The chaotic nature of Earth's atmosphere drives weather forecasts away from reality exponentially. Even assuming perfect atmospheric state estimates, discrepancies between nature and models produce this divergence. In this presentation we demonstrate a principled approach, (called empirical correction), to the mitigation of those discrepancies. By comparing initial conditions from the past to the forecast errors they generate, the error tendencies of a model can be approximated mathematically. Those tendencies can then be counteracted at every step to reduce errors. We present the results of applying this procedure to a toy climate model representing the isolated atmospheric phenomenon of a convection cell. The results suggest that empirical correction can overcome inaccuracies in model parameters and reduce forecast error, but that certain modifications of the general correction procedure may be necessary in order to best approximate the nature of the system being modeled. Finally, we address the challenges associated with the technique's application to more realistic weather and climate models, which can have as many as one billion degrees of freedom.