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adiabatic gas motion

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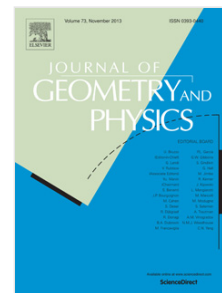
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# GEOMETRIC STRUCTURES ON SOLUTIONS OF EQUATIONS OF 3-DIMENSIONAL ADIABATIC GAS MOTION

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ABSTRACT. In this paper, we show that characteristic covectors of a system of equations of 3-dimensional adiabatic gas motion generate a geometric structure on every solution of this system.

This structure consists of a hyperplane and a non degenerate cone in every cotangent space to a solution. These hyperplane and cone intersect in zero point only.

We construct differential invariants of this structure: a vector field, a conformal structure, a Lorentzian metric, and a linear connection.

In the case of polytropic gas motion, we calculate classes of explicit solutions possessing the linear connection with zero torsion.

## 1. INTRODUCTION

In this paper, we investigate some geometric structures naturally connected with a system of equations of 3-dimensional adiabatic gas motion. In addition, we apply these structures to find explicit solutions of the system.

We show that characteristic covectors of this system form a hyperplane and a non degenerate cone in every cotangent space to an arbitrary solution  $M$  of the system. These hyperplane and cone intersect in zero point only.

Further, we show that the field

$$S : m \longmapsto \mathcal{P}(m) \cup \mathcal{C}(m), \quad m \in M,$$

of these hyperplanes and cones on  $M$  can be considered as a section of some natural bundle over  $M$ . This means that  $S$  is a geometric structure on  $M$ .

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