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Stout-smearing and c_{SW} at one loop order

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The one-loop determination of the coefficient c_{SW} of the Wilson quark action has been useful, in conjunction with non-perturbative determinations of c_{SW} , to push the leading cut-off effects for on-shell quantities to $\mathcal{O}(\alpha^2 a)$, or eventually $\mathcal{O}(a^2)$, if no link-smearing is employed. These days it is common practice to include some link-smearing into the definition of the fermion action. Unfortunately, in this situation only the tree-level value $c_{\text{SW}}^{(0)} = 1$ is known, and cut-off effects start at $\mathcal{O}(\alpha a)$. We present some general techniques for calculating one loop quantities in lattice perturbation theory which continue to be useful for smeared-link fermion actions. Specifically, we discuss the application to the 1-loop improvement coefficient $c_{\text{SW}}^{(1)}$ for stout-smearred Wilson fermions.

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