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Section *Foliation theory*

Title: Lorentzian flows on closed 3-manifolds

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Abstract: Let us call a 1-dimensional foliation $\mathcal{F}$ on a manifold M a flow. A flow $\mathcal{F}$ is said to be Lorentzian if some Lorentzian metric on its normal bundle $\nu(\mathcal{F}) = TM/T\mathcal{F}$ is preserved by its holonomy pseudogroup. In dimension three, Y. Carrière [2] classified the Riemannian analogues of Lorentzian flows, using the Molino theory.

Three types of Lorentzian flows appear on compact 3-manifolds :

(1) Flows that are at the same time Riemannian and Lorentzian, *e. g.* circle bundles.

(2) Algebraic Anosov flows, *e. g.* the geodesic flow on the unit tangent bundle of a compact hyperbolic surface. Those flows are not Riemannian, even restricted to any (saturated) non empty open subset of M.

(3) Flows that are Riemannian on a (saturated) *non empty, proper* open subset of M.

The existence of flows of the last type shows, in a sense, that the collection of Lorentzian flows is richer than that of Riemannian ones. (More precisely, the transverse parallelism, induced on the transverse frame bundle by flows of type (3), is never complete. On the contrary, this parallelism is always complete for types (1) and (2), and for Riemannian flows). The dynamics of flows of type (3) is new; an example of such a flow is given in [1].

We will build and describe several families of flows of type (3).

References

[1] C. Boubel, P. Mounoud, C. Tarquini, Lorentzian foliations on 3-manifolds, *Ergod. Th. and Dyn. Sys.* **26** (2006), 1339—1362.

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[3] P. Molino, Riemannian Foliations. Translated from the French by Grant Cairns. With appendices by G. Cairns, Y. Carrière, É. Ghys, E. Salem and V. Sergiescu. *Progress in Mathematics* **73**, Birkhäuser, Boston, 1988.

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