Abstract of paper [1].

We study a short-interval version of a result due to Montgomery and Hooley. Write

$$S(x,h,Q) = \sum_{q \le Q} \sum_{\substack{a=1 \\ (a,q)=1}}^{q} \left| \psi(x+h;q,a) - \psi(x;q,a) - \frac{h}{\varphi(q)} \right|^2$$

and $\kappa = 1 + \gamma + \log 2\pi + \sum_p (\log p)/p(p-1)$. Denote the expected main term by $M(x,h,Q) = hQ\log(xQ/h) + (x+h)Q\log(1+h/x) - \kappa hQ$. Let ε, $A > 0$ be arbitrary, $x^{7/12+\varepsilon} \le h \le x$ and $Q \le h$. There exists a positive constant c_1 such that

$$S(x,h,Q) - M(X,h,Q) \ll h^{1/2}Q^{3/2}\exp\left(-c_1 \frac{(\log 2h/Q)^{3/5}}{(\log\log 3h/Q)^{1/5}}\right) + h^2 \log^{-A} x.$$

Now assume *GRH* and let $\varepsilon > 0$, $x^{1/2+\varepsilon} \le h \le x$ and $Q \le h$. There exists a positive constant c_2 such that

$$S(x,h,Q) - M(x,h,Q) \ll \left(\frac{h}{Q}\right)^{1/4+\varepsilon} Q^2 + hx^{1/2}\log^{c_2} x.$$

References

[1] A. Languasco, A. Perelli, and A. Zaccagnini. On the Montgomery-Hooley theorem in short intervals. *Mathematika*, 56:231–243, 2010.