SUPPLEMENTAL DATA

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Probable Maximum Precipitation Estimation Using the Revised K_m-Value Method in Hong Kong

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Appendix S1. Derivations of the Inequalities $\boldsymbol{N_s \geq \left[(\frac{K_m^2}{\phi_m^2})/\left(\frac{K_m^2}{\phi_m^2}-1\right)\right](\phi_m^2+2)}$

$\because\ K_m = \phi_m\sqrt{\frac{1}{C_1 - C_2\phi_m^2}}, \quad C_1 = \frac{(n-1)^3}{n^2(n-2)},\ C_2 = \frac{n-1}{n(n-2)}$

$\therefore\ K_m^2 = \phi_m^2\left(\frac{1}{\frac{(n-1)^3}{n^2(n-2)} - \frac{n-1}{n(n-2)}\phi_m^2},\right)$

$\Rightarrow\ \frac{K_m^2}{\phi_m^2} = \frac{n^2(n-2)}{(n-1)^3 - n(n-1)\phi_m^2} = \frac{n^3-2n^2}{n^3-n^2+n-1-(n^2-n)(\phi_m^2+2)} \cdot \frac{\frac{1}{n^2}}{\frac{1}{n^2}}$

$$\Rightarrow\ \frac{K_m^2}{\phi_m^2} = \frac{n-2}{n-1+\frac{1}{n}-\frac{1}{n^2}-(1-\frac{1}{n})(\phi_m^2+2)} \qquad \text{(S1)}$$

When n increasing, $\frac{1}{n}$ and $\frac{1}{n^2}$ could be neglected, $n-2$ and $n-1$ could be close to n, i.e. difference between n and $n-2$ or $n-1$ is very small. Therefore, from the equation (B1) the following equation could be derived.

$$\frac{K_m^2}{\phi_m^2} \approx \frac{n}{n-(\phi_m^2+2)} \qquad \text{(S2)}$$

The above equation could be written as

$\frac{K_m^2}{\phi_m^2} \cdot [n - (\phi_m^2+2)] \approx n$

$\Rightarrow\ n \cdot \frac{K_m^2}{\phi_m^2} - \frac{K_m^2}{\phi_m^2}(\phi_m^2+2) \approx n$

$\Rightarrow\ \frac{K_m^2}{\phi_m^2}(\phi_m^2+2) \approx n \cdot \frac{K_m^2}{\phi_m^2} - n = n(\frac{K_m^2}{\phi_m^2} - 1)$

$\Rightarrow\ n \approx \frac{\frac{K_m^2}{\phi_m^2}(\phi_m^2+2)}{\left(\frac{K_m^2}{\phi_m^2}-1\right)} = \left[(\frac{K_m^2}{\phi_m^2})/\left(\frac{K_m^2}{\phi_m^2}-1\right)\right](\phi_m^2+2)$

Hence, $N_s \geq n$, i.e.,

$$N_s \geq \left[(\frac{K_m^2}{\phi_m^2})/\left(\frac{K_m^2}{\phi_m^2}-1\right)\right](\phi_m^2+2)$$