Gasser-Leutwyler coefficients from partially quenched lattice QCD

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We present the latest results of our ongoing project to determine the Gasser-Leutwyler coefficients of the QCD chiral Lagrangian using partially quenched lattice QCD with three flavors of light dynamical quarks. We are currently studying the mass dependence of the pseudoscalar meson and can extract $2L_8 - L_5$ and $2L_6 - L_4$. Neither combination can be determined from experimental data alone. Our value of $2L_8 - L_5$ is particularly interesting because it rules out the possibility that a massless up quark is responsible for strong CP invariance. We will discuss in some detail the studies we have done to estimate the theoretical uncertainties of our simulations.

References

[1] Daniel R. Nelson, George T. Fleming and Gregory W. Kilcup, hep-lat/0112019, submitted to Phys. Rev. Lett.

[2] Daniel R. Nelson, George T. Fleming and Gregory W. Kilcup, Nucl. Phys. Proc. Suppl. **106** (2002) 221, hep-lat/0110112.