

Multidimensional Dispersionless Integrable Hierarchies and their Reductions

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The scheme of constructing differential reductions for multidimensional dispersionless integrable hierarchies is developed. The reductions are connected with a kind of twisted volume preservation condition. We consider the simplest example of the $(2+1)$ -dimensional Manakov-Santini hierarchy and the general multidimensional case. The four-dimensional case, connected with the second heavenly equation and its generalization proposed by Dunajski is studied in more detail. We also transfer the scheme for constructing differential reductions to the case of the two-component generalization of dispersionless 2DTL hierarchy. We demonstrate that the equation arising as a result of the simplest reduction is equivalent (up to a Legendre type transformation) to the Dunajski-Tod equation, locally describing general ASD vacuum metric with conformal symmetry. We consider higher reductions and corresponding reduced hierarchies also.