Studies of four-dimensional reduction of the 11-dimensional supergravity have a long history. Many years ago Freund and Rubin pointed out that existence of 7 or 4 forms in an 11-dimensional gravity theory dynamically leads to reduction of the theory to 4 or 7 dimensions [1]. This is referred to as the Freund-Rubin reduction; it is also called the Freund-Rubin compactification because in the phenomenologically more interesting four-dimensional reduction the remaining seven dimensions are given by a compact seven-sphere S^7, with inverse of its radius being treated as a mass/energy scale parameter of the compactification. In 1986 de Wit and Nicolai showed that in the context of the Freund-Rubin reduction a consistent four-dimensional reduction of the 11-dim $\mathcal{N} = 1$ supergravity compactified on S^7 becomes the maximal 4-dim $\mathcal{N} = 8$ supergravity [2].

Explicit forms of the Freund-Rubin 4- or 7-form, as well as the corresponding potential, in 11-dim supergravity have not been known for a long time. Recently, however, a series of papers (see, *e.g.*, [3, 4, 5]) show that one can find consistent ansätze for such potentials, using an analysis of what the authors call the generalized vielbein postulate on an $E_{7(7)}/SU(8)$ coset space. The article under review should be understood as a part of such developments in deriving consistent ansätze for a 4-form field strength in 11-dim supergravity. The authors show that such 4-forms can be expressed in terms of the scalars and vectors of the 4-dim maximal supergravity and this result, in turn, provides an explicit uplift of the 4-dim supergravity to the 11-dim counterpart. The resultant form of the Freund-Rubin 4-form is rather simple and depends only on the truncated 4-dim (spacetime) coordinates. This suggests a new perspective on compactification scenarios of superstring and M theories. There are several recent papers which are closely related to this article; see, for example, [6, 7].

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