q^{1/N}}, \]  
\[ J_0(Q) = \log Q, \]  

(1)

(2)

Some may dismiss the \( J_2 \) transformation as simply a sign change of the classical ISR (inverse square-root) one. Indeed they are correct. But as Leonardo Da Vince (1452 - 1519) once said, “Simplicity is the ultimate sophistication.”

For example, \( J_2 \) happens to be a subset of the 1-parameter Box-Cox (1964) transformation (Eq. 6 in Santos et al. paper) when parameter \( \lambda = -1/2 \),

\[ f_{BC}^{\lambda=-1/2}(Q) = \frac{Q^\lambda - 1}{\lambda} = 2(1 + J_2), \]

(3)

The difference between these two ISR-type transformed values is:

\[ f_{BC}^{\lambda=-1/2} - J_2 = 2 + J_2 = 2 - \frac{1}{\sqrt{Q}}, \]

(4)

This has a maximum value of 2.

Figure 1 shows the modifications of the four transformation methods being considered in the authors’ Table 1. These are the original logarithmic, a fixed-parameter Box-Cox, the inverse negated, and the square root both inverted and negated, and labelled \( J_0, f_{BC}^{\lambda=-1/2}, J_1, \) and \( J_2 \), respectively. All four transformation curves share the same inverted U-shape, being an advantage for comparison purposes. These show their relative impact on the transformed flow values, most obviously on the lower ends.

Fig. 1. Comparison of Box-Cox and NIR (negative inverse root) transformation methods.