Nickolas Andersen* (nandersen@math.ucla.edu) and Eren Mehmet Kiral. Level reciprocity for modular $L$-functions.

We prove an exact formula for the second moment of Rankin-Selberg $L$-functions $L(\frac{1}{2}, f \times g)$ twisted by $\lambda_f(p)$, where $g$ is a fixed holomorphic cusp form and $f$ is summed over automorphic forms of a given level $q$. The formula is a reciprocity relation that exchanges the twist parameter $p$ and the level $q$. The method involves the Bruggeman/Kuznetsov trace formula on both ends; finally the reciprocity relation is established by an identity of sums of Kloosterman sums. (Received January 21, 2019)