1056-35-663   **David Maxwell*** (`damaxwell@alaska.edu`), Department of Mathematics and Statistics, PO Box 756660, Fairbanks, AK 99775. *A Model Problem for Conformal Parameterizations of the Einstein Constraint Equations.*

We investigate the possibility that the conformal and conformal thin sandwich (CTS) methods can be used to parameterize the set of solutions of the vacuum Einstein constraint equations. To this end we develop a model problem obtained by taking the quotient of certain symmetric data on conformally flat tori. Specializing the model problem to a three-parameter family of conformal data we observe a number of new phenomena for the conformal and CTS methods. Within this family, we obtain a general existence theorem so long as the mean curvature does not change sign. When the mean curvature changes sign we find that for certain data solutions exist if and only if the transverse-traceless tensor is sufficiently small, and that when solutions exist there are generically more than one. Moreover, the theory for mean curvatures with changing sign is shown to be extremely sensitive with respect to the value of a coupling constant in the Einstein constraint equations. (Received September 15, 2009)