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Guillaume Duval* (guillaume.duval@insa-rouen.fr), 1 chemin du Chateau, Les Trois Pierres, Les Trois Pierres. *Higher variational equations between Kolchin solvability and virtual Abelianity.*

In the current "Galois approach to the integrability of Hamiltonian systems", which was developed by many authors among other by Ziglin, Baider-Churchill-Rod-Singer, Morales-Ramis, one use the following implication: If the original system is Liouville integrable, then all variational equations along a particular trajectory (the VE_p , for $p \geq 1$), are linear systems with virtually Abelian Galois groups. Up to now, most authors were working with the first variational equation for two reasons : first because in practice VE_1 , gives in general very strong obstruction to the integrability of the original Hamiltonian system, secondly because the VE_p , for $p \geq 2$ are very big and complicated linear systems. In the present talk, we shall present some structural properties of these higher variational equations which allow to simplify their study. More precisely, we shall show that assuming that VE_1 is virtually Abelian, the virtual Abelianity of VE_p for $p \geq 2$, reduces to the linear dependence of some primitiv integrals of algebraic functions. This is a joint work with Andrzej Maciejewski. (Received September 05, 2011)