

Hierarchy of Conservation Laws and Potential Symmetries of Diffusion-Convection Equations

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We introduce notions of equivalence of conservation laws with respect to Lie symmetry groups for fixed systems of differential equations and with respect to equivalence groups for classes of such systems. To construct conservation laws, we apply the most direct method which is effective to use in the case of two independent variables. Admitting possibility of dependence of conserved vectors on a number of potentials and using the notions of linear dependence of conservation laws and local dependence of potentials, we generalize the iteration procedure proposed by Bluman and Doran-Wu for finding nonlocal (potential) conservation laws. As an example, we completely classify potential conservation laws (including local ones) of diffusion-convection equations with respect to the equivalence group and construct an exhaustive list of locally inequivalent potential systems corresponding to these equations. For the equations under consideration we describe all possible potential symmetries and prove a theorem on connection of them with local ones via potential equivalence transformations. It is shown that the known non-local transformations between diffusion-convection equations are, in fact, apply potential equivalence transformations.