1032-14-51 **Adrien Dubouloz*** (Adrien.Dubouloz@u-bourgogne.fr), Institut de Mathématiques de Bourgogne, 9 avenue Alain Savary - BP 47870, 21078 Dijon, France. *Additive group actions on smooth affine surfaces and the instability of the Makar-Limanov invariant.* Preliminary report.

Normal affine surfaces S admitting nontrivial algebraic actions of the additive group $\mathbb{C}_+$ has been described by Fieseler in terms of the structure of germs of invariant neighborhoods of the fibers of the algebraic quotient morphism $q : S \to C = \operatorname{Spec}\left(\Gamma\left(S, \mathcal{O}_S\right)^{\mathbb{C}_+}\right)$. The latter morphism is an $\mathbb{A}^1$-fibration over a smooth affine curve C but, in general, it admits reducible or nonreduced fibers which prevent it to be a locally trivial $\mathbb{A}^1$-bundle.

For smooth surfaces, I will explain how to refine and re-interpret Fieseler's descriptions to construct a factorization of $q : S \to C$ through a locally trivial $\mathbb{A}^1$-bundle $\rho : S \to X$ over a smooth algebraic space X, which, in general, is not a scheme. As an application, I will give a partial answer to a question raised by Bandman and Makar-Limanov concerning the instability of the Makar-Limanov invariant of affine surfaces. Namely, I will show that over every smooth affine surface S equipped with an $\mathbb{A}^1$-fibration $q : S \to \mathbb{A}^1$ with at most one degenerate fiber, there exists an algebraic line bundle whose total space has a trivial Makar-Limanov invariant. (Received August 02, 2007)